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CETACEANS AND PINNIPEDS OF THE SOUTHEASTERN UNITED
STATES COAST (FROM CAPE HATTERAS , NORTH CAROLINA, TO THE
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David J. Schmidly
Department of Wildlife and Fisheries Sciences
Texas Agricultural Experiment Station
Texas A & M University
College Station, Texas

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INTRODUCTION

The marine mammal fauna of **the** southeastern United States Coast and the **Gulf** of Mexico consists almost entirely of cetaceans (whales, dolphins, and porpoises), although two other groups, pinnipeds (seals and sea lions) and **sirenians** (manatees), are **also** represented. This paper **only** considers cetaceans and pinnipeds , of which 35 species occur regularly in this region, or have occurred there sometime in the historic past, **or** have been reported so close to the boundaries of the region that occasional strays may be expected. Table 1 lists the species which are discussed, arranged by family. The nomenclature for scientific names is that used by the Marine Mammal Commission (Anonymous 1976).

The purpose of this paper is to synthesize **all** available data and literature about cetaceans and pinnipeds in the region of **study**. Specifically, **the area** of **primary** concern extends **along the** coast and adjacent continental shelf of the United States from Cape Hatteras, North Carolina, in the north to the Florida Keys in the south, and from the Florida Keys to the United States/Mexico boundary near Port Isabel/Brownsville, Texas (Figure 1). This area includes the warmest water in contact with the contiguous United States including the Florida Straits, the southern Gulf Stream **and** other important areas. Because of the extreme mobility of marine organisms, **the** remainder of the **Gulf** of Mexico, the northern portions **of** the Caribbean Sea, and the portions of the South Atlantic extending slightly beyond the 1000 fathom isobath (1,830 meters) have also been included in the survey.

Most reports of marine mammals from the study area are scattered in literature accounts of strandings of individual animals or, in a few instances,

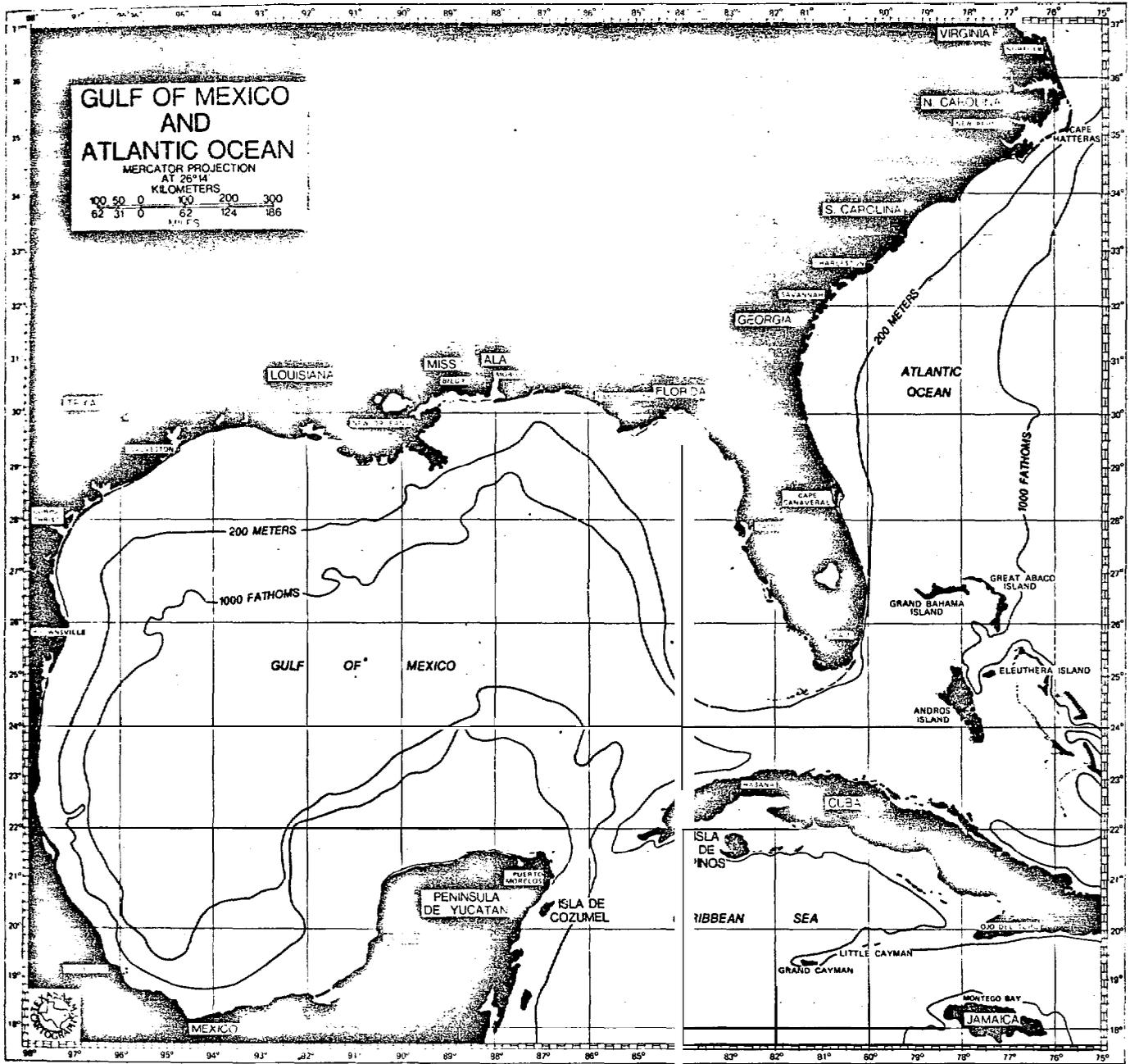


Figure 1. Map of the study area.

Table 1. Cetaceans and pinnipeds of the southeastern United States Coast (Cape Hatteras, North Carolina, to the Florida Keys) and the Gulf of Mexico.

	Page
Order Cetacea	
Suborder Mysticeti - Baleen Whales	
Family Balaenidae - Right Whales	
<u>Eubalaena glacialis</u> - Right Whale	41
Family Balaenopteridae - Rorquals	
<u>Balaenoptera musculus</u> - Blue Whale	45
<u>Balaenoptera borealis</u> - Sei Whale	48
<u>Balaenoptera physalus</u> - Fin Whale	52
<u>Balaenoptera edeni</u> - Bryde's Whale	57
<u>Balaenoptera acutorostrata</u> - Minke Whale	60
<u>Megaptera novaeangliae</u> - Humpback Whale	63
Suborder Odontoceti - Toothed Whales	
Family Physeteridae - Sperm Whales	
<u>Physeter catodon</u> - Sperm Whale	68
<u>Kogia breviceps</u> - Pygmy Sperm Whale	76
<u>Kogia simus</u> - Dwarf Sperm Whale	82
Family Ziphiidae - Beaked Whales	
<u>Mesoplodon densirostris</u> - Blainville's Beaked Whale	86
<u>Mesoplodon europaeus</u> - Antillean Beaked Whale	89
<u>Mesoplodon mirus</u> - True's Beaked Whale	92
<u>Ziphius cavirostris</u> - Goosebeaked Whale	95
Family Delphinidae - Delphinids	
(?) <u>Peponocephala electra</u> - Many-toothed Dolphin	98
<u>Feresa attenuata</u> - Pygmy Killer Whale	99
<u>Pseudorca crassidens</u> - False Killer Whale	102
<u>Orcinus orca</u> - Killer Whale	105
<u>Globicephala melaena</u> - Atlantic Pilot Whale	108
<u>Globicephala macrorhynchus</u> - Short-finned Pilot Whale	112
<u>Steno bredanensis</u> - Rough-toothed Dolphin	120
(?) <u>Lagenodelphis hosei</u> - Fraser's Dolphin	123
<u>Delphinus delphis</u> - Saddleback Dolphin	124
<u>Tursiops truncatus</u> - Atlantic Bottlenose Dolphin	128
<u>Grampus griseus</u> - Grampus	152
<u>Stenella frontalis</u> - Bridled Dolphin	156
<u>Stenella plagiodon</u> - Atlantic Spotted Dolphin	158
<u>Stenella coeruleoalba</u> - Striped Dolphin	168
<u>Stenella longirostris</u> - Spinner Dolphin	172
<u>Stenella clymene</u> - Short-snouted Spinner Dolphin	175
Family Phocoenidae - Porpoises	
<u>Phocoena phocoena</u> - Harbor Porpoise	178
Order Pinnipedia	
Family Otariidae - Eared Seals	
<u>Zalophus californianus</u> - California Sea Lion	182
Family Phocidae - Hair Seals	
<u>Phoca vitulina</u> - Harbor Seal	185
<u>Cystophora cristata</u> - Hooded Seal	188
<u>Monachus tropicalis</u> - West Indian Seal	191

of mass strandings. However, several recent papers are available which synthesize much of the older literature as well as present additional information for specific geographic regions. These are listed below by geographic region, author, and date followed by a brief description of the contents of each article.

1. Southeastern U. S. Coast - **Caldwell and Caldwell** (1974) and **Winn et al.** (1979); a review of all published and unpublished records from **Cape Hatteras**, North Carolina, south to **Cape Canaveral, Florida**, including a summarization of all biological knowledge for species living in this area.

2. Florida - **Moore** (1953); a checklist of Florida species, with detailed annotations, and a compilation of old records. **Layne** (1965); a checklist of Florida records primarily after **Moore**, but with some comments on the earlier records and with detailed annotations.

3. Northeastern Gulf - **Caldwell and Caldwell** (1973); an annotated checklist of marine mammals along the **Gulf Coast** of Florida, Mississippi, and Alabama as well as an assessment of their status.

4. Louisiana - **Lowery** (1974); a summary of all stranding records and observations of marine mammals in Louisiana waters.

5. Texas - **Schmidly and Melcher** (1974); annotated checklist and key to the cetaceans of Texas waters. **Schmidly and Shane** (1978); a revision of the checklist with additional records resulting from a two-year stranding network.

Most of the published records of marine mammals are included in the aforementioned papers, and they constitute the primary basis for the species accounts which assess the status of each species in the study area.

METHODS

A total of 2,034 observations of cetaceans or pinnipeds were recorded from the study area. Observations were obtained from five main sources, including both published and unpublished information. The first source consists of 1,256

records (49.3% of the **total** number of observations) extracted from published sources. One major drawback of this sample of records is the reliability of species identifications, particularly for some of the more **taxonomically** complex groups (such as species of Balaenoptera, Kogia, and Stenella). For example, in analyzing the distribution records of Balaenoptera edeni and B. borealis along the eastern coast of the United States, Mead (1979) found that 38% of the records were erroneous, an additional 38% were unreliable or undocumented, leaving only 24% as **usable** records for critical purposes. We were unable to verify the identity or accuracy of each literature observation and undoubtedly several incorrect **identifications** are still present in this sample. A total of 167 publications pertaining to species in the study area were located; these are listed by author and assigned numerical numbers in Table 2.

The second data source consists of 518 records (20.3%) compiled during five years of operation of the Scientific Event Alert Network (SEAN) of the Smithsonian, in conjunction with records compiled during the first three years of operation of the Marine Mammal Salvage Program (**MMSP**) of the Smithsonian Institution. Virtually all of **the MMSP** records, which are reported in the SEAN bulletins, have been confirmed and most are represented by museum specimens. However, most other SEAN records have not been verified. Because they have not been scrutinized and reviewed by experts (every report submitted is reported without further verification and documentation), the SEAN bulletins are listed in Table 2 under unpublished sources.

The third data **source** consists of 491 (19.2% of the observations) museum records. **Many** of these records, especially those representing **extralimital** records of rare species, have been published. However, many museums also have unpublished records of more common species. To explore this heretofore untapped

data source, questionnaires were sent to 51 museums known or suspected of having specimens of marine mammals from the study area. Of these, 32 responded as having records and these have been listed in Table 2.

The fourth main data source consists of miscellaneous, unpublished information, for which voucher specimens or other documentation is usually lacking. Included in this category of information are personal communications with noted cetologists familiar with the study area, and sighting observations gathered by personnel aboard U.S. National Marine Fisheries Service research vessels traversing the study area. A word of caution is in order about the use of such data sources, especially those which produce records from offshore waters. Inasmuch as those represent only sight records, often by inexperienced observers, they are subject to misidentification unless supported by photographs or unless the sightings were made by competently trained cytologists.

The fifth data source consists of aerial sightings made in 1979 during a pilot project partially designed to conduct preliminary aerial inventories of marine mammals within the Gulf of Mexico. The project, in which the author of this paper participated, was sponsored by the Bureau of Land Management (BLM) and coordinated from the New Orleans Field Station of the National Fish and Wildlife Laboratory (NFWL) on the Riverside Campus of Tulane University. Surveys were conducted at four study areas in the Gulf of Mexico: (1) Naples, Florida; (2) Clearwater, Florida; (3) Corpus Christi, Texas; and (4) Brownsville, Texas (for detailed descriptions, see Fritz and Reynolds 1980). Each study site encompassed borders of approximately 111 km (60 nm) on the shoreline and extending 221 km (120 nm) perpendicular to the shoreline. These surveys represent the first attempt to develop a systematic sampling scheme for estimating population sizes of marine mammals in the Gulf of Mexico. Sightings made during these aerial surveys, which were conducted by experts experienced in the

Table 2. List of data sources used in this study.

Literature Records

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 178. Museum of Vertebrate Zoology, University of California, Berkeley, California.
 179. Charleston Museum of Natural History, Charleston, South Carolina.
 180. Carnegie Museum of Natural History, Pittsburgh, Pennsylvania.
 181. Centenary College Vertebrate Collection, Shreveport, Louisiana.
 182. Museo Poey de Zoologica de Habana, Habana, Cuba.
 183. Everglades National Park Reference Collection, Homestead, Florida.
 - 184.** Field Museum of Natural History, Chicago, Illinois.
 185. The Florida State Museum, University of Florida, Gainesville, Florida.
 - 186.** University of Georgia Museum of Natural History, Athens, Georgia.
 187. Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts.
 188. Houston Museum of Natural Science, Houston, Texas.
 189. Museum of Natural History, University of Iowa, Iowa City.
 - 190.** Los Angeles County Museum, Los Angeles, California.
 - 191.** Louisiana State University, Museum of Zoology, Baton Rouge, Louisiana.
 192. McNeese State University Vertebrate **Museum**, Lake Charles, Louisiana.
 193. University of Miami, Department of Zoology, Miami, Florida.
 194. The **Museum**, Texas Tech University, Lubbock, Texas.
 195. North Carolina State University, Department of Zoology, **Raleigh**, North Carolina.
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 199. Sam Houston State **University** Vertebrate Natural History Collection, Huntsville, Texas.
 200. University of South Alabama, Mobile, Alabama.
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201. University of Southwestern Louisiana, Biology Museum, Lafayette, Louisiana
 202. Stetson University Vertebrate Collection, Department of Biology.
 203. Texas Cooperative Wildlife Collection, Texas A&M University, College Station, Texas.
 204. Texas Memorial Museum, Vertebrate Paleontology Lab, University of Texas, Austin, Texas.
 205. Systematic and Environmental Biology Lab., Tulane University, Belle Chasse, Louisiana.
 206. United States National Museum, Washington, D.C.
 207. Zoology Museum, University College of the West Indies, Jamaica.

Data from Aerial Surveys

208. BLM project, U. S. Fish and Wildlife Service, National Fish and Wildlife Laboratory.
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identification of cetaceans, are indicated in the appropriate species account and referenced using the acronym **NFWL-BLM**.

A computerized data management system was developed to tabulate and summarize data. Each observation was assigned a unique **number** and the following information coded onto a computer sheet: (1) species identification; (2) geographic location of the observation; (3) type of observation (whether it represented a stranding, sighting, or capture); (4) source of information; and (5) nature of the **observation** (including date and number of individuals involved).

Geographic location was recorded by area (western Gulf, eastern Gulf, Atlantic, and Caribbean) and quadrat number (see Figure 2). Each observation **was** categorized, if possible, according to whether it represented a stranding, sighting, or capture. All marine mammals found along a shoreline were referred to as "stranded," and a distinction was made between those which came ashore alive and those which were simply washed ashore dead. It is often difficult to make this distinction, since it is commonly impossible to determine whether an animal was alive or dead when it **arrived** on the beach. Therefore, in coding our data, we recorded animals as having stranded alive only when the account of the stranding clearly indicated this was the case. Consequently, our tabulations certainly represent a minimum estimate and these kinds of data summarization must be viewed with caution.

Sightings were recorded according to whether they resulted from aerial, boat, or land observations. Captures were coded according to whether they resulted from whaling, **oceanaria/zoo** collecting, fishery activities, scientific collecting, or non-scientific **collecting**. Source of information was coded according to whether the observation was a published record, SEAN event, museum specimen, or some other unpublished data source (such as **NMFS** log records). **For each** stranding or sighting, the date was recorded (by year, month, and day) as well

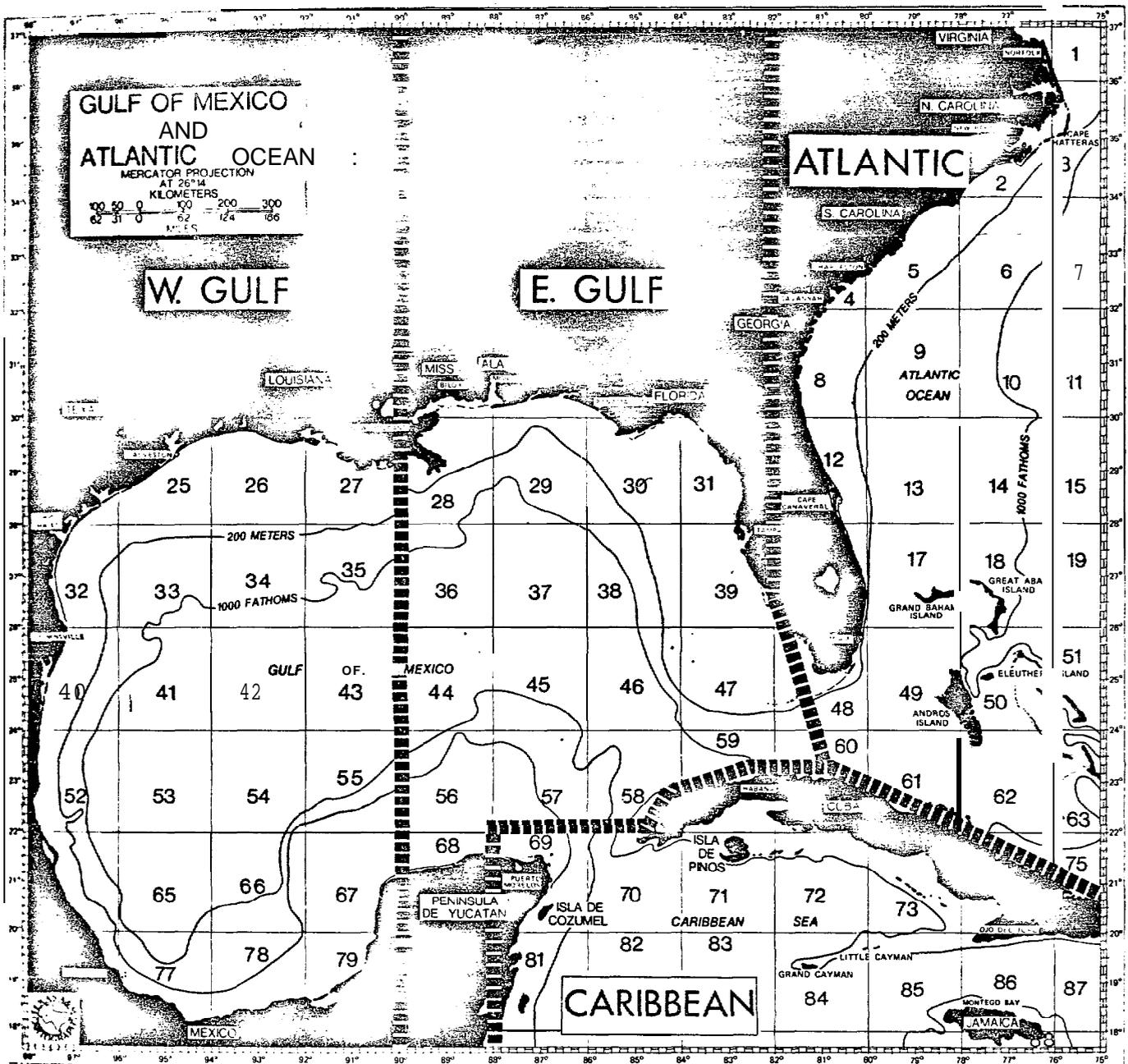


Figure 2. Map of the study area showing major sections (western Gulf, eastern Gulf, Atlantic, and Caribbean) and quadrats.

as whether the observation involved a single individual or a group of individuals (defined as a multiple observation). All data were tabulated using a computer program written for the SAS system at Texas A & M University by Mr. Gary

Binderim.

Detailed species accounts have been prepared for each cetacean and pinniped in the study area and these include the following categories of information:

1. Other common and scientific names. - Both the "scientific" and "common" names of several species vary from one publication to another, and from place to place. While we used the names recommended by the Marine Mammal Commission (July, 1976), we have attempted to **list** all scientific and common names which have been used in the literature to refer to cetaceans and pinnipeds from the study area. Many of the scientific names used in the old literature have been placed in synonymy as a result of recent **taxonomic** research.

2. Description and identification. - A brief description of each species is provided with emphasis given to diagnostic features, and especially those which might be visible from the air or from a ship. Much of this information was taken from the excellent account of whales, dolphins, and porpoises of the western North Atlantic written by Leatherwood et al. (1976).

3. Distribution. - General statements on the distribution of each species are followed by detailed accounts of their distribution within the study area. Where appropriate, known records **are** plotted on a map of the study area using a set of eight different symbols. In most situations, only a single type of observation was evident at a given locality (although **the** same type of observation may have occurred at different times), and these are plotted using the following symbols .

● Stranding

⊙ Aerial Sighting (NEWL-BLM study)

○ Sighting (literature)

■ Capture

For a **few** of the more common species, several types of observation were recorded **at** different **times** and at the same location. These are represented by the following symbols:

▲ **Stranding** + Sighting

□ **Stranding+ Sighting i-Capture** "

△ **Sighting** + Capture

□ **Stranding+ Capture**

Also included in this section are descriptions of general habitat preferences (onshore-offshore, for example) as well as relationships to major oceanographic features, if this is known. **These** data are usually non-random and biased in a variety of ways that relate to man's distribution rather than the particular species of cetacean or pinniped.

