NOAA Technical Memorandum NMFS-SEFSC-438



# **CRUISE RESULTS**

# WINDWARDS HUMPBACK (Megaptera novaeangliae) SURVEY

# NOAA SHIP Gordon Gunter Cruise GU-00-01 9 February to 3 April 2000

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> U.S. DEPARTMENT OF COMMERCE National Oceanic and Atmospheric Administration National Marine Fisheries Service Southeast Fisheries Science Center 75 Virginia Beach Drive Miami, Florida 33149

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National Marine Fisheries Service Penelope D. Dalton, Assistant Administrator for Fisheries

May 2000

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#### Summary

A visual and acoustic survey of the Eastern Caribbean Islands from St. Kitts to Trinidad, and from Venezuela to Guadeloupe, was conducted from 9 February to 3 April 2000 for humpback whales on the 224 foot NOAA research vessel Gordon Gunter. The survey involved scientists from several Southeastern Caribbean nations and the United States, and was sponsored by IOCARIBE. This report presents the preliminary findings of this survey. Three or four observers using 150 mm objective binoculars and handheld binoculars maintained a visual watch. The acoustic survey was conducted using directional (DIFAR) sonobuoys. Acoustic and visual whale detections of humpback whales were compared.

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#### INTRODUCTION

The NOAA Ship Gordon Gunter departed Pascagoula, Mississippi on 9 February 2000 to conduct a survey of humpback whales (Megaptera novaeangliae) and other cetaceans in coastal, shelf and deep waters of the Southeastern Caribbean Islands, the "Windwards" (Fig. 1). This survey was sponsored by the National Marine Fisheries Service's (NMFS) Southeast Fisheries Science Center (SEFSC), and the International Oceanographic Commission's IOCARIBE organization, a multinational organization for the coordination of marine research in the wider Caribbean. The scientific staff included researchers from a number of Southeastern Caribbean nations and the United States. The purpose of this survey was to visit areas where humpback whales were previously hunted to depletion by commercial whalers, and to determine whether the whales have recovered and re-occupied these areas. Previous research indicates that humpback whales migrate from summer feeding grounds in the North Atlantic to winter mating and calving areas in the northern West Indies and south to the northern coast of South America. Whales from the eastern United States, eastern Canada, Greenland, Iceland, and Norway all mix spatially and breed in the West Indies, but their status in the Southeastern Caribbean has not been assessed. Humpback whales will be the subject of a Comprehensive Assessment by the International Whaling Commission in June 2001, and scientific information on the status of humpback whales in the Southeastern Caribbean is relevant to that assessment, and is relevant to U.S. management requirements for endangered whales under the Marine Mammal Protection Act and the Endangered Species Act. In addition to humpback whales, opportunistic observations and biopsy samples were collected from other cetacean species that were encountered in the Southeastern Caribbean.

#### **OBJECTIVES**

1. Assess current distribution and relative densities of humpback whales in historically important habitats.

2. Photograph and biopsy sample humpback whales for individual identification, as well as toxicological and stable isotope analyses, to determine the relationship of these whales with the greater North Atlantic population.

3. Opportunistically obtain biopsy samples of other cetacean species, including Bryde's whales, sperm whales and other odontocetes.

4. Opportunistically collect data on the distribution and relative densities of seabirds and other marine life.

5. Collect associated environmental data at survey locations.

### **COUNTRY CLEARANCES**

Clearance to conduct this survey in the waters of the nations of the Southeastern Caribbean was requested in August 1999, six months prior to the beginning of the survey in February 2000 (Table 1). Clearance for this multinational survey was received from the Dominican Republic, St. Kitts and Nevis, Antigua Barbuda, Guadeloupe-Marie Galante, Martinique, St. Lucia, St. Vincent and the Grenadines, Barbados, Grenada, Trinidad-Tobago, and Venezuela. Clearance was not received from Dominica, Antigua, Barbuda and St. Vincent and Grenadines. When the survey arrived at the waters of those countries that had not provided clearance, all scientific operations were suspended and the vessel proceeded by right of innocent passage through that nation's waters. Scientific operations resumed once the vessel had entered the waters of a nation that had provided clearance for the survey.

#### **METHODS**

Data on the presence and distribution of cetaceans were collected using visual observers in conjunction with passive acoustic monitoring. Humpback whales were considered the primary species and were located visually and acoustically. Photographs and biopsy samples were obtained for individual identification. All other cetacean species opportunistically encountered were recorded, and when possible, photographs and biopsy samples were obtained.

#### Visual Survey

Visual survey operations for cetaceans were conducted using two teams of three observers during daylight hours, weather permitting (i.e., no rain, Beaufort sea state <7, winds approximately 22 kts.). Each team consisted of marine mammal 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 handheld binoculars. Data were recorded on a laptop computer using a data acquisition and logging software program that interfaced with the ship's a global positioning system (GPS). Environmental data recorded included sea state, surface temperature, water depth, weather, visibility, wind direction and speed, and sun glare in the observer's field of view. Cetacean sighting data included species, group-size, presence of calves, bearing from the bow, linear distance from the ship when detected, and behavioral observations.

In accordance with 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 record of this information may be obtained from the SEFSC's Pascagoula Laboratory.

#### Acoustic Survey

The acoustic survey was conducted using DIFAR directional sonobuoys. These sonobuoys contain a compass in the sensor head and transmits continuous signals containing directional information on sound sources back to the ship. The buoy transmits these signals on a VHF radio carrier in an analog multiplexed format which is de-multiplexed to extract the direction information in degrees magnatic from the sonobuoy to the sound source. The magnetic accuracy to a sound source using these buoys has a standard deviation of two degrees. Calling whales were detected on two or more buoys separated by several kilometers baseline distance, and the magnetic bearings to the source of the calls from the buoys determined. When two or more bearings crossed with a sufficient baseline separation it was possible to precisely locate the position of a calling whale. The ship was then directed to the location of the calling whale and attempts were made to locate the whale visually. A NOAA Technical Memorandum describing the details of the passive acoustics activities and methods utilized during this survey may be obtained from the Protected Species Branch, SEFSC, Miami Laboratory.

