September 18, 2004

CRUISE RESULTS

R/V ENDEAVOR
Cruise No. EN 04-395/396
Mid-Atlantic Marine Mammal Shipboard Abundance Survey

CRUISE PERIOD AND AREA

Leg I was conducted from 23 June to 12 July 2004. Leg II was conducted from 16 July to 04 August 2004. Both legs started and ended in Narragansett, RI. The study area for both legs was Mid-Atlantic waters from the 100m depth contour to the Gulf Stream, from Virginia to Cape Cod (Figure 1).

OBJECTIVES

The primary objectives of the survey were to (1) determine the spatial distribution and abundance of cetaceans and turtles in the study region, (2) determine the spatial distribution and relative abundance of sea birds in the same region, and (3) use passive acoustics to record vocalizing cetaceans that will hopefully be used to improve the abundance estimates derived from the visual surveys. A secondary objective was to compare the distribution of these species with each other, physical characteristics, such as water depth and temperature, and biological characteristics, such as relative plankton distributions.

METHODS

While at the dock at Narragansett, RI with the vessel pointing towards the open ocean, at the beginning of each leg, we practiced estimating distances. This was accomplished by having observers standing on their platforms on the ENDEAVOR use their binoculars to estimate the distance to a black buoy that was deployed from one of the ENDEAVOR's small boats. The buoy was placed at various positions in front of the ENDEAVOR. At each position, each observer estimated the distance to the buoy, and the small boat crew reported the position of the small boat using a hand-held GPS. Using this GPS position and the GPS position of each platform, a person on the ENDEAVOR calculated the distance between each platform and the buoy then reported this information to each team after each observer made their own estimate. Using this immediate feed-back the observers were able to improve their skills of accurately estimating distances.

After these training operations, the vessel left the dock to travel to the study area where line-transect visual and passive acoustic surveys for marine mammals, sea turtles, seabirds started.

VISUAL MARINE MAMMAL-TURTLE SIGHTING TEAM

Visual line transect surveys were conducted during daylight hours (approximately 0600-1800 with a 1-hour break at lunchtime) using standard two-team line transect techniques. Surveying was conducted during good weather conditions (Beaufort sea state four and below) while traveling at about 10 knots. The upper and lower team's average eye heights were at 10.2 m and 17.6 m above the water line.

Scientific personnel formed two visual marine mammal-turtle sighting teams. Each team consisted of two on-effort binocular observers, a recorder, and someone off-effort. The team on the lower platform used 25x150 powered binoculars and the team on the upper platform used 20x60 powered binoculars. Observers on each team rotated positions within a team every 30 minutes. The starboard binocular observer searched waters on the starboard side and a small overlap area on the port side: from 10˚ port of the track line to 90˚ starboard, where 0˚ is on the track line. The port-side observer searched waters on the port side and a small overlap area on the starboard side: from 10˚ to starboard of the track line to 90˚ port. The recorder, when not recording data for the team, concentrated searching near the ship using naked eye.

When an animal group (porpoise, dolphin, whale, seal, turtle or a few large fish species) was detected the following factors were recorded onto a computerized data entry device ("pingle"):

1) Time of sighting, recorded to the nearest second,
2) Species composition of the group,
3) Radial distance between the team's platform and the location of the sighting when initially detected, estimated either visually when not using the binoculars or by reticles when using binoculars,
4) Bearing between the line of sight to the group and the track line; measured by a polarus mounted near the observer or a polarus at the base of the binoculars,
5) Best, high and low estimate of group size,
6) Initial direction of swim,
7) Number of calves,
8) Initial sighting cue,
9) Initial behavior of the group, and
10) Any comments on unusual markings or behavior.

The location (latitude and longitude) of the ship when a sighting was detected was determined subsequently using an algorithm which dead reckonings between recorded positions of the ship (see below). Ship's positions were recorded every four seconds.

In addition to the above sighting data, effort and environmental data were logged by a computer hooked up to a differential GPS. Every four seconds, the computerized GPS logger recorded the following environmental factors:

1) Time of recording,
2) Latitude and longitude of ship's position,
3) Ship's bearing,
4) Ship's speed over the ground and through the water,
5) True wind speed and direction,
6) Bottom depth,
7) Surface water temperature at two depths,
8) Air temperature,
9) Relative humidity,
10) Barometric pressure,
11) Surface salinity, and
12) Surface flurometer value.