4. Seasonal movements. - There are few data regarding seasonal distribution of cetaceans or pinnipeds in the study area, primarily because records of sightings and strandings are scattered and sporadic. patterns of strandings and sightings or captures were tabulated for each species in each major **section** of the study area. In **some** cases monthly data were not available for the sighting or stranding. These were plotted on the distribution maps, but not considered in assessment of movement patterns.

5. Status and abundance. - Whenever possible some account of the abundance of a species is given. However, with a few exceptions, the number of any species of cetacean or pinniped which frequents the study area is not known, and one can only infer its abundance from reports of casual sightings or from the number of strandings. **The stranding** or the-washing up of a whale, alive or dead, on the beach is not a completely random **occurrence**, and some species are definitely more subject to this accident than are others. For this reason, we are **badly** in need of adequate **censusing** of the marine mammals in the study area. Based on our knowledge of abundance, we have attempted to assess **the** status (stable, increasing, **decreasing**) of each species, if possible. Several species in the

study area **are** considered endangered, and their status is listed **as** determined by the U. S. authorities (U.S. Fish and Wildlife Service 1973) and in the Red Book (IUCN 1972).

6. Life history. - In general, life history and biological data on marine mammals are very limited. For each species, **all literature** references pertaining **to** reproduction, food habits, and behavior in the study area are discussed. Where no information is available specifically from the study area, references summarizing **life** history parameters in other geographic regions has been used.

7. Records of occurrence. - For each species, the exact location of every sighting or stranding and the reference or references referring to each are given. The records are arranged by quadrats and **major** sections of the study area as shown in Figure 2. Withing each quadrat {called quads) the localities are arranged from north to south and west to east in that order of preference. Following each locality, the number or numbers. in parentheses refer to the reference for that stranding or sighting as listed in Table 2. To find the exact location and reference for a dot on a distribution map, one must first determine what quad the dot is in (using the map in Figure 2) and then look up that **quad** number in the list of records of occurrence. Using the reference rule of north before south "and west before east, it is then possible to determine the exact location and reference for every dot on each distribution map. For a few species, a single dot may represent more than one locality.

ANALYSIS OF OBSERVATIONS

Of the 2,034 observations-of cetaceans and pinnipeds recorded, 1,220 (60.0%) represented strandings, "559 (27.5%) were sightings, and 255 (12.5%) were captures. Of these, **1,132** (55.9%) involved single individuals, 560 (27.6%) involved more than one individual, and in 342 (16.5%) instances the number of individuals involved could not be determined. Of the 1,220 strandings, 142 (11.6%) represented

animals that stranded alive, 452 (37.0%) were dead when they arrived on the shoreline, and in 626 (51.3%) instances it could not be determined whether the animal stranded alive or dead.

Tabulations of observations for each of the major sections of the study area are as follows:

<u>Geographic Area</u>	<u>Strandings</u>	<u>Sightings</u>	<u>Captures</u>	<u>Totals (%)</u>
Western Gulf	158	100	10	268 (13.2)
Eastern Gulf	220	278	77	575 (28.3)
Atlantic	835	177	164	1176 (57.8)
Caribbean	7	4	4	15 (00.7)
<hr/>				
Totals	1 2 2 0	559	255	2034

Data are heavily biased by observational effort, being very high in a few selected areas and totally lacking elsewhere. Almost 60% of the observations have been recorded from the Atlantic portion of the study area, with about 28% being recorded from the eastern Gulf and 13% from the western Gulf. Virtually nothing is available from the Caribbean. These figures reflect the greater amount of cytological activity along the Atlantic Coast as compared to the Gulf of Mexico.

Tabulations of observations by species are shown in Table 3. Twenty-nine cetaceans and four pinnipeds have stranded, been sighted, or captured in the study area. In evaluating these data, the sample was stratified into stranding and non-stranding (sightings and captures) categories. The stranding category primarily includes inshore, coastal species with very few offshore, pelagic species represented. With the exception of Tursiops truncatus (for which there are numerous inshore sightings), the sighting-capture sample is dominated by offshore species.

Table 3. Summary of cetacean-pinniped observations for each species in the study area.

Species	Strandings			Non-Strandings		Totals
	Alive	Dead	Unknown	Sightings	Captures	
<u>Eubalaena glacialis</u>	2	2	5	30	6	45
<u>Balaenoptera musculus</u>	0	0	2	0	0	2
<u>Balaenoptera borealis</u>	1	0	4	0	0	5
<u>Balaenoptera physalus</u>	1	9	8	5	0	23
<u>Balaenoptera edeni</u>	3	2	5	0	1	n
<u>Balaenoptera acutorostrata</u>	4	2	5	0	1	12
<u>Megaptera novaeangliae</u>	1	3	8	3	18	33
<u>Physeter catodon</u>	8	9	25	11	181	234
<u>Kogia breviceps</u>	39	40	62	4	2	147
<u>Kogia simus</u>	6	9	22	0	0	37
<u>Mesoplodon densirostris</u>	1	1	6	0	0	8
<u>Mesoplodon europaeus</u>	2	7	20	0	0	29
<u>Mesoplodon mirus</u>	0	0	6	0	0	6
<u>Ziphius cavirostris</u>	5	3	31	0	0	39
<u>Feresa attenuata</u>	2	1	3	0	0	6
<u>Pseudorca crassidens</u>	2	2	10	9	4	27
<u>Orcinus orca</u>	1	0	8	10	1	20
<u>Globicephala melaena</u>	2	0	4	0	0	6
<u>Globicephala macrorhynchus</u>	18	8	92	18	1	137
<u>Steno bredanensis</u>	1	1	7	1	1	11
<u>Delphinus delphis</u>	1	4	10	12	5	32
<u>Tursiops truncatus</u> "	16	264	213	257	12	762
<u>Grampus griseus</u>	4	1	8	0	0	13
<u>Stenella frontalis</u>	0	1	6	0	0	7
<u>Stenella plagiodon</u>	4	12	28	148	7	199
<u>Stenella coeruleoalba</u>	7	9	3	15	0	34
<u>Stenella longirostris</u>	5	4	5	0	1	15
<u>Stenella clymene</u>	0	2	2	1	0	5
<u>Phocoena phocoena</u>	0	54	2	0	0	56
<u>Zalophus californianus</u>	0	0	0	21	3	24
<u>Phoca vitulina</u>	6	2	13	2	2	25
<u>Cystophora cristata</u>	0	"O	3	0	0	3
<u>Monachus tropicalis</u>	0	0	0	12	9	21
Totals	142	452"	626	559	255	2034

Tabulations of observations by month for each species are shown in Table 4. Once again, the data are separated into stranding and non-stranding categories. This information is the primary basis for interpreting seasonal distributional patterns for each species in the study area, and these data are discussed at the appropriate place in each species account.

Strandings

Strandings provide a valuable source of data for marine mammals. When conducted in a systematic fashion over a long period of time, data derived from stranding studies help to fill important gaps in present knowledge regarding stocks, life history, natural mortality rates, and proportional abundance. However, certain sampling biases are evident when using these data (Mead 1979). The stranding of a particular species on a given coastline may be influenced by several factors. Species that are part of the inshore fauna may be represented by individuals which either die in their normal area of distribution and are washed ashore or by individuals which are ill or stray for any of a variety of possible reasons and wind up as live stranded animals. Animals that are part of the offshore fauna and which die in their normal area of distribution are not likely to be washed ashore because of the distance involved and the chance of scavengers or decomposition breaking up the carcass before it reaches the coast. Most of these carcasses probably sink without refloating, and these species will only be represented by those individuals which stray from their normal area of distribution and die on or near the coast.

Both population size and mortality rate in a given area contribute directly to the relative abundance of a particular species in the stranding record. Both of these factors may vary seasonally and result in regular changes in the abundance of strandings. For these reasons, a relatively rare offshore species with regular inshore movements coincident with increased mortality, may

Table 4. Summary of **cetacean-pinniped** observations by month for each species in the three major sections (western Gulf, eastern Gulf, Atlantic) of the study area. Underlined values represent the number of non-strandings (sightings and captures); other values indicate the number of stranded animals.

Geographic Area	MONTH												
	J	F	M	A	M	J	J	A	s	o	N	D	No date
<u><i>Eubalaena glacialis</i></u>													
Western Gulf	1												
Eastern Gulf			<u>1</u>										
Atlantic	<u>1</u> ;12	2; <u>7</u>	<u>1</u> ;12	<u>4</u>	1						<u>1</u>		1; <u>2</u>
<u><i>Balaenoptera musculus</i></u>													
Western Gulf								1				1	
Eastern Gulf													
Atlantic													
<u><i>Balaenoptera borealis</i></u>													
Western Gulf													1
Eastern Gulf				2									
Atlantic				1								1	
<u><i>Balaenoptera physalus</i></u>													
Western Gulf		1											1
Eastern Gulf		2		1		<u>1</u> ;1	1		<u>1</u>		1		1
Atlantic	1	2	<u>3</u> ;1	1	2						1		1
<u><i>Balaenoptera edeni</i></u>													
Western Gulf													
Eastern Gulf	1			1	1	1							
Atlantic	1		2	1	1						1		
<u><i>Balaenoptera acutorostrata</i></u>													
Western Gulf	1	1	1										
Eastern Gulf			1								1	1	2
Atlantic		2						1				1	

Table 4. continued.

Geographic Area	MONTH												No date
	J	F	M	A	M	J	J	A	s	o	N	D	
<u>Megaptera novaeangliae</u>													
Western Gulf													
Eastern Gulf	<u>1</u>			<u>1</u>		1	1					<u>2</u>	
Atlantic	<u>2;5</u>	2	<u>3</u>	<u>2;6</u>					2		1	<u>1</u>	2
<u>Physeter catodon</u>													
Western Gulf	1	1	1	3				<u>2</u>	2	<u>1</u>			2
Eastern Gulf	<u>1</u>	<u>1;1</u>	<u>1;4</u>	<u>1;7</u>	<u>14</u>	<u>25</u>	<u>13</u>	<u>1</u>	<u>1</u>	<u>1</u>	3	1	2
Atlantic	<u>2;10</u>	<u>2;2</u>	<u>2;6</u>	<u>2;11</u>	<u>14</u>	<u>9</u>	<u>3;15</u>	<u>4;8</u>	<u>3</u>	<u>1;9</u>	<u>20</u>	<u>8</u>	10
<u>Kogia breviceps</u>													
Western Gulf	2	2						1		1	2	2	1
Eastern Gulf	4	1			1			1	1	1	1		3
Atlantic	12	9	<u>12;1</u>	8	8	<u>7;1</u>	6	9	14	10	6	8	10
<u>Kogia simus</u>													
Western Gulf		<u>2</u>										1	1
Eastern Gulf			1	1								1	
Atlantic	,4	1	5	,1	1	3	2			1	1	5	6
<u>Mesoplodon, densirostris</u>													
Western Gulf	1												
Eastern Gulf													
Atlantic	1		2			2				1			1
<u>Mesoplodon europaeus</u>													
Western Gulf	1							1	1				
Eastern Gulf				1									1
Atlantic	3	,	1	1	4	3	1		1	1			5
<u>Mesoplodon mirus</u>													
Western Gulf													
Eastern Gulf													
Atlantic			3				1	1					1

Table 4. continued.

Geographic Area	MONTH												
	J	F	M	A	M	J	J	A	S	o	N	D	No date
<u>Ziphius cavirostris</u>													
Western Gulf									1				
Eastern Gulf			1	1	1			1				1	2
Atlantic	2	7	3	2		1	3		3	1	2	1	4
<u>Feresa attenuata</u>													
Western Gulf	1												
Eastern Gulf	1												
Atlantic			1		2		1						
<u>Pseudorca crassidens</u>													
Western Gulf													1
Eastern Gulf				1		4	3	1					2
Atlantic	1		1	1	1	1	1	1;1			1	1	5
<u>Orcinus orca</u>													
Western Gulf	1	"											1
Eastern Gulf			1		1							1	2
Atlantic		3	1			1			1				7
<u>Globicephala melaena</u>													
Western Gulf													
Eastern Gulf													
Atlantic		1	2				1	"			1		1
<u>Globicephala macrorhynchus</u>													
Western Gulf			1		1;1	1;1	1	1;1	1	1	1	1	5
Eastern Gulf	1	3	1	1;1	2-	3;1	2	6;i	1	2	1	1	12
Atlantic	5	9;1	6	9;1	5;3	2	3	4	1	4	2;2	2;1	21
<u>Steno bredanensis</u>													
Western Gulf						1							
Eastern Gulf					1						1		4
Atlantic			1							1			2

Table 4. continued.

Geographic Area	MONTH												No date
	J	F	M	A	M	J	J	A	s	o	N	D	
<u>Delphinus delphis</u>													
Western Gulf			1			2					<u>2</u>		
Eastern Gulf			1					3					2
Atlantic	<u>4;2</u>	<u>1;1</u>	<u>2</u>	<u>1;1</u>	<u>1</u>	3			1				4
<u>Tursiops truncatus</u>													
Western Gulf	8	13	22	<u>10;2</u>	<u>8;9</u>		<u>7;1</u>	<u>2;?</u>	2	2	<u>3;13</u>	<u>8;4</u>	15
Eastern Gulf	<u>3;7</u>	<u>7;3</u>	<u>18;10</u>	<u>19;9</u>	<u>12;13</u>	<u>2;12</u>	<u>12;10</u>	<u>5;27</u>	<u>3;6</u>	<u>4;10</u>	<u>7;25</u>	<u>1;5</u>	15
Atlantic	<u>28</u>	<u>36;1</u>	<u>5</u> <u>7</u> <u>2</u>	<u>7</u>	<u>25;5</u>	<u>14;1</u>	<u>5</u>	<u>9;63</u>	<u>7</u>	<u>11;2</u>	<u>12;1</u>	<u>20;2</u>	51
<u>Grampus griseus</u>													
Western Gulf													
Eastern Gulf		1				1						1	
Atlantic	1	3		1	2				1				2
<u>Stenella frontalis</u>													
Western Gulf					1								
Eastern Gulf													1
Atlantic	1					1			1		1		1
<u>Stenella plagiodon</u>													
Western Gulf		<u>1</u>	<u>2</u>	<u>2</u>	<u>20</u>	<u>4</u>	<u>4</u>	<u>2;1</u>		<u>7</u>			2
Eastern Gulf	<u>1;?</u>		<u>1</u>	<u>6</u>	<u>1;11</u>	<u>26</u>	<u>1;11</u>	<u>3;5</u>		<u>1</u>	<u>1;4</u>	<u>1</u>	17
Atlantic	<u>6;3</u>	<u>2</u>	<u>3;1</u>	<u>5</u>	<u>3;6</u>	<u>4</u>	<u>1</u>	<u>1;1</u>	<u>2;4</u>	<u>2;1</u>	<u>1</u>	<u>4;2</u>	6
<u>Stenella coeruleoalba</u>													
Western Gulf				1				<u>2</u>					
Eastern Gulf			1					<u>13</u>		<u>1;1</u>			
Atlantic	4	1	1	1	5					1	3	1	
<u>Stenella longirostris</u>													
Western Gulf			1		1	1				1			1
Eastern Gulf			1				1		1				1
Atlantic	1		1					2				1	2

Table 4. concluded.

Geographic Area	MONTH												
	J	F	M	A	M	J	J	A	s	o	N	D	No date
<u>Stenella clymene</u>													
Western Gulf									1				
Eastern Gulf													1
Atlantic	1									1			1
<u>Phocoena phocoena</u>													
Western Gulf													
Eastern Gulf													
Atlantic		9	34	10	2								1
<u>Zalophus californianus</u>													
Western Gulf								1					
Eastern Gulf	<u>1</u>		<u>1</u>	<u>1</u>			<u>1</u>						<u>1</u>
Atlantic	<u>4</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>2</u>		<u>1</u>	<u>1</u>	1				<u>8</u>
<u>Phoca vitulina</u>													
Western Gulf													
Eastern Gulf													
Atlantic	<u>5;1</u>	<u>6;1</u>	4		1				1	2			4
<u>Cystophora cristata</u>													
Western Gulf													
Eastern Gulf													
Atlantic								1			1		1
<u>Monachus tropicalis</u>													
Western Gulf	<u>1</u>			<u>1</u>			<u>1</u>						6
Eastern Gulf		<u>1</u>	1				<u>1</u>						4
Atlantic													2

be represented by more records than a much more common species with an opposite pattern of movement or mortality. Brown (1975) reported that stranding mortality of small cetaceans in the northeast Atlantic Ocean from 1913-1972 did not correlate well with population abundance based upon sighting records. The relationship between stranding mortality and population abundance, according to Brown (1975), will vary with the nature of the coast and with short or long-term changes in environmental factors such as coastal currents and water temperature.

In addition to the above factors, which affect the distribution of the strandings themselves, a number of other influences may affect the stranding record. Once an animal has stranded, it must be noticed, then reported, and finally the report must be recorded. Large and rare or unusually marked animals, such as the great whales and the beaked whales, are much more likely to be noticed and reported than are small or common species. Consequently, past records are likely to be relatively complete for the large whales, followed by rare and unusual species, and least complete for common or rare but unimposing species.

Species composition. - Of the 33 cetaceans and pinnipeds known from the study area, 32 have stranded on one or more occasions (Table 3). Those species with fewer than 10 records are probably either rare or represent extra-limital strays. This accounts for 13 species, two of which (Stenella clymene and Monachus tropicalis) are known primarily from the study area and should not be considered as, strays. The 20 remaining species represent the normal, or at least regularly occurring cetacean-pinniped fauna of this area. This group accounts for 94% of the strandings. Of these, 10 species with greater than 20 records account for 88% of all stranding records and can be considered as common elements of the fauna. The four most common species (greater than 50 records)

are Kogia breviceps, Globicephala macrorhynchus, Tursiops truncatus, and Phocoena phocoena; they comprise 66% of all records and probably represent the regular members of the fauna. (It should be noted that Phocoena only occurs in the extreme northern part of the Atlantic portion of the study area.)

Tursiops truncatus, with a total of 493 records, is without question the commonest element of the coastal fauna. Stranding and sighting records suggest that this species normally occurs near shore in relatively large numbers and is certainly the dominant cetacean element in the study area. The second most abundant species, Kogia breviceps (141 records) is somewhat surprising, as this is usually considered to be a relatively rare, offshore animal. The large number of strandings of this species may result from an inshore movement of part of the population during a period of increased natural mortality, resulting in a somewhat disproportionate number of strandings. The next species in order of relative abundance is Globicephala macrorhynchus. This is apparently not an inshore species, but is probably represented in the study area by a relatively large population.

There are too few records of the remaining species to permit comments about their relative abundance. However, a few comments are pertinent for some species because extenuating circumstances may exist which affect their apparent abundance and distribution. All species of Balaenoptera present problems of identification, particularly when their records are based upon decomposed remains or partial specimens. According to Mead (1979), many of the records presented in the literature as B. physalus probably represent other species. A somewhat analogous situation exists for many early records of Globicephala macrorhynchus which probably represent strandings of Pseudorca crassidens. The differences between the two are evident to cytologists, but descriptions formerly available to the general biological community were inadequate, resulting in most strandings of

large, black cetaceans being referred to as G. macrorhynchus. A comparable problem exists for Delphinus delphis and Stenella coeruleoalba. These two species are frequently confused, and since S. coeruleoalba is the lesser known of the two, the identification is more likely to be given as D. delphis. Until such time as problems such as these described above can be verified, conclusions based upon them must be regarded as tentative.

Live strandings. - It is useful to have some idea of the incidence of live strandings, especially since the factors and species involved are likely to be different. Only 12% of all stranding records involved animals known to be alive at the time of stranding (Table 3). Of the species with a relatively large (about 20) sample size, Stenella coeruleoalba had the highest percentage of live strandings (37%). Kogia breviceps was next with 28%, followed among the smaller cetaceans by Kogia simus (16.2%) and Globicephala macrorhynchus (15.2%). Other species with smaller sample sizes (less than 15 records), but with a high percentage of live strandings include Grampus griseus (30.8%) and Stenella longirostris (28.6%). Of the larger whales, Physeter catodon was most commonly found alive (19% of its stranding records). The commonest baleen whales were Balaenoptera acutorostrata (36%) and B. edeni (30%). Interestingly, all of the species with a high incidence of live strandings are apparently offshore forms, whereas the most abundant inshore species, Tursiops truncatus, had an extremely low incidence of live strandings (3.2%). This is consistent with the viewpoint that stray individuals of offshore species are more likely to wander onto the beach and be found while still alive. The low incidence of live strandings of inshore species suggests that these are generally more capable of avoiding the beach while alive, even though they may be terminally ill or injured (Mead 1979}.

Mass strandings. - A total of 42 mass strandings (five or more individuals)

Table 5. Summary of species which have mass stranded in the study area.

<u>Species</u>	<u>No. Mass Strandings</u>	<u>No. Individuals</u>	<u>Avg. No. Individuals</u>
<u>Physeter catodon</u>	2	27	13.5
<u>Feresa attenuata</u>	1	5	5.0
<u>Pseudorca crassidens</u>	2	167	83.5
<u>Globicephala macrorhynchus</u>	31	1010	32.6
<u>Steno bredanensis</u>	3	59	19.7
<u>Stenella plagiodon</u>	1	7	7.0
<u>Stenella longirostris</u>	2	65	32.5
Totals	42	1340	31.9

Table 6. Summary of strandings for each **quadrat** of coastline (see Figure 00) **in** the study area.

<u>Quadrat</u>	<u>Total Strandings</u>	<u>% of Total</u>
1	40	3.3
2	74	6.2
3	230	19.2
4	31	2.6
5	75	6.2
8	124	10.3
12	1 5 7	13.1
16	68	5.7
48	7 6	6.3
39	37	3.1
31	18	1.5
30	8	.7
22	7 " '	.6
21	18	1.5
20	60	5.0
28	13	1.1
27	13	1.1
26	44	3*7
25	22	1.8
24	15	1.2
32	70	5.8

7 (0.6% of the total) in Quadrat 22 and the highest, 230, in Quadrat 3 (19.2%). These differences probably do **not** reflect **real** variation in abundance of **marine** mammals . Rather, they result from the tremendous difference in cytological activity from one place in the study area to another. The large number of records in Quadrat 3 (which includes the Outer Banks of North Carolina) is a reflection of the concentrated effort in this area by the Marine Mammal Salvage Program (MMSP) of the Smithsonian Institution. The quadrats surrounding Florida (8, 12, 16, 48, 39, 31, 30, 22, 21) encompass 43% of the **total** number of strandings. Florida has a long history of marine mammal activity and has almost certainly more recorded strandings than any other state. It has also the longest coastline of any of the southeastern states.

