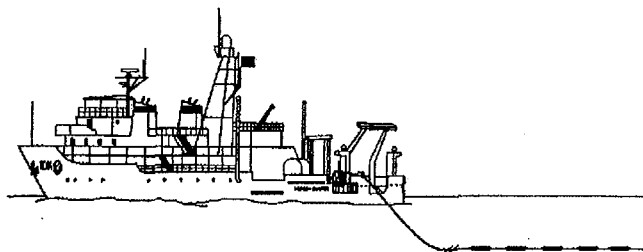




CRUISE RESULTS: NOAA SHIP *Gordon Gunter* CRUISE GU-OI-01 (11) 6
FEBRUARY - 3 APRIL 2001
MARINE MAMMAL SURVEY OF PUERTO RICO AND THE VIRGIN ISLANDS.
AND A STUDY OF SPERM WHALES IN THE SOUTHEASTERN GULF OF MEXICO

Carolyn Burks and Keith D. Mullin
Southeast Fisheries Science Center) NOAA Fisheries) Pascagoula) Mississippi

Steven I. Swartz and Anthony Martinez
Southeast Fisheries Science Center, NOAA Fisheries. Miami. Florida



U.S. DEPARTMENT OF COMMERCE
Donald I. Evans, Secretary

National Oceanic and Atmospheric Administration
Scott B. Gudes, Acting Under Secretary for Oceans and Atmosphere

NOAA Fisheries
William T. Hogarth, Acting Assistant Administrator for Fisheries

August 2001

This Technical Memorandum series is used for documentation and timely communication of preliminary results) interim reports, or similar special-purpose information. Although the memoranda are not subject to complete formal review, editorial control, or detailed editing, they are expected to reflect sound professional work.

NOTICE

NOAA Fisheries does not approve, recommend or endorse any proprietary product of material mentioned in this publication. No reference shall be made to NOAA Fisheries or to this publication furnished by NOAA Fisheries, in any advertising or sales promotion which would imply the NOAA Fisheries approves, recommends, or endorses any proprietary product or proprietary material mentioned herein or which has as its purpose any intent to cause directly or indirectly the advertised product to be used or purchased because of this NOAA Fisheries publication.

This report should be cited as follows:

Burks, C., Mullin, K.D., Swartz, S.L., and Martinez, A. CRUISE RESULTS, NOAA SHIP Gordon Gunter Cruise GU-01-01(11), 6 February - 3 April 2001, Marine Mammal Survey of Puerto Rico and the Virgin Islands, and A Study of Sperm Whales in the Southeastern Gulf of Mexico. NOAA Technical memorandum NMFS-SEFSC- ____, ___ p.

This report has an internal document number PRD-00/01-14..

Copies may be obtained by writing:

Director, Protected Resources Branch
Southeast Fisheries Science Center
NOAA Fisheries
75 Virginia Beach Drive
Miami, FL 33149

or National Technical Information Center
5825 Port Royal Road
Springfield, VA 22161
(703) 605-6000, FAX (703) 605-6900
Rush Orders: (800) 553-6847

Summary

A visual and acoustic survey for humpback whales and other marine mammals was conducted from 6 February to 14 March 2001 in the waters to the east of the Bahamas and around Puerto Rico and the Virgin Islands. This was followed by a survey for sperm whales and other marine mammals in the eastern Gulf of Mexico from 16 March to 3 April 2001. Both surveys utilized passive acoustic techniques to augment traditional visual surveys for marine mammals. The first survey (Legs 1 and 2) relied primarily on directional sonobuoys for acoustic detections of whales, while the second survey (Leg 3) primarily utilized a towed hydrophone array for detection and tracking of sperm whales. Lists of the species encountered and their distributions are presented in 11 tables and 14 figures that accompany the text. Some photographic identification photographs and biopsy samples were obtained.

CRUISE REPORT: NOAA Ship *Gordon Gunter* Cruise GU-01-01 (11), 6 February – 3 April 2001, Marine Mammal Survey of Puerto Rico AND THE Virgin Islands, and A Study of Sperm Whales in the Southeastern Gulf of Mexico

Carolyn Burks, Keith D. Mullin, Steven L. Swartz, and Anthony Martinez

INTRODUCTION

The NOAA Ship *Gordon Gunter* departed Pascagoula, Mississippi on 6 February 2001 to conduct a multiple objective marine mammal cruise in the Atlantic Ocean, Caribbean Sea and the Gulf of Mexico. During Leg 1, an attempt was made to test the capabilities and limitations of the passive acoustic equipment and techniques used during marine mammal cruises aboard the *Gordon Gunter*. This was done at the US Navy's Atlantic Undersea Test and Evaluation Center (AUTEK) in the Tongue of the Ocean, off Andros Island, Bahamas. During Leg 2 a visual and acoustic survey was conducted around Puerto Rico and the Virgin Islands under an Interagency Agreement between the Navy and National Marine Fisheries Service (NMFS). The Navy is providing support to the NMFS SEFSC's existing survey program to collect information on the seasonal abundance and trends of marine mammal populations in Puerto Rican and US Virgin Island waters, as required under the MMPA. These surveys will provide the Navy with current and reliable information on the seasonal status and distribution of marine mammals to guide in planning its operations and activities. This visual and acoustic survey was the first such survey to be conducted under this Interagency Agreement. Leg 3 was a visual and acoustic survey of sperm whales in the eastern Gulf of Mexico. It was based on a pilot study which was conducted in summer 2000 by NMFS under an Interagency Agreement with the Minerals Management Service (MMS). The pilot study was designed to answer research questions on sperm whale populations in the Gulf of Mexico. An area off the west coast of Florida was chosen for this study because concentrations of sperm whales were seen there on previous cruises. The objectives on the third leg of this cruise were to continue the pilot study and improve techniques used on the summer 2000 cruise.

OBJECTIVES

1. Test acoustic range of and calibrate the five element hydrophone array and directional (DIFAR) sonobuoy system.
2. Conduct acoustic and visual survey for humpback whales and other marine mammals along the eastern coast of the Bahama Island chain.
3. Conduct visual line-transect and acoustic surveys for distribution and abundance estimates of humpback whales and other marine mammals in Puerto Rican and Virgin Island waters.

4. Photograph and obtain biopsy samples of marine mammals in all study areas.
5. Collect data on the distribution and relative densities of seabirds and other marine life.
6. Collect associated environmental data at designated sites.
7. Deploy and retrieve two acoustic bottom recorders at designated sites.
8. Conduct visual and acoustic surveys for sperm whales and other marine mammals off western Florida between 24.0° N and 26.5° N in depths from 200 to 3000 m.
9. Attach and monitor acoustic tags placed on sperm whales off of southwest Florida.
10. Collect sloughed skin, fecal samples and behavioral data from sperm whales.

METHODS

Acoustic Array and Sonobuoy Calibration Testing (Leg 1)

This testing required that the *Gordon Gunter* be present at the AUTEK test site in the Tongue of the Ocean off Andros Island, Bahamas. The test was conducted on 10-11 February 2001 and involved the generation of known underwater sounds, at calibrated levels and in fixed locations. The *Gunter* was to have sailed past these locations on a pre-determined course towing a 5 element hydrophone array (Fig.1). These runs were conducted at various tow speeds. The acoustic team aboard the *Gunter* monitored and recorded input for the array, and placed a spread of AN-SSQ-53D directional sonobuoys (Fig. 2) at known locations. AUTEK personnel tracked the precise location of the *Gunter*, the orientation and position of the array, the position of the sound source and the position of the sonobuoys. A towed pinger assembly was attached to the array to allow for 3 dimensional tracking. A radio beacon was installed on board the *Gunter* and the sound generation vessel, the *Range Rover*, to track their positions. A network of antennas were used to triangulate the position of the sonobuoys as they drifted with wind and current. Tracking data in conjunction with recordings made from the array and sonobuoys were to be analyzed to provide measures of detection distance and detection bearing accuracy. This information would provide a better understanding the sensitivity and range of the new passive acoustic survey tools (hydrophone array and sonobuoys) on future cruises.

Visual Survey (Legs 1,2 and 3)

Cetacean visual operations were conducted using 2 teams of 3 observers during daylight hours, weather permitting (i.e., no rain, Beaufort sea state <7). Each team consisted of observers

experienced in shipboard cetacean observation and identification techniques. Two observers searched for cetaceans using 25X "bigeye" binoculars mounted on the ship's flying bridge. The third observer recorded data and maintained a search of the area near the ship using unaided eye or 7X hand-held binoculars. Data were recorded on a laptop computer using a BASIC data acquisition program interfaced with a global positioning system (GPS). Environmental data included sea surface temperature, depth, sea state, weather, wind, and glare. Cetacean sighting data included species group-size, presence of calves, bearing from the bow, linear distance from the ship, sea surface temperature, depth, behavioral observations, and presence of cookie cutter sharks bites and remoras.

As required by Research Permit No. 779-1339 issued to the SEFSC by the National Marine Fisheries Service Office of Protected Resources, data on behavioral responses of cetaceans to the survey vessel were recorded. A complete set of these responses can be obtained from the Pascagoula Laboratory (see cover address).

Acoustic Monitoring (Legs 1, 2 and 3)

The survey platform, the NOAA Ship *Gordon Gunter*, is well suited for both visual and acoustic surveys. The ship is powered by diesel-electric engines, which are acoustically quiet and produce minimal low-frequency background noise during survey operations.

Monitoring to detect humpback whale (*Megaptera novaeangliae*) songs were conducted throughout the primary survey area and opportunistically in other areas with the use of directional sonobuoys (AN-SSQ-53D)(Fig. 2). The sonobuoys contain a compass in the sensor head and transmit 3 types of continuous signal back to the ship on a VHF radio carrier in an analog multiplexed format. The signals are acoustic sound pressure, east/west particle velocity and north/south particle velocity. The frequency range is approximately 10 Hz to 4,000 Hz, which is well suited for large whale vocalizations that have their greatest sound energy concentrated below 1,000 Hz. The sonobuoys could be set to broadcast for up to 8 hrs. A second type of sonobuoy, the AN-SSQ-57-A, was also used to obtain non-directional sound recording from approximately 50 Hz to 20,000 Hz. These sonobuoys did not provide directional information, but their extended frequency range allowed the gathering of sounds from toothed whales that vocalize in higher frequency ranges. The data are important for establishing a library of species specific signature calls for identification when visual data are not available.

The VHF radio signal from the sonobuoys was received by a pair of antennas mounted on the aft mast of the ship at 85 ft above the waterline. Sonobuoy radio broadcast frequencies were chosen near the frequency band of one or the other antenna, depending on the level of radio interference present on a specific frequency band. Radio reception ranges from the sonobuoys averaged 11-13 NM, which, when the ship was running at survey speed (approximately 10 kts), allowed each sonobuoy to be monitored for approximately 1 hour and 10 minutes before the ship moved out of radio reception range. The signals from the radios were recorded at a 48 kHz sampling rate on 2-channel DAT tape recorders for processing and for archival purposes, and

were monitored in real time on PC computers running SpectraPlus¹, a commercial signal-analysis software program.

The magnetic bearing to calling animals was determined by selecting a segment of the humpback song from the sonobuoy signal, using the signal-analysis software program's spectrogram display, computed using standard sound cards. This signal was then stored as a binary file, de-multiplexed using custom software developed by Greeneridge Sciences Inc., and the 3 de-multiplexed signals were processed to yield a magnetic bearing to the sound source, using another custom software program developed by M. McDonald, Whale Acoustics, Inc. The de-multiplexing software produces a plot showing signal intensity as a function of frequency and bearing angle from 0° to 360°. The bearing accuracy to a sound source using these buoys had a standard deviation of 2°. Magnetic bearing angles to calling animals from the sonobuoys were plotted as true bearings on navigational charts to determine the direction to the calling whale relative to the position of the ship. The vagaries of acoustic propagation in the ocean made it impossible to estimate range to a calling whale by received amplitude alone. However, when the same singing whale or whales were detected on 2 or more sonobuoys with a sufficient baseline separation, it was possible to precisely locate the calling whales by crossing 2 or more bearings to determine the location of the source.

The five element towed array is a 100 m long Kevlar reinforced cable assembly with 5 high gain hydrophones, spaced at 2 m intervals along the cable (Fig. 1). Each element is a piezoelectric ceramic striped cylinder, with the cable assembly and strength member passing through the center. Each sensor, along with its associated signal conditioning, filtering, and line drive electronics, is contained within a hydrodynamically shaped tow body assembly. The frequency response is essentially flat at -127 dB from about 2 kHz to 15 kHz, then climbs to a resonance peak at about 35 kHz with a level of -121 dB, then drops behind the forward underwater connector. The aft end of the array is terminated with a similar underwater connector, which allows for testing of the array wiring and for attachment of an additional array or sensor package. This entire assembly is connected to an 800 m tow cable made from the same type cable as found in the array. This constitutes the wet end of the assembly, and it is deployed from and rewound onto a hydraulically powered winch drum with a diameter of 1.2 m. A deck cable running into the acoustics lab completes the assembly and allows for the transfer of power and signal.

Deployment and Retrieval of Autonomous Acoustic Recorders (Leg 2)

The Bioacoustics Research Program (BRP) at the Cornell University Laboratory of Ornithology provided two autonomous acoustic recorders (Pop-Ups) to monitor for whale sounds and ambient noise in the survey area. Each pop-up consists of a 17" Benthos glass sphere that

¹The use of trade names and/or commercial products in this report does not imply the endorsement of NOAA Fisheries or the authors.

contains batteries, communications electronics, and data collection electronics (DSP system with 25GB hard drive) (Fig. 3). A continuous sampling schedule was programmed for each recorder through a serial interface and PC software. Sampling rate range was set from 100 - 8,000 Hz to allow detection of low frequency whale calls as well as higher frequency dolphin and small toothed whales.

Cetacean Biopsy Sampling (Legs 2 and 3)

Biopsy samples provide information about cetaceans. From, individual identification, sex, stock identification and social organization can be determined. Blubber samples can be analyzed for a variety of contaminants.

Biopsy samples of skin and blubber were collected from selected cetaceans when possible (designated by Permit No. 779-1339). Samples were collected using a modified crossbow and a .22 caliber dart rifle. Both of these devices were fitted with specially designed biopsy heads that extract a small plug of tissue from the animals. Sampling was attempted from the bow of the *Gunter*, as well as from a small rigid-hull inflatable (RHIB) boat (R2) launched from the *Gunter*. As required by Permit No. 779-1339, data on each sampling attempt were recorded in a log book, including date, time, platform, sampler and recorder names, field number, sampling device, species, location (GPS), number of hits and misses, body location struck, behavioral reaction, and whether a sample was obtained. A complete log can be obtained from the Pascagoula Laboratory.

Sloughed Skin and Fecal Samples (Leg 3)

Sperm whales (*Physeter macrocephalus*) are known to shed skin and this skin can be used for DNA testing. Small nets and skin diving gear were kept in the R2 to collect skin. Sperm whales often defecate when diving and fecal samples can yield information about the whales diet. Nets were kept on the R2 to scoop fecal samples.

Photographic Identification (Legs 2 and 3)

Variations of dorsal hump and fluke patterns can be used to identify individual whales. Photographs were taken for this purpose and to record the biopsy collection methods during biopsy attempts.

Acoustic Tags (Leg 3)

An acoustic tagging team from Woods Hole Oceanographic Institution (WHOI) joined the cruise for the third leg. They attempted to place a suction cup-attached digital acoustic recording tag (DTAG) on sperm whales. These tags record a variety of information including a sound recording of both the whale and ambient noise, the depth and acceleration of a dive, and

the pitch and roll of the animal while wearing the tag. The tag has a maximum recording time of about 9 hrs.

Behavioral Observations (Leg 3)

Behavioral observations are a crucial element in gaining an understanding of sperm whale biology and habitat utilization. Behavioral observations were recorded on appropriate forms from the R2 during biopsy and photo id attempts. Behavior was also recorded for the *Gunter* using Sperm Count, a software program used primarily for tracking, but it can be useful for making herd size estimates and recording a variety of behavior data.

Environmental Data (Legs 1, 2 and 3)

Environmental data were collected using CTD's and XBT's. A CTD cast was made at the end of each day, and XBT's were launched at noon each day or anytime the acoustic team requested it. A host of information from shipboard sensors was accessed via the Scientific Computer System (SCS). The SCS continuously displayed and recorded to disk the ship's position, heading and speed, wind speed and direction, barometric pressure, sea surface and air temperature, and water depth.

RESULTS

Acoustic Array and Sonobuoy Testing (Leg 1)

Several attempts were made to calibrate the acoustic gear at the AUTEK Testing Range, however the AUTEK computer program that was needed for these calibrations crashed. The only alternate system that AUTEK personnel could provide was an older system that had not been in use for several years and would require at least 1 day to install. There was no guarantee that using the older system would provide all the needed information to successfully calibrate the acoustic gear, thus the decision was made to reschedule the test for another time and to continue on with the cruise.