The following factors were recorded every time one of them changed (usually ever 30 minutes when the observers rotate):

1) Time of recording,
2) position of each observer, and
3) Weather conditions: swell direction and height, Beaufort sea state, presence of rain or fog, percentage of cloud coverage, visibility (i.e., approximate distance to the horizon), vertical and horizontal position of the sun, and glare width and strength.

At times when it was not possible to positively identify a species, surveying went off-effort and the ship headed in a manner to intercept the animals in question. When the species id and group size was confidently recorded, the ship traveled back to the closest point on the original track line. When the ship got back on the original track line, the survey teams went back on-effort.

SEABIRD SIGHTING TEAM

When the visual marine mammal-turtle sighting team was on-effort, the seabird team was also visually searching for seabirds. In addition, because of the seabird sighting procedures (described below), the seabird team was able to work in conditions up to and including Beaufort 6 with light fog and/or rain and when the ship traveled at 6 or more knots.

The seabird team consisted of two people who alternated between being on-effort for 2 hours and off-effort for 2 hours. The one on-effort person was located on the lower platform along with one of the visual marine mammal-turtle sighting teams. The bird team had its own table and chair that was located in the center of the platform.

In low or moderate seabird density areas, the seabird team followed a 300m strip transect methodology, where the observer recorded one observation for each individual bird seen within a 300m strip that was on one side of the ship. The preferred side was the side with the best visibility conditions. The strip stretched from the bow to the beam and out 300 m. Naked eye was used most of the time to search for birds, however binoculars were available to ensure the group size and species identification were correct, and to scan the outer edge of the 300m strip (if needed).

In higher density areas, where it was not possible to record the flight direction of each individual seabird, then the "snapshot" data collection method was used. This is where the total count of flying birds seen within the 300m-strip within a one-minute interval was recorded once a minute.

When a bird was detected the following information was recorded on a computerized data sheet:

1. Species identified to the lowest taxonomic level possible,
2. Group size (usually one),
3. Behavior (sitting on the water, directional flight, non-directional flight, foraging flight, feeding, piracy, ship following, following another ship, diving, dead, unknown, and other),
4. Flight direction (0E is parallel to the ship and in same direction as ship is traveling, 90E is perpendicular to the ship's track line and flying from the left side of the ship to the right side of the boat, etc.),
5. Distance category from the track line (0-100m, 100-200m, 100-300m, and >300m) as measured using an individual-specific range finder following procedures described in Heinemann (1981),
6. Associations (target seabird group not associated with other bird groups, target group was associated with other groups in the vicinity, association unknown),
7. Age (sub-adult, adult, unknown), and
8. Molting condition (not molting, molting, condition not assessed).

In addition to the effort data recorded by the marine mammal – turtle team, the seabird team recorded on its own computer the following:

1. On-effort seabird observer's name,
2. Time started and stopped surveying for birds,
3. Effort type [transect (using strip transect method), instant (using the snapshot method), bird only (no marine mammal observers present), and general (for observations other than birds, and birds outside of the 300m strip)],
4. Subjective visibility code (excellent, good, fair, poor, and bad) that subjectively combines all environmental conditions (such as, glare, wind velocity and direction, and amount of white-caps), and
5. Comments (if any).

Seabird observers calibrated and practiced with their range finder during the distance measuring practice conducted at the beginning of each leg, as described at the beginning of the Methods section.

If a seabird observer detected a marine mammal that was not detected by the marine mammal – turtle team, the seabird observer recorded this sighting under Effort type – general on their own computer.

PASSIVE ACOUSTIC DETECTION TEAM

A dipole (stereo) linear array containing two high frequency elements and two medium frequency elements was towed 400m behind the **Endeavor**. Signals from the medium frequency elements were routed via an amplifier/conditioner box and external sound card into a laptop computer, while high frequency signals were routed through two-high frequency click detector modules and digital acquisition card into the same laptop. Medium frequency signals were processed using two automatic detection programs, Rainbow Click (IFAW, 2004) a click detector and Whistle (IFAW, 2004) a tonal sounds detector. High frequency signals were processed using the program Porpoise (IFAW, 2004). Output from the three detector programs was automatically logged using the program Logger (IFAW, 2004). Logger was linked to the ships navigational and environmental monitoring systems.