Seasonal distribution of strandings. -Monthly tabulations of stranding records for the study area are presented in Table 7. The number of strandings is greatest during the period from January through April, as 54% of the recorded strandings occurred during these months. This pattern holds for the entire study area as well as for each of the major sections. Whether this trend is indicative of higher mortality among marine mammals in colder months or simply a **result** of sampling error (seasonal fluctuations in effort) cannot be ascertained at this time.

Sightings

Sightings from the study area **are** comparatively few and only 17 of the 33 species have been **sighted** (Table 3). There have been few attempts to develop a systematic and **regular** sampling **scheme** for sightings and, consequently, most sighting records come from either incidental observations made by untrained observers or specific attempts by trained cytologists to sight selected species. For example, Leatherwood (1075, 1979) has used **aerial** techniques to survey Tursiops populations in the inshore habitats at several places in the Gulf of

Table 7. Monthly tabulations of stranding records for the entire study area and each major section.

Month	Strandings (%)	Strandings			
		Western Gulf	Eastern Gulf	Atlantic	Caribbean
J	117 (11.4)	17	11	89	0
F	132 (12.9)	20	15	96	1
M	199 (19.4)	28	26	145	0
A	109 (10.6)	11	27	71	0
M	90 (08.8)	10	19	61	0
J	50 (04.9)	3	9	38	0
J	55 (05.4)	8	20	27	0
A	55 (05.4)	6	17	32	0
s	50 (04.9)	10	6	34	0
o	49 (04.8)	5	9	35	0
N	54 (05.3)	5	16	33	0
D	64 (06.2)	13	6	45	0
Totals	1024	136	181	706	1
		% 13.3	17.7	68.9	.1

Mexico and Atlantic Coast of Florida. However, these studies generally cover only a brief period of time and a relatively small geographic area. Excluding the inshore sightings of Tursiops, 52% of the total sightings are of Stenella plagiodon, which is probably the commonest offshore species in the study area. Other species with a high percentage of their total observations represented by sightings include Eubalaena glacialis, Stenella coeruleoalba, Delphinus delphis, Pseudorca crassidens, Zalophus californianus, and Monachus tropicalis. With the exception of Eubalaena glacialis, which is often sighted along the Atlantic Coast during its annual spring migration, and the two pinnipeds, these species are offshore, deep water forms.

Captures

Captures constitute only 12.5% of the total observations in the study area and only 17 of the 33 species have been captured (Table 3). Of the 255 captures, 199 (78%) represent captures by whalers of two species, Megaptera novaeangliae and Physeter catodon (summarized by Townsend 1935). Of the remaining captures, most are of Tursiops collected by oceanaria for use in public display. We could document only 12 captures of Tursiops for this reason, but there undoubtedly have been many more. Other species for which captures constitute a large percentage of their total observations include the pinnipeds, Zalophus californianus and Monachus tropicalis. Zalophus does not occur natively in the study area and most captures are of animals which escaped from oceanarias. Monachus was hunted extensively during colonial times because of its value as a source of oil.

ACCOUNTS OF SPECIES

Order Cetacea

Family Balaenidae

Eubalaena glacialis (Borowski 1781)

Right Whale

Other Common Names. - black right whale.

Other Scientific Names. - Balaena glacialis, Balaena cisarctica.

Description and Identification. - Right whales reach a length of about 53 feet (16.2 m). Their rotund body completely lacks a dorsal fin or dorsal ridge, and their upper jaw is long, narrow, and together with the lips, highly arched. A series of bumps or **callosities**, referred to as the "**bonnet**," is present on the top of the head in front of the blowholes. The two blowholes are widely separated and, consequently, the **blow** is projected upwards in a V-shape as two distinct spouts. Their dark body is sometimes black, but more often brown or mottled with a region of white on the chin and belly, and sometimes with numerous small grayish-white scars (Leatherwood et al. 1976) .

Distribution. - Right **whales** occur in the temperate waters of the North Atlantic, the North Pacific, and the Southern Hemisphere. The southern populations are distinguishable as a separate subspecies (E. g. australis) from E. g. glacialis of the North Atlantic (Rice 1977). In the western North Atlantic, right whales are **distributed** from Iceland to Florida and the Gulf of Mexico, but their range was probably greater during **pre-whaling** days (Leatherwood et al. 1976). ' "

There are numerous records from the Atlantic portion of the study area (Figure 3) where these whales commonly pass along the coast from North Carolina to Florida during their winter and spring migrations (Winn et al.

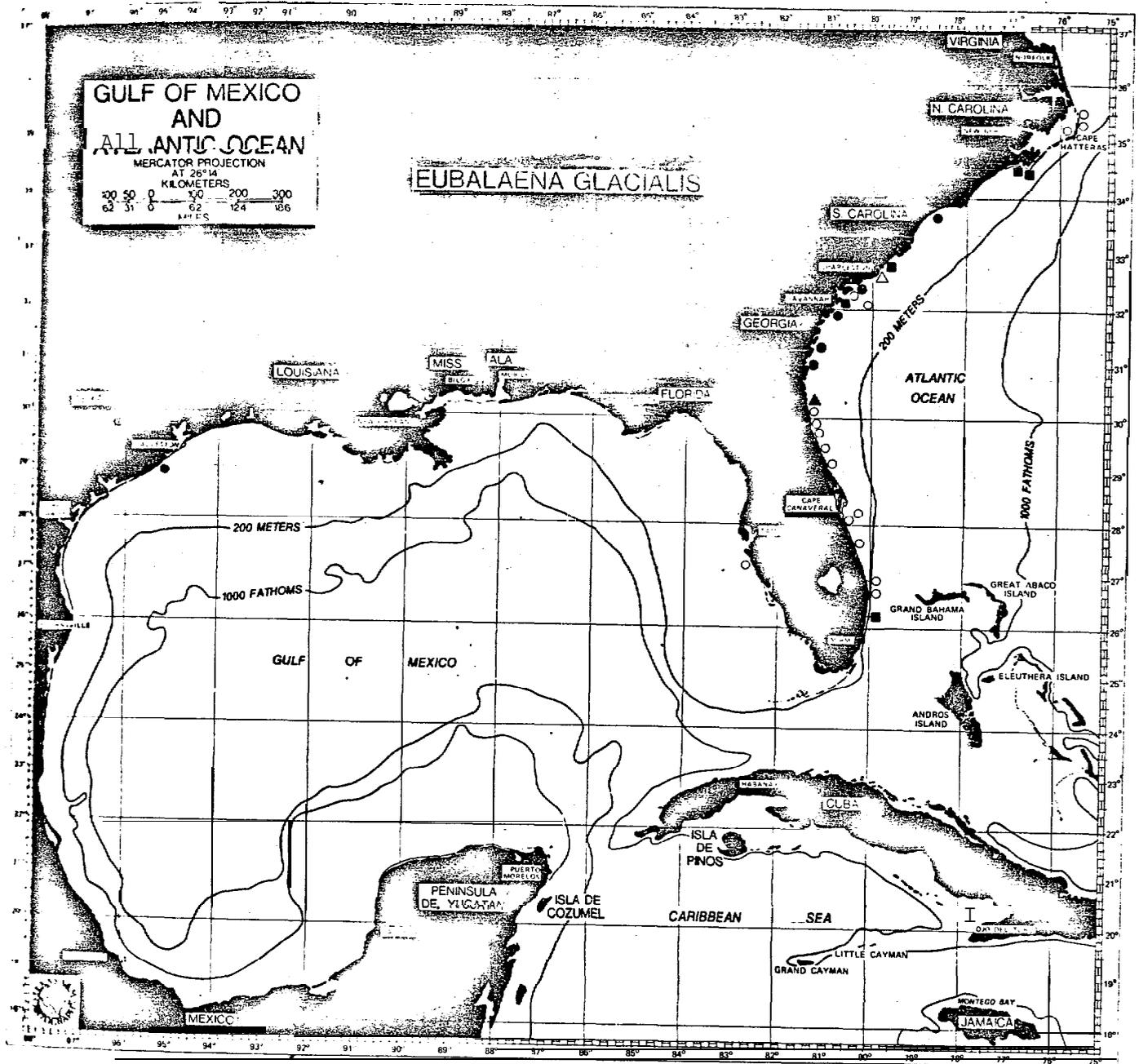


Figure 3. Distribution map of the right whale, Eubalaena glacialis. Symbols for this and all other distribution maps are as follows: ●, stranding; ○, sighting; ⊙, aerial sighting; ■, capture; ▲, stranding + sighting; △, sighting + capture; □, stranding + sighting + capture; and ◻, stranding + capture. See text for additional explanation.

1979) . However, they have only been recorded twice in the Gulf of Mexico, and their status in this portion of the study area is questionable. Moore and Clark (1963) report the occurrence of two right whales off New Pass, near Saratoga, Florida, on 10 March 1963. More recently, on 30 January 1972, one washed ashore near Freeport, Brazoria County, Texas (Schmidly et al. 1972b).

Seasonal Movements. - With two exceptions (one in November and one in May), all strandings and sightings from the study area are from January through April, and most of these are of females with calves observed during January, February, or March (Table 4). There are no records in the study area from June through October. Apparently, these whales move north along the eastern Florida coast between early January and late March. They have also been observed off southwestern Florida and Texas in the Gulf of Mexico during this time. Right whales pass the New England coast in fair numbers in spring and continue as far north as Nova Scotia. Not much is known of the southbound migration, but apparently it occurs much farther offshore, which would account for the scarcity of records in the southern areas during the months of April through December. From October to January right whales are sighted off Massachusetts, New Jersey, and New York, probably on a southward migration (Winn et al. 1979). "

Status and Abundance. - Right whales were once very common in the western North Atlantic; however, overhunting, up until 1953, reduced them to near extinction. According to Mitchell (1973), the western North Atlantic population may number in the "high '10's to low 100's," although no accurate information is available.

Increased sighting reports over the past 25 years at the northern and southern coastal approaches in New England and Florida, respectively, may be cause for some optimism regarding the recovery of the population and hopefully

right **whales** will again recolonize their historical range. They were protected by international agreement in 1929 and since then the western North Atlantic population has evidently increased so that it is now infringing into the Gulf of Mexico, as evidenced by two sightings in the last 20 years. These whales are considered endangered by U. S. authorities (U. S. Fish and Wildlife Service 1973), and they are also listed this way in the Red Book (IUCN 1972).

Right whales approach very close to the coast on the eastern seaboard of the United States where pairs and females with calves are often sighted just several hundred meters offshore. Because of these habits, they are threatened by pollution, habitat destruction, and ship traffic (Winn et al. 1979). They are not easily startled and may be readily approached by vessels (Prescott et al. 1979).

Life History. - No data are available on life history parameters from the study area. Mating probably occurs in late summer; the gestation period is assumed to be about a year, and the length of the young at birth is about one-fourth that of the mother (Walker 1975). Calves are suckled for about a year. Right whales feed by "skinning," either **at** or below the surface, on **copepods** and euphausiids. Specific dietary items include Calanus finmarchius and Thysanoessa inermis (Gaskin 1976). One instance has been recorded of a right whale taking **small pelagic pteropod molluscs**.

Records of Occurrence. - Quad 1. North Carolina: Beaufort (7, 14, 41, 153, 196); Cape Lookout (153, 189); Cape Lookout (7, 15, 41, 140, 153); Cape Lookout (153). Quad 3. North Carolina: Hatteras Island 35°31'N, 75° 28'W (171); 4.8 km E Ocracoke Island (126). Quad 4. South Carolina: Edisto Island, Edingsville Beach (37, 94, 126, 206); near Beaufort (8, 126); Port Royal (2, 126); Georgia: Savannah, 32° 04'N, 80° 07'W (169); Savannah (37, 94, 126, 206). Quad 5. South Carolina: Myrtle Beach (37, 61, 126); Sullivan's Island (2, 78, 126); Charleston, Charleston Harbor (7, 41, 61,

78, 12.6, 153, 179); near Charleston, 8.5 mi N Edisto River entrance (8, 126).
Quad 8. Georgia: McIntosh Co., Sapelo Island, Nannygoat Beach (186); 9.5 km
 E Island, 31°03'N, 81°23'W (171); Florida: Jacksonville (169); Neptune
 Beach (34); St. John's Co., Ponte Vedra Beach (85). Quad 12. Florida: Vilano
 Beach, 29°56'N, 81°17'W (169); St. John's Co., 2 mi off St. Augustine (85); St.
 John's Co., 1 mi off Crescent Beach (85); St. John's Co., Smer Haven (85);
 Flagler Co., 1.5 mi N Marineland (85); Flagler Co., Marineland (85); Flagler Co.,
 Marineland (85); Flagler Co., off Marineland (104); Flagler Co., 2 mi S Flagler
 Beach (85); Flagler Co., N Flagler Beach (85); Flagler Co., Flagler Beach, 29°28'N,
 81°07'W (104); Volusia Co., Daytona Beach (85); Volusia Co., Daytona Beach (104);
 near Cape Canaveral, 28°13'N, 80°20'W (1.66); Brevard Co., Canova Beach (85); S
 Melbourne, 28°04'N, 80°38'W (168). Quad 16. Indian River Co., Vero Beach (85);
 Indian River Co., Vero Beach (85); Martin Co., N Juniter Inlet (85); W Palm
 Beach, 26°42'N, 80°05'W (169); Pompano, Hillsboro Lighthouse (23, 104). Quad
25. Texas: Brazoria Co., Surfside Beach (90, 132). Quad 39. Florida: Manatee
 co., New Pass (36, 109). Not Plotted. North Carolina: Asheville (187).

Family Balaenopteridae

Balaenoptera musculus (Linnaeus, 1758)

Blue Whale

Other Common Names. - sulphur-bottom whale.

Other Scientific Names. - Sibbaldus musculus, Sibbaldius tectirostris.

Description, and Identification, - Blue whales are the largest living mammals in the world. In the North Atlantic, they may reach lengths of 80-85 feet (24.4-25.9 m); females are slightly larger than males of the same age (Leatherwood et al. 1976). These whales are easily distinguished by their large size; bluish, often mottled coloration; broad, flat, U-shaped head with

a single ridge extending from just in front of the blowholes **almost** to the tip of the snout; and a small dorsal fin (only 13 inches, 33 cm, tall) which is positioned well aft on the animal.

Distribution. - Blue whales occur in **all** oceans of the world, but they are partial to cold water and seem to avoid warmer waters (Kellogg 1929). Three subspecies are recognized: a **small** one, B. m. musculus, in the North Atlantic and North Pacific; a large one, B. m. intermedia, that **spends the summer in** Antarctic waters; and a pygmy subspecies, B. m. breviceuda, in the **southern** Indian Ocean (Rice 1977). There are only two records of this species from the study area (Figure 4), and both are from 'he Gulf of Mexico. One is of a single individual which stranded on 17 August 1940 between **Freeport** and **San Luis Pass**, **Brazoria** County, along the Texas coast (**Schmidly and Melcher** 1974). However, the identification of this specimen has been questioned (see **Caldwell and Caldwell** 1973). The other record **is** of an individual which beached near the mouth of Sabine Pass, Louisiana, in early December 1924. **Lowery** (1974) identifies this animal as B. physalus, but Mead (conversation in November 1979 with James G. Mead, United States National Museum, Washington, D. C. 20560) says it is definitely a blue whale. There are no records from the Atlantic portion of the study area.

Seasonal Movements. - Blue **whales** concentrate in the northern portion of their range, from New **Foundland** to the Arctic Circle, during the spring and summer where **they feed** on the **krill** which is abundant in **those** waters (Kellogg 1929) . In fall, and winter they move **south** into temperate and perhaps to tropical waters. Records **in** the study area are from August and December (Table 4).

Status and Abundance. - Blue whales were extensively hunted throughout the North Atlantic until the early 1950's, and they are **only** now beginning to

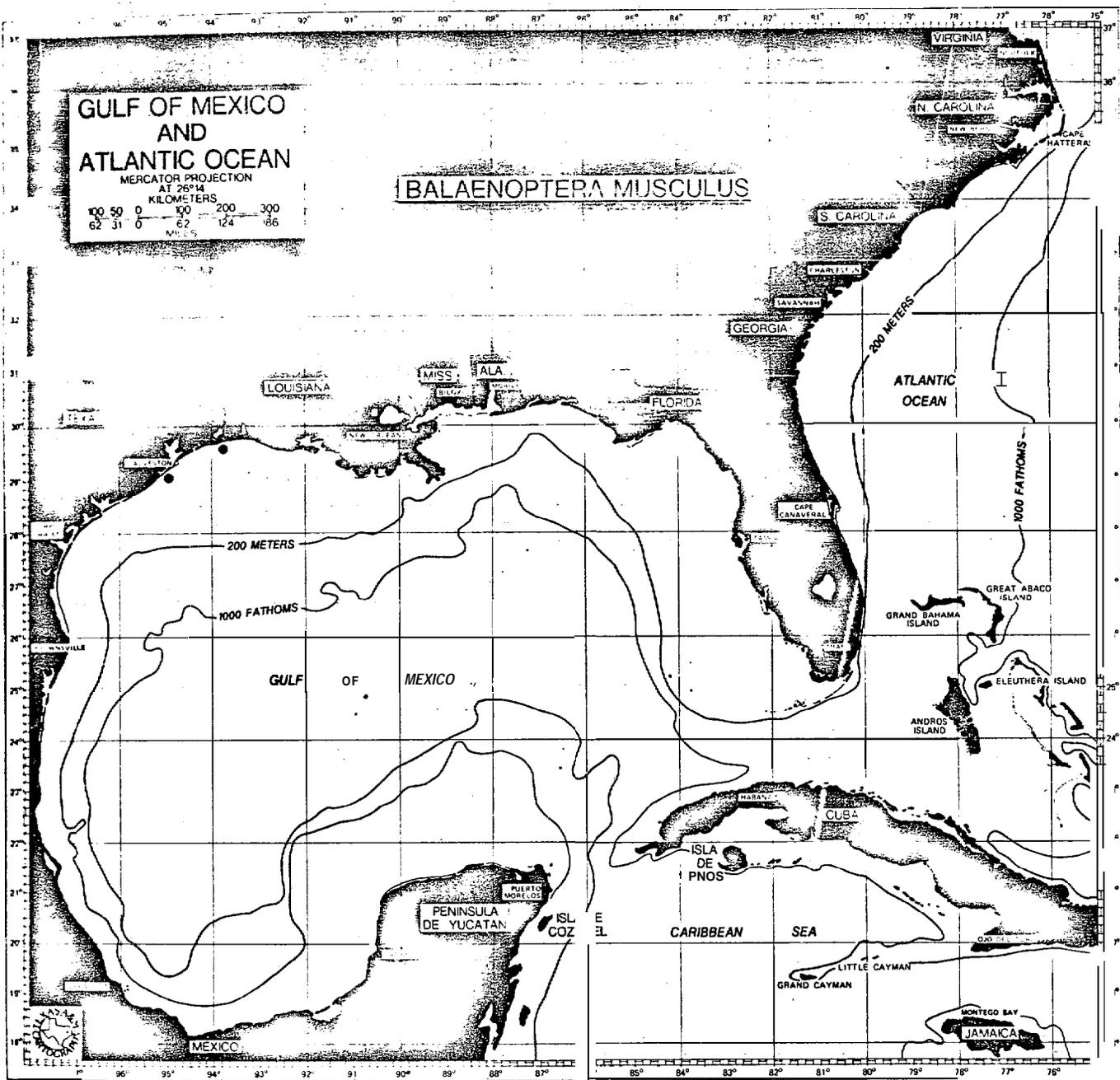


Figure 4. Distribution of the blue whale, Balaenoptera musculus. See legend for Figure 1 and text for explanation of symbols.

recover from this exploitation. They have been protected by international agreement since 1966. Gulland (1972) estimates there may be as many as 12,000 individuals remaining and, according to Leatherwood et al. (1976), there are sufficient numbers for them to continue to increase barring renewed exploitation. Blue whales are listed as endangered by U. S. authorities (U. S. Fish and Wildlife Service 1973) and in the Red Book (IUCN 1972).

Life History. - No data are available on life history parameters from the study area. Blue whales usually occur singly or in pairs. In the southern oceans peak pairing occurs between April and June. After a gestation period of about 11 months, calving occurs between March and June with a lactation period of 7 months (Gaskin 1976). Blue whales are relatively shallow feeders, feeding almost exclusively on krill, most of which is distributed 100 m below the surface (Leatherwood et al. 1976). Specific dietary items in the North Atlantic include Thysanoesa inermis, Temora longicornis, and Meganyctiphanes norvegica (Gaskin 1976).

Records of Occurrence. - Quad 25: Texas: Brazoria Co., between Freeport and San Luis Pass (1, 51, 52, 90, 130). Quad 26. Louisiana: near mouth Sabine Pass (90, 173).

Balaenoptera borealis Lesson 1828

Sei Whale

Other Common Names. - pollack whale.

Other Scientific Names. - none. .

Description and Identification. - Sei whales may reach a total length of 62 feet (19 m). Their color is dark steel gray on the back and sides, and they often have a shiny or galvanized appearance due to the presence of ovoid, grayish scars (Leatherwood et al. 1976). They differ from all other

balaenopterids by the very fine bristles of their baleen (about 0.1 mm in diameter at the base of the bristle, as opposed to about 0.3 mm or greater for the other species). Their relatively short ventral grooves distinguish them from all other species except the Minke whale (B. acutorostrata). In B. borealis and B. acutorostrata, the ventral grooves reach a point about midway between the flipper and the umbilicus, whereas they reach the umbilicus in the other species. B. borealis may be readily distinguished from B. acutorostrata on the basis of size, pigmentation, and the color and texture of the baleen (Mead 1977). Their right lower lip and mouth cavity, unlike those of fin whales (B. physalus), is uniformly gray. Their head is intermediate in shape between that of blue (B. musculus) and fin whales. Their tall, falcate dorsal fin, which is located more than one-third forward from the tail, distinguishes them from blue whales. From Bryde's whale (B. edeni), they differ in having a single head ridge instead of three.

Distribution. - Sei whales occur in all oceans, but they are rare in tropical and polar seas. Two subspecies are distinguished: a smaller one, B. b. borealis, in the Northern Hemisphere and a larger one, B. b. seklegelli, in the Southern Hemisphere. Sei whales are widely distributed in near-shore and offshore waters of the western North Atlantic from the Gulf of Mexico and the Caribbean to Nova Scotia and Newfoundland (Leatherwood et al. 1976). Three stocks may exist: a Newfoundland/Labrador stock probably limited to the waters around Newfoundland and Labrador to Davis Strait; a Nova Scotia stock which probably migrates southward along the U. S. coast; and a Caribbean/Gulf of Mexico stock-- which may migrate and overlap with the Nova Scotia stock.