Cetacean Visual Survey (Legs 1 and 2)

During 21 survey days, 3,268 transect km were surveyed (Table 1, Fig. 4). Daily effort ranged up to 10.9 hours/day and 198.5 km/day, and averaged 8.9 hours/day and 155 km/day (Table 1). A total of 142 cetacean groups were sighted (Leg 1, 53 groups; Leg 2, 89 groups) (Tables 2 and 3, Figs 4-9). Eleven species of cetaceans were observed during legs 1 and 2. The highest number of cetacean groups sighted on one day was 38. The most commonly sighted species were humpback whales (72 sightings), Atlantic spotted dolphins (*Stenella frontalis*) (10 sightings) and pilot whales (*Globicephala* spp.) (8 sightings).

Spinner dolphins (*Stenella longirostris*) had the largest mean group size, averaging 95 animals/group, as well as the largest overall group estimated at 130 animals. Atlantic spotted dolphins had the next largest mean group size with 22 animals per group. Pilot whales (12.5) and pantropical spotted dolphins (*Stenella attenuata*) (12.6) had very similar mean group sizes. A summary of group size, water depth and sea surface temperature for each species is presented in Table 4.

Sightings of pantropical spotted dolphins were of particular note. Although strandings of dead pantropical spotted dolphins have been recorded, this is the first record of live sightings of this species in Puerto Rican waters.

Observations were recorded on the presence of bite wounds from cookie-cutter sharks (*Isistius* spp.) on all cetaceans observed at close enough range to see the crater wounds or healed scars. Five groups representing 4 species showed evidence of cookie-cutter bites. Species that were observed with bites were spinner dolphins (2 sightings), Atlantic spotted dolphin (1 sighting) and bottlenose dolphin (*Tursiops truncatus*) (1 sighting). The presence of remoras attached to marine mammals was also recorded. Remoras were observed once on the body of one Atlantic spotted dolphin.

Acoustic Monitoring (Legs 1 and 2)

A total of 135 sonobuoys were deployed during Legs 1 and 2 along approximately 6,044 km of trackline (Table 5, Fig. 10). Of these, 112 sonobuoys (83%) detected singing humpback whales, 79 (58%) detected Atlantic "thumptrains" which are presumed to be the calls of minke whales (*Balaenoptera acoutorostrata*), and 6 (5%) detected sperm whale calls. Post cruise analysis of these data is currently in progress to verify bearings to singing whales obtained in the field, and to examine the acoustic data for additional whale calls and other biological sounds. Assessment of ambient noise including sounds from commercial and Navy vessels recorded during the survey is also underway, and a report of preliminary findings is expected by fall 2001.

Approximately 27 hrs of 5-track DAT tape recordings of ambient sounds and whale calls were obtained during the survey. Each evening following the termination of the visual surveys, the hydrophone array was towed at approximately 4 kts for optimum recording of ambient and biological sounds. The recordings and biological sounds will be compared with similar recordings obtained during daytime visual surveys to correlate specific sound signatures with confirmed species identifications. Over time such information will establish a reference library of signature sounds and calls for specific cetacean species and aid in the interpretation of recordings made in the absence of visual survey data.

A number of times during the survey DIFAR sonobuoys could not be used to record sounds near the shore of Puerto Rico due to radio and other electronic interference emanating from the island. In these instances, the vessel's speed was reduced to approximately 7 kts and the hydrophone array was used as a substitute for the sonobuoy to collect data on whale calls and

ambient noise. While the reduction in speed was a compromise for the visual survey that is normally conducted at 9-10 kts, it provided a reasonable reduction in flow noise and turbulence from the array to allow for detection and recording of biological sounds from cetaceans. Analysis of the hydrophone array tapes is currently in progress and preliminary results are expected by fall 2001.

Deployment and Retrieval of Autonomous Acoustic Recorders (Leg 2)

"Pop-up" autonomous bottom recording devices were deployed in two locations (Fig. 3). The first was in the middle of Mono Channel, approximately 15 km southwest of Desecheo Island, on 16 February 2001 in approximately 166 fm. The second was placed approximately 8 km south of Vieques Island on 17 February 2001 in approximately 296 fm. The recorder deployed off Vieques Island was recovered on 25 February 2001 having recorded for 9 days, and the recorder located off Desecheo Island was recovered on 4 March 2001 having recorded for 15 days.

Initial data analysis will be accomplished in collaboration with Cornell University's Bioacoustics Research Program who has developed analysis software routines designed for processing large volumes of data. These routines are used for automated detection of species-specific sounds [e.g., right (*Eubalaena glacialis*), fin (*Balaenoptera physalus*), humpback and sperm whales, delphinid whistles], and measurement of acoustic power at selected frequency bands. Data from both bottom recorders will be co-analyzed by scientists from the SEFSC and Cornell University during the summer of 2001 and results are expected by fall 2001.

Cetacean Biopsy Sampling (Legs 1 and 2)

Eight biopsy samples were obtained during Leg 2 of the cruise (Table 6). Sperm whales were considered a primary objective, and one skin and blubber sample was collected from a sperm whale. In addition, 3 other species were sampled including Atlantic spotted dolphin (3), bottlenose dolphin (2) and spinner dolphin (1). All samples were sent to the NOAA Fisheries Southeast Fisheries Science Center's Genetics Laboratory located at the National Ocean Service's Center for Coastal Environmental Health and Biomolecular Research (CCEHBR) at Charleston, South Carolina Laboratory for analysis and archiving.

Environmental Data Legs (1 and 2)

Seventeen profiles from the SBE 25 SeaLogger CTD and 29 XBT profiles were collected. These data as well as data from the ship's SCS, were returned to the NMFS Pascagoula Laboratory for analysis, editing, comparison, and archiving.

Leg 3 - Summary of Daily Activities

16 March - Departed Key West, Florida at 1530.

17 March - Sperm whales were found at about noon in good weather (Sea State 3) and the *R2* was launched to collect biopsies, photo-id pictures, and to test the receiving range of the DTAG.

18 March - Sperm whales were found at 1000 hr, but the seas were too rough to launch the *R2*. Seas calmed down about 1200 and the *R2* was launched to attempt to attach a DTAG.

There was a 4-6 foot swell that prevented the *R2* from going fast. The whales were traveling south, and due to the swell a tagging attempt could not be made. However, photo-id pictures were taken.

19 March - The *R2* was launched in very marginal weather to attempt a tagging. Many sperm whales were in the area, but due to weather close approaches were not possible. Finally heavy rain and high winds forced the *R2* to return to the Gunter.

20-23 March - The winds were 20-30 knots and seas 8-10 feet. The conditions were not suitable for sperm whale behavioral studies or *R2* operations. Therefore, oceanographic sampling of the Tortugas Gyre was conducted with XBTs and the CTD. The acoustic array was deployed and monitored during the day throughout this period.

23 March - The winds were about 10 knots and the skies were clear. Sighting conditions were excellent, but no sperm whales could be found either visually or acoustically. The array was monitored until 2300 hours.

24 March - Sperm whales were located around 1200 and the *R2* was launched to tag. Attempted tagging with no success until dark, but photo-id pictures were collected.

25 March - Sperm whales were acoustically tracked throughout the night. The *R2* was launched about 0730 and tagging was attempted until 1800. Sperm whale behavior was the same all day long. They would tolerate moderately close approaches but would fluke up well before a tagging attempt could be made. Many photo-id pictures were taken.

26 March - Sperm whales were acoustically tracked throughout the night. *R2* was in the water from 0730 to 1600 to collect biopsy samples. Seven biopsies were collected. Winds picked up to 15 plus knots and we ran south all night to attempt to find calmer conditions.

27 March - Winds 10-15 knots all day. Good conditions but could not find any sperm whales during daylight. At sunset, the ship headed back to where sperm whales were seen the first day and some were finally detected acoustically about 2100.

28 March - Sperm whales were tracked all night. Launched the *R2* at 0800 to tag in 15 knots of wind and 5 foot swells. Decided it was too dangerous to tag at 1130. Attempted biopsy sampling until 1400.

29 March - Conducted acoustic sampling of the Tortugas Valley due to very rough seas.

30 March - Heavy rain and winds prevented effort most of the day. Some visual effort was attempted. Calibration experiments of the acoustic array were conducted.

31 March - Listened for sperm whale acoustically all night but did not hear any. The weather was excellent (5 knot winds) all day and sperm whales were found about 0930 visually. Attempted tagging from 1030-1800. Many photo-id pictures were taken and there were three good tagging attempts, but no tag was attached.

1 April - Sperm whales were tracked throughout the night but lost at 0500. They were found again visually at 0900 and attempted biopsy sampling was conducted all day. Two biopsies were collected.

2 April - Sea state was very rough with wind increasing throughout the day to 25 knots. Visual and acoustic searches were conducted until 1600.

3 April - Arrive in Pascagoula at 0800.

Cetacean Sightings (Leg 3)

While sperm whales were the focus of Leg 3, eleven cetacean species and 60 cetacean groups were sighted while searching for or observing sperm whales (Tables 7, 8 and 9; Figs. 11-13).

Acoustic Monitoring (Leg 3)

During Leg 3 the method for acoustic monitoring changed to the 5 element towed hydrophone array as the primary tool. The objectives were to localize an individual or group of sperm whales as efficiently as possible in conjunction with the visual teams, maintain acoustic contact with the animal(s) through the day and night, and to make high fidelity recordings of all marine mammal species encountered if time and circumstance allowed.

A wide array of software was used throughout the leg. The program "Ishmael", written by D. Mellinger, in conjunction with the towed array, was the chief tool used by the acoustics team to find and track sperm whales. SpectraPlus was used to display data from the array, an active sonobuoy or from hard disk files. SpectraPlus also allowed easy recording to hard disk, though limited in bandwidth. The program "Record", written by J. Barlow of the NOAA Fisheries Southwest Fisheries Science Center (SWFSC), was used to make high frequency recordings to hard disk. "Rainbow Click", written by D. Gillespie of the International Fund for Animal Welfare (IFAW), assisted with locating and tracking sperm whales, especially late into the night. "WhaleTrak", also by J. Barlow, was linked with "Ishmael" and real-time GPS data to provide a graphical display of bearing information and as a means of keeping a log of acoustic activity.

Recordings of sperm whales, other marine mammals, and anthropogenic sounds were made on various media during this leg. In general, recordings from the towed array were made with a TASCAM 8-track digital tape recorder. Recordings from sonobuoys were made on a Sony 2-track DAT recorder or on open tracks on the 8-track tapes. Additionally, when high frequency (> 24 kHz) recordings were needed, 1-track recordings from the towed array were made to the hard disk drive of a PC. These hard disk recordings cover a range from 1kHz to 75kHz. A total of seventeen DTRS (8-track) tapes and one DAT (2-track) tape were recorded on leg three. Thirty-five individual high frequency hard disk recordings (HDR) were also made during this time.

Nine identified species of marine mammals were recorded during Leg 3 (Table 10). The following table outlines the various species and types of recordings collected. Several recordings

of anthropogenic sound were also made during Leg 3. Among these were examples of seismic exploration activity and the sound of a supertanker transiting the Gulf of Mexico.

A click detection distance test was conducted in an effort to help quantify the maximum range at which a sperm whale click could be heard and reliably used for localization of the animal. After ending work with a group of sperm whales on the 18 March 2001, the *Gordon Gunter* proceeded on a course that would take her away from the clicking animals in a direction perpendicular to the group's general direction of movement. Group size was acoustically estimated at between 3 to 6 individuals. Initially, speed over ground was 5.5 knots (kts). Unfortunately, rainsqualls kept moving past the area, raising ambient noise levels. At a distance of roughly 3 nautical miles from the starting point, bearing generation became erratic. The ship was slowed to 3 kts in an attempt to improve the generation of bearings to the clicks. This did not seem to help and a 90-degree turn was executed. Putting the array roughly broadside to the group did not help gain steadier bearings.

The towed array was instrumented with a time depth recorder (TDR) for calibration of array depth versus tow speed on the 27 March 2001. On the 30 March 2001, the array was again instrumented but this time with two digital recording tags (DTAG). These tags provided precise depth and orientation at two locations along the array. During both of these episodes, a series of speed and course changes were performed. Careful note was made of the timing of these changes so that they may be matched up with the depth and orientation data provided by the TDR and DTAG. The analysis of this data will help to shed light on the dynamics of the array as it is towed through the water.

Cetacean Biopsy Sampling (Leg 3)

Twenty-five biopsy samples were obtained during Leg 3 (Table 11). Sperm whale samples were the main objective. Fifteen skin and blubber samples were collected from sperm whales (Figure 19). Samples were obtained from 6 other species including Atlantic spotted dolphin (1), pantropical spotted dolphin (3), false killer whale (1), melon-headed whale (3) and spinner dolphin (2) (Figure 14).

Environmental Data (Leg 3)

Four profiles from the SBE 25 SeaLogger CTD and 29 XBT profiles were collected. These data as well as data from the ship's SCS, were returned to the NMFS Pascagoula Laboratory for analysis, editing, comparison, and archiving.

CRUISE GU-01-01 (11) PARTICIPANTS

Leg 1 (6 February - 19 February 2001)

Carolyn Burks	Chief Scientist	NMFS, Pascagoula, MS
Steven Swartz	Principal Investigator	NMFS, Miami, FL
Tony Martinez	Acoustics/Biopsy	NMFS, Miami, FL
Jack Stamates	Acoustics	AOML, Miami, FL
Bret Elkind	Acoustics	AOML, Miami, FL
Aaron Thode	Acoustics	MIT, Boston, MA
Kathy Foley	Visual Observer	JCWS, Pascagoula, MS
Joe Contillo	Visual Observer	NMFS, Miami, FL
Grisel Rodriguez	Visual Observer	UPR, Cabo Rojo, Puerto Rico
Diana Mora	Visual Observer	UPR, Lajas, Puerto Rico
Marta Rodriguez	Visual Observer	UM, San Juan, Puerto Rico
Mayela Alsina	Visual Observer	UM, San Juan, Puerto Rico
Vera Rosado	Visual Observer	UM, San Juan, Puerto Rico
Suranahi Buglass	Visual Observer	Dominican Republic
Lanora Lang	Environmental Technician	JCWS, Pascagoula, MS

Leg 2 (21 February - 14 March 2001)

Carolyn Burks	Chief Scientist	NMFS, Pascagoula, MS
Steve Swartz	Principal Investigator	NMFS, Miami, FL
Tony Martinez	Acoustics/Biopsy	NMFS, Miami, FL
Jack Stamates	Acoustics	AOML, Miami, FL
Paul Damman	Acoustics	AOML, Miami, FL
Erin Oleson	Acoustics	Scripps, La Jolla, CA
Carrie Hubard	Visual Observer	NMFS, Pascagoula, MS
Andre Debose	Visual Observer	NMFS, Pascagoula, MS
Grisel Rodriguez	Visual Observer	UPR, Cabo Rojo, Puerto Rico
Diana Mora	Visual Observer	UPR, Lajas, Puerto Rico
Tony Mignucci	Acoustics	UM, San Juan, Puerto Rico
Maria Cardona	Visual Observer	UM, San Juan, Puerto Rico
Liza Guzman	Visual Observer	UM, San Juan, Puerto Rico
Jose Perez	Visual Observer	UM, San Juan, Puerto Rico
Eric Zolman	Visual Observer/Biopsy	NOS, Charleston, SC

Leg 3 (16 March - 3 April 2001)

Keith Mullin	Chief Scientist	NMFS, Pascagoula, MS
Wayne Hoggard	Biopsy	NMFS, Pascagoula, MS
Tony Martinez	Acoustics/Biopsy	NMFS, Miami, FL
Kathy Foley	Visual Observer	JCWS, Pascagoula, MS
Karen Mitchell	Visual Observer	NMFS, Pascagoula
Julie Oswald	Acoustics	Scripps Institute, San Diego, CA
Kathy Hough	Visual Observer	JCWS, La Jolla, CA
Joy Henne	Visual Observer	JCWS, New Mexico
Todd Pusser	Visual Observer	JCWS, North Carolina
Jenny Litz	Visual Observer	Contract, Miami, FL
Dan Engelhaupt	Biopsy/Genetics	University of Durham, England
Jules Craynock	Acoustics	AOML, Miami, FL
Patrick Miller	Tagging	WHOI, Woods Hole, MA
Nicoletta Biassoni	Tagging	WHOI, Woods Hole, MA
Mark Johnson	Tagging	WHOI, Woods Hole, MA

Submitted by:

Approved by:

Carolyn M. Burks
Field Party Chief

Scott Nichols, Director
Mississippi Laboratories

Nancy Thompson, Acting Director
Southeast Fisheries Science Center

List of Tables:

Table 1. Effort, Beaufort sea state, and number of sightings for each day during Legs 1 and 2 of the NOAA Ship *Gordon Gunter* Cruise GU-01-01(11), February 6 - March 14, 2001.