## Cetacean Biopsy Sampling

Biopsy samples of skin and blubber were collected from humpback whales and other cetacean species encountered during the survey. Samples of skin and blubber approximately 0.75 cm x 0.75 cm were collected by SEFSC staff authorized as collection agents under CITES permit No. 99US015415/9 and Endangered Species Act (ESA) and Marine Mammal Protection Act (MMPA) permit No. PRT 1023 issued to the United States National Museum of Natural History. Samples were collected for genetic analyses to determine the relationship of humpback whales in the southeastern Caribbean to the greater North Atlantic population, toxicological and stable isotope analyses. Samples were collected using either a modified crossbow or a modified .22 caliber dart rifle. Both of these sampling devices were fitted with specially designed darts tipped with biopsy sampling heads that extract a small plug of tissue from the animals. Biopsy sampling was conducted from the bow of the Gordon Gunter as well as from rigid-bottom inflatable boats that were launched from the Gordon Gunter. Data on each biopsy sampling attempt were recorded in a log book, and included the date, time, platform, sampler and recorder names, field number, sampling device, species sampled, location (GPS), number of attempts (successful and misses), body location struck and sampled, and behavioral reaction of the subject animal. A complete log of biopsy sampling operations and activities may be obtained from the SEFSC Pascagoula Laboratory.

### Photographic Identification

Variations of dorsal humps and pigmentation patterns on the underside of the tail flukes of humpback whales can be used to identify individual animals. Photographs were taken on black and white ASA 400 film with 35 mm cameras equipped with 200-300 mm telephoto lenses. Attempts were made to photograph all whales and especially those from which biopsy samples were obtained. Other species of cetaceans were opportunistically photographed for species identification.

#### Environmental Data

Water temperature data were collected using a SBE9/11 Continuous Time Depth (CTD) recorder at the request of the acoustic team leader to provide a temperature-depth profile to model the transmission of sound at depth. Additional environmental information from shipboard sensors was recorded by the shipboard Scientific Computer System (SCS). The SCS continuously displayed and recorded the ship's position, heading and speed, wind speed and direction, barometric pressure, sea surface and air temperature, and water depth.

### RESULTS

### Cetacean Visual Survey

During the 37 days at sea, a total of 4584 km were surveyed on effort during daylight hours (Table 2, Fig. 1). Daily effort ranged up to 14.6 hours/day and 242 km/day and averaged 7.5 hours/day and 124 km/day. A total of 196 cetacean groups were sighted (Leg 1, 68 groups; Leg 2, 128 groups) (Tables 3, 4 and 5, Fig. 2-10). At least 19 cetacean species were observed. The highest number of cetacean groups sighted on one day was 20 on March 26, 2000 during the transect south of Puerto Rico (Table 3). The most commonly sighted species were humpback whales (n = 33), bottlenose dolphins (*Tursiops truncatus*)(n = 19), and sperm whales (*Physeter macrocephalus*) (n = 16) (Table 3).

Of the 33 sightings of humpback whales, 18 were of single whales, 2 sightings of three whales, and 8 sightings of 2 whales (including two cow-calf pairs). Humpback whale mean group size was 1.4 (Table 4). Humpback whales were seen in both shallow and deep water. Water depths at sighting locations ranged from 27 to 5029 m with a mean depth of 586 m (Table 4). The largest groups of other cetaceans observed included a group of 175 pantropical spotted dolphins (*Stenella attenuata*) and a group of 175 spinner dolphins (*Stenella longirostris*). Spinner dolphins had the largest mean group size with 105 animals per group.

While humpback whale song was heard throughout the entire survey area (see Acoustic Survey below), except for three sightings north of Puerto Rico, visual sightings of humpback whales were made only in the areas from Guadeloupe south to Trinidad-Tobago and Venezuela

(Fig. 3). The few visual sightings of humpback whales compared to the number acoustic detections of singing whales is attributed to the generally high Beaufort Sea State (5+ on average) and the relatively brief periods that humpback whales spent at the surface. Eighteen humpback sightings occurred in waters east of Trinidad and Tobago (including one cow-calf pair), 6 in Guadeloupe and Marie Galante waters, and 2 sightings each off Barbados and Martinique, one sighting off Venezuela, and the remaining sighting of a cow-calf pair off southern end of Grenada (Fig. 3).

Sightings of three species of odontocete cetaceans off Trinidad-Tobago and Venezuela were of particular note. Observers agreed that these animals appeared to be smaller than the same species found in the Gulf of Mexico. This size difference was first noted when a group of what appeared to be Atlantic spotted dolphins or bottlenose dolphin came to ride the bow of the *Gordon Gunter*. These animals were all approximately the same size and at first appeared to be juvenile bottlenose dolphins. However upon closer examination it was noted that some animals in the group were spotted like Atlantic spotted dolphins. This size variation was also noted in a group of rough-toothed dolphins (*Steno bredanensis*) encountered off the east coast of Trinidad, and a group of spinner dolphins north of the Venezuelan and Trinidad border.

Associations between cetacean species were noted on five occasions. On two occasions rough-tooth dolphins were associated with humpback whales. In both cases the rough-tooth dolphins were observed from the small inflatable boats while approaching a humpback whale during attempts to obtain biopsy samples. In both instances the rough-toothed dolphins attempted to ride the small boat's bow wake. Pilot whales were sighted in association with Fraser's dolphins (*Lagenodelphis hosei*) and Atlantic spotted dolphins were associated with the smaller bottlenose/Atlantic spotted dolphins noted in the previous paragraph.

### Acoustic Survey

A small number of sonobuoys were deployed while transiting through the Gulf of Mexico and along the southern sides of Silver and Navidad Banks north of the Dominican Republic to test and calibrate the passive acoustic recording and tracking systems. Passive survey effort began when the vessel reached the waters of St. Kitts and Nevis. A total of 176 sonobuoys were deployed throughout the study area. A total of 96 sonobuoys were deployed during Leg 1 (Fig. 11). Survey effort for Leg 2 began in Venezuelan waters and a total of 80 sonobuoys were deployed. These included 16 sonobuoys deployed near and to the north of Puerto Rico and the northern coast of the Dominican Republic to obtain recordings of humpback song for comparison with song recorded in more southerly areas (Fig. 12).

Humpback whale song was detected throughout virtually the entire area surveyed in the Southeastern Caribbean. A number of islands were not surveyed acoustically either due to time constraints or lack of clearance to conduct surveys those waters. The number of acoustic detections derived from the sonobuoy tapes was used to estimate the number of singing humpback whales along that portion of the survey track line. The estimated number of singing

whales in each area surveyed is shown in Table 6. A total of 30 singing whales were detected during "on effort" surveys during Leg 1 and 44 during Leg 2 of the survey. This is compared to 8 and 15 humpback whales sighted during the same "on effort" survey in Legs 1 and 2, respectively. The greater number of acoustic detections relative to visual sightings demonstrates the advantage of passive acoustic over visual methods for surveys in these areas and during environmental conditions that severely limit the effectiveness of visual methods. Future analyses of these data will form the basis of an estimation of the relative density of humpback whales in the Southeastern Caribbean.