Sei whales have been recorded from North Carolina and South Carolina in the Atlantic portion of the study area; records of their occurrence in the

Gulf of Mexico are limited to strandings from Campeche, Mexico, and from the coasts of Mississippi and Louisiana (Figure 5). Moore (1953) recorded a specimen from Duval County, Florida, but Mead (1977) has subsequently referred this specimen to Balaenoptera cf. edeni.

Seasonal Movements. - The distributions and migrations of sei whales during most of the year are poorly known. Records in the study area are from April and December (Table 4). They are irregular and unpredictable in their movements in the Northern Hemisphere (Kellogg 1929). Apparently they winter south of Cape Cod, but very little information is available for movements south of New England. Mead (1977) reported a whale of this species that stranded alive at Eastham, Massachusetts, on 21 July 1974; the animal was towed back to sea, released, and subsequently washed ashore dead near Currituck light, Corolla, North Carolina, on 5 April 1975. The December record of this species. from South Carolina many have come from a southward migration of this population during the winter months.

Status and Abundance. - Stocks in the northwest Atlantic are presently not being fished and, according to Mitchell (1973), they are above the level giving maximum sustainable yield. For the Newfoundland/Labrador stock, Mitchell and Chapman (1975) estimate a minimum' population of 965 harvestable animals based on shipboard censuses. The same authors estimate-a minimum of 870 for the. Nova Scotia stock from shipboard censuses, and offer an estimate of 1393-2248 on the basis of tag-recapture data. No population estimates are available from the study area. These whales are considered endangered by U. S. authorities (U. S. Fish and Wildlife Service 1973).

Life History. - No data are available on life history parameters from the study area. In the eastern North Atlantic, sexual maturity in females is reached at 13.6 m as compared to 13 m for males (Jonsgaard and Darling

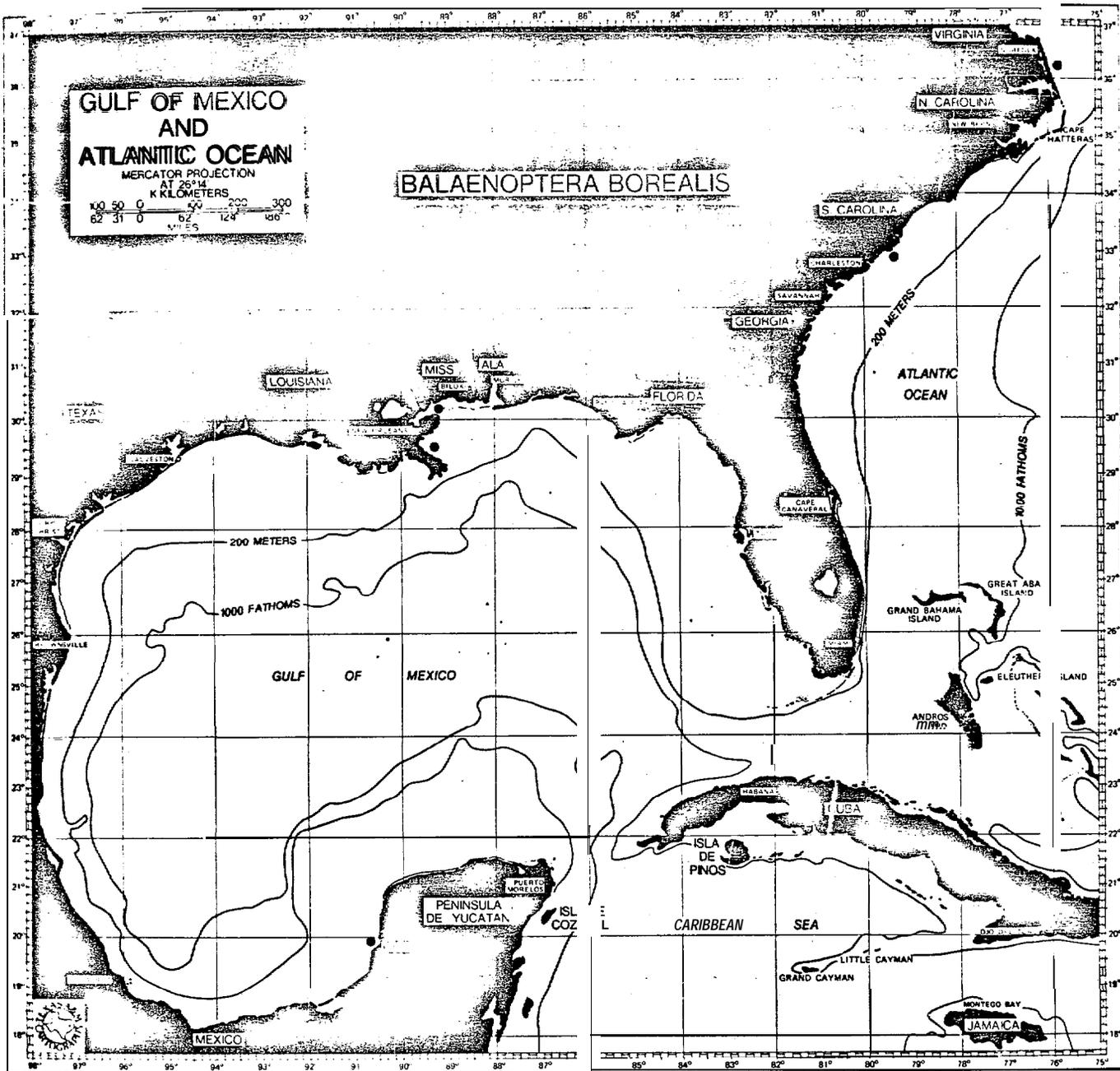


Figure 5. Distribution map of the sei whale, Balaenoptera borealis. See legend for Figure 1 and text for explanation of symbols.

1975). The mean age at sexual maturity is 7.5 years for males and 8.4 years for females in southern oceans. Lockyear (1974) suggests a 3-year breeding cycle. Jonsgård and Darling (1975) suggest that calving could occur every other year. Gestation lasts 1 year, and, according to Matthews (1938), calves are born during February and March and measure 4.8 m at birth. Gaskin (1976) reports that peak pairing is from November to February with lactation lasting 6 months after birth.

In the North Atlantic, sei whales feed primarily on copepods (Calanus finmarchius and Thysanoessa inermis), although they also take euphausiids as a preferred food (possibly due to an absence of copepods), as well as a variety of small schooling fish (Matthews 1938).

Sei whales usually travel in groups of from two to five individuals, though they may concentrate in larger numbers on their feeding grounds (Leatherwood et al. 1976). They usually do not dive very deeply and the head rarely emerges at a steep angle except when the whales are chased.

Records of Occurrence. - Quad I. "North Carolina: Corolla, 36° 26'N, 75° 50'W (94, 95, 206). Quad 5. South Carolina: Cape Island, 33° 04'N, 79° 20'W (95, 206). Quad 20. Mississippi: Gulfport Harbour, 30° 19'N, 89° 18'W (70 incorrectly as B. physalus, 71, 9,0, 95). Quad 28. Louisiana: near mouth Fort Bayou, 29° 22'N, 89° 21'W (90, 95, 113 incorrectly as B. acutorostrata, 164 incorrectly as B. acutorostrata). Quad 79. Mexico: Campeche, 19° 50'N, 90° 32'W (90, 95, 100).

Balaenoptera physalus

Fin Whale

Other Common Names. - finback whale, common rorqual, finbacks.

Other Scientific Names. - none.

Description and Identification. - Fin whales may reach a length of 79 feet (24 m) and females are slightly longer than males of the same age. From blue whales, the species with which they are most likely to be confused, fins differ in: (1) having a narrower, more V-shaped rostrum but with the same sort of single distinctive head ridge; (2) having a dorsal fin that is longer (up to 24 inches, 61 cm, tall) and located slightly more than one-third forward from the tail; (3) having a coloration that is dark gray to brownish-gray on the back and sides with none of the mottling present on the blue whales; (4) having a grayish-white chevron evident along the back just behind the head, which may be visible as the animals surface to breathe; and (5) having a yellowish-white coloration to the right lower lip, including the mouth cavity, and the right front baleen (Leatherwood et al. 1976).

Distribution. - Fin whales are cosmopolitan and occur in all oceans. In the western North Atlantic they occur from Greenland south to the Gulf of Mexico and the Caribbean (Leatherwood et al. 1976). Two subspecies are recognized: a smaller Northern Hemisphere form, B. p. physalus, and a larger Southern Hemisphere form, B. p. quoyi (Rice 1977).

Fin whales have stranded along the coasts of North Carolina and Florida in the Atlantic portion of the study area and along Florida, Texas, and Louisiana in the Gulf (Figure 6). Sightings at sea have been recorded in the northern Gulf between 28° and 30° latitude and 86° and 88° longitude. Of particular importance are records in the Gulf of Mexico during February, April, June, July, September, and November (Table 4), which shows their presence in the Gulf through-out the year and suggests a somewhat isolated population like that in the Gulf of California (Caldwell and Caldwell 1973).

Seasonal Movements. - In the western North Atlantic, fin whales summer from below the latitude of Cape Cod, Massachusetts, north to the Arctic

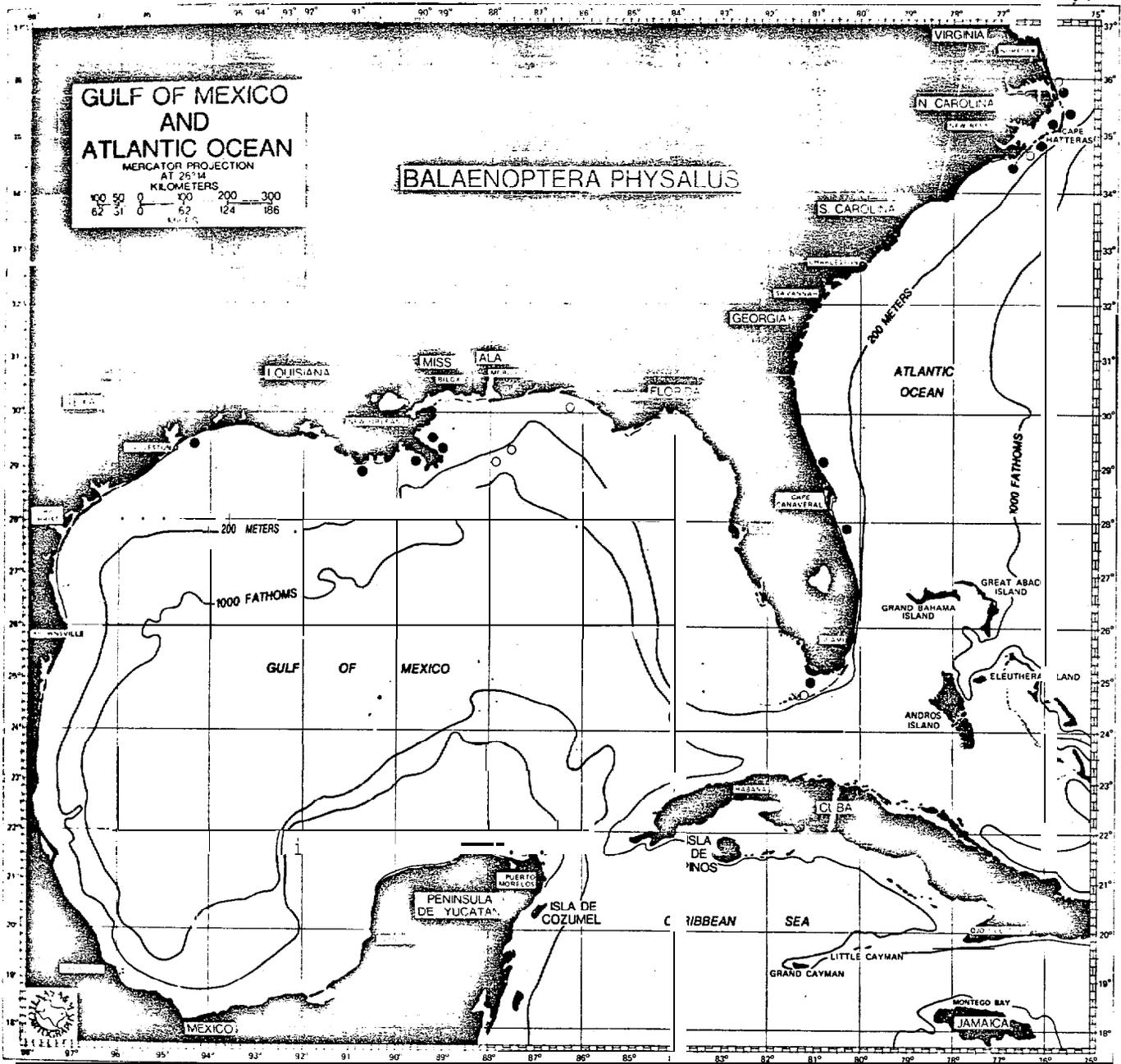


Figure 6. Distribution map of the fin whale, *Balaenoptera physalus*. See legend for Figure 1 and text for explanation of symbols.

Circle, where they are usually concentrated between shore and the 1,000-fathom (1,830 m) curve (Leatherwood et al. 1976). Their movements are generally offshore and southward in the winter, and northward and inshore in the summer. Their winter range reaches at least to the coast of Florida and to the Greater Antilles. Northward migrations probably begin in midspring. Records in the Atlantic portion of the study area are from November and January through May (Table 4).

There may be two or possibly three separate stocks of fin whales in the western North Atlantic (Leatherwood et al. 1976). One is a more northern cold-adapted stock and the other is a more southern stock. Mitchell (1975) suggests that these populations are stratified so that areas inhabited by a southern population in the summer are occupied by a northern population in the winter. A third stock may consist of an isolated population in the northern Gulf of Mexico, but confirmation will require additional data.

Status and Abundance. - These whales are not numerous in the western North Atlantic, and they are considered endangered by U. S. authorities (U. S. Fish and Wildlife Service 1973) and listed as vulnerable in the Red Book (IUCN 1972). They are still widely hunted and are not protected by international agreement. Mitchell's (1975) estimate for the finback population between Cape Cod and 57°N is a mean of 7,200 animals, with a maximum of 11,984 (derived from tag-recapture data) and a minimum of 3,162 (derived from shipboard strip census). There are no population estimates available for the study area.

Life History. - No data are available on life history parameters from the study area. Fin whales mate and calve from November to March. Females probably bear a calf every third year after a gestation period of 11-12 months (Gaskin 1976). Lactation lasts 7 months (Gaskin 1976). Canadian

fin whales are sexually mature at 17.6 to 18.3 m (females) and 16.9 to 17.5 m (males). Life span could be over 50 years (Winn et al. 1979).

Fin whales in the North Atlantic feed mostly on pelagic crustaceans, capelin, and herring. Euphausiids are the main food, and both Thysanoessa inermis and Meganyctiphanes norvegica are important food species (Pilson and Goldstein 1973). Fish are eaten more exclusively in the winter months (Gaskin 1976). Fin whales come close to shore in pursuit of fish and this may account for their frequent strandings. Their appearance in New England appears to coincide with times when herring are plentiful. Large feeding frenzies, comprising 30 to 50 animals, are often seen during the spring, summer and fall in areas of high productivity along the New England coast (Prescott et al. 1979).

Records of Occurrence. Quad 2. North Carolina: Carteret Co., Cape Lookout Bight, Wreck Point (41,206); Drum Inlet (41); Cape Lookout (14, 18, 41, 206). Quad 3. North Carolina: Nags Head (14); S Nags Head, 7 mi N Oregon Inlet (206); Rodanthe (173); 8 mi S Oregon Inlet (173); Cape Hatteras (41, 206); Cape Hatteras (93). Quad 12. Florida: Volusia Co., Ormond Beach, 29°17'N, 81°04'W (104). Quad 16. Florida: Sabastian Island, 27°50'N, 88°29'W (169), Quad 21. Florida: off Destin, 30°00'N, 86°15'W (36, 174). Quad 22. Florida: Wakulla Co., Shell Point (36, 174). Quad 25. Texas: 22 mi E Galveston (12, 67, 90). Quad 27. Louisiana: Terrebonne Parish, Isles Dernieres (89, 90). Quad 28. off coast of Mississippi and SE Louisiana (89, 90); Plaquemines Parish, Venice (89, 90, 191); Plaquemines Parish, Pelican Island (89, 90). Quad 29. 29°18'N, 87°36'W (90, 175); 29°07'S, 87°54'W (175). Quad 48. Florida: Florida Bay, Man-o-War Key (116); Monroe Co., near Boot Key, 24°41'N, 81°07'W (171).

Balaenoptera edeni Anderson 1879

Bryde's Whale

Other Common Names. - none.

Other Scientific Names. - none.

Description and Identification. - Bryde's whales reach a maximum length of approximately 46 feet (14 m). They closely resemble sei whales in external appearance, but they can be positively identified by the presence of three ridges along the head anterior to the blowhole. In addition to the medial ridge characteristic of all balaenopterids, Bryde's whales have two secondary ridges on the top of the head - one along each side even with the blowhole running forward towards the tip of the snout. These whales have a moderate dorsal fin (up to 18 inches, 45.7 cm) which is often ragged on the trailing edge and located more than one-third forward from the tail. They are dark grey in body color.

Distribution. - Their distribution is poorly documented primarily because they are difficult to identify at sea. They appear to be limited to the tropical and warm temperate waters of the Atlantic, Indian, and Pacific oceans between 40°N and 40°S and within areas where the water temperature is over 20°C. They are seldom found in higher latitudes except where there are warm water projections (Nishiwaki 1972).

These whales have stranded on the coasts of Georgia and Florida in the Atlantic portion of the study area and along the coasts of Louisiana and Florida in the Gulf of Mexico (Figure 7). The number of strandings has increased in recent years, suggesting that a small, resident population may occur somewhere in the Caribbean or Gulf of Mexico.

Seasonal Movements. - To date no migration and seasonal movements have been described (Leatherwood et al. 1976). Records in the study area are

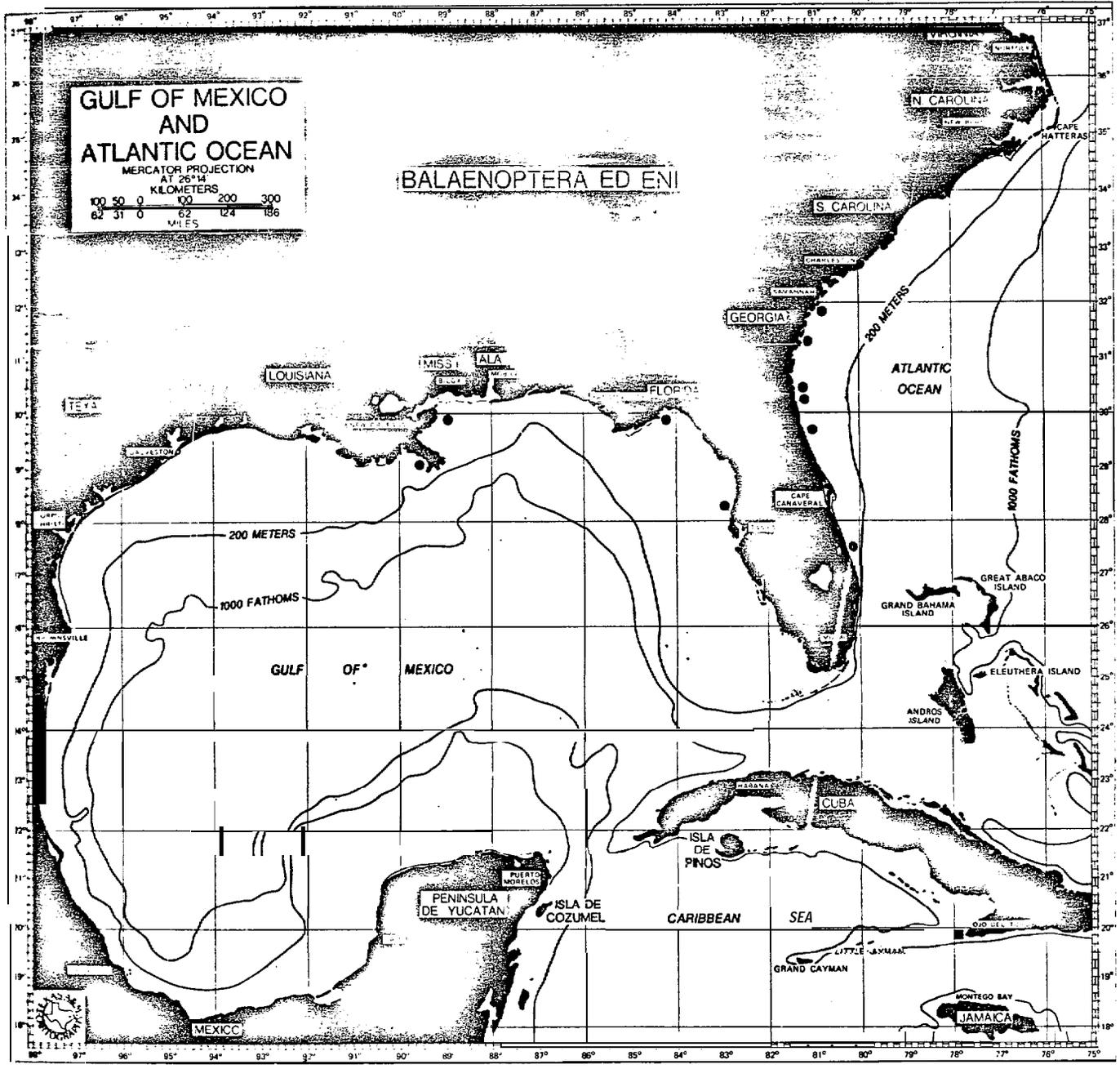


Figure 7. Distribution map of the Bryde's whale, Balaenoptera edeni. See legend for Figure 1 and text for explanation of symbols.

from winter, spring, and early summer (Table 4).

Status and Abundance. - Population estimates are not available for the study area. However, populations are considered stable and not endangered (Caldwell and Caldwell 1974).

Life History. - No data are available on life history parameters from the study area. Males attain sexual maturity at 12 m and females at 12.5 m (Nishiwaki 1972). These whales are one of the few baleen species which feeds in relatively warm water (Gaskin 1976). They usually feed on small schooling fish such as sardines, mackerel, anchovies, and clupeid fishes together with some pelagic crustaceans. There are also reports of them eating sharks and herring (Winn et al. 1979). Bryde's whales dive deeper for their food than most other baleen whales (Caldwell and Caldwell 1974). Like Minke whales, they often approach close to vessels (Leatherwood et al. 1976).