Table 2. Number of cetacean group sightings during Legs 1 and 2 of the NOAA Ship *Gordon Gunter* Cruise GU-01-01(11) conducted in the Atlantic Ocean and Caribbean Sea, February 6 - March 14, 2001.

Table 3. Summary of cetacean sightings during Legs 1 and 2 of the NOAA ship *Gordon Gunter* Cruise GU-01-01(11) in the Atlantic and Caribbean Sea, February 6 - March 14, 2001 (S = effort status of sighting, SST = Sea Surface Temperature).

Table 4. Number of groups (n), mean group size, water depth, and sea surface temperature for cetacean sightings in the Atlantic and Caribbean Sea during Legs 1 and 2 of the NOAA Ship *Gordon Gunter* Cruise GU-01-01(11), February 6 - March 14, 2001.

Table 5. DIFAR sonobuoys deployed during Legs 1 and 2 of the NOAA Ship *Gordon Gunter* Cruise GU-01-01(11) conducted in the Atlantic and Caribbean Sea, February 6 - March 14, 2001.

Table 6. Summary of biopsy tissue samples collected during Legs 1 and 2 of the NOAA Ship *Gordon Gunter* Cruise GU-01-01(11) in the Atlantic and Caribbean Sea, February 6 - March 14, 2001.

Table 7. Number of cetacean group sightings for Leg 3 of NOAA Ship *Gordon Gunter* Cruise GU-01-01(11) conducted in the Gulf of Mexico, March 16 - April 3, 2001.

Table 8. Number of groups (n), mean group size, water depth, and sea surface temperature for cetacean sightings in the Gulf of Mexico during Leg 3 of NOAA Ship *Gordon Gunter* Cruise GU-01-01(11), March 16 - April 3, 2001.

Table 9. Summary of cetacean sightings during Leg 3 of the NOAA Ship *Gordon Gunter* Cruise GU-01-01(11) in the Gulf of Mexico March 16 - April 3, 2001 (S = effort status of sighting, SST = Sea Surface temperature).

Table 10. Cetaceans recorded during Leg 3 of the NOAA Ship *Gordon Gunter* Cruise GU-01-01(11), in the Gulf of Mexico, March 16 - April 3, 2001.

Table 11. Summary of biopsy tissue samples collected during Leg 3 of the NOAA Ship *Gordon Gunter* Cruise GU-01-01(11) in the Gulf of Mexico, March 16 - April 3, 2001.

List of Figures:

Figure 1. Five-element hydrophone array utilized during the NOAA Ship *Gordon Gunter* Cruise GU-01-01(11). Total length when deployed was 250 m.

Figure 2. Typical DIFAR directional sonobuoy utilized during the NOAA Ship *Gordon Gunter* Cruise GU-01-01(11).

Figure 3. "Pop-up" autonomous bottom recorder developed by C. Clark of Cornell University's Bioacoustics Research Program. Two of these units were tested during the NOAA Ship *Gordon Gunter* Cruise GU-01-01(11).

Figure 4. On-effort (bold lines) visual sightings of dolphins during Leg 2 of the NOAA Ship *Gordon Gunter* Cruise GU-01-01(11): *Steno bredanensis* (open star, n = 1); *Tursiops truncatus* (open triangle, n = 2); *Stenella attenuata* (closed circles, n = 3); *Stenella frontalis* (closed squares, n = 10); *Stenella longirostris* (open circles, n = 2).

Figure 5. On-effort (bold lines) sightings of odontocete whales during Leg 2 of the NOAA Ship *Gordon Gunter* Cruise GU-01-01(11): *Physeter macrocephalus* (closed circles, n = 6); *Ziphius spp.* (closed circles, n = 3); *Mesoplodon spp.* (closed squares, n = 3); *Pseudorca crassidens* (closed star, n = 1); *Globicephala spp.* (open circles, n = 8).

Figure 6. On-effort (bold lines) sightings of humpback whales (triangles, n = 32 sightings of 51 whales) during Leg 1 of the NOAA Ship *Gordon Gunter* Cruise GU-01-01(11) along the eastern and southern sides of the Bahamas south to Navidad Bank, showing locations of sonobuoys with magnetic bearings to singing humpback whales (circles with radials) along the survey trackline (thin line).

Figure 7. On-effort (bold lines) sightings of humpback whales (triangles) during Leg 2 of the NOAA Ship *Gordon Gunter* Cruise GU-01-01(11) to the north of Puerto Rico and the Virgin Islands showing the location of sonobuoys and magnetic bearings to singing humpback whales (circles with radials) along the survey trackline.

Figure 8. On-effort (bold lines) sightings of humpback whales (triangles) during NOAA Ship *Gordon Gunter* Cruise GU-01-01(11) to the south of Puerto Rico and the Virgin Islands showing the location of sonobuoys with magnetic bearings to singing humpback whales (circles with radials) along the survey trackline.

Figure 9. On-effort (bold lines) sightings of humpback whales (triangles) during NOAA Ship *Gordon Gunter* Cruise GU-01-01(11) to the west, northwest, and southwest of Puerto Rico showing the location of sonobuoys with magnetic bearings to singing humpback whales (circles with radials) along the survey trackline.

Figure 10. Location of sonobuoys (circles, n = 135) and sonobuoys that detected Atlantic Thumptrains (triangles, n = 79) deployed during Legs 1 and 2 of the NOAA Ship *Gordon Gunter* Cruise GU-01-01(11) along the survey trackline.

Figure 11. Location of sperm whale sightings (circles, n = 11) during Leg 3 of the NOAA Ship *Gordon Gunter* Cruise GU-01-01(11) showing the 100 fathom and 1,000 fathom depth contours.

Figure 12. Location of odontocete whale sightings other than sperm whales during Leg 3 of the NOAA Ship *Gordon Gunter* Cruise GU-01-01(11) showing the 100 fathom and 1,000 fathom depth contours: + = *Peponocephala electra*, n = 1; ★ = *Grampus griseus*, n = 5; ▲ = *Ziphius sp.*, n = 4; ■ = *Pseudorca crassidens*, n = 1; □ = *Mesoplodon sp.*, n = 2; ○ = Unidentified cetacean.

Figure 13. Location of *Stenella* dolphin sightings during Leg 3 of the NOAA Ship *Gordon Gunter* Cruise GU-01-01(11) showing the 100 fathom and 1,000 fathom depth contours. ○ = *Stenella attenuata*, n = 18; ■ = *Stenella frontalis*, n = 1; ▲ = *Stenella coeruleoalba*, n = 1; + = *Stenella longirostris*, n = 2.

Figure 14. Locations where biopsy samples were obtained during Leg 3 of the NOAA Ship *Gordon Gunter* Cruise GU-01-01(11) showing the 100 fathom and 1,000 fathom depth contours. ▲ = *Physeter macrocephalus*, n = 15; □ = *Pseudorca crassidens*, n = 1; ○ = *Stenella sp.*, n = 6; + = *Peponocephala electra*, n = 3.

Table 1. Effort, Beaufort sea state, and number of sightings for each day during Legs 1 and 2 of the NOAA Ship *Gordon Gunter* Cruise GU-01-01(11), February 6 - March 14, 2001.

Leg Date	Effort Hours	Transect Kilometers	Average Sea State	Number of Sightings
<u>Leg 1</u>				
06 February	Depart Pascagoula			
07 February	Transit			
08 February	Transit			
09 February	Transit			
10 February	8.5	139.6	3.4	1
11 February	Arrive AUTEK			
12 February	AUTEK			
13 February	Depart AUTEK			
14 February	4.9	76.6	5.4	0
15 February	9.5	160.1	4.6	38
16 February	8.9	141.9	4.5	5
17 February	9.6	173.3	3.6	6
18 February	9.7	183.0	3.9	3
19 February	Arrive San Juan			
Total	51.1	874.5	3.2	44
<u>Leg 2</u>				
22 February	Depart San Juan			
	10.7	180.8	5.0	1
23 February	10.3	191.6	4.2	4

continued

Leg Date	Effort Hours	Transect Kilometers	Average Sea State	Number of Sightings
24 February	10.0	185.9	4.3	1
25 February	6.7	118.6	5.0	0
26 February	10.9	198.5	5.0	1
27 February	8.0	139.8	4.8	4
28 February	9.0	150.3	3.1	10
01 March	8.5	153.4	2.6	5
02 March	9.0	147.2	2.7	13
03 March	10.4	186.8	4.0	5
04 March	7.7	118.2	3.7	8
05 March	10.8	184.5	3.3	4
06 March	7.3	129.1	1.9	10
07 March	8.3	140.4	3.2	11
08 March	9.2	168.7	3.2	6
09 March	Arrive San Juan			
10 March	Depart San Juan			
11 March	Transit			
12 March	Transit			
13 March	Transit			
14 March	Arrive Key West			
Total	136.8	2393.8	3.7	83
TOTAL	187.9	3268.3	4.0	127

Table 2. Number of cetacean group sightings during Legs 1 and 2 of the NOAA Ship *Gordon Gunter* Cruise GU-01-01(11) conducted in the Atlantic Ocean and Caribbean Sea, February 6 - March 14, 2001.

Species	Leg 1	Leg 2	Total
Humpback whale (<i>Megaptera novaeangliae</i>)	35	37	72
Sperm whale (<i>Physeter macrocephalus</i>)	2	4	6
Cuvier's beaked whale (<i>Ziphius cavirostris</i>)	0	1	1
Unidentified beaked whale (<i>Mesoplodon</i> spp.)	0	3	3
False killer whale (<i>Pseudorca crassidens</i>)	0	1	1
Pilot whale (<i>Globicephala</i> spp.)	2	6	8
Rough-toothed dolphin (<i>Steno bredanensis</i>)	1	0	1
Bottlenose dolphin (<i>Tursiops truncatus</i>)	1	1	2
Unidentified <i>Stenella</i> (<i>Stenella</i> spp.)	0	1	1
Pantropical spotted dolphin (<i>Stenella attenuata</i>)	2	1	3
Atlantic spotted dolphin (<i>Stenella frontalis</i>)	0	10	10
Spinner dolphin (<i>Stenella longirostris</i>)	0	2	2
Unidentified dolphin	2	9	11
Unidentified small whale	0	3	3

continued

Species	Leg 1	Leg 2	Total
Unidentified large whale	8	5	13
Unidentified ziphiid	0	2	2
Unidentified odontocete	0	3	3
TOTAL	53	89	142

Table 3. Summary of cetacean sightings during Legs 1 and 2 of the NOAA Ship *Gordon Gunter* Cruise GU-01-01(11) in the Atlantic and Caribbean Sea, February 6 - March 14, 2001 (S = effort status of sighting, SST = Sea surface temperature).

Date	Species	Group	Position	SST (°C)	Depth (m)	S
2001 Feb 10	<i>Physeter macrocephalus</i>	1	26°03' 78°29'	24.6	672	on
2001 Feb 11	<i>Globicephala sp.</i>	19	24°41' 77°39'	24.2	1244	off
2001 Feb 15	<i>Megaptera novaeangliae</i>	1	21°06' 70°14'	25.9	4141	on
2001 Feb 15	<i>Megaptera novaeangliae</i>	1	21°04' 70°09'	25.9	3157	on
2001 Feb 15	<i>Megaptera novaeangliae</i>	1	21°00' 70°01'	25.9	2086	on
2001 Feb 15	<i>Megaptera novaeangliae</i>	2	21°00' 70°00'	26.0	2086	
2001 Feb 15	<i>Megaptera novaeangliae</i>	2	21°00' 70°01'	26.0	2086	on
2001 Feb 15	<i>Megaptera novaeangliae</i>	2	20°58' 69°58'	26.0	2086	on
2001 Feb 15	<i>Megaptera novaeangliae</i>	1	20°58' 69°57'	26.0	2086	on
2001 Feb 15	<i>Megaptera novaeangliae</i>	1	20°58' 69°56'	26.0	2086	on
2001 Feb 15	<i>Megaptera novaeangliae</i>	2	20°57' 69°56'	26.0	2086	on
2001 Feb 15	<i>Megaptera novaeangliae</i>	1	20°55' 69°51'	26.0	1281	on
	<i>Megaptera novaeangliae</i>	1				
2001 Feb 15	<i>Megaptera novaeangliae</i>	1	20°55' 69°50'	26.0	1281	on
2001 Feb 15	<i>Megaptera novaeangliae</i>	1	20°54' 69°49'	26.0	1281	on
2001 Feb 15	<i>Megaptera novaeangliae</i>	1	20°54' 69°49'	26.0	1281	on
2001 Feb 15	<i>Megaptera novaeangliae</i>	2	20°54' 69°48'	26.0	1281	on
2001 Feb 15	<i>Megaptera novaeangliae</i>	1	20°53' 69°48'	26.0	1281	
2001 Feb 15	<i>Megaptera novaeangliae</i>	1	20°53' 69°48'	26.0	1281	on
2001 Feb 15	<i>Megaptera novaeangliae</i>	2	20°52' 69°45'	26.0	1601	
2001 Feb 15	<i>Megaptera novaeangliae</i>	1	20°50' 69°41'	26.0	1491	on
2001 Feb 15	<i>Megaptera novaeangliae</i>	1	20°50' 69°40'	26.0	1669	on
2001 Feb 15	Unidentified large whale	1	20°48' 69°37'	26.0	1669	
2001 Feb 15	<i>Megaptera novaeangliae</i>	1	20°46' 69°34'	26.1	3020	on
2001 Feb 15	<i>Megaptera novaeangliae</i>	1	20°46' 69°32'	26.1	3221	on
2001 Feb 15	<i>Megaptera novaeangliae</i>	1	20°38' 69°18'	26.1	2626	on
2001 Feb 15	<i>Megaptera novaeangliae</i>	1	20°38' 69°16'	26.1	2626	on
2001 Feb 15	Unidentified large whale	1	20°32' 69°10'	26.0	2582	

continued

Date	Species	Group	Position	SST (°C)	Depth (m)	S
2001 Feb 15	<i>Megaptera novaeangliae</i>	4	20°32' 69°10'	26.0	2582	on
2001 Feb 15	<i>Megaptera novaeangliae</i>	2	20°29' 69°08'	26.0	2167	on
2001 Feb 15	<i>Megaptera novaeangliae</i>	1	20°28' 69°06'	26.1	185	on
2001 Feb 15	<i>Megaptera novaeangliae</i>	4	20°27' 69°05'	26.1	185	on
2001 Feb 15	<i>Megaptera novaeangliae</i>	2	20°22' 69°00'	26.3	1610	on
2001 Feb 15	<i>Megaptera novaeangliae</i>	1	20°14' 68°51'	26.3	1098	on
2001 Feb 15	Unidentified large whale	1	20°13' 68°49'	26.3	1098	
2001 Feb 15	Unidentified large whale	1	20°12' 68°49'	26.0	1034	
2001 Feb 15	Unidentified large whale	1	20°11' 68°47'	26.3	1007	
2001 Feb 15	Unidentified large whale	1	20°11' 68°48'	26.3	1007	
2001 Feb 15	<i>Megaptera novaeangliae</i>	1	20°11' 68°48'	26.3	1007	
2001 Feb 16	Unidentified large whale	2	18°21' 67°44'	26.6	337	
2001 Feb 16	<i>Megaptera novaeangliae</i>	1	18°18' 67°41'	26.5	2776	on
2001 Feb 16	Unidentified large whale	2	18°14' 67°37'	26.5	377	
2001 Feb 16	<i>Megaptera novaeangliae</i>	1	18°04' 67°28'	26.6	293	
2001 Feb 16	<i>Stenella attenuata</i>	5	18°01' 67°25'	26.8	655	
2001 Feb 17	Unidentified dolphin	2	18°29' 65°09'	26.0	51	
2001 Feb 17 on	<i>Megaptera novaeangliae</i>	2	18°31' 65°08'	26.0	55	
2001 Feb 17 on	<i>Megaptera novaeangliae</i>	2	18°33' 65°05'	26.1	68	
2001 Feb 17 on	Unidentified dolphin	1	18°45' 64°47'	26.0	68	
2001 Feb 17 on	<i>Physeter macrocephalus</i>	7	18°59' 64°48'	26.5	3294	
2001 Feb 17 on	<i>Tursiops truncatus</i>	3	18°58' 65°07'	26.5	2837	
2001 Feb 18 on	<i>Globicephala</i> sp.	7	19°01' 65°18'	26.1	3660	
2001 Feb 18 on	<i>Stenella attenuata</i>	18	19°14' 65°27'	26.0	7137	
	<i>Steno bredanensis</i>	3				
2001 Feb 18	Unidentified ziphiidae	1	19°15' 65°31'	26.3	6588	
2001 Feb 22	<i>Megaptera novaeangliae</i>	2	20°34' 64°43'	26.1	5033	