The acoustic monitoring team consisted of two monitors who operated a “six hours on six hours off” shift around the clock. Where possible acoustic monitoring was conducted around the clock, and was only stopped for inclement weather, fishing gear and technical problems or where the array compromised the safe operation of the vessel. While the array was wet all detector programs were run continuously. Every ten minutes the principal monitor was required to listen intensely for one minute, score the presence or absence of vocalizing marine mammals and make subjective assessments of the intensity of marine mammal vocalizations and those covariates affecting detection efficiency, i.e. background noise levels. All subjective assessments of intensity were scored on a scale of 0 (nothing heard) to 5 (very loud). Additionally every half hour in Leg I and every 10 minutes in Leg II, the principal monitor was prompted to enter information about the current environmental conditions, in particular sea state, wave height, swell height and visibility, other environmental variables including wind speed and direction, water temperature at 1 and 5 meters, salinity, fluorescence, air temperature and barometric pressure were updated automatically from the ships underway systems. (N.B. The one-minute listen every 10 minutes is equivalent to a monitoring station). Thirty-second long automated recordings from the medium frequency system were made to hard disk every 2 minutes, with recording starting at 1 minute 30 seconds and ending at 2 minutes. The principal monitor could control the recording schedule and duration of recordings, and was able to extend the duration of recording if any unusual or interesting events were heard.

Survey lines followed those laid out for the visual surveys, except during transits between lines or inclement weather when visual surveys were not possible. The protocol at night was similar to that during the day and surveys were either conducted along the proposed survey track for the following morning, or back along the track covered during that day, using this method we hoped to be able to assess the effect on the abundance estimates of only surveying during the day.

HYDROGRAPHIC CHARACTERISTICS

In addition to the computerized logger that continuously recorded bottom depth and surface water temperature, a SEACAT 19 Profiler (CTD) was used to measure temperature, depth, and salinity of the water column in which the Profiler was lower into. The Profiler, with an attached water pump, was lowered to within 5 meters of the bottom or to 200m depth, whichever was shallower. This was done at approximately 0530, 1200, and 1830 hours on days visual surveying was conducted and when not in the same place several days in a row.

In between CTD casts, an XBT was deployed at 1000 and 1400 on survey days. The XBT recorded temperature and depth of the water column in which the XBT was deployed into, down to a maximum depth of 200 m.

ZOOPLANKTON DISTRIBUTION

At 0530, 1200, and 1830, when the visual sighting survey was off-effort, a bongo net was towed with the CTD attached. A 505-mesh bongo was lowered obliquely while traveling at 1.5 to 2.5 knots to 200m depth or to within 5m of the bottom, whichever was shallower. The samples collected by both bongo nets were stored in jars containing seawater and formalin. Later the species composition and density will be determined and then correlated with the distribution and density of marine mammal, turtle and seabird species.

BIOPSY SAMPLING

When the opportunity arose biopsy samples were collected using a cross-bow that shot modified arrows, where the tip of the arrow was actually a corer that retained a 1 mm^2 sample of skin and blubber. Once the biopsy sample was retrieved it was wrapped in alcohol cleaned aluminum foil, labeled and then frozen. At the end of the cruise, samples were transferred to a vial with DMSO for long-term storage.

RESULTS

VISUAL MARINE MAMMAL-TURTLE SIGHTING TEAM

The visual marine mammal and turtle team surveyed 1893 km (1022 nmi) of track lines during Leg I and 1623 km (876 nmi) during Leg II. Of these track lines, 1816 km (980 nmi) and 1376 km (763 nmi) are track lines that correspond to the on-effort criteria (Figure 1). About 48% and 50% of the survey transects during Legs I and II, respectively, were conducted in very good weather conditions, Beaufort sea state 2 or less (Table 1).

During Leg I, there were 16 species of identifiable cetaceans, two turtle species, and basking sharks and sunfish recorded during the survey (Table 2). In total, the upper team detected 386 groups and 5601 individuals, while the lower team detected 526 groups and 8527 individuals (Table 2). Note, some, but not all, groups detected by one team were also detected by the other team.

During Leg II, there were 16 species of identifiable cetaceans,, and basking sharks and sunfish recorded during the survey (Table 3). In total, the upper team detected 430 groups and 9007 individuals, while the lower team detected 418 groups and 9036 individuals (Table 3). Note, some, but not all, groups detected by one team were also detected by the other team.