#### Cetacean Biopsy

Nineteen biopsy samples were obtained during the cruise (Leg 1, n = 3; Leg 2, n = 16) (Table 7). Humpback whale biopsies were considered the primary objective, and three skin and blubber samples were collected (Fig.13). In addition, six other species were sampled including Atlantic spotted dolphin (n = 1), Common dolphin (n = 8), Bryde's whale (n = 1), bottlenose dolphins (n = 4), and pantropical spotted dolphins (n = 2) (Figs. 13 and14). Humpback whale biopsy samples were sent to Dr. Per J. Palsboll at the University of Wales Bangor, United Kingdom for analysis, archiving, and comparison with the North Atlantic humpback whale population genetic database. All other biopsy samples were sent to Dr. Patty Rosel at the NOAA, National Ocean Service (NOS) Laboratory in Charleston, South Carolina for analysis and archiving.

#### Environmental data

Profiles from the SBE 9/11 Sea logger CTD, other environmental data, and data from the ship's SCS were returned to the NMFS Pascagoula Laboratory for editing and archiving.

#### ACKNOWLEDGMENTS

We wish to thank IOCARIBE for their sponsorship and encouragement of this multinational survey for humpback whales in the Southeastern Caribbean. We also extend our gratitude to the Eastern Caribbean nations that provided clearance to conduct this survey and that provided assistance during the cruise. Special thanks go to the Officers and Crew of the NOAA ship Gordon Gunter, and the staff of the SEFSC Pascagoula Laboratory for logistical and technical support. We could not have had a more dedicated scientific team, that often preformed above and beyond the normal call of duty. To all of the science party from all of the participating nations, we are pleased to have sailed with you and hope we will work together again. Assistance critical to the success of this survey was provided by many individuals, but we wish to especially thank Fred Berry, Bradford Brown, David Chadee, Phil Clapham, Tom Coxe, Shelby Drummond, Wayne Hoggard, Keith Mullin, Randi Olsen, Charlie Potter, Per Palsboll, Randy Reeves, Carol Roden, Donna Spencer, Rafael Steer-Ruiz, and Jim Tobias.

## **CRUISE PARTICIPANTS**

Leg 1 (9 February - 7 March 2000)

Name Carolyn Burks Steven Swartz Carol Roden Charlotte Cates Eric Zolman David Weller Mark McDonald Rene DeVito Jenny Litz Grisel Ferrer Jay Barlow Barbara Miller Title Field Party Chief Principal Investigator Fishery Biologist Biologist Research Scientist Acoustician Biologist Biologist Graduate Student Research Scientist Cooperator Organization NMFS, Pascagoula, MS NMFS, Miami, FL NMFS, Pascagoula, MS Contractor, Pascagoula, MS NOS, Charleston, SC SWFSC, La Jolla, CA Whale Acoustics, Laramie, WY Medford, OR SEFSC, Miami, FL University Of Puerto Rico, Puerto Rico SWFSC, La Jolla, CA American Embassy, Bridgetown, Barbados

Leg 2 (9 March - 3 April 2000)

Name Tony Martinez Tim Cole Kevin Rademacher Denice Drass Harriet Corbett Danielle Savarese Tom Fernald John Hildebrand Erin Oleson Maria Morete Ana Fretias Dianna Mora Pinto Analisa Tam

<u>Title</u> Field Party Chief Principal Investigator Fishery Biologist Biologist Biologist Biologist Acoustician Acoustician Biologist Biologist Graduate Student Graduate Student Organization NMFS, Miami, FL NMFS, Woods Hole, MA NMFS, Pascagoula, MS NMFS, Pascagoula, MS Roberts, MT Cetacean Research Unit, Glouchester, MA College of the Atlantic, Bar Habor, ME Scripps Institute, San Diego, CA Scripps Institute, San Diego, CA Brazil Humpback Program, San Paulo, BR Brazil Humpback Program, San Paulo, BR University of Puerto Rico, Lajas, PR Institute of Marine Affairs, Port of Spain, TT

Submitted by:

Approved by:

Steven L. Swartz, Ph.D. Principal Investigator

Nancy Thompson, Acting Director Southeast Fisheries Science Center

	Clearance received	Clearance revoked
Dominican Republic	1/4/00	
St. Kitts & Nevis	11/16/99	
Antigua & Barbuda	9/29/00	1/27/00 revoked
Guadeloupe-Marie Galante	2/1/00	
Dominica	,	1/26/00 denied
Martinique	2/1/00	
St. Lucia	1/11/00	
St. Vincent and the Grenadines	11/22/99	2/1/00 revoked
Barbados	1 <b>0/8/99</b>	
Grenada	1/10/00	
Trinidad-Tobago	1/24/00	
Venezuela	3/8/00	

## Table 1. 2000 Windwards Humpback Whale Cruise: List of Country Clearances

Table 2.	Survey cruise effort hours,	transect kilometers,	average sea state,	, and number of cetacean sightings	5.

SPECIES	EFFORT HOURS	TRANSECT KILOMETERS	AVERAGE SEA STATE	NUMBER OF SIGHTINGS
LEG I				
2000 Feb 9 Depart Pascagoula, Mississinni				
2000 Feb 15 Arrive San Juan, Puerto Rico				
Depart San Juan, Puerto Rico				
2000 Feb 17	4.5	78.3	4,9	0
2000 Feb 18	8.7	154.9	5.3	Û
2000 Feb 19	6.9	126.5	5.3	4
2000 Feb 20	6.9	119.4	3.8	5
2000 Feb 21	6.6	114.8	3.4	6
2000 Feb 22 2000 Feb 22	4.1	66.0	4.3	2
2000 Feb 24 Arritis Deidesterre Dedester	8.4	133.1	4.3	4
2000 Feb 24 Antive Bridgetown Darbados	5.2	89.3	4.1	2
2000 Feb 20 Depart Bridgetown, Barbados	6,4 9,5	124.0	3.0	3
2000 Feb 28	8.5	148.6	3.3	2
2000 Feb 29	4.2	1.80	3.8	4
2000 Mar 01	10.7	211.1	4.0	1
2000 Mar 02	4.9	82.1	5.0	1
2000 Mar 03	7.0	28.0	5.7	2
2000 Mar 04	14.6	2020	3.0	19
2000 Mar 05	6.6	111.6	4.3	4
2000 Mar 06	0.3	43	5.0	, ,
2000 Mar 07 Arrive Port of Spain, Trinidad			2.0	L
TOTAL	117.9	2014.9		68
I EC 2		•		
2000 Mar 09 Depart Port of Spain Trinidad				•
2000 Mar 11		00.0	5.0	
2000 Mar 12	4.9	90.0 140.7	5.0	1
2000 Mar 13	10.3	931	3.0	2
2000 Mar 14	4.9	151 4	4.2	1
2000 Mar 15	9.2	131.3	40	7
2000 Mar 16	8.2	76.6	47	ý
2000 Mar 17	9.2	83.1	27	Ś
2000 Mar 19	9.0	142.2	3.5	8
2000 Mar 20	11.0	157.9	3,4	4
2000 Mar 21	10.6	107.6	2.9	6
2000 Mar 22	7.3	109.9	2.4	3
2000 Mar 23 Arrived Bridgetown Barbados	9.9	55.2	2.1	5
2000 Mar 24 Departed Bridgetown Barbados	3.4	-181.1	2.6	17
2000 Mar 25	9.5	116.7 -	2.6	13
2000 Mar 26	0.3	135.9	1.3	20
2000 Mar 27 Arrived San Juan, Puerto Rico	7.1			
2000 Mar 25 Departed San Juan, Puerto Rico	67	128.0	3.2	2
2000 Apr 29 2000 Amr 01	11.5	237.3	2.9	5
≏ovo npios 2000 Ane 02	11.8	242.2	3.7	3
2000 Apr 03 Arrive Pascagoula, Misissippi	10.6	197.1	3.7	2
ΤΟΤΑΙ	160.0	2540.2		
TOTAL	100.9	2009.5		128
ITHAI.	278.8	4584 7		106