continued

Date	Species	Group	Position	SST (°C)	Depth (m)	S
2001 Feb 23	<i>Physeter macrocephalus</i>	1	20°25' 64°20'	26.1	4758	
2001 Feb 23	Unidentified dolphin	3	19°46' 65°02'	26.0	6954	
	<i>Globicephala</i> sp.	10				
2001 Feb 23	<i>Megaptera novaeangliae</i>	2	19°43' 65°09'	26.2	6863	on
2001 Feb 24	<i>Stenella frontalis</i>	12	17°22' 66°07'	26.6	4443	
2001 Feb 26	<i>Mesoplodon</i> sp.	1	16°04' 65°46'	26.4	4451	
2001 Feb 27	<i>Stenella frontalis</i>	25	16°19' 66°11'	26.4	4357	
2001 Feb 27	<i>Stenella frontalis</i>	22	16°45' 66°19'	26.6	4379	
2001 Feb 27	<i>Physeter macrocephalus</i>	5	17°03' 66°24'	26.7	4575	
2001 Feb 27	Unidentified dolphin	2	17°05' 66°21'	26.6	4548	
2001 Feb 28	<i>Stenella frontalis</i>	37	17°33' 66°33'	26.5	3338	
2001 Feb 28	Unidentified ziphiidae	1	17°44' 66°36'	26.9	1493	
2001 Feb 28	Unidentified dolphin	1	17°46' 66°37'	26.9	1493	
2001 Feb 28	<i>Tursiops truncatus</i>	9	17°51' 66°39'	27.1	447	
	<i>Stenella frontalis</i>	1				
2001 Feb 28	<i>Stenella frontalis</i>	20	7°52' 66°43'	26.9	1007	
	<i>Stenella</i> sp.	2				
2001 Feb 28	<i>Stenella frontalis</i>	15	17°49' 66°48'	27.2	1135	
2001 Feb 28	Unidentified small whale	1	17°45' 66°52'	27.3	1739	
2001 Feb 28	Unidentified dolphin	1	17°43' 66°53'	26.0	2233	
2001 Feb 28	<i>Stenella attenuata</i>	15	17°38' 67°00'	25.5	3038	
2001 Mar 01	<i>Globicephala</i> sp.	6	17°33' 67°06'	26.0	3825	
2001 Mar 01	Unidentified large whale	1	17°26' 67°07'	25.7	3488	
2001 Mar 01	<i>Stenella frontalis</i>	12	17°20' 67°15'	26.4	3967	
2001 Mar 01	<i>Pseudorca crassidens</i>	9	17°30' 67°43'	26.8	3065	
2001 Mar 01	<i>Mesoplodon</i> sp.	1	17°43' 67°28'	27.0	2471	
2001 Mar 02	<i>Megaptera novaeangliae</i>	3	17°57' 67°25'	26.5	717	
2001 Mar 02	<i>Stenella longirostris</i>	130	17°57' 67°25'	26.5	831	
2001 Mar 02	<i>Megaptera novaeangliae</i>	3	18°03' 67°26'	26.4	210	
2001 Mar 02	<i>Megaptera novaeangliae</i>	1	18°05' 67°26'	26.4	179	
2001 Mar 02	Unidentified large whale	1	18°03' 67°42'	26.7	699	
2001 Mar 02	Unidentified large whale	1	18°04' 67°45'	27.9	578	
2001 Mar 02	<i>Stenella frontalis</i>	25	18°04' 67°45'	26.0	699	

continued

Date	Species	Group	Position	SST (°C)	Depth (m)	S
2001 Mar 02	<i>Megaptera novaeangliae</i>	2	18°07' 67°48'	26.7	518	
2001 Mar 02	<i>Megaptera novaeangliae</i>	1	18°10' 67°53'	26.8	273	
2001 Mar 02	Unidentified large whale	1	18°07' 68°00'	26.7	536	
2001 Mar 02	<i>Physeter macrocephalus</i>	4	18°06' 68°01'	26.6	798	
2001 Mar 02	<i>Physeter macrocephalus</i>	2	18°01' 67°59'	26.0	904	
2001 Mar 02	Unidentified large whale	2	17°56' 68°05'	26.6	4227	
2001 Mar 03	<i>Megaptera novaeangliae</i>	4	18°30' 68°14'	26.0	110	
2001 Mar 03	<i>Megaptera novaeangliae</i>	1	18°32' 68°11'	26.5	178	
2001 Mar 03	<i>Megaptera novaeangliae</i>	3	18°32' 68°11'	26.4	178	
2001 Mar 03	<i>Megaptera novaeangliae</i>	2	18°32' 68°03'	26.6	86	
2001 Mar 03	<i>Megaptera novaeangliae</i>	10	18°32' 68°08'	26.6	59	
2001 Mar 04	<i>Globicephala</i> sp.	20	18°21' 67°35'	26.0	796	
2001 Mar 04	Unidentified dolphin	4	18°20' 67°27'	26.7	844	
2001 Mar 04	Unidentified dolphin	9	18°20' 67°23'	27.1	604	
2001 Mar 04	<i>Megaptera novaeangliae</i>	3	18°23' 67°17'	26.6	254	
2001 Mar 04	<i>Megaptera novaeangliae</i>	3	18°32' 67°10'	26.6	59	
2001 Mar 04	<i>Megaptera novaeangliae</i>	1	18°32' 67°07'	26.4	55	
2001 Mar 04	<i>Megaptera novaeangliae</i>	1	18°35' 67°03'	26.5	361	
2001 Mar 04	<i>Megaptera novaeangliae</i>	1	18°39' 67°09'	26.3	1098	
2001 Mar 05	Unidentified small whale	1	18°49' 67°23'	26.2	4992	
2001 Mar 05	<i>Ziphius cavirostris</i>	3	18°52' 66°56'	26.5	2837	
2001 Mar 05	<i>Megaptera novaeangliae</i>	2	18°47' 66°53'	26.0	2681	on
2001 Mar 05	<i>Globicephala</i> sp.	15	18°36' 66°43'	26.0	1336	on
2001 Mar 06	<i>Globicephala</i> sp.	14	18°38' 66°42'	26.3	1546	on
2001 Mar 06	Unidentified odontocete	1	18°46' 66°18'	26.8	2180	
2001 Mar 06	Unidentified odontocete	2	18°44' 66°16'	27.7	1837	
2001 Mar 06	<i>Megaptera novaeangliae</i>	4	18°42' 66°11'	27.7	1636	on
2001 Mar 06	<i>Stenella frontalis</i>	54	18°39' 66°06'	27.4	1385	on
2001 Mar 06	Unidentified dolphin	4	18°39' 66°01'	27.1	1290	
2001 Mar 06	<i>Megaptera novaeangliae</i>	2	18°37' 65°58'	27.1	1096	on
2001 Mar 06	<i>Stenella longirostris</i>	60	18°33' 65°48'	27.0	759	on
2001 Mar 06	<i>Megaptera novaeangliae</i>	2	18°32' 65°48'	27.0	728	off
2001 Mar 06	Unidentified odontocete	1	18°31' 65°47'	27.0	620	on

continued

Date	Species	Group	Position	SST (°C)	Depth (m)	S
2001 Mar 07	<i>Megaptera novaeangliae</i>	2	18°33' 64°44'	26.0	46	on
2001 Mar 07	<i>Megaptera novaeangliae</i>	2	18°38' 64°38'	26.3	37	on
2001 Mar 07	<i>Megaptera novaeangliae</i>	2	18°40' 64°38'	25.3	37	on
2001 Mar 07	<i>Megaptera novaeangliae</i>	2	18°42' 64°38'	26.3	34	on
2001 Mar 07	<i>Megaptera novaeangliae</i>	1	18°49' 64°37'	26.3	732	on
2001 Mar 07	<i>Megaptera novaeangliae</i>	1	18°47' 64°17'	26.6	487	on
2001 Mar 07	<i>Megaptera novaeangliae</i>	1	18°45' 64°14'	26.6	408	on
2001 Mar 07	Unidentified dolphin	2	18°44' 64°07'	26.5	366	on
2001 Mar 07	<i>Megaptera novaeangliae</i>	1	18°43' 64°03'	26.5	739	on
2001 Mar 07	Unidentified small whale	1	18°46' 63°53'	26.5	3495	on
2001 Mar 07	<i>Megaptera novaeangliae</i>	1	18°46' 63°42'	26.4	6101	on
2001 Mar 08	<i>Megaptera novaeangliae</i>	5	18°23' 64°06'	26.3	441	on
2001 Mar 08	<i>Mesoplodon</i> sp.	3	18°20' 64°11'	26.3	531	on
2001 Mar 08	<i>Megaptera novaeangliae</i>	1	18°11' 64°23'	26.6	1373	on
2001 Mar 08	Unidentified dolphin	1	18°09' 64°25'	26.7	763	on
2001 Mar 08	<i>Megaptera novaeangliae</i>	1	17°50' 64°31'	26.8	822	on
2001 Mar 08	<i>Megaptera novaeangliae</i>	2	17°50' 64°29'	26.8	818	on
2001 Mar 08	<i>Megaptera novaeangliae</i>	3	17°47' 64°25'	26.9	897	on
2001 Mar 08	<i>Megaptera novaeangliae</i>	2	17°45' 64°28'	26.8	1135	on
2001 Mar 08	<i>Globicephala</i> sp.	9	17°40' 64°33'	26.8	840	on

Table 4. Number of groups (n), mean group-size, water depth, and sea surface temperature for cetacean sightings in the Atlantic and Caribbean Sea during Legs 1 and 2 of the NOAA Ship *Gordon Gunter* Cruise GU-01-01 (11), February 6 - March 14, 2001.

Species	n	Group Size (animals)			Water Depth (meters)			Sea Surface Temperature (°C)		
		Mean	(SE)	Range	Mean	(SE)	Range	Mean	(SE)	Range
<i>Megaptera novaeangliae</i>	72	1.8	(0.15)	1 - 10	1395	(167)	34 - 6948	26.2	(0.43)	25.3 - 27.7
<i>Physeter macrocephalus</i>	6	3.3	(0.98)	1 - 7	2531	(802)	680 - 4817	26.0	(0.31)	24.6 - 26.7
<i>Ziphius cavirostris</i>	1	3.0			2872			26.5		
<i>Mesoptodon spp.</i>	3	1.6	(0.66)	1 - 3	2515	(1145)	537 - 4506	26.5	(0.21)	26.3 - 27.0
<i>Pseudorca crassidens</i>	1	9.0			3103			26.8		
<i>Globicephala spp.</i>	8	12.5	(1.88)	6 - 20	2556	(770)	806 - 7041	25.9	(0.26)	24.2 - 26.8
<i>Steno bredanensis</i>	1	3.0			7226			26.0		
<i>Tursiops truncatus</i>	2	6.0	(3.0)	3 - 9	1662	(1210)	452 - 2872	26.8	(0.30)	26.5 - 27.1
<i>Stenella spp.</i>	1	2.0			1019			26.9		
<i>Stenella attenuata</i>	3	12.6	(3.9)	5 - 18	3655	(1916)	663 - 7226	26.1	(0.37)	25.5 - 26.8
<i>Stenella frontalis</i>	10	22.3	(4.6)	1 - 54	2547	(548)	452 - 4499	26.7	(0.13)	26.0 - 27.4
<i>Stenella longirostris</i>	2	95.0	(35.0)	60 - 130	805	(36)	768 - 841	26.7	(0.25)	26.5 - 27.0
<i>Unidentified dolphin</i>	11	11.6	(8.7)	1 - 99	1768	(655)	51 - 7041	26.5	(0.13)	26.0 - 27.1
<i>Unidentified small whale</i>	3	1.0		1 - 1	3451	(952)	1760 - 5054	26.6	(0.32)	26.2 - 27.3
<i>Unidentified large whale</i>	13	1.2	(0.1)	1 - 2	1451	(348)	340 - 4280	26.4	(0.14)	25.7 - 27.9
<i>Unidentified Ziphiid</i>	2	1.0		1 - 1	4091	(2579)	1512 - 6670	26.6	(0.30)	26.3 - 26.9
<i>Unidentified odontocete</i>	3	1.3	(0.3)	1 - 2	1565	(479)	628 - 2206	27.1	(0.33)	26.8 - 27.7

Table 5. DIFAR sonobuoys deployed during Legs 1 and 2 of the NOAA Ship Gordon *Gunter Cruise-01-01* (11) conducted in the Atlantic and Caribbean Sea February 6 - March 14, 2001.

Sonobuoy ID Number	Date Deployed	Time (GMT)	Water Depth	Lat	Lon	Number Singers	Bearing One	Bearing Two	Bearing Three	Thumptrains 1=yes	Sperm Whales 1=yes
7	02/13/2001	1439	4800	250713	753982					1	
8	02/13/2001	1833	4600	246873	749740					1	
9	02/13/2001	2213	5151	243829	745812					1	
10	02/14/2001	0857	4400	232450	735380	1	087			1	
11	02/14/2001	0943	4400	231577	734670	1				1	
12	02/14/2001	1110		229881	733287	1				1	
13	02/14/2001	1328	3800	227272	731126	3	307	314	325	1	
14	02/14/2001	1645		224175	727037	2	025	018		1	
18	02/14/2001	1953		222485	722868	1				1	
19	02/14/2001	2149		221240	720303	3	010	285	238	1	
22	02/14/2001	0029		219240	716765	1					
25	02/14/2001	0359		217095	711915	3	010	356	079	1	
26	02/15/2001	0929		212627	704859	3	024	350	060		
27	02/15/2001	1125		211092	702279	3	350	048	120	1	
30	02/15/2001	1618	3475	207705	695409	3	190	100	130	1	
31	02/15/2001	1953	1500	204456	690815	3	280	055	015	1	
32	02/15/2001	0138		198333	684367	3	160	092	200	1	
33	02/16/2001	0448	6500	193854	682217	3	260	340	045	1	
34	02/16/2001	0713	1870	190421	680549	2	020	247		1	
35	02/16/2001	1144	232	184154	677582	3	100	045	260	1	
37	02/16/2001	1522	239	182252	676147						
39	02/16/2001	1709	100	180250	674330	2	188	194			
40	02/16/2001	1751	243	179436	673634						
41	02/17/2001	0753	450	180932	652937						
43	02/17/2001	0915	800	181524	652191						
44	02/17/2001	1100	24	183916	650887	3	220	122	150	1	
46	02/17/2001	1400		186998	648681	1	211			1	1

continued

Table 5. continued.

Sonobuoy ID Number	Date Deployed	Time (GMT)	Water Depth	Lat	Lon	Number Singers	Bearing One	Bearing Two	Bearing Three	Thumptrains 1=yes	Sperm Whales 1=yes
47	02/17/2001	1648	1600	189719	647969	1	180			1	
48	02/17/2001	1909	3630	192136	650182	2	163	100		1	
49	02/17/2001	1958	2835	190637	650850	3	353	305	020	1	
50	02/17/2001	0129	84	195276	653209	3	345	025	064	1	
51	02/18/2001	1008	2650	188995	652633	3	335	058	015	1	
52	02/18/2001	1146		190463	653432	1					
54	02/18/2001	1440	6584	192420	655588						
55	02/18/2001	1524		191397	655950	1	170				
56	02/18/2001	1745	2000	187706	657470					1	
57	02/18/2001	0106	6400	191878	660708	1					
58	02/22/2001	1319		209835	656354	3	150	200	090	1	
59	02/22/2001	1415	50000	209205	654938	1	143				
60	02/22/2001	1502	50000	208725	653785	3	130	202	080		1
61	02/22/2001	1630	5000	207771	651606	3	150	093	243	1	
62	02/22/2001	1827	5000	206437	648656	1				1	
63	02/22/2001	2121	5000	204713	645086	3	090	270	165	1	
64	02/23/2001	1128	5500	204167	643167	1					1
65	02/23/2001	1240	5500	203003	640795	3	200	230	330	1	
66	02/23/2001	1517		200932	644917	3	300	328	100	1	
67	02/23/2001	1730	5500	199068	648545	2	245	130		1	
73	02/23/2001	2010	2900	197429	651358	3	165	200	014		
74	02/23/2001	2228	6590	195840	654727	3	046	202	012		
75	02/24/2001	1048	3800	178260	654310	3	004	335	012		
76	02/24/2001	1249		176710	657623	2	325	011			1
77	02/24/2001	1424		175635	660260	1				1	
78	02/24/2001	1512		174963	661535	3	297	301	319	1	
79	02/24/2001	1756		173148	659815	2	274	318		1	
80	02/24/2001	1944	4750	171568	657057	1					
81	02/24/2001	2134	4575	170086	654349	3	121	197	001		

continued.

Table 5. continued.