SEA BIRD SIGHTING TEAM

The seabird team surveyed during the same time as the visual marine mammal and turtle team, and some additional times in weather conditions too bad for the visual marine mammal and turtle team. During Leg I, 1211 seabird groups and 2462 individual seabirds of 20 species were detected (Table 4). During Leg II, 1505 seabird groups and 3665 individual seabirds of 19 species were detected (Table 4). In addition, 8 non-seabird species were identified (Table 4).

During the second leg, an attempt was made to record whether or not any birds were associated with groups of whales recorded from the lower team. A total of 339 sightings of marine mammals were made; of these 227 were checked, usually by the initial observer of the marine mammals, for associated birds (Table 5). Only eleven of the sightings had birds apparently associated, and several of these appeared accidental rather than deliberate associations. This low ratio contrasts with other oceans where flocks are often the prompt for the presence of marine mammals. There was no obvious relationship between a species of marine mammal and bird associations.

PASSIVE ACOUSTIC DETECTION TEAM

The passive acoustic team surveyed not only during the times when the visual marine mammal and seabird teams were surveying, but also during most days when the

weather was too bad to visually survey and during most nights. They surveyed for 8423 km (4472 nmi) during both legs, representing 75% of the total track line covered during the entire cruise (11,240 km or 6069 nmi); this is 5139 km (2774 nmi) and 3284 km (1773 nmi) during Legs I and II, respectively. Presence or absence of vocalizations was recorded during 1628 monitoring stations in Leg I and during 974 monitoring stations in Leg II (Figure 2). The difference between legs reflects the poorer weather conditions and greater technical issues encountered during Leg II.

Sperm whales were detected aurally at 241 (15%) monitoring stations during Leg I, and 220 (23%) during Leg II. Dolphin species were detected aurally at 425 (26%) monitoring stations during Leg I and 220 (23%) during Leg II. One hundred and fifty one hours of recordings were made, where recording duration varied between 1 second and 55 minutes.

Rainbow Click (medium frequency click detector) detected 53,804 sperm whale and 2428 dolphin events. Note that these events do not reflect the total number of vocalizing cetaceans, nor do they reflect the total number of encounters with cetaceans.

Whistle (medium frequency tonal detector) detected a total of 3340 whistle events and 273,915 whistle fragments. Long recordings of single species dolphin groups, for example common dolphin (*Delphinus delphis*), striped dolphin (*Stenella coruleoalba*) and pilot whale (*Globicephala* spp.), made during the course of these cruises can be used in subsequent statistical analyses to determine species-specific characteristics to improve automated species classification.

The Porpoise detector, though functioning properly did not detect any harbor porpoises, though automated detections of echolocating dolphin species were made as groups passed directly by the hydrophone. A single porpoise like event was attributed to a sighting of *Kogia simus*, and this warrants further investigation.

The passive acoustic monitoring was completed successfully, however technical problems with equipment and damage to the array resulted in time being lost during troubleshooting and repairs. Static or crackling on the medium frequency was a persistent problem throughout this survey and has been on previous surveys. The static was typically associated with periods when the array was under extreme tension, for example during tight turns and at speeds exceeding 10 knots. Although the cause of this problem was identified as a damaged core within the tow cable, it was difficult to identify the exact location and make repairs. The cable was damaged 50m above the sensor array by a large fish or shark during the second leg, and although the Kevlar sheath and several of the cores were damaged and exposed to seawater and effective repair was made on board. This damage was not the cause of the static.

HYDROGRAPHIC/BONGO SAMPLES

There were 34 and 25 Bongo/CTD stations during Legs I and II, respectively (Figure 1). XBT's were deployed at 34 and 25 different stations during Leg I and Leg II, respectively (Figure 1).

BIOPSY SAMPLES

One biopsy tissue sample was collected from a dead fin whale found floating. Half of the sample went to SWFSC and half was retained at the NEFSC.

RESCUE OF A LEATHERBACK TURTLE

At 1500 local time on 6 July 2004 (37˚ 32.85N 69˚ 53.98W) a leatherback turtle that was entangled in longline gear was encountered. A small boat was launched with two scientists and two ENDEAVOR crew members. The scientists cut the gear off the animal and the turtle swam away. The gear was wrapped tightly around the left flipper, cutting 2-3 inches into the flesh. The turtle was not hooked, but there were two hooks, a small float and a ganging on the line. Digital pictures were taken.

DISPOSITION OF THE DATA

All data collected will be maintained by the Protected Species Branch at the Northeast Fisheries Science Center in Woods Hole, MA. Most of which will be available from the NEFSC's Oracle database. The biopsy sample will be archived at the NEFSC.