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Table 3	Number of sightings of	f cetacean species	during each leg	of Cruise GU - 00	- 01, February 9	- April 3, 2000
			_			

SPECIES	LEG 1	LEG 2	TOTAL
Fin whale (Balaenoptera physalus)	Û	I	ł
Bryde's whale (Balaenoptera edeni)	0	5	5
Humpback whale (Megaptera novaeangliae)	17	16	33
Sperm whate (Physeter macrocephalus)	1	15	. 16
Dwarf sporm whale (Kogia simus)	Û	2	2
Cuvier's beaked whale (Ziphius cavirostris)	U	1	ı
Blainville's beaked whale (Mesoplodon densirostris)	0	I	i
Melon-headed whale (Peponocephala electra)	0	t	I
False killer whale (Pseudorca crassidens)	i	0	1
Rough-toothed dolphin (Steno bredanensis)	6	0	·6
Fraser's dolphin (Lagenodelphis hosei)	1	0	~ ا
Bottlenose dolphins (Tursiops trancatus)	7	12	19
Risso's dolphin (Grampus griseus)	U	l	1
Pantropical spotted dolphin (Stenella attenuata)	4	6	10
Atlantic spotted dolphin (Stenella frontalis)	5	3	8
Spinner dolphin (Stenella longirostris)	2	-	2
Balaenopterid whale (Balaenoptera spp.)	-	4	- 4
Pygmy/Dwarf sperm whale (Kogia spp.)	<u>~</u>	, ,	7
(Kogia spp.)	0	3	3

continued

### Table 3. Continued.

SPECIES	LEG 1	LEG 2	TOTAL	
Unidentified stenellid dolphin (Stenella spp.)	ĩ	4	5	
Unidentified <i>Delphinus</i> dolphin ( <i>Delphinus spp.</i> )	0	· 11	11	
Unidentified Mesoplodon (Mesoplodon spp.)	D	2	2	
Pilot whale (Globicephala spp.)	5	2	7	
Bottlenose/Atlantic spotted dolphin ( <i>Tursiops truncatus/Stenella frontalis</i> )	7	0	7	
Melon-headed/Pygmy killer whale (Peponocephala electralFeresa attenuata)	0	ł	1	
Unidentified dolphin	6	20	26	
Unidentified small whate	0	1	1	
Unidentified large whale	1	11	12	
Unidentified odontocete	4	5	9	
TOTAL	68	128	196	

Table 4. Number of cetacean groups (n), mean group size, water depth, and sea surface temperature for cetacean sightings during cruise GU - 00 - 01, February 9 - April 3, 2000.

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Group Size					Water Depth			Sea Surface Temperature			
		(animals	;)		(w	eters)		(0	legrees (	C)	
Species	n	Mean	(SE)	Range	Mean	(SE)	Range	Мезп	(SE)	Range	
Balaenoptera physalus	1	0.1				(63.0)		23.3			
Balaenoptera edeni	5	1.6	(0.24)	1 - 2	63	(19.7)	23 - 117	24.1	(0.26)	23.6 - 24.9	
Megaptera novaeangliae	33	1.4	(0.11)	1-3	586	(224.4)	27 - 5029	16.8	(0.12)	23.9 - 28.1	
Physeler macrocephalus	16	2.7	(0.62)	1 - 11	. 1784	(169.4)	877 - 2498	27.2	(0.21)	26.0 - 30.0	
Kogia simus	2	3.0	• •		1648	(850.0)	799 - 2498	26.7	(0.60)	26.1 - 27.3	
Ziphius cavirostris	1	3.0			(499	• •		27.2			
Mesoplodon densirostris	1	2.0			3658			27.8			
Peponocephala electra	i	38.0			1699			26.7			
Pseudorca crassidens	1	4.0			309			27.0			
Steno bredanensis	6	9.4	(0.68)	8 - 11	54	(8.2)	31 - 74	27.2	(0.06)	27.1 • 27.4	
Lagenodelphis hosei	1	70.9	. ,		1280	• •		26.5			
Delphinus spp.	11	18.1	(5.46)	3 - 60	56	(4.2)	24 - 71	23.9	(0.29)	22.9 - 26.4	
Tursiops truncatus	19	13.5	(2.99)	1 - 50	399	(139.0)	20 - 2498	26.6	(0.29)	23.7 - 28.6	
Gramous griseus	Ĩ	3.0	()		2498	(		27.4	. ,		
Stenella SDD.	ŝ	29.2	(16.29)	3 - 90	1129	(725.0)	249 - 4006	26.4	(0,79)	24.2 - 28.9	
Stenella attenuata	10	37.1	(15.90)	5 - 175	1126	(93.0)	49 - 2506	26.6	(0.26)	24.6 - 27.4	
Stenella frontalis	8	16.0	(4.63)	4 - 40	163	(104.2)	48 - 893	26.3	(0.30)	24.7 - 27.3	
Stenella longirostris	2	105.0	(70.00)	35 - 175	1556	(457.2)	1097 - 2012	26.6	(0.05)	26.6 - 26.7	
Balaenoptera spp.	4	1.2	(0.25)	1+2	77	(24.3)	9-119	24.0	(0.73)	23.0 - 26.2	
Kogia spp.	2	3.7	(0.88)	2 - 5	2225	(363.0)	1499 - 2597	27.5	(0.31)	27.0 - 28.1	
Mesoplodon spp.	2	2.0	(1.00)	1 - 3	2478	(180.0)	1299 - 3658	27.6	(0.10)	27.5 - 27.7	
Globicephala spp.	7	7.0	(2.28)	3 - 18	1746	(252.0)	1006 - 2835	26.7	(0.24)	25.8 - 27.7	
T. truncatus/S. frontalis	7	8.1	(1.47)	3 - 12	49	(2.1)	42 - 55	26.7	(0.01)	26.7 - 26.8	
P. electra/F. attenuata	i	16.0			1536			26.8	. ,		
Unidentified dolphin	26	9.6	(1.93)	1 - 30	902	(212.0)	38 - 4024	26.1	(0.32)	22.6 - 29.0	
Unidentified small whale	1	1.0	,,		26	, ,		26.3			
Unidentified large whale	12	1.3	(0.14)	1 - 2	601	(348.3)	35 - 4024	23.4	(1.84)	23.7 - 27.2	
Unidentified adoptocete	-0	1.6	(0.29)	1.3	1859	1472 21	165 - 4024	26.8	(0.17)	26.0 - 27.5	