Sonobuoy ID Number	Date Deployed	Time (GMT)	Water Depth	Lat	Lon	Number Singers	Bearing One	Bearing Two	Bearing Three	Thumptrains I=yes	Sperm Whales I=yes
82	02/25/2001	1104		176130	652113	2	102	204		1	
83	02/25/2001	1229		177346	650341		204			1	
84	02/25/2001	1327		178157	649116						
85	02/25/2001	1344		178392	648764						
86	02/25/2001	1450	1320	179283	649712						1
87	02/25/2001	1528		179814	650737	2	224	090			
88	02/25/2001	1852	22	181672	652732						
89	02/26/2001	0218	613	175340	652888	3	110	273	320	1	
91	02/26/2001	0449	2700	173179	653101						
92	02/26/2001	1200		169765	653154	1	345			1	
93	02/26/2001	1439		165800	655214	1	260				
94	02/26/2001	1741		161249	657588	1				1	
95	02/26/2001	1807		160682	657905	1				1	
96	02/26/2001	2103		156612	659900	3	235	206	015	1	
97	02/27/2001	1256	5400	161382	661447	2	250	230		1	
99	02/27/2001	1735		168028	663195	1	150			1	
100	02/27/2001	2043		171006	663807	2	145	270		1	1
101	02/28/2001	1115		170042	662530	3	245	265	155		
102	02/28/2001	1331	1500	172771	664778	1	275				
103	02/28/2001	1612	3336	176317	665830	2	280	111			
104	02/28/2001	2123	2210	177250	669067	1	290			1	
105	03/01/2001	1125	3200	175575	671158	2	250	150		1	
106	03/01/2001	1249	3300	173853	671220	1					
107	03/01/2001	1304		173453	671233	3	170	156	290		
108	03/01/2001	1550		173981	674799	3	170	165	185	1	
110	03/01/2001	1740		174833	677602	3	190	175	185	1	
112	03/01/2001	2055		176428	675875	2	175	190		1	
113	03/02/2001	1106	1636	178382	673233	3	155	160	140		
114	03/02/2011	1206	825	179717	674346	3	151	316	165	1	

continued.

Table 5. continued.

Sonobuoy ID Number	Date Deployed	Time (GMT)	Water Depth	Lat	Lon	Number Singers	Bearing One	Bearing Two	Bearing Three	Thumptrains I=yes	Sperm Whales I=yes
115	03/02/2011	1437	311	181853	674614	3	151	145	162		
116	03/02/2001	1623		180651	677275	3	140	117	300		
117	03/02/2001	1902		181782	679567	3	300	155	100	1	
118	03/02/2001	2028		179758	679820	3	259	180	175		
119	03/03/2001	1015		180972	680563	3	194	255	165		
120	03/03/2001	1318	2300	178544	683570	3	240	270	200		
121	03/03/2001	1545		182157	685002	3	270	280	305		
123	03/03/2001	1835		185469	681896	3	340	145	095		
127	03/03/2001	2204		184789	677338	3	132	100	180	1	
129	03/04/2001	0845		184363	678734	3	127	291	100		
130	03/04/2001	1255		183731	677416	2	175	295		1	
131	03/04/2001	2202	1100	186752	671749	3	035	100	300	1	
135	03/05/2001	1222	5050	188699	674661	3	085	300	077		
136	03/05/2001	1405		190032	676012	3	330	275	055	1	
137	03/05/2001	1550	4345	189973	673100	1				1	
138	03/05/2001	1744	4056	190000	670002	3	150	350	077		
140	03/05/2001	1949		187137	668566	3	120	010	116		
141	03/06/2001	1108		186625	666964	3	075	260	117		
142	03/06/2001	1325		189870	665070	3	250	070	300	1	
143	03/06/2001	1643		186789	671511	3	086	302	345	1	
144	03/07/2001	1047		184952	648620	3	045	015	024	1	
145	03/07/2001	1209		186197	646541	3	200	185	013		
146	03/07/2001	1348	50	188659	646077	3	285	120	218		
147	03/07/2001	1504	1209	188254	644350	1				1	
148	03/07/2001	1524	1692	187903	642870	3	300	227	283	1	
149	03/07/2001	1600		187650	642617	3	330	290	340	1	
150	03/07/2001	1659		187445	640570	3	060	163	122	1	
151	03/07/2001	2107	6000	197698	636692	3	225	160	032	1	
152	03/07/2001	0024	6100	187561	637684	1				1	

Sonobuoy ID Number	Date Deployed	Time (GMT)	Water Depth	Lat	Lon	Number Singers	Bearing One	Bearing Two	Bearing Three	Thumptrains 1=yes	Sperm Whales 1=yes
155	03/08/2001	1059		185453	641140	3	075	033	045		
156	03/08/2001	1258	891	183346	644939	3	128	104	135	1	
157	03/08/2001	1324		183140	642598	3	225	125	236	1	
158	03/08/2001	1615	2788	180195	646330	3	236	117	211	1	
159	03/08/2001	1705	2500	178936	646632	3	230	245	085	1	
160	03/08/2001	1915		178299	643845	3	235	035	210	1	
161	03/08/2001	2051		176436	645778	1				1	
162	03/08/2001	2145		176349	646315	3	294	314	340		
163	03/11/2001	0020	6000	194704	679657					1	
164	03/11/2001	0331	3600	197522	684936	3	161	307	230	1	
165	03/11/2001	0540	969	199110	688561					1	
166	03/11/2001	0738		200559	691917						
167	03/11/2001	0959		202262	696034						
169	03/11/2001	1452		203392	705500						
170	03/11/2001	1714	3689	204096	710101		331	241	246		
171	03/11/2001	1741	3700	204240	711082	3	160	355	013		
172	03/11/2001	1943	3000	204871	715172	3				1	
173	03/12/2001	0000	4180	206122	723159					1	
174	03/12/2001	0236		206954	728292						
175	03/12/2001	0541		207848	734122						
176	03/12/2001	1000	2800	210000	742230	2	258	269		1	

Table 6. Summary of biopsy tissue samples collected during Legs 1 and 2 of the NOAA Ship *Gordon Gunter* Cruise GU-01-01(11) in the Atlantic and Caribbean Sea, February 6 - March 14, 2001.

Date	Sighting #	Species	Lat	Lon
02/24/2001	1	<i>Stenella frontalis</i>	17° 22.71	66° 73.70
02/27/2001	1	<i>Physeter macrocephalus</i>	17° 02.60	66° 20.10
02/28/2001	1	<i>Stenella frontalis</i>	17° 33.40	66° 33.62
02/28/2001	4	<i>Tursiops truncatus</i>	17° 51.88	66° 39.11
02/28/2001	4	<i>Tursiops truncatus</i>	17° 51.88	66° 39.11
03/01/2001	3	<i>Stenella frontalis</i>	17° 20.52	67° 15.01
03/06/2001	5	<i>Stenella frontalis</i>	18° 39.36	66° 62.20
03/06/2001	8	<i>Stenella longirostris</i>	18° 33.31	66° 48.09

Table 7. Number of cetacean group sightings for Leg 3 of NOAA Ship *Gordon Gunter* Cruise GU-01-01 (11) conducted in the Gulf of Mexico, March 16 - April 3, 2001.

Species	Leg 3
Sperm whale (<i>Physeter macrocephalus</i>)	11
Cuvier's beaked whale (<i>Ziphius cavirostris</i>)	3
Pantropical spotted dolphin (<i>Stenella attenuata</i>)	19
Atlantic spotted dolphin (<i>Stenella frontalis</i>)	1
Spinner dolphin (<i>Stenella longirostris</i>)	2
Striped dolphin (<i>Stenella coeruleoalba</i>)	1
Bottlenose dolphin (<i>Tursiops truncatus</i>)	2
Risso's dolphin (<i>Grampus griseus</i>)	5
False killer whale (<i>Pseudorca crassidens</i>)	1
Melon-headed whale (<i>Peponocephala electra</i>)	1
Unidentified beaked whale (<i>Mesoplodon</i> spp.)	2
Unidentified ziphiidae	1

Species	Leg 3
Unidentified dolphin	9
Unidentified small whale	2
Unidentified large whale	1
Total	60

Table 8 . Number of groups (n), mean group-size, water depth, and sea surface temperature for cetacean sightings in the Gulf of Mexico during Leg 3 of the NOAA ship *Gordon Gunter* Cruise GU-01-01 (11), March 16 - April 3, 2001.

Species	n	Group Size (animals)			Water Depth (meters)			Sea Surface Temperature (°C)		
		Mean	(SE)	Range	Mean	(SE)	Range	Mean	(SE)	Range
<i>Physeter macrocephalus</i>	11	3.8	(0.69)	1 - 9	1555	(158)	652 - 2038	23.9	(0.47)	21.7 - 26.3
<i>Ziphius cavirostris</i>	3	3.3	(1.85)	1 - 7	1072	(131)	841 - 1297	24.7	(0.78)	23.9 - 26.3
<i>Mesoplodon</i> spp.	2	2.0			1051	(4.63)	1046 - 1056	21.8	(0.25)	21.6 - 22.1
<i>Pseudorca crassidens</i>	1	15.0			1067			26.1		
<i>Peponocephala electra</i>	1	80.0			1760			23.8		
<i>Tursiops truncatus</i>	2	2.0			453	(204)	248 - 657	24.3	(0.70)	23.6 - 25.0
<i>Grampus griseus</i>	5	2.0	(26.2)	5 - 72	884	(201)	520 - 1576	22.8	(0.48)	21.4 - 24.2
<i>Stenella</i> spp.	1	20.0			2001			24.6		
<i>Stenella attenuata</i>	18	54.2	(9.5)	11 - 150	1777	(184)	907 - 3428	25.9	(0.28)	21.6 - 25.9
<i>Stenella frontalis</i>	1	15.0			248			23.6		
<i>Stenella coeruleoalba</i>	1	12.0			757			22.7		
<i>Stenella longirostris</i>	2	147.0	(90.0)	57 - 237	1048	(22)	1026 - 1071	22.9	(0.50)	22.4 - 23.4
Unidentified dolphin	9	33.2	(12.9)	5 - 99	1034	(179)	392 - 2001	23.7	(0.41)	21.8 - 25.3
Unidentified small whale	2	1.0			1273	(254)	1019 - 1528	24.3	(1.00)	23.3 - 25.3
Unidentified large whale	1	1.0			1667			25.0		
Unidentified ziphiid	1	2.0			2242			24.0		

Table 9. Summary of cetacean sightings during Leg 3 of the NOAA Ship *Gordon Gunter* Cruise GU-01-01(11) in the Gulf of Mexico, March 16 - April 3, 2001 (S = effort status of sighting, SST = Sea surface temperature).

Date	Species	Group	Position	SST (°C)	Depth (m)	S
2001 Mar 17	<i>Stenella attenuata</i>	15	24°16' 83°58'	25.9	1427	on
2001 Mar 17	<i>Stenella attenuata</i>	40	24°26' 83°56'	25.5	1363	on
2001 Mar 17	<i>Physeter macrocephalus</i> <i>Ziphius cavirostris</i>	5 7	24°40' 84°05'	26.3	1281	off
2001 Mar 18	<i>Stenella attenuata</i>	22	24°43' 84°30'	24.3	3386	on
2001 Mar 18	<i>Physeter macrocephalus</i> <i>Stenella</i> sp.	3 20	24°46' 84°29'	24.6	1976	on
2001 Mar 18	Unidentified dolphin	10	24°52' 84°24'	25.3	1976	off
2001 Mar 19	Unidentified dolphin	1	24°54' 84°20'	25.1	1074	on
2001 Mar 19	<i>Stenella attenuata</i>	150	24°48' 84°14'	25.0	981	on
2001 Mar 19	Unidentified dolphin	1	24°49' 84°15'	25.2	981	on
2001 Mar 19	Unidentified large whale	1	24°45' 84°16'	25.0	1647	on

Table 9. continued

Date		Species	Group	Position	SST (°C)	Depth (m)	S
2001	Mar 19	<i>Physeter macrocephalus</i>	3	24°42' 84°16'	25.0	1647	off
2001	Mar 19	<i>Physeter macrocephalus</i>	4	24°41' 84°15'	25.1	1647	off
2001	Mar 19	<i>Stenella attenuata</i>	140	24°40' 84°12'	24.6	1647	off
2001	Mar 20	<i>Stenella attenuata</i>	40	24°36' 84°05'	25.0	1922	on
2001	Mar 20	<i>Physeter macrocephalus</i>	1	24°30' 84°00'	25.2	2013	off
2001	Mar 22	<i>Stenella attenuata</i>	50	25°13' 84°36'	23.2	1464	on
2001	Mar 22	Unidentified dolphin	6	25°13' 84°25'	23.3	388	on
2001	Mar 22	<i>Stenella frontalis</i> <i>Tursiops truncatus</i>	15 2	25°12' 84°09'	23.6	245	on
2001	Mar 23	Unidentified small whale	1	24°42' 84°10'	23.3	1510	on
2001	Mar 23	Unidentified dolphin	5	24°40' 84°07'	23.3	1281	on
2001	Mar 23	<i>Stenella attenuata</i>	85	24°35' 84°10'	23.6	2214	on
2001	Mar 23	<i>Stenella attenuata</i>	11	24°36' 84°10'	23.7	1687	off
2001	Mar 23	Unidentified ziphiidae	2	24°34' 84°13'	24.0	2214	on
2001	Mar 23	<i>Stenella attenuata</i>	50	24°25' 84°09'	23.7	2745	on

continued.

Table 9. continued

Date	Species	Group	Position	SST (°C)	Depth (m)	S
2001 Mar 23	<i>Stenella attenuata</i>	36	24°26' 84°08'	23.7	2196	off
2001 Mar 24	Unidentified dolphin	10	25°14' 84°31'	23.5	952	on
2001 Mar 24	<i>Physeter macrocephalus</i>	2	25°20' 84°33'	23.3	1069	on
2001 Mar 24	<i>Stenella longirostris</i>	57	25°20' 84°32'	23.4	1058	off
2001 Mar 24	<i>Grampus griseus</i>	5	25°15' 84°30'	24.2	1089	off
2001 Mar 25	<i>Physeter macrocephalus</i>	6	25°02' 84°31'	23.5	2013	on
2001 Mar 25	Unidentified dolphin	40	25°02' 84°29'	23.5	1557	off
2001 Mar 25	<i>Grampus griseus</i>	72	25°02' 84°28'	23.5	1557	off
2001 Mar 25	<i>Ziphius cavirostris</i>	2	25°09' 84°27'	23.9	1067	off
2001 Mar 25	<i>Ziphius cavirostris</i>	1	25°09' 84°26'	24.0	831	off
2001 Mar 25	<i>Tursiops truncatus</i>	2	25°12' 84°27'	25.0	650	off
2001 Mar 25	<i>Stenella attenuata</i>	30	25°15' 84°32'	24.9	1285	off
2001 Mar 26	<i>Stenella attenuata</i>	101	25°15' 84°57'	23.8	3331	on
2001 Mar 26	<i>Physeter macrocephalus</i>	9	25°16' 84°56'	0	on	on
2001 Mar 27	<i>Stenella attenuata</i>	35	24°21' 83°43'	23.2	963	on

Table 9. continued.

Date	Species	Group	Position	SST (°C)	Depth (m)	S
2001 Mar 27	Unidentified small whale	1	24°15' 83°42'	25.3	1007	on
2001 Mar 28	<i>Stenella attenuata</i>	25	24°38' 84°18'	23.2	2013	off
2001 Mar 28	<i>Physeter macrocephalus</i>	1	24°38' 84°19'	23.2	2013	on
2001 Mar 29	<i>Stenella attenuata</i>	30	23°55' 83°00'	25.8	1054	off
2001 Mar 29	<i>Pseudorca crassidens</i>	15	23°52' 82°55'	26.1	1054	off
2001 Mar 30	<i>Peponocephala electra</i>	80	25°50' 84°51'	23.8	1739	off
2001 Mar 31	<i>Stenella attenuata</i>	74	27°15' 85°16'	22.0	1021	on
2001 Mar 31	<i>Mesoplodon</i> sp.	2	27°20' 85°18'	22.1	1034	on
2001 Mar 31	<i>Physeter macrocephalus</i>	4	27°23' 85°21'	21.7	1058	on
2001 Mar 31	<i>Mesoplodon</i> sp.	2	27°25' 85°21'	21.6	1043	off
2001 Mar 31	<i>Stenella coeruleoalba</i>	12	27°33' 85°17'	22.7	748	on
2001 Mar 31	<i>Grampus griseus</i>	30	27°43' 85°18'	21.4	644	off
2001 Apr 01	<i>Physeter macrocephalus</i>	4	27°58' 85°32'	21.9	644	on
2001 Apr 01	Unidentified dolphin	20	28°04' 85°45'	22.4	586	off
2001 Apr 01	<i>Grampus griseus</i>	12	28°07' 85°45'	22.4	562	off

continued.