REFERENCES

Heinemann, D. 1981. A range finder for pelagic bird censusing. Journal of Wildlife Management 45: 489-493.

SCIENTIFIC PERSONNEL

Name	Title	Organization
Leg I		
Gordon Waring	Chief Scientist	NMFS, NEFSC, Woods Hole, MA
Gina Shield	Seabird team leader	NMFS, NEFSC, Woods Hole, MA
Robert Pitman	Visual team leader	NMFS, SEFSC, La Jolla, CA
Gary Friedrichsen	Visual team leader	Integrated Statistics, Inc, Woods Hole, MA
Rene Swift	Acoustic team leader	Volunteer
Irene Briga	Visual observer	Integrated Statistics, Inc, Woods Hole, MA
Sophie Webb	Visual observer	Integrated Statistics, Inc, Woods Hole, MA
Kimberly Fleming	Visual observer	Integrated Statistics, Inc, Woods Hole, MA
Elizabeth Josephson	Visual observer	Integrated Statistics, Inc, Woods Hole, MA
Elizabeth Phillips	Visual observer	Integrated Statistics, Inc, Woods Hole, MA
Rich Pagen	Sea bird observer	Integrated Statistics, Inc, Woods Hole, MA
Dan Smith	Acoustic observer	Integrated Statistics, Inc, Woods Hole, MA
Leg II		
Debra Palka	Cruise leader	NMFS, NEFSC, Woods Hole, MA
Mark Tasker	Seabird team leader	Volunteer
Gary Friedrichsen	Visual team leader	Integrated Statistics, Inc, Woods Hole, MA
Virginie Chadenet	Visual team leader	Integrated Statistics, Inc, Woods Hole, MA
Rene Swift	Acoustic team leader	Volunteer
Laura Morse	Visual observer	Integrated Statistics, Inc, Woods Hole, MA
Heather Haas	Visual observer	NMFS, NEFSC, Woods Hole, MA
Keri Lodge	Visual observer	Integrated Statistics, Inc, Woods Hole, MA
Marjorie Rossman	Visual observer	NMFS, NEFSC, Woods Hole, MA
Jakobina Arch	Visual observer	Integrated Statistics, Inc, Woods Hole, MA
Candice Emmons	Visual observer	Integrated Statistics, Inc, Woods Hole, MA
Rich Pagen	Sea bird observer	Integrated Statistics, Inc, Woods Hole, MA
Robert DiGivonni	Acoustic observer	Integrated Statistics, Inc, Woods Hole, MA

Table 1. Length of visual teams' on-effort track lines (in km) and percentage surveyed during each Leg within each Beaufort sea state condition.

Beaufort Sea state	Leg I		Leg II		Total	
	Length	%	Length	%	Length	%
0	13.3	0.7	24.1	1.8	37.4	1.2
1	284.2	15.7	272.6	19.8	556.8	17.5
2	574.4	31.6	389.8	28.3	964.2	30.2
3	810.7	44.7	437.9	31.8	1248.6	39.1
4	117.0	6.4	250.6	18.2	367.6	11.5
5	15.9	0.9	1.0	0.1	16.9	0.5
Total	1815.5	100	1376.0	100	3191.5	100

Table 2. Number of groups and individuals of marine mammal, turtle and large fish species detected during Leg I.