Records of Occurrence. - Quad 8. Georgia: Chatham Co., Orange Canal, 31°55' N, 81°14' W (170); NE St. Simons Island, 31°17' N, 81°17' W (170); Florida: Jacksonville, NE shore of Ft. George Island, 30°20' N, 81°40' W (170); Duval Co., Pablo Beach, 18 mi E Jacksonville, 30°17' N, 81°23' W (95, 99 as B. borealis, 104 as B. borealis, 206) Quad 12. Florida: Summer Haven, 29°41' N, 81°13' W (170). Quad 16. Florida: Ft. Pierce, 27°28' N, 80°20' W (168). Quad 22. Florida: Walker Co., near Panacea, approximately 30°02' N, 84°22' W (90, 95, 127). Quad 28. Louisiana: St. Bernard Parish, Chandeleur Island, 29°50' N, 88°50' W (90, 95, 135, 191); Louisiana: Plaquemines Parish, Mississippi River delta near Venice', 89°024', 29°07' (94, 95, 131, 135). Quad 31. Florida: Anclote Key, 28°10' N, 82°51' W (94, 95, 206). Quad 86. Cuba: Enseñada de Mora, E Cabo Cruz, 19°51' N, 77°44' W (95, 160 incorrectly as B. borealis).

Balaenoptera acutorostrata Lacépède 1804

Minke Whale

Other Common Names. - little piked whale, sharp-headed finner

Other Scientific Names. - Agaphelus gibbosus.

Description and Identification. - These are the smallest baleen whales in the Northern Hemisphere, reaching maximum lengths of just over 30 feet (9.1 m). Other than their small size, identifying features include: (1) an extremely narrow, pointed (V-shaped), distinctively Triangular rostrum with a single head ridge, similar to but much sharper than that of the fin whale; (2) a tall, falcate dorsal fin which is located about one-third forward from the tail in about the same position as that of the sei whale. Minke whales are black to dark grey on the back and white on the belly and on the underside of the flippers.

Distribution. - Minke whales are widely distributed in all oceans. Three subspecies are recognizable: B. a. acutorostrata in the North Atlantic; B. a. davidsoni in the North Pacific; and B. a. bonaerensis in the Southern Hemisphere (Rice 1977). They are distributed in the polar, temperate, and tropical waters of the western North Atlantic (Leatherwood et al. 1976) where they occur from the pack ice south to the West Indies (18°N) and the Gulf of Mexico. They appear to be most abundant in temperate waters north of the latitude of New York and are infrequently reported from tropical waters. Within the study area, documented records are from South Carolina, the Bahamas, southern Florida, the eastern Gulf of Mexico, and Louisiana (Figure 8). In particular, "there have been a large number of strandings in the vicinity of the Florida Keys. In the North Atlantic, minke whales seem to be mainly limited to continental shelf areas, with variation in density in different areas depending on the distribution of prey species

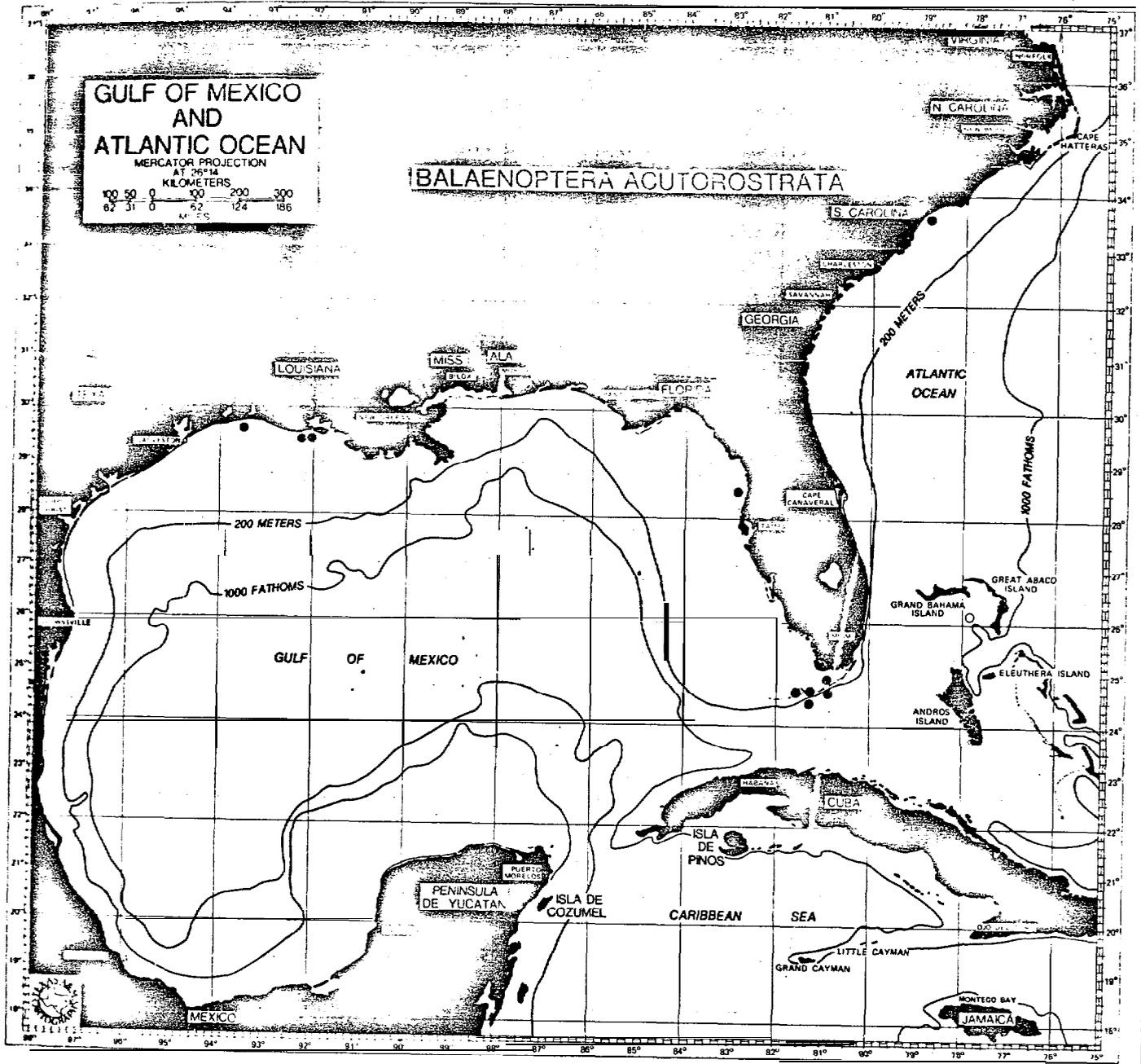


Figure 8. Distribution map of the Minke whale, Balaenoptera acutorostrata. See legend for Figure 1 and text for explanation of symbols.

(Mitchell 1975).

Seasonal Movements. - Seasonal movements are not well understood in these whales, but there seems to be a general north-south and onshore-offshore trend between summer and winter (Sergeant 1963). Supposedly they winter offshore and south to Florida and the Lesser Antilles, and they summer north of Cape Cod where they are common in the nearshore waters of the Gulf of Maine and the Bay of Fundy. Sightings in the north are not common from November through March (Katona et al. 1977), but they are sighted frequently during this time in the West Indies (Winn and Perkins 1976). With one exception, all of the records in the study area are in the winter from November through March (Table 4). The exception is an individual which stranded at Myrtle Beach, South Carolina, on 30 August 1976 (SEAN 1976) .

Status and Abundance. - No population estimates are available for the western North Atlantic or the Gulf of Mexico and, for this reason, it is difficult to determine their status in the study area. According to Mitchell (1973), minke whales in the northeast sector of the North Atlantic appear to be at a reduced level.

Life History. - No data are available on life history parameters from the study area, but the following information has "been summarized for Minke whales in the North Atlantic (Mitchell 1974). Most females have one calf, and the occurrence of **twins** is very rare; length at birth is 2.4-2.8 m. The gestation period is 10-10½ months. The pairing season is spent over a period from October to March. The lactation period is estimated to be less than 6 months.

Minke whales appear to be more solitary than other species of baleen whales, although some large schools (in the low hundreds) have been observed. There is some association of minke whales with other baleen whales such as

fin and blue. In eastern Newfoundland minke feed primarily on capelin (Mallotus villosus) between May and September. Also included in their diets are cod, herring, salmon, squid, shrimp, and possibly copepods (Sergeant 1963) .

Minke whales often approach boats, particularly stationary ones. Juveniles seem to be susceptible to entanglement and drowning in fixed fishing gear in the Cape Cod region. It is unknown whether this is accidental or the result of an attraction to the concentrations of fish present (Mead 1979).

Records of Occurrence. Quad 5. South Carolina: Myrtle Beach, S Murrell's Inlet, 33°42'N, 78°53'W (168). Quad 18. Bahamas: Little Bahama Bank, 26°06'N, 77°53'W (141). Quad 22. Florida: Wakulla Co., 30 mi E Spring Creek (36, 104, 110). Quad 26. Louisiana: Cameron Parish, Holly Beach (90, 191); Vermilion Parish, 5 mi W SW Pass (201); Vermilion, .5 mi W SW Pass (201). Quad 31. Florida: Hernando Co., near Bayport (85). Quad 48. Florida: N Long Key, 25°51'N, 80°50'W (104); Mayo Key, 24°44'N, 81°31'08"W (171); .5 mi E Little Duck Key, 24°41'N, 81°14'W (110); Long Key (44); Bahia Honda Key, 24°30'N, 81°17'W (110).

Megaptera novaeangliae (Borowski 1781)

Humpback Whale

Other Common Names. - humpbacked whale, hunchbacked whale, humpbacks.

Other Scientific Names. - Megaptera longimana.

Description and Identification. "- Humpback whales reach a length of 53 feet (16.2 m). They are easily identified by their very long (nearly a third as long as the body), nearly all white flippers that are knobby and irregular on the leading edge; the fleshy "knobs" or protuberances which are randomly distributed on the top of the head and on the lower jaw; and the small dorsal fin, located slightly more than two-thirds towards the back

of the animal, which frequently includes a step or hump. Humpback whales are basically black in color with a white region of varying size on the belly; the flippers and the undersides of the flukes are also white.

Distribution. - These whales occur in all oceans of the world. In the western North Atlantic, they are widely distributed from north of Iceland, **Disho** Bay and west of Greenland, south to Venezuela and around the tropical islands of the West Indies (Leatherwood et al. 1976).

There are several records of humpbacks from the Atlantic portion of the study area, and all of these correlate with the known time and route of migrations for this species (Figure 9). The only recent record for the Gulf of Mexico is of an individual sighted 8 April 1962 at the mouth of Tampa Bay (Layne 1965). Townsend (1935) noted humpback whaling just off the southwest tip of Florida in January and about half of the records shown in Figure 6 are based on coordinates estimated from a map showing the location of a whaling boat sometime during the day of capture of one or more humpbacks. Humpbacks are a coastal species which accounts for their long history of exploitation by hunters. In the West Indies, they are found **almost** exclusively **on** banks between the 10-100 (18.3-183.0 m) fathom line (Winn et al. 1975). "

Seasonal Movements. - Humpbacks migrate in distinct seasonal patterns. They spend spring, summer, and early fall feeding from Cape Cod to Iceland. **In** late **fall** and **é**arly winter they begin to migrate southward to the Caribbean for calving and' breeding. Their **rét**urn northward migration begins in early spring (Winn et al. 1975). Most records in the Atlantic portion of the study area **are** from fall, winter, and **early** spring (Table 4). Humpbacks passing through this region probably represent the stock breeding on Navidad, Silver, and **Monchoir** Banks, at the end of the Bahamian archipelago (Winn et

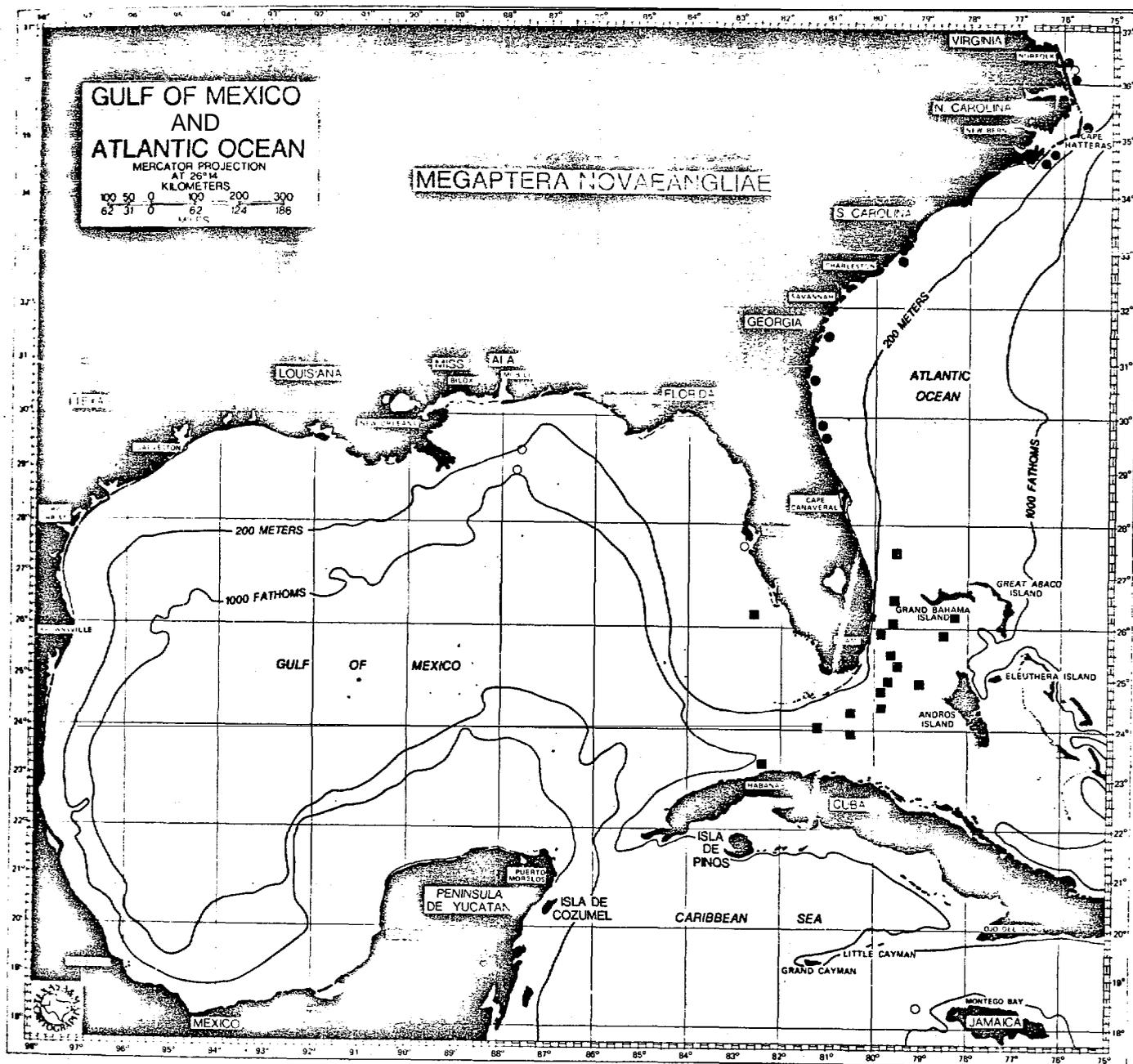


Figure 9. Distribution map of the humpback whale, Megaptera novaeangliae. See legend for Figure 1 and text for explanation of symbols.

al. 1979).

Status and Abundance, - Humpbacks are considered endangered by U. S. authorities (U. S. Fish and Wildlife Service 1973) and the Red Book (IUCN 1972). Sergeant (1966) calculated the number in existence at the end of the 19th century, based on cumulative catch data from 1903 to 1915, as at least 15,000 animals. By 1915 the population had been decimated, and it is reasonable to infer that **only** a few hundred animals remained by 1915. The total population around the world is now estimated at 5,000 animals (Gaskin 1976). Mitchell (1973) estimated 1,259 humpbacks in the western North Atlantic on their feeding grounds. Winn et al. (1975) estimated the same population on its southern breeding grounds at 785-1,157 animals. There are no population estimates available for the study area, and **it** is doubtful that a resident population occurs in this region. Most individuals sighted are migratory animals either heading north during the early spring or south during the late fall or winter. "The sighting of single individuals by NMFS personnel on 11 July 1952 and 5 June 1957 in the north-central Gulf of Mexico raises the possibility that a distinct breeding stock of these whales might occur in the **Gulf** during the summer. Clark (1887) showed commercial humpback whaling in the central Gulf in the 19th century.

Life History. - No data are **availabe** on life history parameters from the study area. Breeding and calving occur in Caribbean waters from January to March. **Gestation lasts approximately** 10 months, with lactation lasting from 10.5-11 months. **Since** yearling-size animals are seen with adults in the Caribbean, it is possible **that** the young stay with the cow after weaning (Winn et al. 1979).

In the western North Atlantic humpbacks feed only in northern waters and not **while** they are in the Caribbean (Winn et al. 1979) . Limited data

from Newfoundland indicate they feed mainly on capelin, with krill as second choice (Gaskin 1974). Herring and cod are also eaten (Winn et al. 1979). Humpbacks approach or follow trawlers rather commonly, presumably for escaping fish or because the trawlers scare and school fish tightly and make them easier to capture in cooperative hunting and feeding ventures. This may also explain why they approach stationary ships (Mitchell 1975). Humpbacks emit sounds in long, predictable patterns ranging over frequencies audible to humans. The function of the songs is unknown.

Records of Occurrence. Quad 1. North Carolina: Corolla (94, 206); Duck, 36°11'N, 75°45'W (169); Kill Devil Hills, 36°02'N, 75°40'W (170). Quad 2. North Carolina: Shackleford Banks, 34°38'N, 76°35'W (41, 104); Boque Banks, 34°33'N, 76°45'W (41). Quad 3. North Carolina: Dare Co., S Avon, N Buxton (196). Quad 5. South Carolina: Charleston Co., Cape Island, 16 km E McClellandville (47). Quad 8. Georgia: Sapelo Island (37); Georgia-Florida state boundary, 30°32'N, 81°18'W (166). Quad 12. Florida: Marineland (37, 174); Crescent Beach (174). Quad 16. Florida: Palm Beach Co., Delray Beach (85). Quad 17. 27°30'N, 79°30'W (147); 26°30'N, 79°30'W (147); 26°30'N, 78°30'W (147); 26°00'N, 79°50'W (147); 26°00'N, 79°30'W (147); 26°00'N, 78°30'W (147). Quad 29. 29°29'N, 87°33'W (175); 29°00'N, 87°41'W (175). Quad 39. Florida: off Egmont Key, mouth Tampa Bay (85); within 40 mi of the east coast between 25°00'N and 27°30'N (104, 147). Quad 48. 24°20'N, 80°30'W (147); 24°00'N, 81°10'W (147); 24°00'N, 80°30'W (147). Quad 49. 25°30'N, 79°30'W (147); 25°20'N, 79°30'W (147); 2379°40'W (147); 25°00'N, 79°00'W (147); 24°50'N, 79°50'W (147); 24°30'N, 79°50'W (147). Quad 59. Cuba: 20 mi off Habana (1). Quad 85. 18°28'N, 79°01'W (175). Not plotted. Louisiana: Balize (53, 173); Cuban Waters (50); Antilles (50); Bahamas (19, 85).

Family Physeteridae

Physeter catodon Linnaeus 1758

Sperm Whale

Other Common Names. - cachalot.

Other Scientific Names. - Physeter macrocephalus.

Description and Identification. - Male sperm whales may reach a length of 69 feet (20.9 m), although individuals larger than 50 feet (15.2 m) are rare; females are much smaller and rarely exceed 38 feet (11.6 m). These large whales are easy to identify. Their color is bluish-black except for occasional small areas of white on the lower jaw and venter. The head is rectangular in profile and comprises from a fourth to a third of the animal's total length. The dorsal fin is replaced by a hump and by a series of longitudinal ridges on the posterior part of the back. The lower jaw is small, narrow, and decidedly shorter than the snout. The pectoral flippers are exceedingly small, and the single blowhole is located well to the left of the midline and far forward on the head. Consequently, the small bushy blow emerges forward at a sharp angle from the head and towards the left (Leatherwood et al. 1976).

Distribution. - Sperm whales occur throughout the oceans of both the Eastern and Western Hemispheres, ranging from the Arctic to the Antarctic, but occurring most commonly in the temperate and tropical latitudes of the Atlantic and Pacific oceans (Lowery 1974). They occur along the continental shelf itself in the western North Atlantic, but rarely appear on the shelf itself since they are basically limited to deeper waters. They were apparently once quite numerous in the Gulf of Mexico, enough so to justify full-scale whaling operations; Townsend (1935), in summarizing 160 years of whaling, included many records from April through July in the north central

Gulf of Mexico and southeast to the lower Florida Keys; he also included a few records from the central Gulf in March (Figure 10). Whaling records are available for every month of the year in the Atlantic portion of the study area. Stranding records are known from Cape Hatteras to Cape Canaveral along the Atlantic Coast, from the west coast of Florida, and also from the coasts of Louisiana, Texas, and Veracruz, Mexico (Figure 10). Strandings or sightings are known for every month of the year in the Gulf (Table 4). This and a number of other circumstances, particularly the old whaling records, suggests there may be a separate population in the Gulf of Mexico, although this remains to be well substantiated. Sperm whales were observed during the NFWL-BLM aerial surveys in August in the Brownsville and Corpus Christi study areas along the Texas coast.

Seasonal Movements. - Seasonal distributions and migrations vary between males and females. Along the Atlantic Coast; harem and nursery schools (consisting of females, calves, juveniles, and young and old "harem master" bulls) move north from tropical and subtropical winter grounds to breeding grounds in temperate waters around 40°N latitude (Townsend 1935). Consequently, sperm whales are fairly abundant near the edge of the continental shelf off the mid-Atlantic. Young bulls, sexually mature but unable to maintain harems, and older bulls move farther north into polar waters (Winn et al. 1979). Virtually nothing is known of seasonal movements in the Gulf of Mexico.