··· · ·									
DAT	Ē		SPECIES	GROUP SIZE	PO	SITION	SST	DEPTH	s
<u></u>	-		<u>9, 20,000</u>	01000.0000			<u></u>		-
						8	(C)	(m)	
			o 11						. 67
2000	Feb	19	Sienella attenuata	15	16'19'	61"09"	26.1	1190	oπ
2000	reD E-F	19	Inrstops truncatus	8	12,29	61 10	20.3	1190	011
2000	reD D	19	Stenetta attemiata	11	10.02	01 49	20.7	915	011
2000	red r-l	12	Sienetta attenuata	173	14-201	0149	20.0	1501	011
2000	rep Esh	20	Unidentified delphin	12	14:39	6113	20.5	1464	on
2000	reu Est	20	Beugeten maamaanhalua	٨	14'37	61 14 61917	20.5	1464	00
2000	Feb	20	Globicanhala con	4	1/141 01	60.54	26.5	1007	00
2000	Fab	20	Undentified dolphin	5	1410	600/37	20.5	512	off
2000	Feb	20	Lagenodelphis hosei	70	1446	61015	26.5	1281	off
2000	1.00		Globicenhala son	15	1440	01-15	-0.2	1	VII
2000	Feb	21	Unidentified adontocete	13	14.38'	61027	26.5	2800	00
2000	Feb	71	Unidentified dolphin	1	14.33	61.27	26.6	2699	ണ്
2000	Feb	21	Globicenhala son	4	14-12	61.30	25.8	2837	00
2000	Feh	21	Megantera novaeangliae	-	14.13	61:30	25.0	2745	off
2000	Feh	22	Sienella attenuata	45	13.56	61.09	26.6	2507	01
2000	Feb	22	Unidentified large whale	.5	13.54	61.00	26.5	1995	on
2000	Feb	23	Stepella langinstris	35	12,22	61.35	26.7	1098	07
2000	Feh	23	Stenella langirastris	175	12.11	61.47	26.6	2013	on
2000	Feh	23	Megantera novoenngline	3	11.57	61.50	26.9	33	on
2000	Feb	23	Pseudorca crassidens	4	12.06	61.29	27.0	309	on
2000	Feb	24	Tursions truncatus	4	13 10	59 43'	26.6	381	on
2000	Feb	24	Unidentified dolphin	1	12,59	59 31'	26.7	247	00
2000	Feb	26	Unidentified adoptocete	1	12 48'	59 47	27.0	1098	00
2000	Feb	26	Tursions truncatus	12	12 45'	59 48'	27.0	1098	on
2000	Feb	26	Globicephala spp.	17	11 51	60 14	27.1	1601	on
2000	Feb	27	Tursions truncatus	18	11.04	60 30'	27.1	73	on
2000	Feb	27	Megaptera novaeangliae	1	11 07	60.31'	27.2	77	on
2000	Feb	28	T. truncatus/S. frontalis	H	10 36	60 34	26.8	53	on
2000	Feb	28	Megaptera novaeangliae	2	10°30'	60'36'	27.2	33	off
2000	Feb	28	Megaptera novaeangliae	-	10 25	60 47	27.3	31	on
			Steno bredanensis	6	<sub>0</sub>	<u> </u>			
2000	Feb	29	Stenella spp.	90	10 38'	61 47'	27.2	260	on
2000	Mar	01	Megaptera novaeangliae	3	10 50	60°55'	27.1	53	on
2000	Mar	02	Megaptera novaeangliae	2	LI °04'	60 56	26.8	38	on
2000	Mar	02	T. truncatus/S. frontalis	12	11'04'	60°55'	26.8	42	off
2000	Маг	02	Megaptera novaeangliae	1	10"30"	60°38'	27.0	40	off
2000	Mar	03	Stenella frontalis	17	10"37"	60'39'	26.8	51	off
2000	Маг	03	T. truncatus/S.frontalis	8	10'36'	60°37'	26.8	55	off
2000	Mar	03	Megaptera novaeangliae	2	10'34'	60°34'	26.7	48	on
2000	Маг	03	Stenella frontalis	4	10°32'	60'35'	26.7	48	otř
			T. truncatus/S.frontalis	3	0	4			
2000	Mar	03	Megaptera novaeangliae	2	10 29'	6036' -	- 27.1	40	on
2000	Mar	03	Steno bredanensis	11	10.29	60°3 <i>5'</i>	27.1	38	off
2000	Mar	03	Unidentified dolphin		10:30	60"36"	27.1	55	off
2000	Маг	03	Megaptera novaeangliae	2	11.04'	60°56'	26.8	38	on
2000	Mar	03	T. truncatus/S. frontalis	12	11•04'	60°55'	26.8	42	off
2000	Мат	03	Megaptera novaeanghae	1	L0º30'	60°38'	26.8	40	off
2000	Mar	03	Stenella frontalis	17	10°37'	60°39'	27.0	51	off
2000	Маг	03	T. truncatus/S. frontalis	8	10:36'	60•37'	26.8	55	off
2000	Маг	03	Megaptera novaeangliae	2	10•34'	60•34'	26.8	48	on
2000	Mar	03	Stenella frontalis	4	10.32'	60•35'	26.7	48	otř
			T. truncatus/S. frontalis	3	e	n			
2000	Mar	03	Megaptera novaeangliae	2	10 29'	60 36'	<b>27</b> .1	40	on
					0				

Table 5. Summary of cetacean sightings by day during Cruise GU - 00 - 01 in the Atlantic Ocean and Caribbean Sea, February 9 - April 3, 2000 (S = effort status, SST = sea surface temperature).

continued

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## Table 5. Continued.