SPECIES		LOWER TEAM		UPPER TEAM	
Common name	Scientific name	GROUPS	INDIV	GROUPS	INDIV
Bottlenose dolphin, offsh	*Tursiops truncates*	0	0	5	153
Bottlenose dolphin, uid	*T. truncates*	25	264	8	85
Bottlenose dolphin, uid?	*T. truncates*	7	90	0	0
Common dolphin	*Delphinus delphis*	94	2960	56	1622
Rissos dolphins	*Grampus griseus*	76	583	39	457
Rissos dolphins?	*G. griseus*	1	6	1	7
Spotted dolphin, Atlantic	*Stenella frontalis*	1	18	1	12
Striped dolphin	*S. coeruleoalba*	55	2296	25	1210
Striped dolphin?	*S. coeruleoalba*	6	292	1	25
White-sided dolphin	*Lagenorhynchus acutus*	4	39	0	0
Cuvier's beaked whale	*Ziphius cavirostris*	7	25	2	4
Sowerby's beaked whale	*Mesoplodon bidens*	1	4	1	3
Sowerby's beaked whale?	*M. bidens*	1	4	0	0
Unidentified beaked whale	*Mesoplodon spp.*	8	11	9	17
Unidentified beaked whale?	*Mesoplodon spp.*	0	0	1	1
Sperm whale	*Physeter macrocephalus*	50	77	46	84
Dwarf sperm whale	*Kogia simus*	1	2	2	2
Pygmy or dwarf sperm whale	*Kogia spp.*	1	2	0	0
Northern bottlenose whale	*Hyperoodon ampullatus*	1	8	2	16
Pilot whale	*Globicephala spp.*	30	360	25	214
Pilot whale?	*Globicephala spp.*	0	0	1	1
Fin whale	*Balaenoptera physalus*	10	11	3	5
Sei whale	*B. borealis*	1	1	0	0
Fin/sei whale	*B. physalus or B. borealis*	1	1	8	9
Humpback whale	*Megaptera novaeangliae*	2	2	1	1
Minke whale	*B. acutorostrata*	1	1	0	0
Unidentified cetacean		11	17	10	10
Unidentified dolphin		106	1414	88	1600
Unidentified large whale		3	3	6	6
Unidentified small whale		5	18	16	27
Loggerhead turtle	*Caretta caretta*	4	4	1	1
Leatherback turtle	*Dermochelys coriacae*	1	1	2	2
Unidentified turtle		4	4	0	0
Basking shark		3	4	1	1
Sunfish		5	5	25	26
TOTAL		526	8527	386	5601

Table 3. Number of groups and individuals of marine mammal, turtle and large fish species detected during Leg II.

SPECIES		LOWER TEAM		UPPER TEAM	
Common name	Scientific name	GROUPS	INDIV	GROUPS	INDIV
Bottlenose dolphin, offsh	*Tursiops truncatus*	13	226	5	93
Bottlenose dolphin, uid	*T. truncates*	19	227	22	281
Bottlenose dolphin, uid?	*T. truncates*	2	70	0	0
Common dolphin	*Delphinus delphis*	51	3059	46	2187
Common dolphin?	*D. delphis*	2	60	1	3
Rissos dolphins	*Grampus griseus*	78	777	58	1032
Rissos dolphins?	*G. griseus*	3	25	2	6
Spotted dolphin, Atlantic	*Stenella frontalis*	13	663	7	261
Striped dolphin	*S. coeruleoalba*	33	2443	12	2388
Striped dolphin?	*S. coeruleoalba*	2	45	0	0
Spotted or Striped dolphin	*Stenella?*	5	126	7	249
Blainville's beaked whale	*Mesoplodon densirostris*	2	10	0	0
Cuvier's beaked whale	*Ziphius cavirostris*	1	3	4	7
Sowerby's beaked whale	*M. bidens*	5	18	0	0
Sowerby's beaked whale?	*M. bidens*	1	4	0	0
Unidentified beaked whale	*Mesoplodon spp.*	9	25	12	56
Unidentified beaked whale?	*Mesoplodon spp.*	1	1	0	0
Sperm whale	*Physeter macrocephalus*	52	74	51	97
Sperm whale?	*P. macrocephalus*	1	1	0	0
Dwarf sperm whale	*Kogia simus*	1	1	0	0
Pygmy sperm whale		3	3	0	0
Pygmy or dwarf sperm whale	*Kogia spp.*	2	2	9	15
Northern bottlenose whale	*Hyperoodon ampullatus*	2	5	0	0
Pilot whale	*Globicephala spp.*	28	442	22	291
Pilot whale?	*Globicephala spp.*	0	0	2	10
Fin whale	*Balaenoptera physalus*	8	9	6	6
Fin/sei whale	*B. physalus or B. borealis*	6	6	1	1
Humpback whale	*Megaptera novaeangliae*	1	1	1	1
Humpback whale?	*M. novaeangliae*	2	2	0	0
Unidentified cetacean		4	8	15	32
Unidentified dolphin		41	669	100	1931
Unidentified large whale		10	10	23	27
Unidentified small whale		6	9	6	15
Loggerhead turtle	*Caretta caretta*	3	3	3	3
Leatherback turtle	*Dermochelys coriacae*	3	4	1	1
Basking shark		1	1	0	0
Sunfish		4	4	14	14
TOTAL		418	9036	430	9007

Table 4. Number of groups and individuals of bird species detected during Legs I and II.