Date	Species	Group	Position	SST (°C)	Depth (m)	S
2001 Apr 02	<i>Stenella attenuata</i>	43	29°11' 87°18'	21.6	897	on
2001 Apr 02	<i>Stenella longirostris</i>	237	29°14' 87°31'	22.4	1014	on
2001 Apr 02	<i>Grampus griseus</i>	12	29°14' 87°44'	22.5	514	off
2001 Apr 02	Unidentified dolphin	10	29°11' 87°38'	21.8	401	on

Table 10. Cetaceans recorded during Leg 3 of the NOAA Ship *Gordon Gunter* Cruise GU-01-01 (11) March 16 - April 3, 2001.

Species	Type of Recording
Sperm whale	DTRS, HDR, DAT
Pantropical spotted dolphin	DTRS, HDR
Clymene dolphin	DTRS
Atlantic spotted dolphin	DTRS, HDR
Spinner dolphin	DTRS, HDR
Bottlenose dolphin	DTRS, HDR
Risso's dolphin	DTRS
Melon-headed whale	DTRS, HDR
False killer whale	DTRS

Table 11. Summary of biopsy tissue samples collected during Leg 3 of the NOAA Ship *Gordon Gunter* Cruise GU-01-01 (11) in the Gulf of Mexico, March 16 - April 3, 2001.

Date	Sighting #	Species	Lat	Lon
03/17/2001	1	<i>Physeter macrocephalus</i>	24°41.05	84° 07.63
03/17/2001	1	<i>Physeter macrocephalus</i>	24°40.97	84° 11.12
03/17/2001	1	<i>Physeter macrocephalus</i>	24° 41.46	84° 13.32
03/17/2001	1	<i>Physeter macrocephalus</i>	24° 42..05	84° 13.93
03/17/2001	1	<i>Physeter macrocephalus</i>	24° 41.35	84° 15.43
03/22/2001	3	<i>Stenella frontalis</i>	25° 12.63	84° 97.40
03/23/2001	4	<i>Stenella attenuata</i>	24° 36.11	84° 10.68
03/26/2001	1	<i>Physeter macrocephalus</i>	25° 16.60	84° 55.68
03/26/2001	1	<i>Physeter macrocephalus</i>	25° 17.15	84° 54.18
03/26/2001	1	<i>Physeter macrocephalus</i>	25° 15.20	84° 54.18
03/26/2001	1	<i>Physeter macrocephalus</i>	25° 14.96	84° 54.51
03/26/2001	1	<i>Physeter macrocephalus</i>	25° 15.06	84° 53.85
03/26/2001	1	<i>Physeter macrocephalus</i>	25° 15.54	84° 54.12
03/26/2001	1	<i>Physeter macrocephalus</i>	25° 15.60	84°54.68
03/27/2001	1	<i>Stenella attenuata</i>	24° 21.18	83° 43.19
03/28/2001	1	<i>Physeter macrocephalus</i>	24° 37.52	84° 12.06
03/29/2001	2	<i>Pseudorca crassidens</i>	23° 52.29	82° 55.14

Date	Sighting #	Species	Lat	Lon
03/30/2001	1	<i>Peponocephala electra</i>	25° 50.05	84° 51.25
03/30/2001	1	<i>Peponocephala electra</i>	25° 50.06	84° 51.26
03/30/2001	1	<i>Peponocephala electra</i>	25° 50.07	84° 51.27
03/31/2001	1	<i>Stenella attenuata</i>	27° 17.58	85° 16.50
04/01/2001	1	<i>Physeter macrocephalus</i>	28° 04.37	85° 42.64
04/01/2001	1	<i>Physeter macrocephalus</i>	28° 05.99	85° 43.25
04/02/2001	1	<i>Stenella longirostris</i>	29° 12.33	87° 33.71
04/02/2001	1	<i>Stenella longirostris</i>	29° 12.34	87° 33.72

Figure 1. Five-element hydrophone array utilized during the NOAA Ship *Gordon Gunter* Cruise GU-01-01(11). Total length when deployed was 250 m.

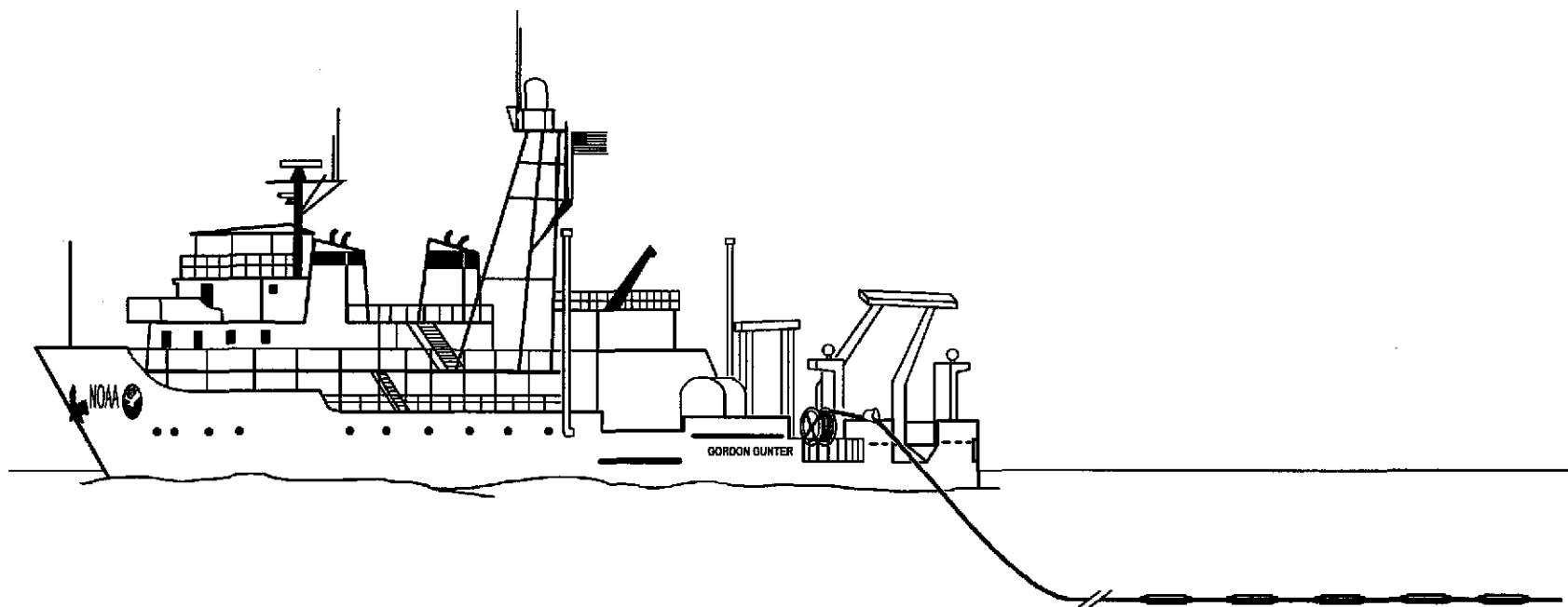


Figure 2. Typical DIFAR directional sonobuoy utilized during the NOAA Ship *Gordon Gunter* Cruise GU-01-01(11).

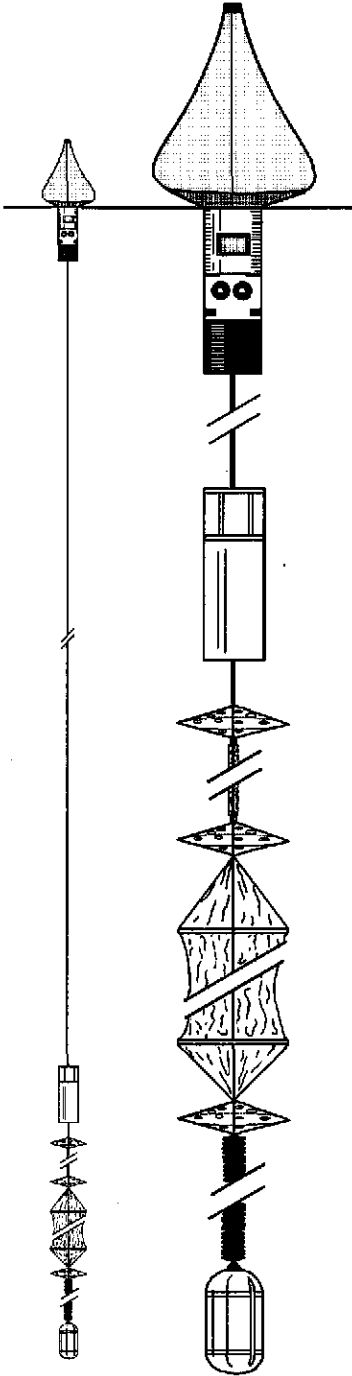


Figure 3. "Pop-up" autonomous botom recorder developed by C. Clark of Cornell University's Bioacoustics Research Program. Two of these units were tested during the NOAA Ship *Gordon Gunter* Cruise GU-01-01(11).

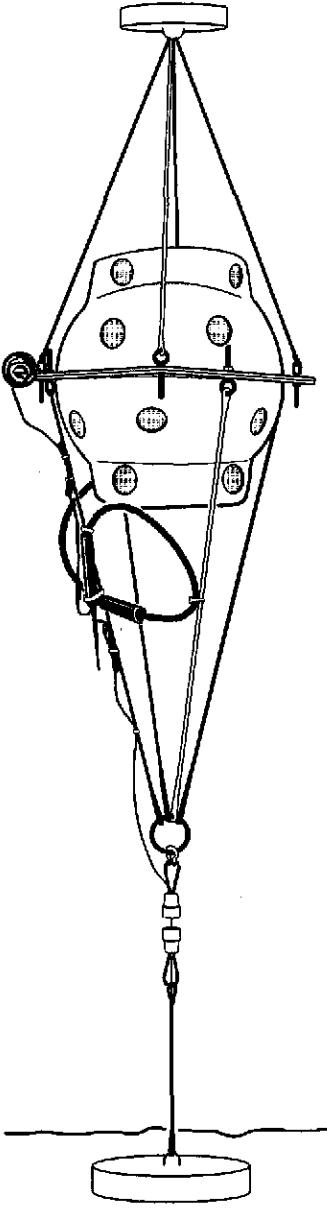


Figure 4. On-effort (bold lines) visual sightings of dolphins during Leg 2 of the NOAA Ship *Gordon Gunter* Cruise GU-01-01(11): *Steno bredanensis* (open star, n = 1); *Tursiops truncatus* (open triangle, n = 2); *Stenella attenuata* (closed circles, n = 3); *Stenella frontalis* (closed squares, n = 10); *Stenella longirostris* (open circles, n = 2).

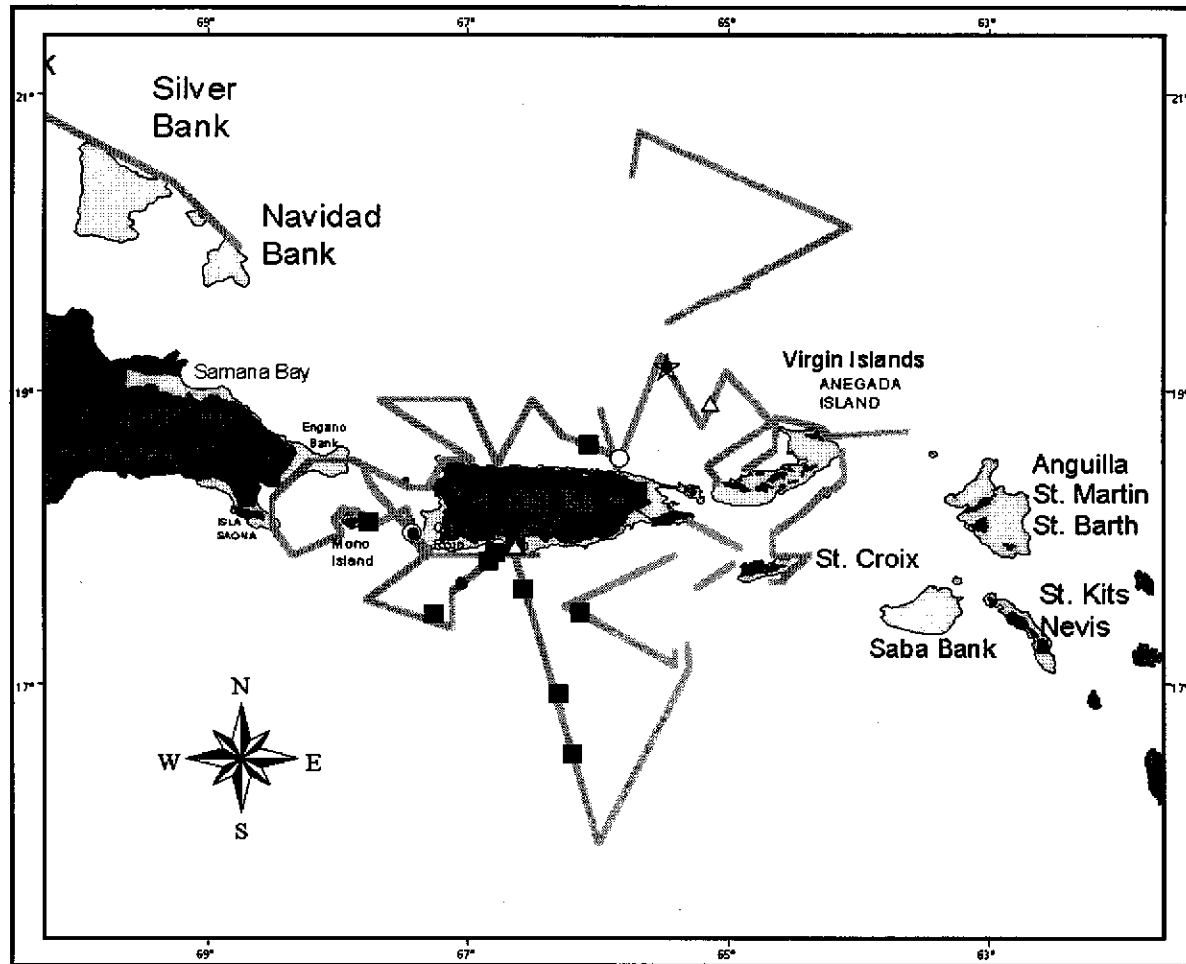


Figure 5. On-effort (bold lines) sightings of odontocete whales during Leg 2 of the NOAA Ship Gordong Gunter Cruise GU-01-01(11): *Physeter macrocephalus* (closed circles, n = 6); *Ziphius spp.* (closed circles, n = 3); *Mesoplodon spp.* (closed squares, n = 3); *Pseudorca crassidens* (closed star, n = 1); *Globicephala spp.* (open circles, n = 8).

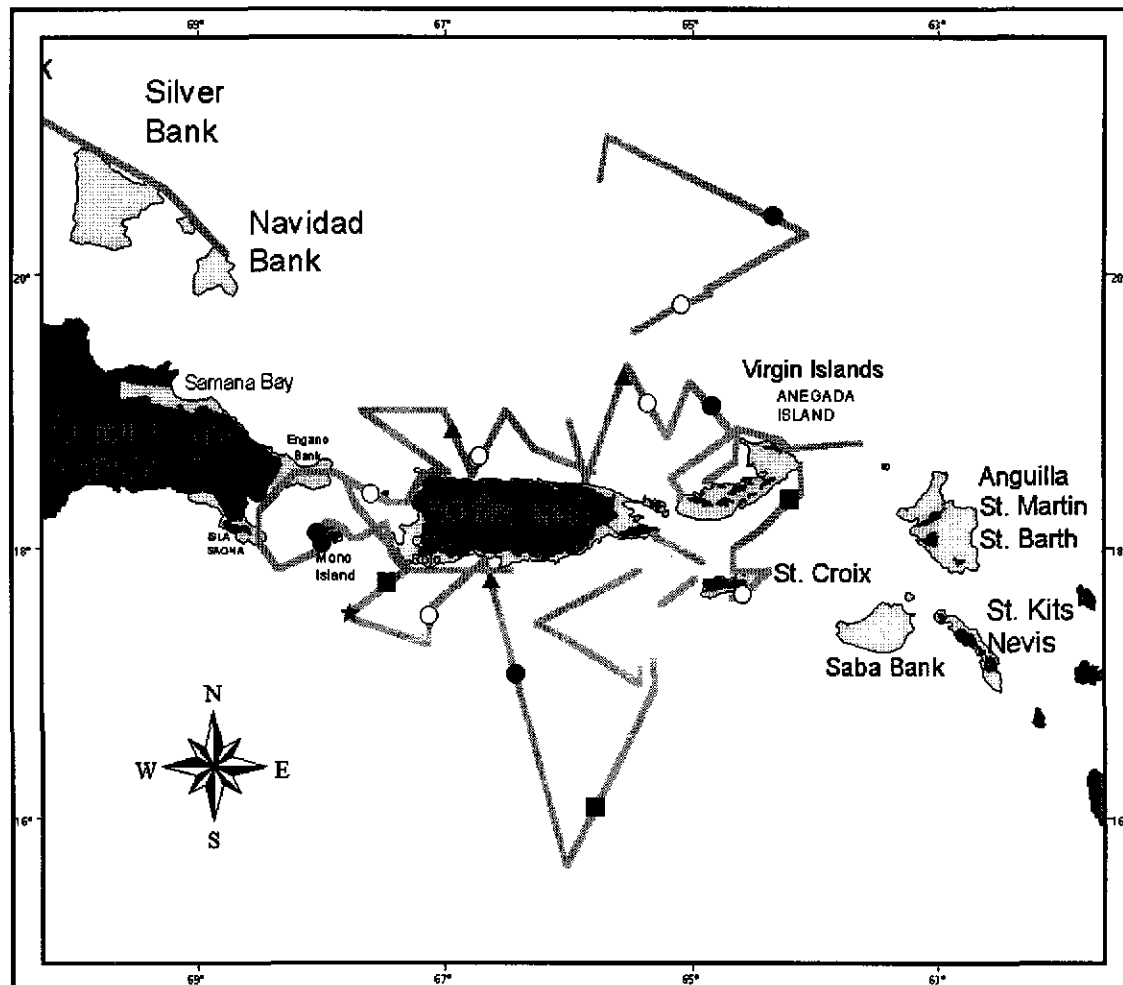


Figure 6. On-effort (bold lines) sightings of humpback whales (triangles, $n = 32$ sightings of 51 whales) during Leg 1 of the NOAA Ship *Gordon Gunter* Cruise GU-01-01(11) along the eastern and southern sides of the Bahamas south to Navidad Bank, showing locations of sonobuoys with magnetic bearings to singing humpback whales (circles with radials) along the survey trackline (thin line).