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DATE			SPECIES	GROUP SIZE	<u>PC</u>	<b>SITION</b>	<u>SST</u>	<u>DEPTH</u>	<u>s</u>
			· · · · · · · · · · · · · · · · · · ·				(C)	(m)	
2000	Mar	03	Steno bredanensis	11	10°29'	60'35'	27.1	38	off
2000	Mar	03	Unidentified dolphin	_	10'30'	60'36'	27.1	55	off
2000	Mar	04	Tursiops truncatus	1	11-16	60'28'	26.9	210	011
2000	Mar	04	Unidentified odontocete	1	10.46	60°13'	27.2	641	00
2000	Mar	04	Turstops truncatus	1	11*16	60°28	26.9	210	OL
2000	Mar	04			10"46"	6013	27.2	041	00
2000	iviar	05	Iursiops truncatus	8	10"37	60.42	20.9	48	00
2000	Mor	05	Magantena neuronalian	9	10-40	60°24 60°25	27.4	75	011
2000	Mor	05	Steno bradanonaio	د •	10-30	60.25	27.0	71	01
2000	Mar	05	Steno breaanensis	8	10-52	60.708	27.**	57	00
2000	Mar	0.5	Magaptang nawaganglian	0	10.30	00 29 40-27	27.3	57 94	00
2000	Mar	0.0	Megaptera novaeanguae	1	10-47	00°21 60.76'	27.5	71	ണ്
2000	1.91.211	00	Stong bradanansis	0	10.52	00.70	27.1	/1	UII
2000	Mar	11	Linidentified dolphin	0	10-55	67.07	26.3	403	0.0
2000	Mar	12	Tursions transatus	10	12021	66.26	20.5	199	00
2000	Mar	12	Indentified large whole	2	12.02	66.36	26.2	313	ഷ്
2000	Mar	13	Stenella frontalis	40	12/02	64.56'	20.2	84	00
2000	Mar	14	Delnhinus enn	2 2	10.30	63.56'	27.7	71	00
2000	Mar	14	Delphinus spp. Delphinus spp.	6	10.30	63 59'	73.7	62	ണ്
2000	Mar	14	Tursions trancatus	1	10,30	64 02'	23.9	59	off
2000	101001	1.4	Delnhinus enn	ŝ	10,50	04,02	23.0	66	0.11
2000	Mar	14	Delphinus spp.	6	10,301	63 501	23.7	68	or
2000	Mar	14	Delphinus spp.	2	10,30	64 06'	23.6	59	
2000	Mar	14	Delphinus spo	10	10,33	64 04'	23.6	64	00
2000	Mar	14	Delphinus spp.	7	10,31	64 00'	24 1	75	or
2000	Mar	14	Unidentified dolphin	25	10,29	64 12'	24.2	512	off
2000	Mar	14	Unidentified dolphin	10	10 26'	64 20'	23.1	42.1	00
2000	Mar	14	Unidentified dolphin	3	10 26	64 24'	22.5	168	00
2000	Mar	14	Unidentified dolphin	15	10 24	64 <sup>°</sup> 30'	23.1	77	or
2000	Mar	14	Balaenoptera spp.	i i	10'24'	64 30'	23.0		or
2000	Mar	14	Balaenoptera physalus	1	10'22'	64 32'	23.3	119	or
2000	Маг	14	Balaenoptera spp.	ī	10 22'	64 32'	23.3	119	or
2000	Mar	15	Delphinus spp.	34	10 42	64 03'	22.9	42	on
2000	Mar	ι5	Balaenoptera edeni	2	10'46'	64 <sup>°</sup> 17'	23.6	46	or
2000	Mar	15	Unidentified dolphin	4	10'46'	64 <sup>°</sup> 16'	23.8	38	off
2000	Маг	15	Balaenoptera edeni	2	10'48'	64°17'	24.0	26	or
2000	Mar	15	Delphinus spp.	30	10'48'	64°17'	23.8	24	on
2000	Mar	15	Delphinus spp.	30	10''49'	64°16'	26.4	46	on
2000	Mar	15	Delphinus spp.	60	10'51'	63°58'	24.3	51	on
2000	Mar	16	Balaenoptera edeni	1	10"59'	62°03'	23.6	102	or
2000	Mar	16	Unidentified large whale	1	11°00'	62°03'	23.5	101	on
2000	Mar	16	Unidentified large whale	1	10 57'	62 04'	23.7	99	of
2000	Маг	16	Unidentified large whale	2	10°56'	62°02'	23.7	106	on
2000	Mar	16	Balaenoptera spp.	2	10.56'	62°01'	23.7	104	on
2000	Mar	16	Unidentified large whale	I	10°54'	61*58'	23.7	117	់លា
2000	Mar	16	Unidentified large whale	E	10•54'	61*58'	23.8	117	00
2000	Mar	16	Balaenoptera edeni	L	10.21	62°55'	24.9	117	of
2000	Mar	16	Tursiops trancatus	28	10•49'	61.55'	23.7	113	off
2000	Mar	17	Unidentified dolphin	20	10-54	63•22'	23,4	49	on
2000	Mar	17	Tursiops truncatus	8	10-59	63-46'	25.0	20	off
2000	Mar	17	Balaenoptera edeni	2	10-59	63•45'	24.6	24	on
2000	Mar	17	Megaptera novaeangliae	2	11-10'	63,48'	23.9	31	0D
2000	Mar	17	Unidentified large whale	1	11 13'	63 49'	24.0	35	off

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## Table 5. Continued.