Species	Scientific name	Leg I		Leg II	
SEABIRDS					
Common name		GROUPS	INDIV	GROUPS	INDIV
Dovekie	*Alle alle*	2	4	1	1
Fulmar, Northern	*Fulmarus glacialis*	2	2	0	0
Gull, Great Black-back	*Larus marinus*	1	1	0	0
Gull, Herring	*Larus argentatus*	1	1	0	0
Gull, Laughing	*Larus atricilla*	0	0	3	4
Jaeger, Parasitic	*Stercorarius parasiticus*	1	1	0	0
Jaeger, Unknown		6	6	1	1
Petrel, Black-capped	*Pterodroma hasitata*	7	9	6	6
Petrel, Bulwer's	*Bulweria bulwerii*	1	1	2	2
Petrel, Fea's	*Pterodroma feae*	0	0	1	1
Petrel, Herald	*Pterodroma heraldica*	0	0	4	4
Petrel, Unknown		0	0	2	2
Shearwater, manx or audobons		7	7	0	0
Shearwater, audobons	*Puffinus lhermineri*	124	214	88	218
Shearwater, Corys	*Calonectris diomedea*	102	136	86	152
Shearwater, Greater	*Puffinus gravis*	369	1129	310	878
Shearwater, manx	*Puffinus puffinus*	2	2	3	3
Shearwater, Unknown		9	22	7	8
Shearwater, Sooty	*Puffinus griseus*	15	20	2	2
Skua, Great	*Catharacta skua*	0	0	2	2
Skua, south polar	*Catharacta maccormicki*	1	1	1	1
Skua, Unknown		2	2	0	0
Storm petrel, Band-rumped	*Oceanodroma castro*	1	2	27	38
Storm petrel, Leach's	*Oceanodroma leucorhoa*	218	289	171	220
Storm petrel, Unknown		58	167	27	315
Storm petrel, White-faced	*Petagodroma marina*	0	0	2	2
Storm petrel, Wilson	*Oceanites oceanicus*	279	441	754	1800
Tern, Arctic	*Sterna hirundo*	1	2	0	0
Tern, Bridled	*Sterna anaethetus*	1	1	2	2
Tern, Unknown		2	4	1	1
Tropic bird, white-tailed	*Phaethon lepturus*	0	0	1	1
Tropic bird, Unknown		0	0	1	1
SEABIRD TOTAL		1212	2464	1505	3665
NON-SEABIRDS					
Whimbrel	Numerius phaeopus	0	0	1	1
Greater yellowlegs	Tringa melanoleuca	0	0	1	3
Peep	Calidris spl	1	1	0	0
Dowitcher	Limnodromus sp.	0	0	1	1
Barn swallow	Hirundo rustica	0	0	1	1
Prothonotary warbler	Protonotaria citrea	0	0	1	1
Brown headed cowbird	Molothrus ater	1	1	0	0
Eastern red bat	Lasiurus borealis	0	0	1	1
NON-SEABIRD TOTAL		2	2	6	8

Table 5. Number of cetacean sightings from the lower platform associated with birds.

Species	No. of sightings	No. checked for birds	No. with birds	Comments
Fin whale *Balaenoptera physalus*	10	10	1	Possibly with raft of storm petrels
Fin/sei whale *B. physalus/ borealis*	3	2	0	
Humpback whale *Megaptera novaeangliae*	1	1	0	
Pygmy sperm whale *Kogia breviceps*	3	3	1	Two (Wilson's) storm petrels nearby
Dwarf sperm whale *Kogia simus*	2	2	0	
Unidentified *Kogia* sp.	1	1	0	
Sperm whale *Physeter macrocephalus*	43	25	0	
Northern bottlenose whale *Hyperoodon ampullatus*	2	2	0	
Sowerby's beaked whale *Mesoplodon bidens*	4	3	0	
Blainville's beaked whale *Mesoplodon densirostris*	2	1	0	
Cuvier's beaked whale *Ziphius cavirostris*	1	1	0	
Unidentified beaked whale	11	7	0	
Pilot whale *Globicephala macrorhynchus/melas*	22	16	1	4 Cory's shearwater, 1 black-capped petrel, 1 herald petrel
Common dolphin *Delphinus delphis*	36	28	3	Each with greater shearwaters.
Striped dolphin *Stenella coeruleoalba*	24	14	1	'some birds'
Atlantic spotted dolphin *Stenella frontalis*	11	7	0	
Unidentified *Stenella*	3	2	0	
Bottlenose dolphin *Tursiops truncatus*	27	19	0	
Risso's dolphin *Grampus griseus*	66	54	2	One with 8 greater shearwater, one with 2-3 storm-petrels
Unidentified cetacean	4	3	0	
Unidentified large whale	13	3	0	
Unidentified small whale	7	3	0	
Unidentified dolphin	43	20	2	One with 30 greater shearwaters One with 5 'birds'
Total	**339**	**227**	**11**	