Status and Abundance. - Sperm whales are considered endangered by U. S. authorities (U. S. Fish and Wildlife Service 1973). The number of observations and stranding records have decreased in recent years suggesting that populations have declined. Consequently, Mead (1975) considers them uncommon in the study area. Due to their size and unique character, they are more likely to be recognized and reported than most other whales, so stranding records are

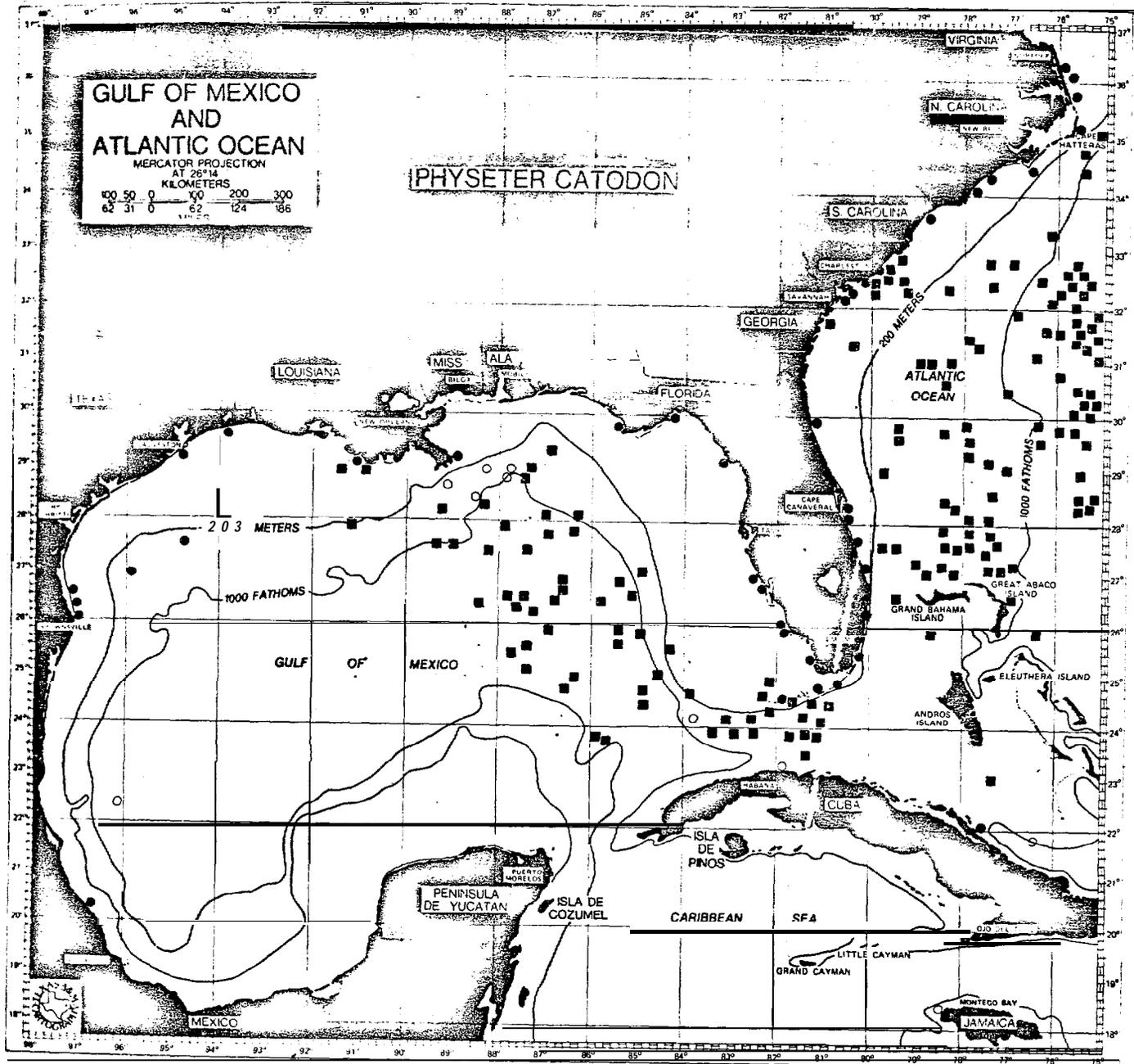


Figure 10. Distribution of the sperm whale, *Physeter catodon*. See legend for Figure 1 and text for explanation of symbols.

likely to be biased in their favor. Stranding and sighting records are commonest in the Gulf of Mexico, but the available data are not complete enough to indicate any sort of pattern. Many of the recent records are of young animals. Mitchell (1973) estimates the population in the entire North Atlantic to be around 22,000, but no specific estimates are available for the study area.

Life History. - Virtually nothing is known of life history parameters from the study area. Sperm whales are polygamous (Allen 1942). During the spring mating season, harems are formed when bull "harem masters" join the predominantly female nursery schools. Mating occurs in the spring during migration to the north. Gestation lasts 14-16 months, with a 1-2 year lactation period followed by a resting period of 8-10 months (Winn et al. 1979),

Squid is the primary food of sperm whales, supplemented by deepwater species such as octopus, sharks, cod, **scorpaenids**, snapper, 'barracuda, sardines, ragfish, skates, albacore, angler fish, **rattails**, and bottom dwellers such as spring lobsters, crayfish, crabs, jellyfish, sponges, and tunicates (Caldwell et al. 1966). Most of their food is taken in the open ocean, and at great depths below the surface (Pilson and Goldstein 1973), with some taken from the bottom sediments by scraping the lower jaw along the bottom (Caldwell et al. 1966). Sperm whales feed throughout the year, with no **noticeable** fasting period (Winn et al. 1979).

Sperm whales may be found singly or in groups of up to 35-40 individuals. Older males are **usually** solitary except during the breeding season. During the remainder of the year large groups may include bachelor **bulls** (sexually inactive males) or nursery schools containing females and juveniles of **both** sexes (Leatherwood et al. 1976).

Sperm whales **are** among the longest and deepest divers of all cetaceans. Dive duration estimates are recorded of up to 90 minutes, and depend on the

size of the individual. Depths have been reported as deep as 620 fathoms (1,145 m).

Records of Occurrence. - Quad 1. North Carolina: Currituck Inlet (173); Kitty Hawk, Bodie Island, 36°04'N, 75°34'W (169). Quad 2. North Carolina: Carteret Co., Core Banks Beach (196); Pender Co., Topsail Beach (196); Wrightsville (14, 41, 196). Quad 3. North Carolina: Bodie Island, 35°50' N, 75°34' W (169, 206); Cape Hatteras National Seashore (171); NE Cape Hatteras (149); Cape Hatteras (173); 35°10' N, 75°01' W (147); 35°00' N, 75°27' W (147); 35°00' N, 75°00' W (147); 34°40' N, 75°00' W (147); 34°30' N, 75°26' W (147). Quad 4. South Carolina: Simmon's Island (Seabrook Island) (61); 32°33' N, 80°05' W (147); 32°27' N, 80°00' W (147); Hunting Island (37, 47); 32°18' N, 80°39' W (147); Daws Island, Broad River (61, 179). Quad 5. South Carolina: Horry Co., N Myrtle Beach, 33°42' N, 78°53' W (168, 206); 33°00' N, 79°20' W (147); 32°52' N, 79°43' W (147); Off coast at "Charleston ground" (156); 32°40' N, 79°47' W (147); 32°35' N, 79°22' W (147). Quad 6. 33°21' N, 76°12' W (147); 32°53' N, 77°00' W (147); 32°49' N, 77°30' W (147); 32°29' N, 76°27' W (147); 32°26' N, 77°28' W (147); 32°22' N, 76°00' W (147); 32°08' N, 76°10' W (147); 32°00' N, 76°56' W (147). Quad 7. 33°30' N, 75°00' W (147); 33°00' N, 75°01' W (147); 32°50' N, 75°38' W (147); 32°28' N, 75°00' W (147); 32°37' N, 75°28' W (147); 32°30' N, 75°40' W (147); 32°30' N, 75°32' W (147); 32°30' N, 75°26' W (147); 32°30' N, 75°00' W (147); 32°25' N, 75°27' W (147). Quad 8. 31°43' N, 81°00' W (147); 31°27' N, 80°28' W (147). Quad 9. 31°31' N, 78°00' W (147); 31°00' N, 79°00' W (147); 31°00' N, 78°41' W (147); 30°53' N, 78°30' W (147); 30°38' N, 78°30' W (147). Quad 10. 31°40' N, 76°21' W (147); 31°35' N, 76°00' W (147); 31°17' N, 77°45' W (147); 31°09' N, 76°30' W (147); 30°51' N, 76°00' W (147); 30°34' N, 77°08' W (147). Quad 11. 31°48' N, 75°37' W (147); 31°46' N, 75°13' W (147); 31°42' N, 75°18' W (147); 31°40' N, 75°00' W

(147); 31° 40' N, 74° 58' W (147); 31° 36' N, 75° 20' W (147); 31° 29' N, 75° 11' W (147); 31° 28' N, 75° 22' W (147); 31020'' N, 75° 00' W (147); 31° 17' N, 75° 27' W (147); 31° 06' N, 75° 10' W (147); 30° 40' N, 74° 58' W (147); 30° 38' N, 75° 00' W (147); 30° 32' N, 75° 31' W (147); 30° 30' N, 75° 22' W (147); 30° 19' N, 75° 20' W (147); 30° 17' N, 75° 14' W (147); 30° 12' N, 75° 22' W (147); 30° 08' N, 75° 35' W (147); 30° 00' N, 75° 30' W (147). Quad 12. Florida: Ponte Vedra Beach (37); Brevard Co., Cape Canaveral (104); Charlotte Co., Englewood, 29° 54' N, 81° 05' W (36, 104, 184); near Cape Canaveral (149); Brevard Co., Melbourne Beach (185). Quad 13. 29° 52' N, 78° 00' W (147); Brevard Co., Cape Canaveral (104); (36, 104, 184); near Cape Canaveral (149); Brevard Co., Melbourne Beach (185). Quad 13. 29° 52' N, 78° 00' W (147); 29° 46' N, 79° 27' W (147); 29° 43' N, 78° 30' W (147); 29° 35' N, 78° 00' W (147); 29° 33' N, 79° 29' W (147); 29° 00' N, 79° 48' W (147); 28° 22' N, 78° 28' W (147); 28° 20' N, 78° 19' W (147); 28° 00' N, 78° 32' W (147); 28° 00' N, 78° 00' W (147). Quad 14. 29° 47' N, 76° 33' W (147); 29° 47' N, 76° 00' W (147); 29° 18' N, 77° 59' W (147); 29° 31' N, 76° 27' W (147); 29° 10' N, 77° 34' W (147); 29° 03' N, 77° 13' W (147); 28° 34' N, 77° 30' W (147); 28° 00' N, 77° 33' W (147). Quad 15. 29° 47' N, 75° 40' W (147); 29° 50' N, 75° 00' W (147); 29° 30' N, 75° 28' W (147); 28° 57' N, 75° 39' W (147); 28° 30' N, 75° 1.5' W (147); 28° 29' N, 75° 36' W (147); 28° 18' N, 75° 37' W (147); 28° 15' N, 75° 23' W (147); 28° 20' N, 75° 00' W (147). Quad 16. Florida: Indian River Co., Vero Beach, 27° 39' N, 80° 22' W (170); Jupiter Island, 90 mi N Miami (36, 139); Palm Beach Co., Juno Beach, 26° 51' N, 80° 03' W (170); Palm Beach Co., Lake Worth (185); Palm Beach Co., Delray Beach (85); Naples (26, 44) . . Quad 17. 27° 50' N, 78° 00' W (147); 27° 34' N, 78° 00' W (147); 27° 33' N, 79° 50' W (147); 27° 33' N, 79° 30' W (147); 27° 33' N, 78° 29' W (147); 27° 33' N, 78° 07' W (147); 27° 12' N, 79° 04' W (147); 27° 08' N, 77° 31' W (147); 27° 07' N, 78° 30' W (147); 27° 06' N, 78° 57' W (147); 27° 05' N, 78° 18' W

(147); 26°30' N, 79°30' W (147); 26°00' N, 78°46' W (147). Quad 18. 27°49' N, 77°32' W (147); 27°37' N, 77°24' W (147); 27°23' N, 77°35' W (147); 27°12' N, 77°00' W (147); 27°00' N, 77°22' W (147); 26°35' N, 77°00' W (147); 26°00' N, 76°29' W (147); Quad 25. Texas: 5 mi S Galveston (204). Quad 26. Texas: Port Arthur, Sabine Pass (90, 114, 130, 131). Quad 27. Louisiana: Bayou De Largo (169, 206); 29°02' N, 91°29' W (147); 28°58' N, 91°00' W (147); 28°00' N, 91°16' W (147); Quad 28. Louisiana: mouth of Thomasin Bayou, 29°13' N, 89°03' W (90); 29°00' N, 88°19' W (175); 20 - 25 mi off South pass, mouth of Mississippi River (90); 28°24' N, 88°29' W (175); 28°23' N, 88°25' W (147); 28°14' N, 89°18' W (147); 28°00' N, 88°00' W (147). Quad 29. 29°21' N, 87°00' W (147); 29°00' N, 87°23' W (147); 28°59' N, 87°49' W (175); 28°55' N, 87°51' W (175); 28°50' N, 87°32' W (147); 28°00' N, 87°03' W (147); 28°00' N, 86°21' W (147). Quad 30. Florida: Franklin Co., Alligator Peninsula, 29°54' N, 84°20' W (36, 104); Gulf Co., 5 mi NW Port St. Joe (44). Quad 31. Florida: near Cedar Key, 29°08' N (168). Quad 32. Texas: Padre Island National Seashore, 3 mi S wreck of the Nicaragua, N Mansfield Channel (130, 131); Cameron Co., 17 mi N Port Isabell Jetties (131); Texas: South Padre Island, near Brownsville (131). Quad 33. Gulf of Mexico: Brownsville study area, 95°07' N, 26°57' W (208); Gulf of Mexico: Brownsville study area, 94°46' N, 27°27' W (208). Quad 36 27°34' N, 89°27' W (147); 27°33' N, 89°07' W (147); 27°27' N, 88°23' W (147); 26°28' N, 88°32' W (147). Quad 37. 27°48' N, 86°28' W (147); 27°45' N, 87°00' W (147); 27°27' N, 87°29' W (147); 26°50' N, 86°41' W (147); 26°38' N, 86°41' W (147); 26°35' N, 87°51' W (147); 26°34' N, 87°30' W (147); 26°28' N, 86°42' W (147); 26°25' N, 87°40' W (147); 26°19' N, 87°22' W (147); 26°00' N, 87°00' W (147). Quad 38. 27°02' N, 85°00' W (147); 26°54' N, 85°24' W (147); 26°37' N, 85°12' W (147); 26°27' N, 86°00' W (147); 28°27' N, 85°51' W (147); 26°00' N, 85°32' W (147). Quad 39. Florida: Charlotte Co., Englewood, 26°56' N,

82° 22' N (36, 104, 84); Tampa Bay, 27°32' N, 82°44' W (94, 206). Quad 45.^{25, 37}, N, 87°26'; W (147); 25°30' N, 85°47' W (147); 25°09' N, 87°27' W (147); 25°03' N, 86°26' W (147); 24°48' N, 86°38' W (147). Quad 46. 25°52' N, 85°03' W (147); 25°36' N, 85°33' W (147); 25°28' N, 84°25' W (147); 25°00' N, 84°40' W (147); 24°45' N, 84°47' W (147); 24°40' N, 84°00' W (147); 24°26' N, 84°56' W (147). Quad 47. 24°47' N, 82°00' W (147); 24°44' N, 82°10' W (147); 24°18' N, 82°09' W (147, 175); 24°11' N, 83°13' W (147); 24°10' N, 83°50' W (175); 24°10' N, 82°36' W (147); 24°00' N, 83°29' W (147); 24°00' N, 83°00' W (147); 24°00' N, 82°37' W (147). Quad 48. Florida: Collier Co., 12 mi off Marco Is. (85); Sands Key, Biscayne Bay (94, 206); Everglades National park Waters, Highland Beach, N entrance to Whitewater Bay (94, 116); Matecumbe Key (139); Monroe Co., Marathon Key, 24°43' N, 81°05' W (36, 104, 206); Monroe Co., near Key West, 24°38' N, 81°50' W (169); 24°33' N, 81°47' W (147); 24°33' N, 81°18' W (147); 24°26' N, 80°56' W (147); 24°10' N, 81°28' W (147); 24°00' N, 81°26' W (147); 24°00' N, 81°06' W (147). Quad 52. 22°19' N, 96°05' W (175). Quad 57. 23°44' N, 86°05' W (147); 23°34' N, 86°00' W (147). Quad 60. 23°50' N, 81°47' W (147); 23°49' N, 81°10' W (147); 23°07' N, 81°25' W (147); Cuba: El Fraile, 23°09' N, 81°52' W (50). Quad 62. 23°01' N, 77°26' W (147); Cuba: Cayo Romano, 22°01' N, 77°39' W (50). Quad 64. Mexico: Veracruz, Tecolutla, 20°15' N, 96°47' W (95, 162 as Balaenoptera borealis). Quad 74. 21°41' N, 76°28' W (175). Quad 85. Jamaica: off Negril Point (88). Quad 86. Cuba: Jucaro, 19°56' N, 77°40' W (129, 161). Not Plotted. Eastern Gulf to the mouth of Mississippi River (67); Florida (149); Cuban waters (1); Cuban waters (50).

Kogia breviceps (Blainville 1838)

Pygmy Sperm Whale

Other Common Names. - none.

Other Scientific Names. - none.

Description and Identification. - Pygmy sperm whales reach a length of between 9-12 feet (2.7-3.4 m) and a weight between 700-900 pounds (318-408 kg). They may be identified by (1) a blunt, **squarish** head with a narrow, underslung lower jaw that terminates well behind the tip of the snout; (2) an extremely robust body that rapidly tapers near the **tail**; (3) by a low dorsal fin that is positioned posterior to the center of the back; (4) **by** a crescent shaped bracket mark, called a false gill, which is positioned between **the** eyes and the flippers; (5) and by flippers that are located well forward **on** the body, just below and behind the bracket mark. These small whales are dark gray on the back, changing to lighter gray on the sides, and gradually fading to a **dull white** on the **belly**.

Handley (1966) has demonstrated beyond any reasonable doubt that two well-defined species, K. breviceps and K. simus, are recognizable instead of **only** one, as was previously believed. Of the two, K. breviceps is decidedly larger; they also differ in several other important features, which are outlined in the account of K. simus.

Distribution. - Pygmy sperm whales presumably have a worldwide distribution in warmer seas, but they **are** thought. **to be** relatively rare (Handley 1966). In the western **North** Atlantic, they occur from as far north as Nova Scotia to as far **south**'as Cuba, and as far' west as Texas in the Gulf of Mexico. They occur throughout the study area and these small whales frequently strand along the Atlantic coast of Florida as well as throughout the eastern and northern Gulf of Mexico (Figure 11). Observations at sea are very rare, and it is believed that this is an offshore species which lives in deep waters except

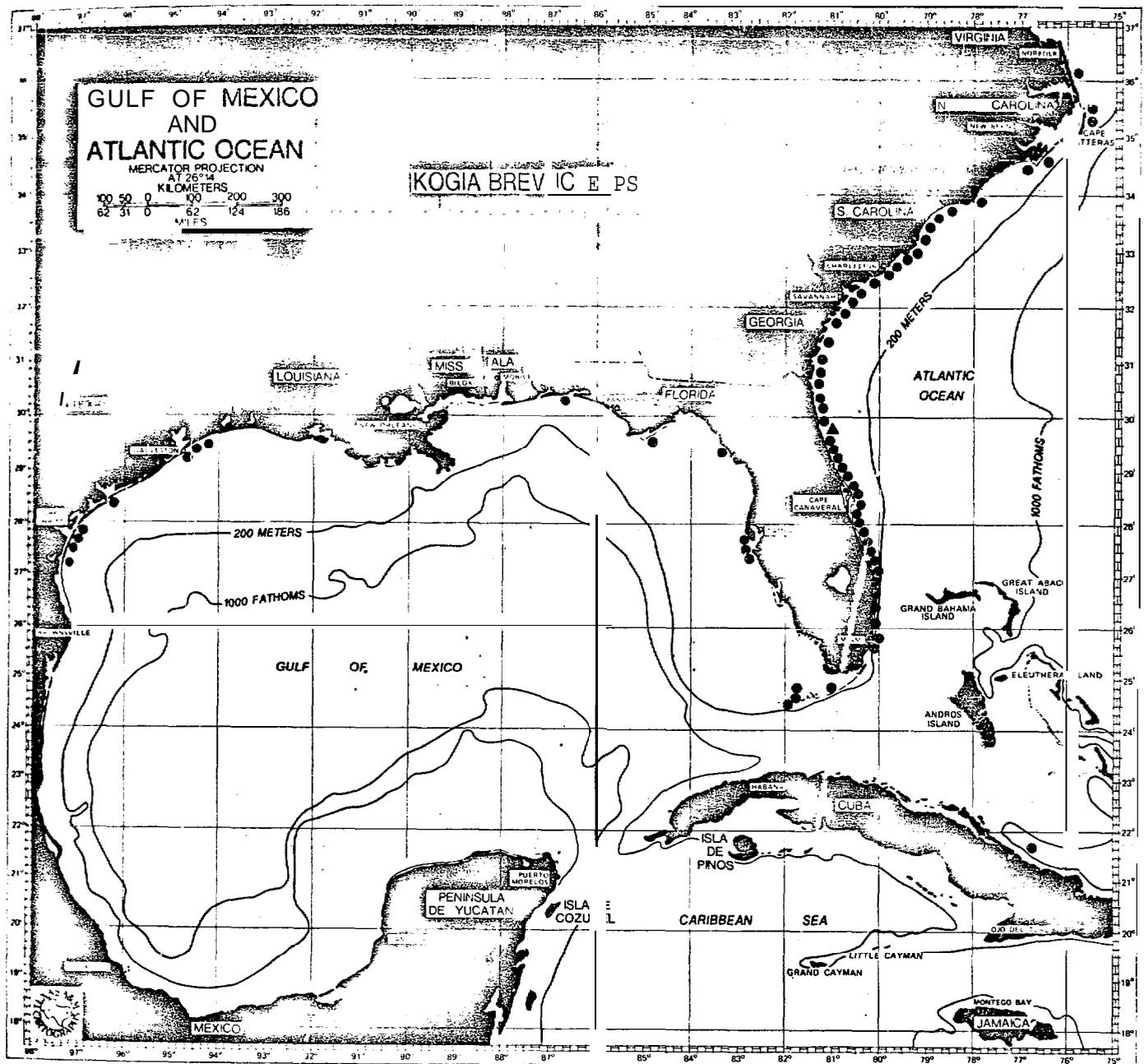


Figure 11 Distribution map of the pygmy sperm whale, Kogia breviceps. See legend for Figure 1 and text for explanation of symbols.

perhaps during the calving season (Winn et al. 1979).