DATE		SPECIES	GROUP SIZE	P	OSITION	<u>SST</u>	DEPTH	5
						( C)	(m)	
2000 Mar	19	Balaenoptera spp.	1	11'43'	61'59'	26,2	9	off
2000 Mar	19	Unidentified dolphin	30	12'02'	61°51'	26.8	361	on
2000 Mar	19	Unidentified dolphin	15	12'03'	61°51'	27.1	677	оп
2000 Mar	19	Unidentified dolphin	3	12.03	61°51'	27.1	769	on
2000 Mar	19	Stenella attenuata	5	12'04'	61*51'	27.1	1219	on
2000 Mar	19	Stenella attenuata	15	12°05'	61*50	27.3	1215	on
2000 Mar	19	Stenella attenuata	20	12°06'	61°50'	27.3	1096	on
2000 Mar	19	Peponocephala electra	38	12°12'	61-47	26.7	1 <b>700</b>	ОП
2000 Mar	20	Tursiops truncatus	1	10.25	60°32'	27.1	71	011
2000 Mar	20	Unidentified dolphin	4	10.52	60•34'	27.0	75	on
2000 Mar	20	Stenella attenuata	15	10 39'	60 40'	27.4	49	on
2000 Mar	20	Megaptera novaeangliae	1	10°49'	60-43'	27.3	44	on
2000 Mar	21	Tursiops truncatus	1	10.57	61-28	26.6	121	on
2000 Mar	21	Unidentified large whale	1	10-56	61-33'	26.0	130	on
2000 Mar	<b>2</b> 1	Tursiops truncatus	20	10.55	61-27'	26.5	106	off
2000 Mar	21	Tursiops truncatus	50	10-54'	61-25	26.9	92	off
2000 Mar	<b>2</b> 1	Unidentified large whale	2	10-56'	61.27	27.0	88	on
2000 Mar	21	Unidentified large whale	2	10.55'	61.23'	27.2	92	off
2000 Mar	22	Tursiops truncatus	25	13,02'	59,40'	28.3	269	07
2000 Mar	22	Tursiops truncatus	30	13.01	59.41	28.4	329	an
2000 Mar	22	Megaptera novaeangliae	1	13.16	59.41	27.6	295	01
2000 Mar	23	Tursiops truncatus	15	13 10	59 41	28.6	512	01
2000 Mar	23	Unidentified dolphin	S	13 16	59 47'	29.0	366	011
2000 Mar	23	Stenella spn.	35	13 18'	59.41'	28.9	371	on
2000 Mar	23	Unidentified dolphin	7	13 18	59 30'	28.1	522	011
2000 Mar	23	Megaptera novaeangliae	1	13 17	59,27	28.1	522	on
2000 Mar	24	Zinhius cavirostris	3	14.10	60 50	20.1	1501	On
2000 Mar	24	Physeter macrocenhalus	2	14 10	61.03	27.2	2006	on
2000 Mar	24	Unidentified dolphin	30	1/ 10	61,00	27.4	2190	on
2000 Mar	24	Kogia simus	3	14 10	61 15	27.1	2500	on
2000 Mar	24	Unidentified adontacete	1	14 202	61 10	27_3	2500	on
2000 Mar	24	Tursions truncatus	16	14 20	61 19	27.2	2500	on
2000 Mar	74	Physeter macrocenhalus	10	14 21	61 701	27-2	2500	on
2000 Mar	24	Gramous arisous	7	14 23	61°20	27.3	2300	OR
2000 Mar	24	Physeter macrocenhabic	5	14 23	6121 6121	27.4	2500	on
2000 Mar	24	I hyseler mucrocephilus	2	14 22	61 21	27.0	2500	on
2000 Mar	24	Globicenhala spn	3	14 20	01 22	27.9	2500	on
2000 Mar	74	Physatar macrossphalus	3	1434	6125	27.7	2500	on
2000 Mar	24	Physeter macrocophalus	4	14.20	01 43	30.0	2500	оп
2000 Mar	24	Physeter macrocephalus	+	14 44	0127	27.4	2500	on
2000 Mar	24	Physeter macrocephalus	1	14 47	01 20	27.4	2500	011
2000 Mar	24	Stanalla attanuata	15	14*48	61.72	27.4	2500	on
2000 Mar	27	Magantary novacanglian	43	14.59	01.01.	20.8	/91	on
2000 Mar	24	Megaptera novaeangliae	l l	14 38	60.37	27.7	71	on
2000 Mar	25	Inidentified adoptesets	1	10°24	60°47 (0°47)	20.2	390	on
2000 Mar	25	Unidentified delabie	1	10°20	60"46"	20.3	1210	on
2000 Mar	20 75		د	16°24	61"03"	26.3	2745	on
2000 Mar	20	Unidentified and Unit-1-	2	10-20'	C1 08	26.4	1208	on
2000 Mar	2.5	Manantuna a man whaie	1	16'13'	01-08	26.3	26	оп
2000 Mar	20 25	megapiera novaeangliae	1	16'09'	01-09	26.3	27	off
2000 Mar 2000 Mar	43 25	megapiera novaeangliae	1	16.09	61.09	26.4	27	off
2000 Mar	20	megaptera novaeangliae	1	16.06	61.12'	26.6	309	on
2000 Mar	22	Megaptera novaeangliae	1	16-06'	61-12	26.6	309	off
2000 Mar	23	Megaptera novaeangliae	1	16.05'	61.16	26.6	311	on
2000 Mar	25	Unidentified dolphin	6	16 00	61 26'	27.1	1 <b>92</b>	on
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## Table 5. Continued.

DATE		SPECIES	GROUP SIZE	<u>PC</u>	<u>SITION</u>	<u>SST</u> (C)	DEPTH (m)	<u>s</u>
			<u> </u>					
2000 Mar	25	Megaptera novaeangliae	2	1 <i>5</i> °59'	61'28'	27.2	309	off
2000 Mar	25	Megaptera novaeangliae	1	I <i>5</i> °57'	61'29'	27.3	306	off
2000 Mar	26	Kogia simus	3	17'26'	64'00'	26.1	800	on
2000 Mar	26	Unidentified dolphin	6	1 <b>7°29'</b>	64°03'	26.2	800	on
2000 Mar	26	Physeter macrocephalus	1	17º31'	64 05'	26.5	1501	оц
2000 Mar	26	Peponocephala/Feresa	16	17'35'	64'08'	26.8	1537	on
2000 Mar	26	Physeter macrocephalus	1	17'36'	64"09'	26.7	1537	on
2000 Mar	26	Physeter macrocephalus	2	17:37	64•10'	26.8	888	оп
2000 Mar <sup>-</sup>	26	Physeter macrocephalus	3	1 <b>7·39'</b>	64"11'	27.1	878	on
2000 Mar	26	Physeter macrocephalus	2	17-39	64-11'	27.2	2013	on
2000 Mar	26	Globicephala spp.	18	17 45'	64 16'	27.4	1501	on
2000 Mar	26	Mesoplodon spp.	3	17-47	64-18'	27.5	1299	on
2000 Mar	26	Kogia spp.	5	17-50	64-20'	27.6	1501	00
2000 Mar	26	Physeter macrocephalus	1	17-54	64-34'	27.6	1098	on
2000 Mar	26	Physeter macrocephalus	2	17-55	64-35'	27.5	1098	on
2000 Mar	26	Mesoplodon densirostris	$\overline{2}$	17.55	64.37	27.8	3660	on
2000 Mar	26	Mesoplodon spp.	1	17.57	64,42'	27.7	3660	on
2000 Mar	26	Unidentified odontocete	2	17.57	64.45'	27.5	3660	оп
2000 Mar	26	Kogia spp.	4	18.02'	64.57	28.1	2580	00
2000 Mar	26	Kogia spn.	2	18.03'	64.59	27.0	2599	on
2000 Mar	26	Physeter macrocephalus	Ī	18.07	65.02'	26.1	893	on
2000 Mar	26	Stenella frontalis	30	18.08	65.02'	26.1	893	on
2000 Mar	28	Megantera novaeanvliae		18 50	66 41'	26.1	3660	ÓП
2000 Mar	28	Megantera novoengliae	1	19 04'	67 13'	26.1	5033	00
2000 Mar	29	Megantera novaeangliae	Î	20 14	70 15	25.5	4160	on
2000 Mar	29	Unidentified dotabin	5	20,21,	70 54'	26.4	4026	on
2000 Mar	29	Stenella son	3	20,24	71 08'	26.6	4008	01
2000 Mar	29	Unidentified odontocete	3	20 27	71 26	26.4	4026	on
2000 Mar	29	Linidentified large whole	ĩ	20'31'	71 51	26.2	4026	00
2000 Apr	ñi	Stepella frontalis	10	25 02	ร <b>ว</b> ัวรา	25.4	77	00
2000 Apr	01	Unidentified odoptocete	1	25 30	84 08'	26.0	165	on
2000 Apr	01	Stenella son	15	26'06'	84 35'	25.4	249	on
2000 Apr	02	Stonella son	1.2	28 32	86 55'	24.7	761	00
2000 110	<u>0</u>	Changelling and an and a star	75	2000	00.00	24.4	1070	011