Figure 1. Location of visual teams' on-effort track lines covered during leg I, June 23 – July 12, 2004, (dotted black line) and leg II, July 16 – August 4, 2004 (solid red line). Also displayed are locations of stations where a combined bongo net and CTD (light green circle) and XBT's (dark green squares) were deployed.

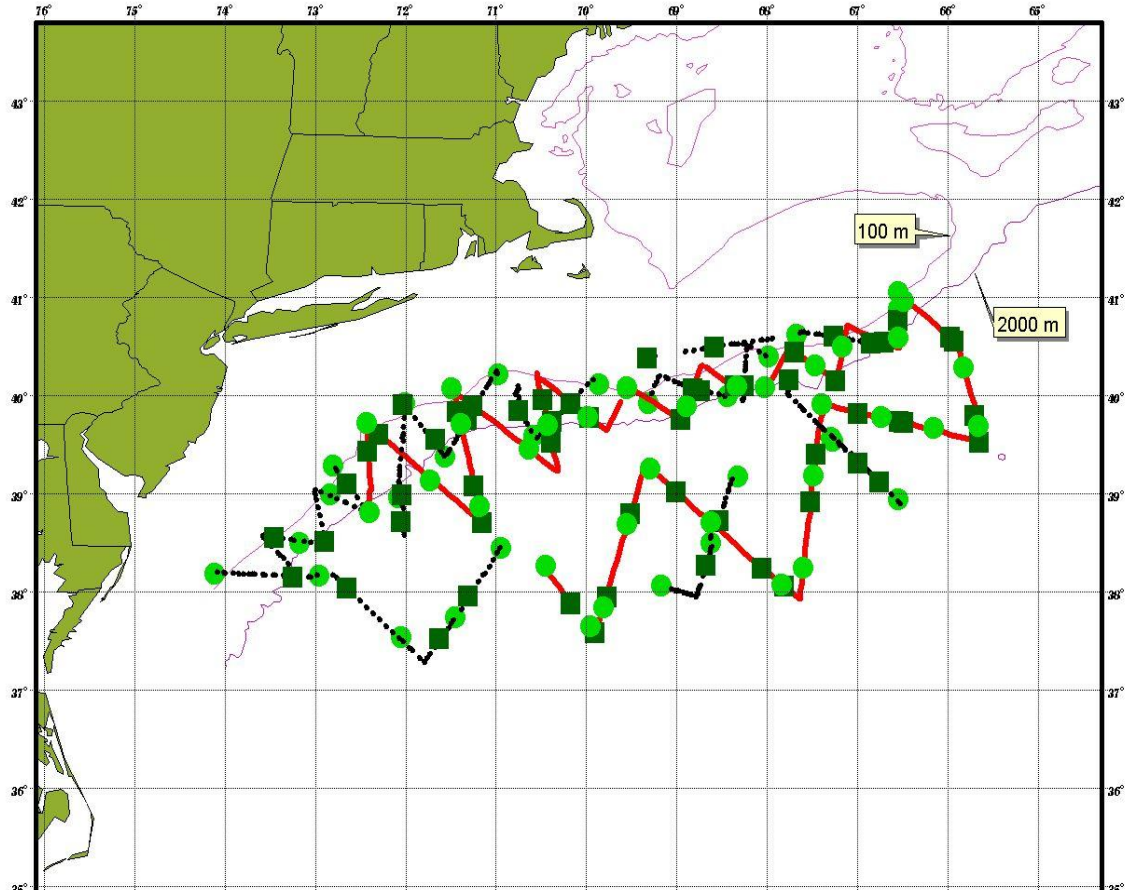

Figure 2. Location of 1-minute acoustic monitoring stations from Legs I and II. Pink points are stations from Leg I, red points are stations from Leg II and the black line is the cruise track.