Seasonal Movements. - There are 148 records of pygmy sperm whales in the study area, but there is **no** apparent pattern to them except for the superabundance of Florida records (Table 4). Records are available for the entire study area from North Carolina to Florida to Texas except for the coasts of Louisiana, Mississippi and Alabama. Taking the Florida records alone, where they seem to strand most commonly, there are peaks in January (12 strandings), September (11), October (9), March (7), and August (7), with scattered records through the other months, except for July and November which have only one record each. This distribution does not readily lend itself to interpretation. One known problem is the presence of records of K. simus in the old literature, as this species **was** not widely recognized until 1966. A pattern may become evident when these are eliminated and more new records become available.

Status and Abundance. - There are no population estimates available from the study area. The most striking aspect of the stranding records is that there are so many of them, especially for an animal that is usually considered to **be** a rare offshore species. This either is not the case in the study area or some unusual selective factor causes these animals to beach. It is also possible that these small whales **are** a common element in the inshore fauna of this area, **but** their habits prevent them from being seen alive. Many strandings appear to be directly related to the birth process as females with newborn calves often strand as well as females whose ovaries and uteri apparently have been involved **in** births just prior to stranding.

Life History. - Very little data are available on life history parameters from the study area. **Mating** may take place in late summer, and the young are born in the following spring, after a gestation period of some 9 months (Allen 1941). Strandings have been reported in the study area where a pregnant

female, still lactating, has been accompanied by a yearling animal, indicating that the single calf stays with the mother during the first year.

Pygmy sperm whales feed on squid, crab, and shrimp (Handley 1966), as well as some fishes (Winn et al. 1979). In Texas, Raun et al. (1970) reported squid (Ommastrephes sp.), two type of shrimp (Gnathophausia ingens and Aristaeomorpha foliacea), and Sargassum in the stomach of a stranded animal.

Pygmy sperm whales seem to occur in small schools of three to six individuals and seem to be rather timid (Mitchell 1975), slow-moving, and deliberate (Handley 1966).

Records of Occurrence. - Quad 1. North Carolina: Kitty Hawk (4, 14, 119, 150, 206). Quad 2. North Carolina: Cape Lookout National Seashore, Core Banks S, 34° 39' N, 76° 30' W (170); Morehead City (176); Carteret Co., Atlantic Beach (196). Quad 3. North Carolina: opposite Oregon Inlet Life Saving Station, 200 yds offshore (4, 14, 187); 1 km N Hatteras Inlet, Cape Hatteras National Seashore, 35° 12' N, 75° 44' W (169); 275 - 365 m S of point, Cape Hatteras National Seashore (171); Avon (173); Oracoke Island, 35° 10' N, 75° 78' W (170, 206). Quad 4. South Carolina: Charleston Co., Seabrook's Beach (41, 61, 72); Parris Point, Parris Island (171); Hilton Head Island (94, 179); Sea Pines, Hilton Head Island, 32° 10' N, 80° 40' W (171); Beaufort co., Hilton Head Island (47); Long Island Fill, near mouth Savannah River (4, 41, 61, 143, 157, 179). Quad 5. North Carolina: Brunswick, Ocean Isle Beach, 33° 54' N, 78° 24' W (170); South Carolina: Myrtle Beach, 33° 42' N, 78° 53' W (168); Litchfield Beach (94, 179); Georgetown Co., Pawley's Island (41, 61, 72, 179); Georgetown Co., North Island, 33° 15' N, 79° 12' W (171, 179); Cape Romain (94, 179); Capers Island, 32° 53' N, 79° 39' W (169, 179); Big Capers (94); Charleston Co., Isle of Palms (61, 72, 279); Isle of Palms (47); Charleston Co., Sullivan's Island, 32° 44' N, 79° 49' W (170); Charleston CO., Sullivan's Island (61, 72, 179); Sullivan's

Island (47); Charleston Co., Beach Inlet, **between** Sullivan's Island and Isle of Palms (47); Charleston (93). Quad 6. North Carolina: **Southport, 33°55' N, 78°00' W** (168, 206). Quad 8. Georgia: Tybee Islands (37, 94); Wassaw Island (94); Chatham Co., **Ossabow** Island (37, 47, 186); Liberty Co., St. Catherine Island (176); McIntosh Co., Blackboard Island (47); **Sapelo** Island (93); McIntosh Co., **Sapelo** Island (41, 138); McIntosh Co., **Sapelo** Island (41, 138, 206); McIntosh Co., **Sapelo** Island, Nannygoat Beach (47); McIntosh Co., **Sapelo** Island, Nannygoat Beach (47); St. Simons Island, 31°08' N, 81°24' W (168, 206); St. **Simons** Island (37); Glynn Co., NE Little St. **Simons** Island, 31°17' N, 81°17' W (170); Glynn Co., **Little St. Simons** Island (172); Sea Island, near Brunswick (41); Glynn Co., Jekyll Island (206); Glynn Co., Jekyll Island, **31°03' N, 81°25' W** (171); Glynn Co.; Jekyll Island (47); Camden Co., **Cumberland** Island, 30°57' N, 81°24' W (170); Camden Co., **Cumberland** Island, 30°56' N, 81°24' W (170); Camden Co., **Cumberland** Island, 30°44' N, 81°27' W (170); Camden Co., **Cumberland** Island (37, 186); N Little **Cumberland** Island (47, 186); **Cumberland** Island, Pig Heaven, 30°46' N, 81°28' W (170); Florida: Nassau Co., American Beach, 30°40' N, **81°26' W** (170); Atlantic Beach, 30°19' N, 81°24' W (169); Atlantic Beach (37); Jacksonville, 30°18' N, 81°24' W (169, 206); **Duval** Co., Jacksonville Beach, **30°11' N, 81°22' W** (185). Quad 12. Florida: near ponte Vedra Beach (37); St. John's Co.; N St. Augustine Inlet, **Usina** Beach, 29°54' N, 81°19' W (170); St. John's Co., St. Augustine Beach, 29°52' N, 81°16' W (90, 104); **St. John's Co.**, S St. Augustine Inlet (85); St. John's Co., Conch Island (172); St. John's Co., between St.-Augustine and Matanzas Inlet (185); St. Augustine (94); St. **John's** Co., St. Augustine Beach, 29°51' N, 81°15' W (171); St. John's Co., 2 mi S St. Augustine Beach (85); Crescent Beach, 29°48' N 81°30' W (85, 206); **Matanzas** Inlet, 29°43' N, 81°25' W (104); **Matanzas** Inlet, 29°43' N, 81°25' W (104); Summer Haven, 29°41' N, 81°13' W (170); **Flagler** Co., 45 m S Marineland, 29°36' N, 81°05' W (171); **Flagler** Co., near Marineland (4, 91);

beach within 10 mi Marineland (85); beach adjacent to Marineland (85); Flagler Beach; 29°29' N, 81°08' W (169); Flagler Beach (94); Volusia Co., 3 mi N Ormand Beach (57, 85); Volusia CG., 3 mi N Ormand Beach (85); Ormond Beach 29°17' N, 81°03' W (168); Volusia Co., Daytona Beach, 29°10' N, 81°00' W (170); Daytona Beach (94); Volusia Co., New Smyrna Beach, 29°01' N, 80°56' W (171); Volusia co., New Smyrna Beach (185); 1.5 km S Sebastian Inlet, 28°57' N, 80°26' W (170); Playa Linda Beach, 28°38' N, 80°36' W (170); Merritt Island, 28°30' N, 80°30' W (169); Merritt Island, Patrick Air Force Base, 28°13' N, 80°37' W (170); Indian Harbour Beach, 28°09' N, 80°35' W (169); Melbourne, 28°04' N, 80°38' W (169); Melbourne, 28°04' N, 80°38' (169); Melbourne Beach (85); Melbourne (187).

Quad 16. Florida: Brevard Co., 13 km N Sebastian Inlet, 27°55' N, 80°32' W (170); Brevard Co., 3.5 km S Sebastian Inlet, 27°52' N, 80°26' W (172); 5.6 km S Sebastian Inlet, 27°50' N, 80°29' W (170); Sebastian Inlet, 27°49' N, 80°28' W (168); Indian River Co., Vero Beach, 27°39' N, 80°21' W (171); Indian River Co., Vero Beach (94); Hutchinson's Island (94); St. Lucie Co., Hutchinson's Island, Jensen Beach, 27°14' N, 80°15' W (169); St. Lucie Co., Hutchinson's Island, Jensen Beach, 27°14' N, 80°15' W (171); Palm Beach Co., Jupiter Island, 1 mi N Jupiter Inlet (85); Jupiter Island, 27°06' N, 80°04' W (170); Martin Co., Jupiter Island, 27°03' N, 80°06' W (171); Jupiter Island, 26°75' N, 80°08' W (168); Palm Beach Co., Jupiter Inlet, 26°55' N, 80°06' W (4, 104, 206); Palm Beach Co., Jupiter Inlet, 26°55' N, 80°05' W (171); Palm Beach Co., Palm Beach Inlet, 26°46' N, 80°02' W (170); Palm Beach Co., Palm Beach (85); Palm Beach co., Delray Beach, 26°27' N, 80°3' W (171); Broward Co., Hallandale Beach (85).

Quad — Okaloosa Co., Ft. Walton Beach (36); Okaloosa Co., Ft. Walton Beach (48). Quad 24. Texas: Calhoun Co., Port O'Connor, 1 mi S Boogey Bayou (131).

Quad 25. Texas: Chambers Co., High Island (131); Chambers Co., 13 mi E Galveston, Crystal Beach (131); Galveston Island, 29°17' N, 94°48' W (169); city limits Galveston City (44). Quad 30. Florida: Franklin Co., St. George

Island, 29°36' N 84°50' W (185); Franklin Co., St. George Island (185).

Quad 31. Florida: Dixie Co., Horseshoe Beach, 29°27' N, 83°17' W (168);

Dixie Co., Horseshoe Beach (185). Quad 32. Texas: Nueces Co., 1 mi S Aransas Pass jetties, Mustang Island (72); Port Aransas (204); Padre Island, 27°37' N, 97°12' W (169); 15.8 mi S south jetty Port Aransas, Mustang Island (90, 124); 20 mi S Corpus Christi, Gulf Beach of Padre Island (44, 72, 90); Padre Island National Seashore, N Yarborough Pass (93, 94, originally speculated as K. simus by 130; 131). Quad 39. Florida: Pinellas CO., St. Petersburg Beach, 27°45' N, 82°50' W (90, 104); Hillsboro Inlet (94)"; Manatee Co., Holmes Beach (36).

Quad 48. Florida: S Miami Beach (94); Dade Co., Key Biscayne S of Miami Beach (85); Marathon, Vaca Key, 24°43' N, 81°05' W (168); Marathon, Vaca Key, 24°42' N, 81°50' W (170); Isla Morada, near Key West, 24°33' N, 81°48' W (168); Stock Island (94). Quad 74. Cuba: Bahia de Nuevas, 21°25' N, 77°00' W, (1).

Not plotted. South Carolina: no specific locality (41, 176); Florida: Vilano Beach {37}.

Kogia simus (Owen 1866)

Dwarf Sperm Whale

Other Common Names. - none.

Other Scientific Names. - none.

Description and Identification. - Dwarf sperm whales are similar in overall appearance to pygmy sperm whales (K. breviceps) from which they differ in the following characters (those of breviceps are listed first): total length from snout to notch in flukes, 9-11 feet (2.7-3.4 m) versus 7-9 feet (2.1-2.7 m); weight 700-900 pounds (318-408 kg) versus 300-600 pounds (136-272 kg); dorsal fin, low and posterior to center of back versus high and near center of back; condylobasal length, 391-469 mm versus 262-302 mm; mandibular teeth, 12-16 (rarely 10 or 11) pairs versus 8-11 (rarely 13) pairs; mandibular symphysis,

long (86-120 mm) and ventrally keeled versus short (37-46 mm) and without ventral keel (Handley 1966). The bracket-shaped mark on each side of the head, between the eyes and the flippers, is apparently present in both species. Similarly, the color pattern of the two species is indistinguishable.

Distribution. - Dwarf sperm whales are known from the seas adjacent to South Africa, India, Ceylon, Japan, Hawaii, South Australia, and eastern United States (Handley 1966). In the western North Atlantic, they have been positively reported from Virginia south to St. Vincent in the Lesser Antilles, and in the Gulf of Mexico (Leatherwood et al. 1976). Their range completely overlaps with that of *K. breviceps*. No specific data are available, but supposedly they primarily inhabit deep water. Stranding records are known from several widely scattered places throughout the study area (Figure 12), but they have been recorded much more frequently from the Atlantic Coast than from the Gulf Coast. The number of records is not nearly as numerous as are records of *K. breviceps*, but inasmuch as this species has only recently been clearly delineated from *K. breviceps* (see Handley 1966), it is likely that some of the old records of that species are actually *K. simus*.

Seasonal Movements. - No information is available. Within the study area, they have been recorded from every month save August and September (Table 4), but there are too few records for any pattern to be apparent.

Status and Abundance. - There are no population estimates available from the study area and, consequently, it is impossible to determine their status. They appear to be substantially less common than *K. breviceps* and to be restricted to more southern waters. According to Caldwell and Caldwell (1974), populations are stable and not endangered.

Life History. - No data are available on life history parameters from the study area and very little is known from other geographic regions. Some

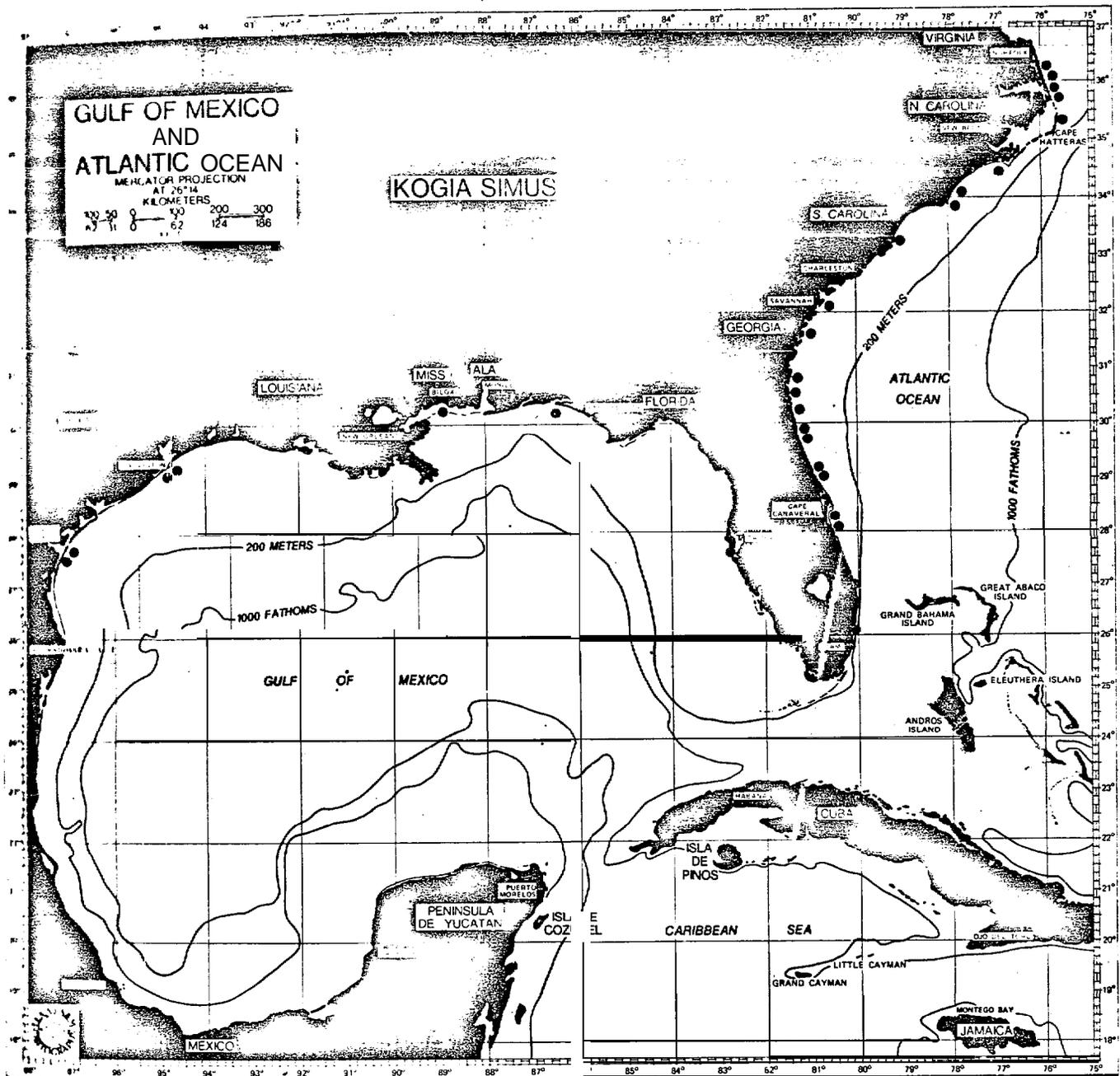


Figure 12. Distribution map of the dwarf sperm whale, Kogia simus. See legend for Figure 1 and text for explanation of symbols.

strandings appear to be related to females giving birth close to shore (Winn et al. 1979). They feed primarily on squid, but eat some crustaceans and fish as well (Caldwell and Caldwell 1974).

Records of Occurrence. Quad 1. North Carolina: Corolla, 36°25'N, 75°50'W (206); Kitty Hawk (4, 14, 119, 150, 206). Quad 2. North Carolina: Ocean Ridge, 1.5 mi W Atlantic Beach (41); Carolina Beach, 34°02'N, 77°56'W (170). Quad 3. Nag's Head, 35°58'N, 75°38'W (169, 206); Pea Island (94, 206); Dare Co., Oregon Inlet (14 incorrectly as K. breviceps; 41 incorrectly as K. breviceps; 187); Avon, 35°22'N, 75°30'W (170, 206); Cape Hatteras (173). Quad 4. South Carolina, Hilton Head Island (206). Quad 5. South Carolina: Debedieu Beach of Arcadia Plantation (41, 61, 157, 198). Quad 6. North Carolina: Fort Fisher (94, 206). Quad 8. Georgia: Wassaw Island, 31°51'N, 80°57'W (206); Chatham Co., Ossabaw Island Beach (47); Camden Co., Cumberland Island, 30°53'N, 81°24'W (170); Camden Co., Cumberland Island, 30°50'N, 81°26'W (168); Camden Co., Cumberland Island, 30°50'N, 82°26'W (168, 206); Camden Co., Cumberland Island (186); Camden co., Cumberland Island, 30°46'N, 81°28'W (170); Florida: Fernandina Beach (37); near Atlantic Beach (37). Quad 12. Florida: approx. 1 km S St, Augustine Beach, 29°50'N, 81°16'W (170); Vilano Beach (37); St. Augustine (37); 29°05'N, 80°55'W (166); 28°55'N, 80°43'W (166); Cocoa Beach, 28°20'N, 80°43'W (171); Melbourne, 28°04'N, 80°38'W (168). Quad 16. Florida: near Jupiter Island, 26°57'N, 80°08'W (168); Ft. Lauderdale (94). Quad 20. Mississippi; beach at Biloxi (71, 94). Quad 21. Florida: Okaloosa Co., 3 mi E Destin (44 incorrectly as K. breviceps; 9 0 Quad 25. Texas: Galveston Island" (44 incorrectly as K. breviceps; 124); Galveston, 29°17'N, 94°48'W (170,206). Quad 32. Texas: Padre Island (134); Padre Island National Seashore, 27°35'N, 97°15'W (170). Quad 39. Florida: Pinellas Co., St. Petersburg Beach, 27°45'N, 82°40'W (170).

Family Ziphiidae

Mesoplodon densirostris (Blainville in Desmarest 1817)

Blainville's Beaked Whale

Other Common Names. - dense-beaked whale.

Other Scientific Names. - none.

Description and Identification. - **Blainville's** beaked whale may reach a length of at least 17 feet (5.2 m). Their most distinctive characteristic is the head, which is marked by a prominent rise located near the angle of the gape on each side. In adult males this rise bears the teeth and gives a peculiar high, arching contour to the mouth (Leatherwood et al. 1976). This rise is not prominent in females or immature males and detailed study of a **skull is** usually required to identify these individuals. These whales are **black** or charcoal gray on the back and slightly lighter on the abdomen. They are somewhat blotched with grayish-white and are often extensively scratched or scarred (Leatherwood et al. 1976).

Three species of beaked whales of this genus (M. mirus, M. europaeus, and M. densirostris) occur in the study area. All are known strictly from stranded specimens and have not been encountered at sea. For this reason, information on appearance of the species in the wild is almost totally lacking. All of the species have five features in common, namely (1) two small creases on the throat which are **V-shaped**; (2) absence of a conspicuous notch on the rear margin of the tail" flukes; (3) absence of functional teeth in all except adult males; (4) black to **dark** gray'body coloration; and (5) a dorsal fin that is situated well past mid-body. Adult males have a functional pair of teeth in the lower jaw, the position of which can be used for species identification. In M. mirus, the teeth are located near the tip of the lower jaw; in M. europaeus, they are located about a third of the way from the **tip** of the

snout to the corner of the mouth; and in *M. densirostris*, they are located in large prominences near the back of the mouth (Leatherwood et al. 1976). Positive identification of females or immature males usually requires museum preparation and examination.

Distribution. - These whales are found in all oceans having tropical and warm temperate waters (Rice 1977). This is the only species of Mesoplodon which seems normally to occur both north and south of the equator. Nishiwaki (1972) suggests they are limited by 45° latitude in either hemisphere. They have stranded along the American coast from Florida to Nova Scotia and there is a single record for the Gulf of Mexico. According to Moore (1966), their distribution is farther offshore than any other Mesoplodon found in the North Atlantic. There have been seven strandings from the Atlantic portion of the study area (Figure 13); these are from North Carolina (three records), South Carolina (one), Georgia (one), and Florida (two). The single individual from the Gulf of Mexico stranded at Jack Stout Bayou, Terrebonne Parish, Louisiana on 5 January 1974. Gunter (1955) reported a specimen from Padre Island, Texas, but Moore (1966) has subsequently shown this to be Mesoplodon europaeus. A stranding also occurred in the Bahama Islands on 17 October 1944.

Seasonal Movements. - No information is available concerning movements. Within the study area, records are from January, March, June, and October (Table 4), but these data are too meager to indicate a definite pattern of movement. The strandings are also evenly divided between males and females.

Status and Abundance. - There are no estimates of population size for the study area, but the available information suggests these whale are uncommon along the Atlantic coast and extremely rare in the Gulf of Mexico.