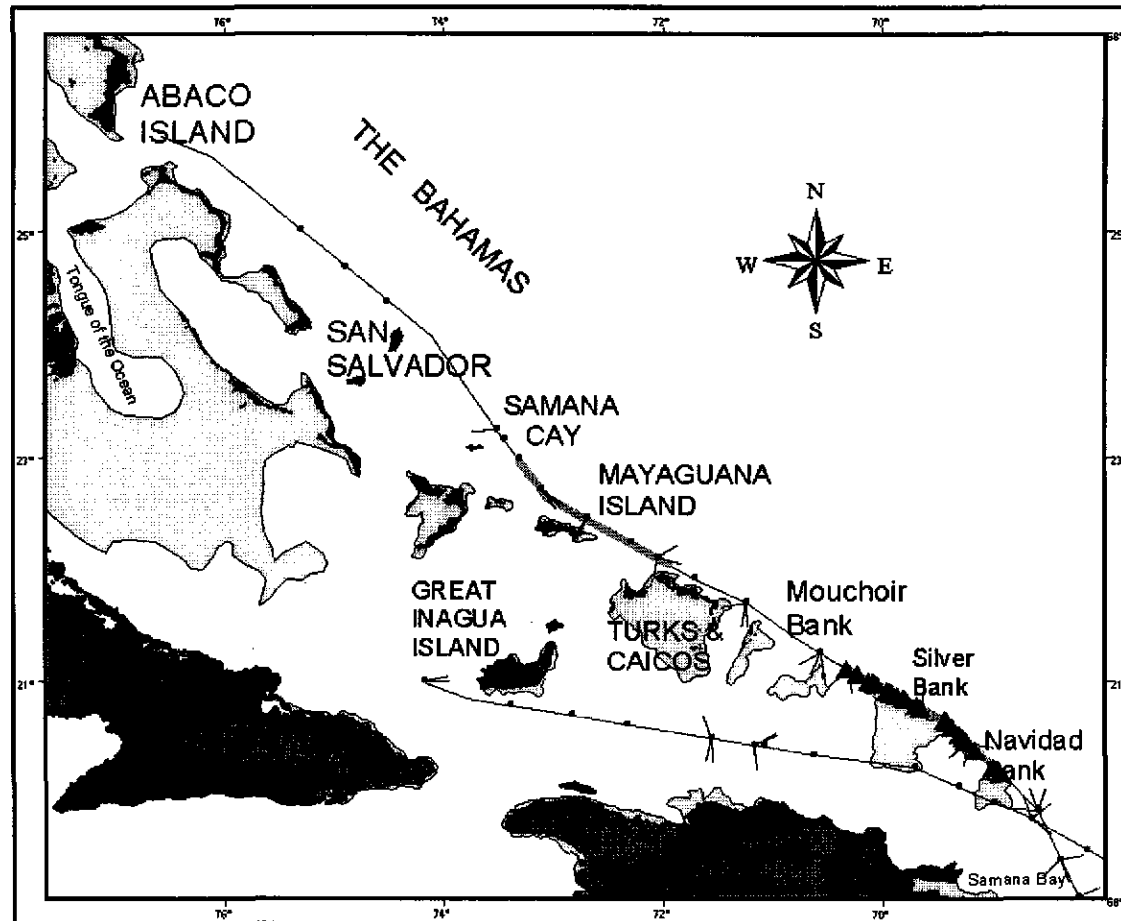


Figure 7. On-effort (bold lines) sightings of humpback whales (triangles) during Leg 2 of the NOAA Ship *Gordon Gunter* Cruise GU-01-01(11) to the north of Puerto Rico and the Virgin Islands showing the location of sonobuoys and magnetic bearings to singing humpback whales (circles with radials) along the survey trackline.

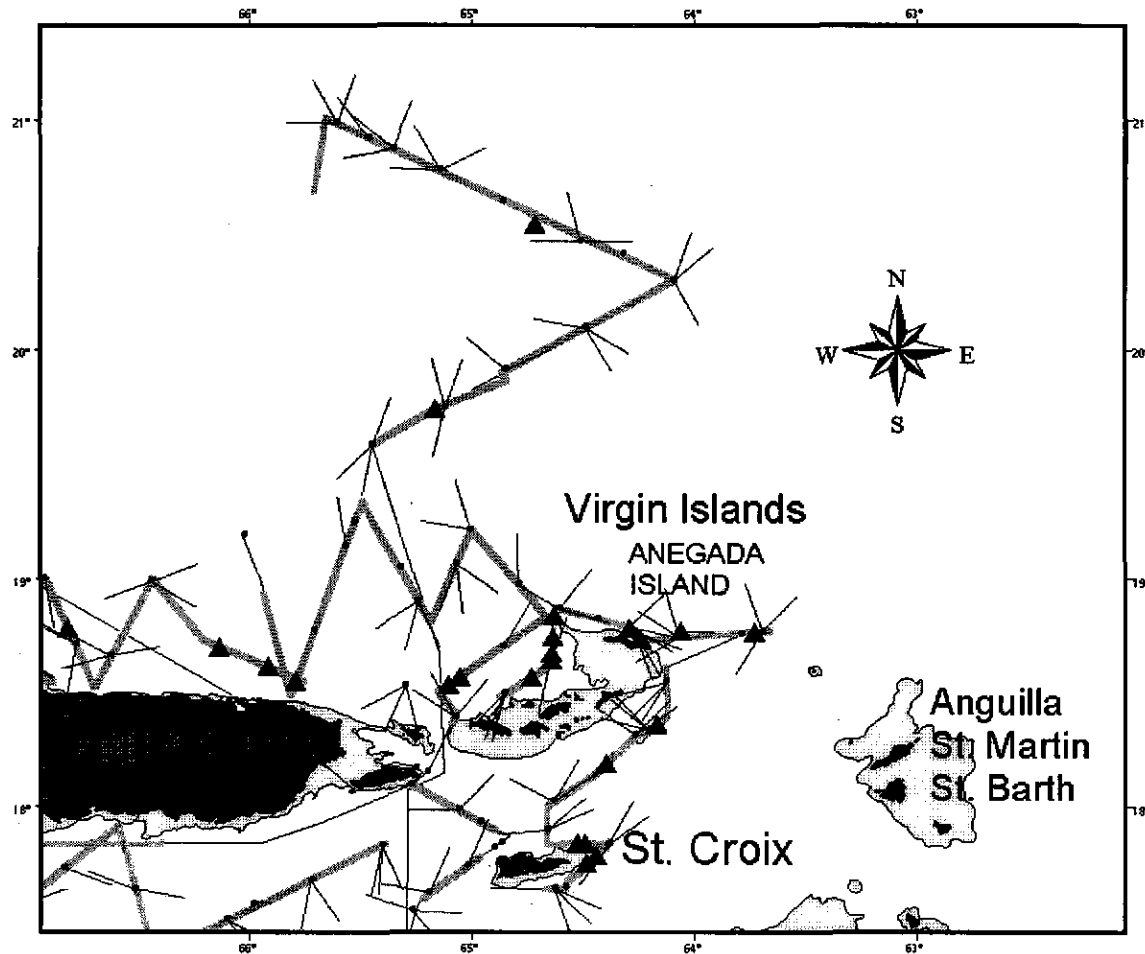


Figure 8. On-effort (bold lines) sightings of humpback whales (triangles) during NOAA Ship *Gordon Gunter* Cruise GU-01-01(11) to the south of Puerto Rico and the Virgin Islands showing the location of sonobuoys with magnetic bearings to singing humpback whales (circles with radials) along the survey trackline.

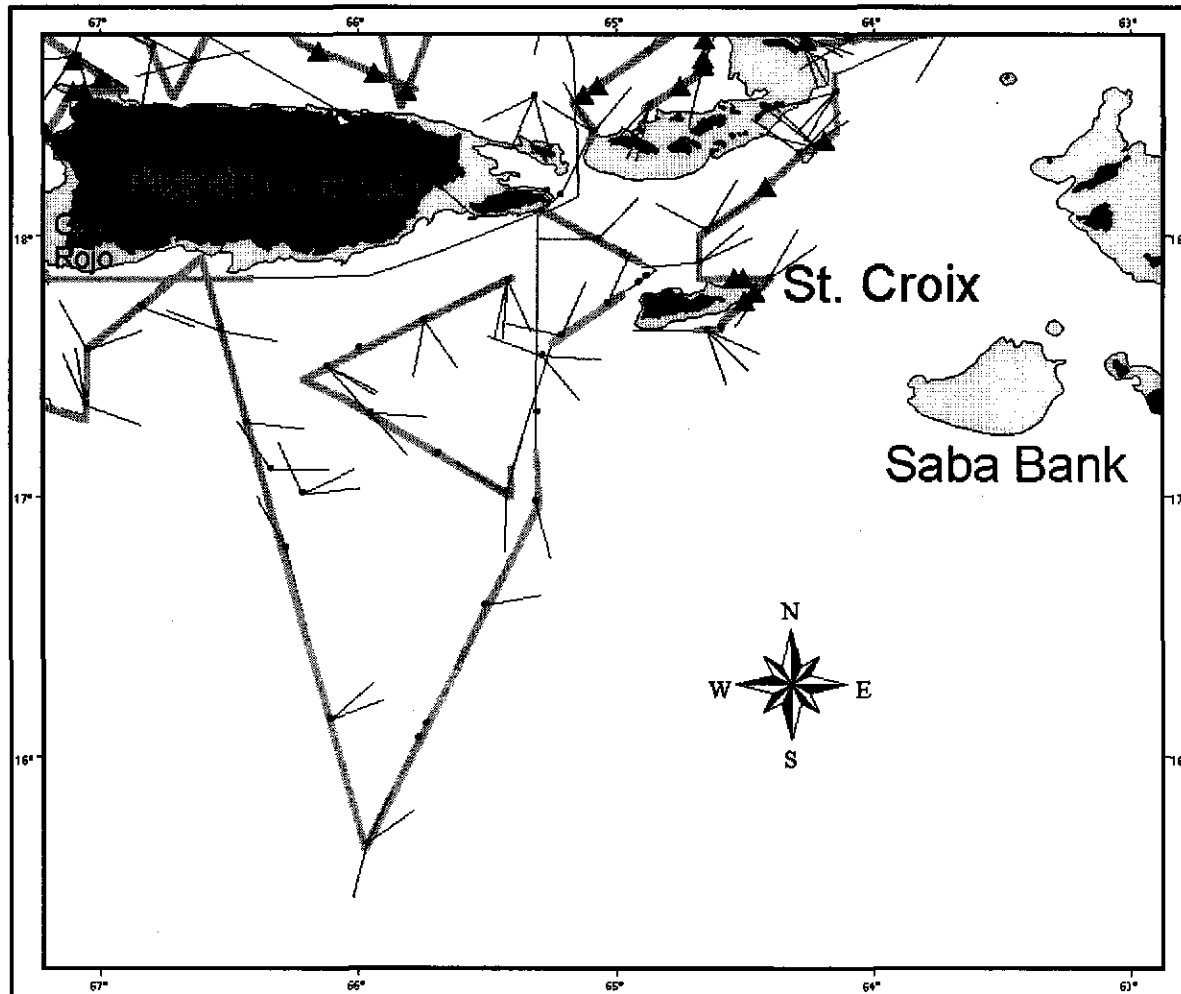


Figure 9. On-effort (bold lines) sightings of humpback whales (triangles) during NOAA Ship *Gordon Gunter* Cruise GU-01-01(11) to the west, northwest, and southwest of Puerto Rico showing the location of sonobuoys with magnetic bearings to singing humpback whales (circles with radials) along the survey trackline

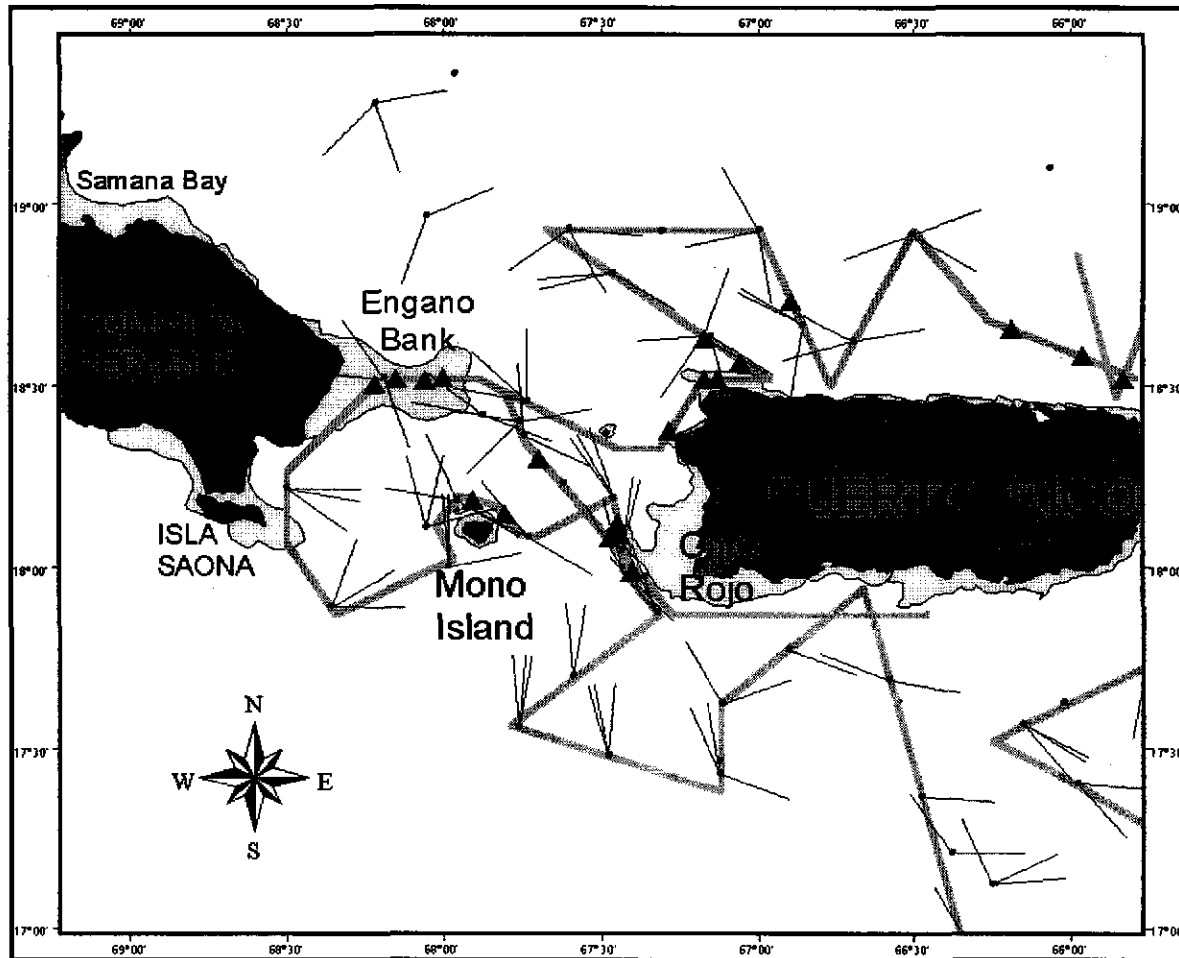


Figure 10. Location of sonobuoys (circles, n = 135) and sonobuoys that detected Atlantic Thumptrains (triangles, n = 79) deployed during Legs 1 and 2 of the NOAA Ship *Gordon Gunter* Cruise GU-01-01(11) along the survey trackline.