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AREA - LEG 1	SURVEY DATES	VISUAL SIGHTINGS	ACOUSTIC DETECTIONS
St. Kitts and Nevis	17-18 February	0	7
Guadeloupe	19 February	0	7
Martinique	20-21 February	1	7
St. Lucia	22 February	0	2
Grenada	23 February	I, IC/c pair	0
Barbados	24 February	0	0
Tobago & E. Trinidad	26-27 February	1	0
Other Trinidad & Gulf of Paria	28-29 February	3	0
Sub-Totai:		6, 1C/c pair	30
AREA - LEG 2			
Venezuela	10-14 March	2	11
Grenada	19 March	0	5
Trinidad-Tobago	20-21 March	1	6
Barbados	22-23 March	2	5
Martinique	24 March	1	7
Guadeloupe	25 March	9	10
Sub-Total:		15	44
GRAND TOTAL:		21, 1C/c pair	74

Table 6. Number of "on effort" visual sightings and acoustic detections of singing humpback whales during leg 1 and leg 2 of the Gordon Gunter Windwards cruise GU - 00- 01.

DATE	TIME	SIGHTING #	SPECIES	<u>LAT</u>	LON
2/27/00	1236	2	Megaptera novaeangliae	11068	60330
2/28/00	1042	2	Megaptera novaeangliae	10306	60301
2/28/00	1410	3	Megaptera novaeangliae	10252	60466
3/13/00	745	1	Stenella frontalis	11016	64573
3/14/00	759	1	Delphinus spp.	10306	63573
3/14/00	759	i	Delphinus spp.	10306	63573
3/14/00	822	2	Delphínus spp.	10307	5 <b>9860</b>
3/14/00	858	4	Delphinus spp.	10309	64009
3/14/00	1007	6	Delphinus spp.	10332	64044
3/14/00	1007	6	Delphinus spp.	10332	64044
3/15/00	94 <b>0</b>	2	Balaenoptera edeni	10472	64182
3/15/00	1335	7	Delphinus spp.	10504	63571
3/15/00	1335	7	Delphinus spp.	10504	63571
3/21/00	1400	4	Tursiops truncatus	10531	61250
3/21/00	14 <b>30</b>	4	Tursiops truncatus	10532	61269
3/22/00	1430	1	Tursiops truncatus	13016	59430
3/23/00	1340	1	Tursiops truncatus	13122	59431
4/02/00	1615	2	Stenella attenuata	29038	87238
4/02/00	1615	2	Stenella attenuata	29038	87238

Table 7. Summary of cetacean sightings from which biopsy samples were collected during Cruise GU - 00 - 01, February 9 - April 3, 2000.



Figure 1. Locations of survey effort during Cruise GU - 00 - 01



Figure 2. Location of cetacean sightings during Cruise GU - 00 - 01

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Figure 3. Locations of humpback whale (n=33) sightings during Cruise GU - 00 - 01



Figure 4. Location of unidentified balaenopterid whale (n=4), fin whale (n=1), Bryde's whale (n=5) and sperm whale (n=16) sightings during Cruise GU - 00 - 01.

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Figure 5. Location of dwarf sperm whale (n=2), Cuvier's beaked whale (n=1), Blainville's beaked whale (n=1) and melon-headed whale (n=1) sightings during Cruise GU - 00 - 01.



Figure 6. Location of false killer whale (n=1), pilot whale (n=7),rough-toothed dolphin (n=6) and Fraser's dolphin (n=1) sightings during Cruise GU - 00 - 01.



Figure 7. Location of bottlenose dolphin (n=19), Risso's dolphin (n=1), unidentified stenellid dolphin (n=5) and *Delphinus* spp. (n=11) sightings during Cruise GU - 00 - 01.



Figure 8. Location of pantropical spotted dolphin (n=10), Atlantic spotted dolphin (n=8), and spinner dolphin (n=2) sightings during Cruise GU - 00 - 01.

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Figure 9. Location of Kogia spp. (n=3), Mesoplodon spp. (n=2), bottlenose/Atlantic spotted dolphin (n=7), and melon-headed/pymgy killer whale (n=1) sightings during Cruise GU - 00 -01.



Figure 10. Location of unidentified dolphin (n=26), unidentified small whale (n=1), unidentified large whale (n=12) and unidentified odontocete. (n=9) sightings during Cruise GU - 00 - 01.

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Figure 11. Sonobuoy deployment (Leg 1) during Cruise GU - 00 - 01.



Figure 12. Sonobuoy deployment (Leg 2) during Cruise GU - 00 - 01.



Figure 13. Location of biopsy samples obtained from humpback whales (n=3), and Bryde's whale (n=1) during Cruise GU - 00 - 01.



Figure 14. Location of biopsy samples obtain from Atlantic spotted dolphin (n=1), unidentified *Delphinus* (n=8), bottlenose dolphin (n=4) and pantropical spotted dolphin (n=2) during Cruise GU - 00 - 01.