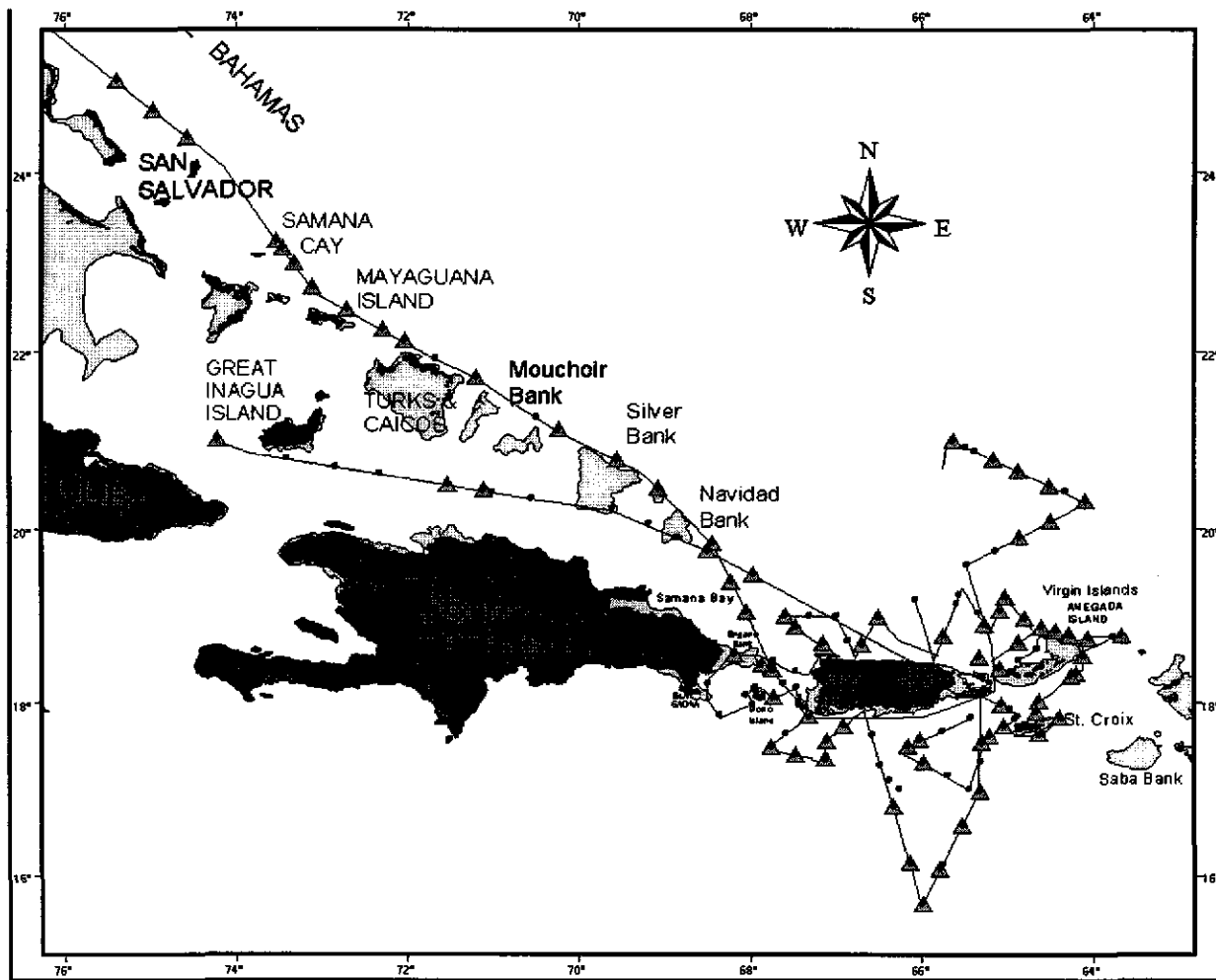


Figure 11. Location of sperm whale sightings (circles, n = 11) during Leg 3 of the NOAA Ship *Gordon Gunter* Cruise GU-01-01(11) showing the 100 fathom and 1,000 fathom depth contours.

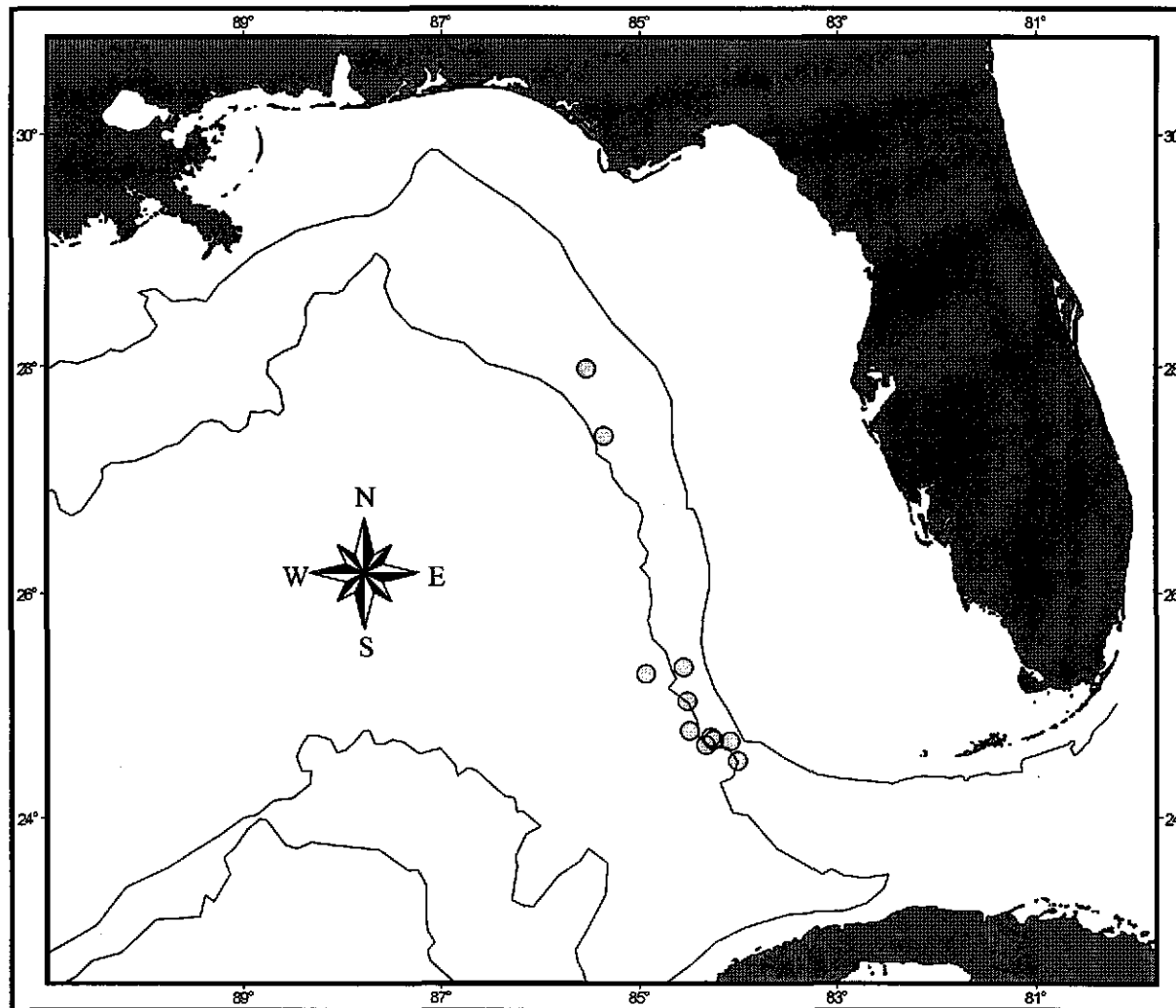


Figure 12. Location of odontocete whale sightings during Leg 3 of the *Gordon Gunter* cruise GU-01-01(11) showing the 110 fathom and 1,000 fathom depth contours. + = *Peponocephala electra*, n = 1; ★ = *Grampus griseus*, n = 5; ▲ = *Ziphius* sp., n = 4; ■ = *Psuedorca crassidens*, n = 1; □ = *Mesoplodon* sp., n = 2; ○ = Unidentified cetacean.

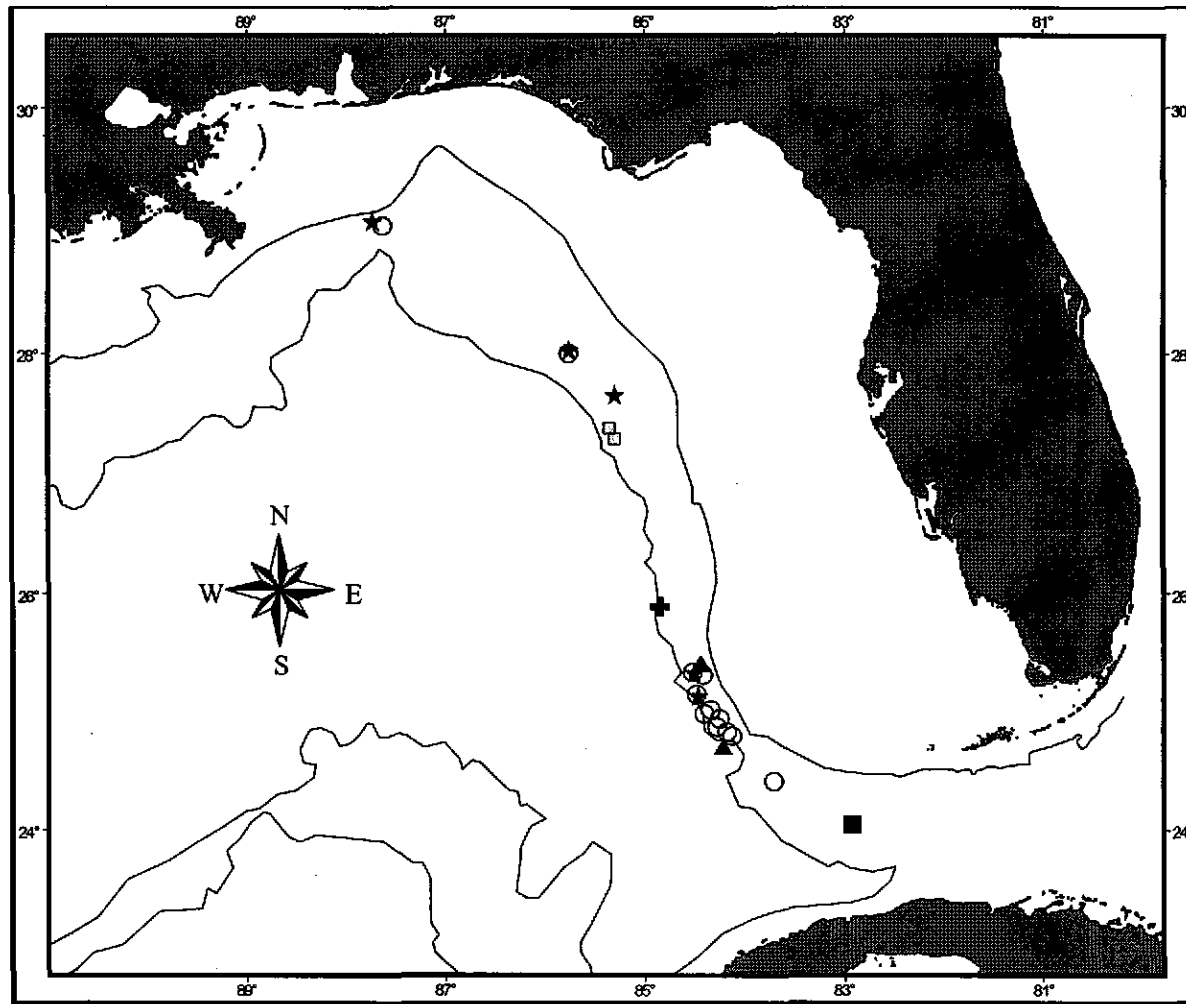


Figure 13. Location of *Stenella* dolphin sightings during Leg 3 of the *Gordon Gunter* cruise GU-01-01(11) showing the 100 fathom and 1,000 fathom depth contours. ○ = *Stenella attenuata*, n = 18; ■ = *Stenella frontalis*, n = 1; ▲ = *Stenella coeruleoalba*, n = 1; + = *Stenella longirostris*, n = 2.

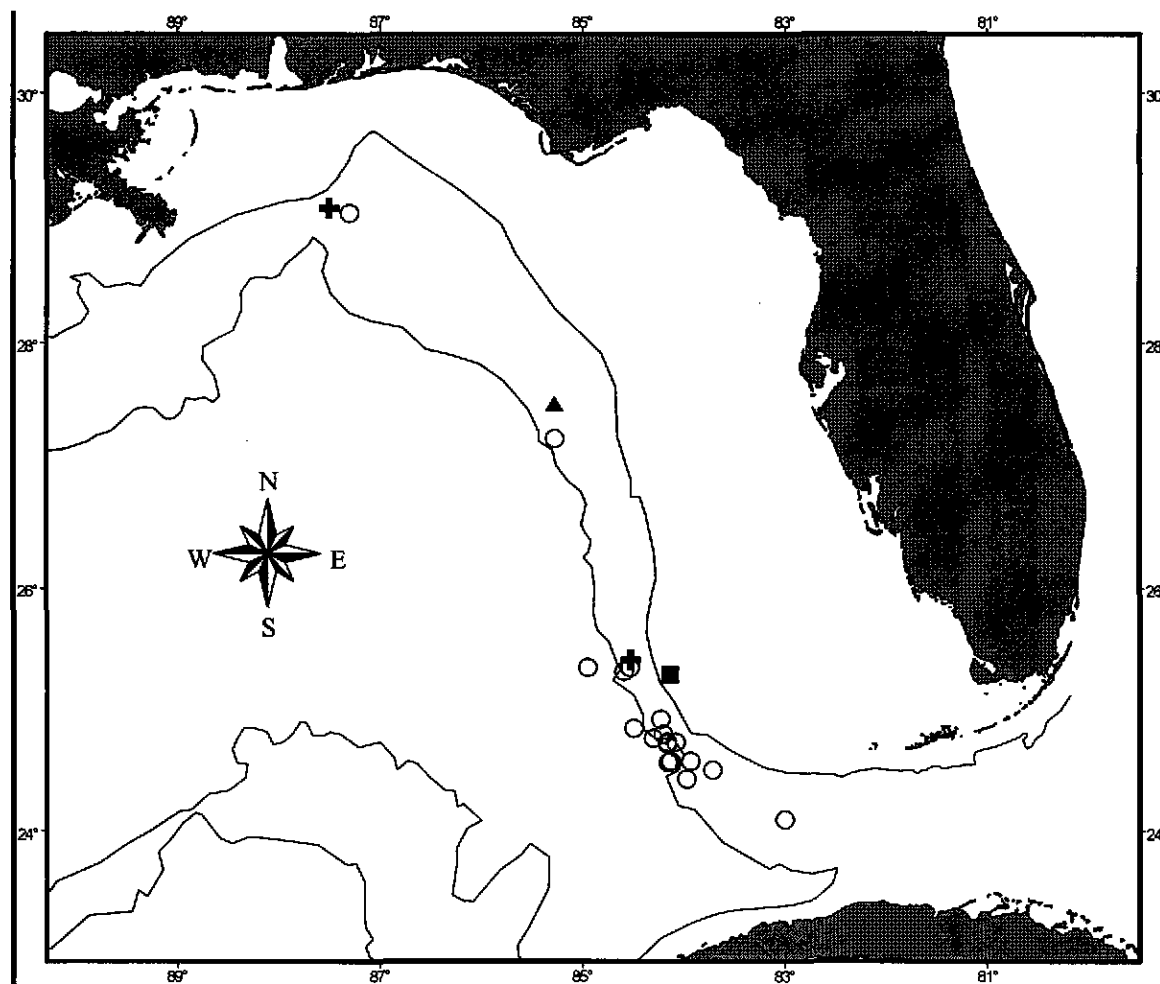


Figure 14. Locations where biopsy samples were obtained during Leg 3 of the *Gordon Gunter* cruise GU-01-01(11) showing the 100 fathom and 1,000 fathom depth contours. ▲ = *Physeter macrocephalus*, n = 15; □ = *Pseudorca crassidens*, n = 1; ○ = *Stenella sp.*, n = 6; + = *Peponocephala electra*, n = 3.