Life History. - No data are available on life history parameters from the study area and very little is known from other geographic regions. Analysis

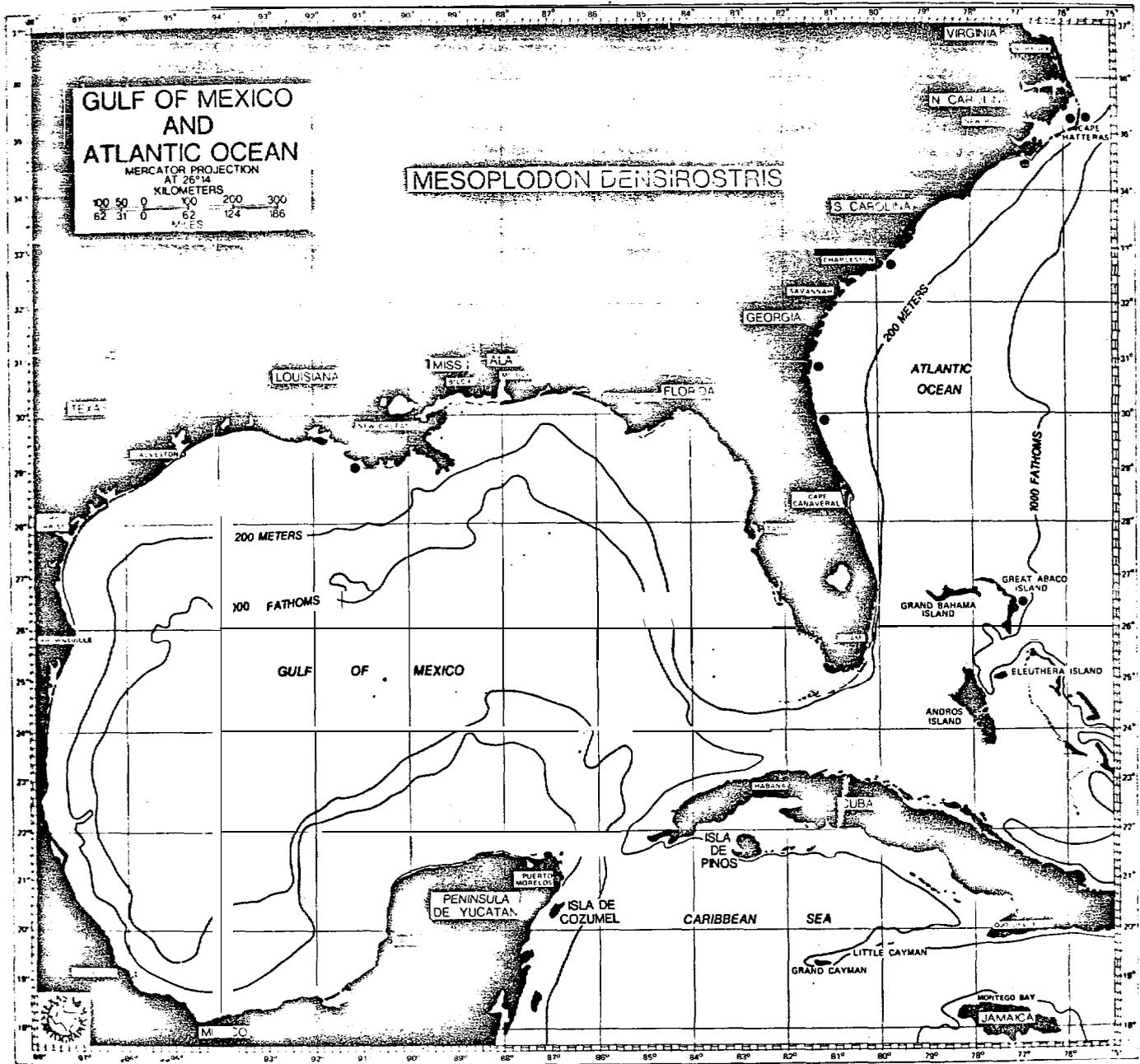


Figure 13 Distribution map of Blainville's beaked whale, *Mesoplodon densirostris*.

See legend for Figure 1 and text for explanation of symbols.

of the stomach contents of a stranded animal revealed these whales feed on squid (Leatherwood et al. 1976).

Records of Occurrence. Quad 2. North Carolina: Bogue Banks, near Beaufort (41, 104, 158, 206). Quad 3. North Carolina: Buxton (44, 206); Cape Hatteras (93, 94, 206). Quad 5. South Carolina: near Charleston (41, 61, 108, 179). Quad 8. Georgia: Cumberland Island, 30°50'N, 81°27'W (170). Quad 16. Florida: near Crescent Beach, 29°52'N, 81°10'W (34, 37). Quad 18. Bahamas: Green Turtle Cay Bay, Abaco, 26°46'N, 77°18'W (79, 106, 108, 176). Quad 27. Louisiana: Terrebonne Parish, Jack Stout Bayou, SW Houma, 29°10'N, 91°00'W (173, 191). Not Plotted. Florida (206).

Mesoplodon europaeus Gervais 1855

Antillean Beaked Whale

Other Common Names. - Gulfstream beaked whale, Gervais' beaked whale.

Other Scientific Names. - Mesoplodon gervasi, M. gervaii.

Description and Identification. - Antillean beaked whales reach a length of at least 22 feet (6.7 m). Their slender form (much taller than wide) gives them the appearance of being laterally compressed. Their head is extremely small and tapers rapidly to a narrow beak. The small flippers are positioned well down on the sides of the body. These whales are colored dark grayish-black on the back and sides and slightly lighter on the abdomen. Adult males can be distinguished from the other species of Mesoplodon as described in the account of M. densirostris; females and immature males are easily confused with the other beaked whales, although Antillean beaked whales are larger than all except goosebeaked whales (Ziphius cavirostris).

Distribution. - These beaked whales occur in the western North Atlantic from Trinidad, Jamaica, and the Gulf of Mexico to Long Island, New York (Rice

1977); one individual (the **holotype**) has been reported from the English Channel, but according to Moore (1966) **it** was probably a stray. In the study area strandings are known from several places along the Atlantic Coast. These include numerous strandings from North Carolina and Florida and a single one from Georgia (Figure 14). They are known from the Gulf of Mexico on the basis of only five records, three of which are from the Texas Coast and two from Florida. Moore (1966) suggests they inhabit deep waters close to shorelines.

Seasonal Movements. - Nothing is known about seasonal movements in the study area or, so far as known, any other geographic region. Strandings in the Gulf are from winter and summer; whereas they have been recorded during **all** seasons along the Atlantic Coast (Table 4). There are many more strandings of females than males, and many of these appear to be directly related to the birth process as several pregnant females and females with newborn calves have washed **ashore**.

Status and Abundance. - No population estimates are available from the study area, but these beaked whales are assumed to be rare throughout their range (Lowery 1974). As of 1966 only 14 records were known and 11 of these were from the study area. Recent years have witnessed a proliferation of strandings so that presently there are 29 recorded strandings, which suggests they are not as rare as previously suspected.

Life History. - **Virtually** nothing, is known about life history parameters from the study **area**. Females with calves have stranded in the study area in May and June. A pregnant female with a near-term fetus stranded along the Texas Coast in August. . These whales are known to feed on squid (Leatherwood et al. 1976).

Records of Occurrence. - Quad 1. North Carolina: Kitty Hawk, N Cape Hatteras (108, 206). Quad 2. North Carolina: **Bogue Banks, 34°42'N, 77°02'W (168,206);**

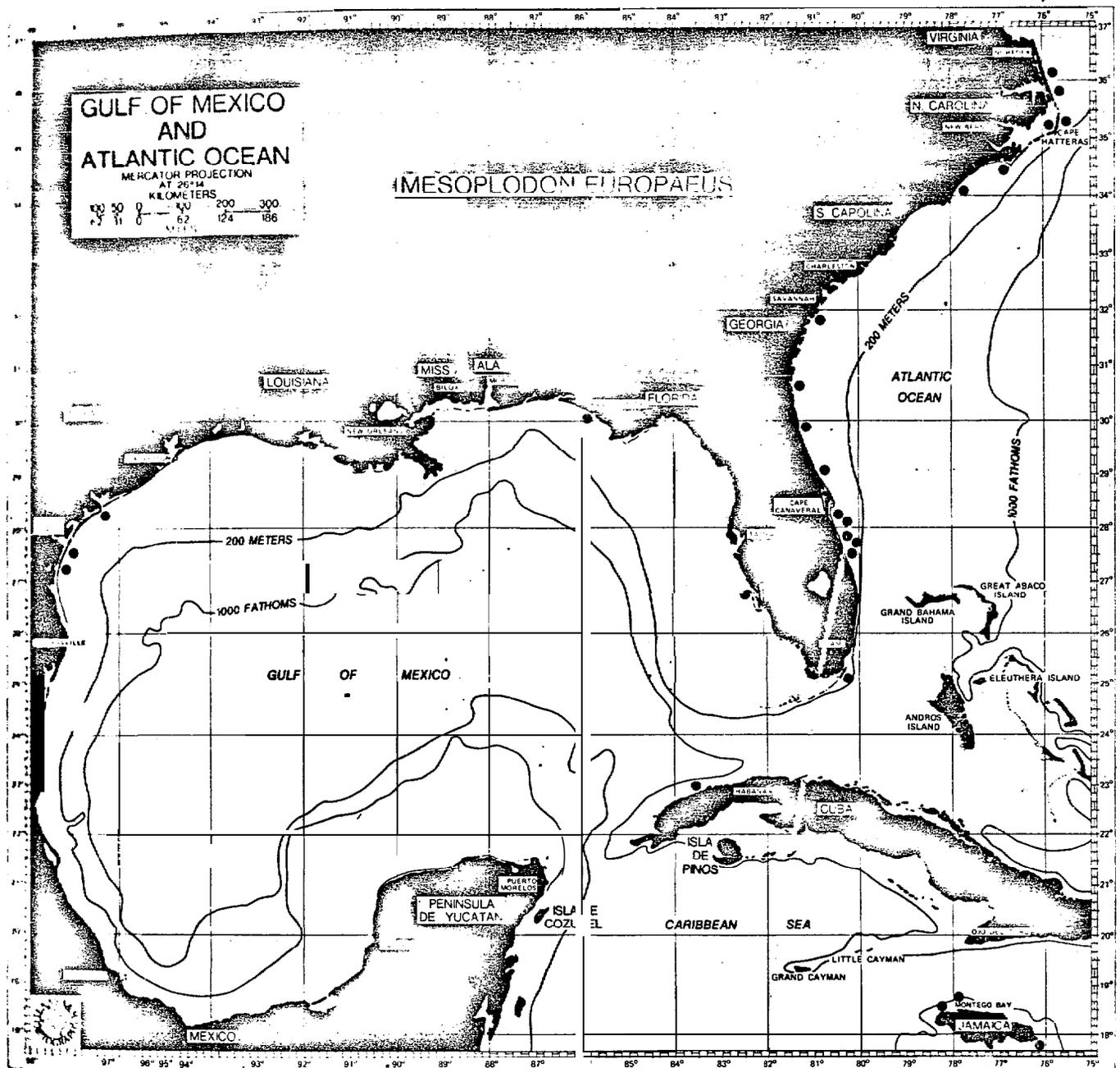


Figure 14. Distribution map of the Antillean beaked whale, Mesoplodon europaeus. See legend for Figure 1 and text for explanation of symbols.

Snow's Cut, 34° 03'N, 77° 54'W (169, 206). Quad 3. North Carolina: Dare Co., Oregon Inlet, N Cape Hatteras (17 as M. mirus, 108, 196); N Oregon Inlet (173, 206); Cape Hatteras, 35° 14'N, 75° 32'W (170, 206); Buxton (45, 206). Quad 8. Georgia: Chatham Co., Ossabaw Island, Middle Beach (168); Florida: Fernandina Beach (37). Quad 12. Florida: St. John's Co., St. Augustine Beach, 29° 55'N, 81° 17'W (37, 104, 108, 121, 159); Volusia Co., New Smyrna Beach, 28° 59'N, 80° 52'W (170); 3 mi S Melbourne Beach (104, 107, 111, 176); E Hutchinson's Island near Melbourne, 28° 05'N, 80° 37'W (168); S Cape Canaveral, 28° 05'N, 80° 27'W (166). Quad 16. Florida: 8 mi N Vero Beach (107, 108, 206); 3 km N Vero Beach, 27° 40'N, 80° 22'W (170); Ft. Pierce, 27° 28'N, 80° 20'W (168). Quad 22. Florida: Panama City, St. Andrews Bay (206). Quad 24. Texas: Matagorda Island, Gulf Beach (203). Quad 32. Texas: Nueces Co., 27° 35'N, 97° 13'W (203); Padre Island, 40 mi S Port Aransas (67 and 68 incorrectly as M. densirostris, 106, 176). Quad 39. Florida: Boca Grande (36, 107, 108, 176). Quad 48. Florida: Monroe Co., Key Large, 25° 15'N, 80° 20'W (104, 111, 121, 122, 125, 158, 176); Key Large, 25° 11'N, 80° 21'W (168). Quad 59. Cuba: Cayo Alacranes, Pinar del Rio (1, 108, 122}. Quad 85. Jamaica: Bull Bay, St. Thomas Parish (120, 121, 122, 177, 207). Quad 86. Jamaica: Montego Bay (28). Quad 88. Jamaica: Morant Cays (88).

Mesoplodon mirus True, 1913

True's Beaked Whale

Other Common Names. - 'none.

Other Scientific Names". - Mesoplodon mirum.

Description and Identification. - True's beaked whales may reach a length of 16 feet (4.9 m). They resemble goosebeaked whales (Ziphius cavirostris) in having a chunky mid-body which rapidly narrows toward the tail. Their head is small with a slight indentation near the blowhole, a slight bulge to the forehead, and a pronounced beak. The flippers are small, as is the slightly

falcate dorsal fin, which is located in the latter third of the back. Body coloration is dull black to dark gray on the back, lighter **slate** gray on the sides, and white on the belly. The body is often covered with **light** spots or splotches and numerous pairs of scratch marks.

Distribution. - These beaked whales occur in the North Atlantic from Florida and Nova Scotia east to the British Isles (Rice 1977). They tend to maintain this location despite the sweep of the Gulf Stream, possibly in part by keeping between it and the American coast (Moore 1966). There are six recorded strandings in the Atlantic portion of the study area, three from North Carolina, two from South Carolina, and one from Florida (Figure 15). There are no records from the Gulf of Mexico.

Seasonal Movements. - Strandings have occurred in March (three strandings), July (one), and August (one) (Table 4). These data are too meager for a pattern to emerge.

Status and Abundance. - There are no population estimates available for the study area, and it is impossible to accurately assess their status. Based on stranding records, they appear to be rare in the Atlantic portion of the study area and absent in the Gulf of Mexico. As with most species of Mesoplodon, they are hypothesized to have a pelagic range far offshore, which might account for their infrequent stranding.

Life History. - Very little data are available on life history parameters. Supposedly they feed on cephalopods as well as a variety of fishes (Mitchell 1975) .

Records of Occurrence. - Quad 2. North Carolina: Beaufort Harbor, Bird Island Shoal (17, 41, 76, 108, 125, 155, 158, 206). Quad 3. North Carolina: Oregon Inlet (18); Dare CO., Buxton, New Inlet, Gulf Shoal Beach (14, 17, 107, 108, 111, 196). Quad 5. South Carolina: Isle of Palms

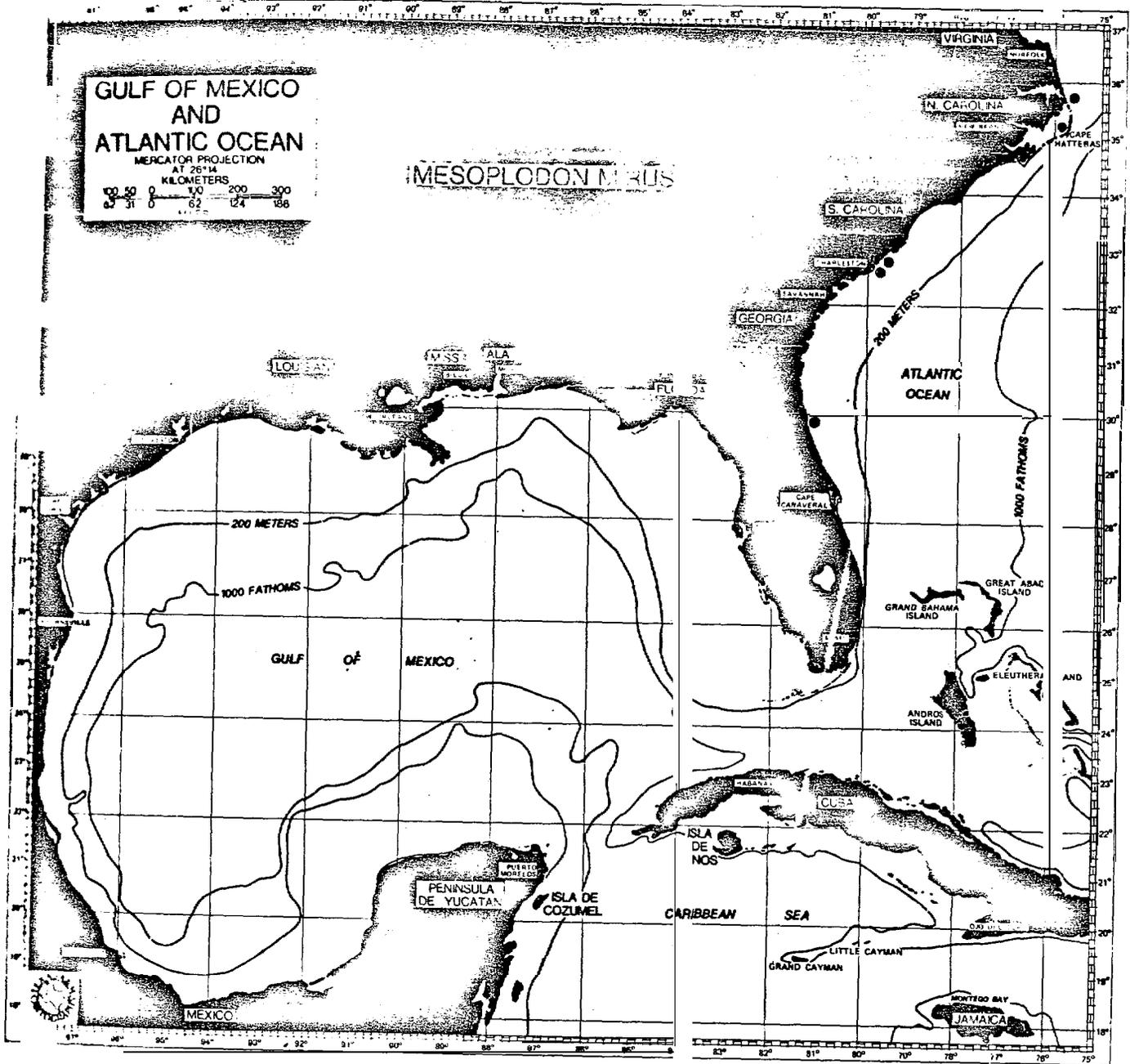


Figure 15. Distribution map of True's beaked whale, *Mesoplodon mirus*.

for Figure 1 and text for explanation of symbols.

See legend

(94, 179); Charleston (14, 41). Quad 12. Florida: Flagler Beach, 29°28'N, 81°07'W (107, 108, 111, 176).

Ziphius cavirostris G. Cuvier 1823

Goosebeaked Whale

Other Common Names. - Cuvier's beaked whale.

Other Scientific Names. - Hyperodon semijunctus.

Description and Identification. - Goosebeaked whales usually measure between 18-26 feet (5.5-8.5 m) in total length. The head is small relative to body length, and the beak is indistinct in larger individuals. The cleft of the mouth is smaller than in other beaked whales. The dorsal fin is relatively tall and distinct, smoothly falcate, and located approximately two-thirds the distance between the tip of the snout and the midpoint between the tail flukes. Coloration is variable, but two frequently observed color schemes are:

(1) face and upper back cream-colored with the remainder of the body black; or
(2) entire body grayish fawn with small blotches of slightly darker gray below (Walker 1975). Old males have a distinct white head and are frequently extensively scarred (Leatherwood et al. 1976). These cetaceans are distinguished from other beaked whales in the family Ziphiidae mainly by features of the skull. Males have two functional teeth, one at the tip of each lower jaw, which are usually not visible in females.

Distribution. - Z. cavirostris is a truly cosmopolitan species, with records extending from tropics to subpolar waters in all of the world's oceans (Rice 1977). In the western North Atlantic they have been reported from Massachusetts and Rhode Island south to Florida and thence to the islands of the West Indies. Within the study area, they have been recorded from Cape Hatteras south to the Florida Keys on the Atlantic Coast and from the western

coast of the Florida Peninsula, Louisiana, and Texas in the Gulf of Mexico (Figure 16).

Seasonal Movements. - Goosebeaked whales are pelagic, open-ocean forms which undertake long migrations, especially in polar regions (Marcuzzi and Pilleri 1971). Seasonal patterns cannot be discerned in the study area because of insufficient data. Strandings have occurred in every month of the year in the Atlantic states, but only in the fall and spring months in the Gulf of Mexico (Table 4). The records present no apparent pattern, and may represent strays from a normally and probably wide-ranging population (Mead 1975a).

Status and Abundance. - Goosebeaked whales are the most commonly stranded beaked whale in the study area. There are numerous stranding reports from the Atlantic Coast and from the western coast of the Florida Peninsula. The only records from the western Gulf are of strandings from the coasts of Louisiana and Texas, suggesting they may be rarer there than in other portions of the study area. There are no population estimates available from the study area.

Life History. - Virtually nothing is known about life history parameters. A female with a fetus stranded near Cape Canaveral, Florida, in August. These whales feed primarily on squid (Caldwell and Caldwell 1974)..

Records of Occurrence. - Quad 1. North Carolina: Currituck Co., 5 mi S Corolla (206). Quad 2. North Carolina: Morehead City (176); S end Wrightsville Beach, 34° 12' N, 77° 48' W (170). Quad 4. South Carolina: Edisto Island (61, 37, 179). Quad 5. South Carolina: Myrtle Beach, 33° 42' N, 78° 54' W (168); Cape Island (37, 61, 179); Charleston Harbor, 32° 50' N, 79° 41' W (154, 49, 158, 61, 41, 37, 14, 206); Sullivan's Island, 32° 40' N, 79° 52' W (41, 37, 61, 179). Quad 6. North Carolina: New Hanover Co., near Ft. Fisher (82). Quad 8.

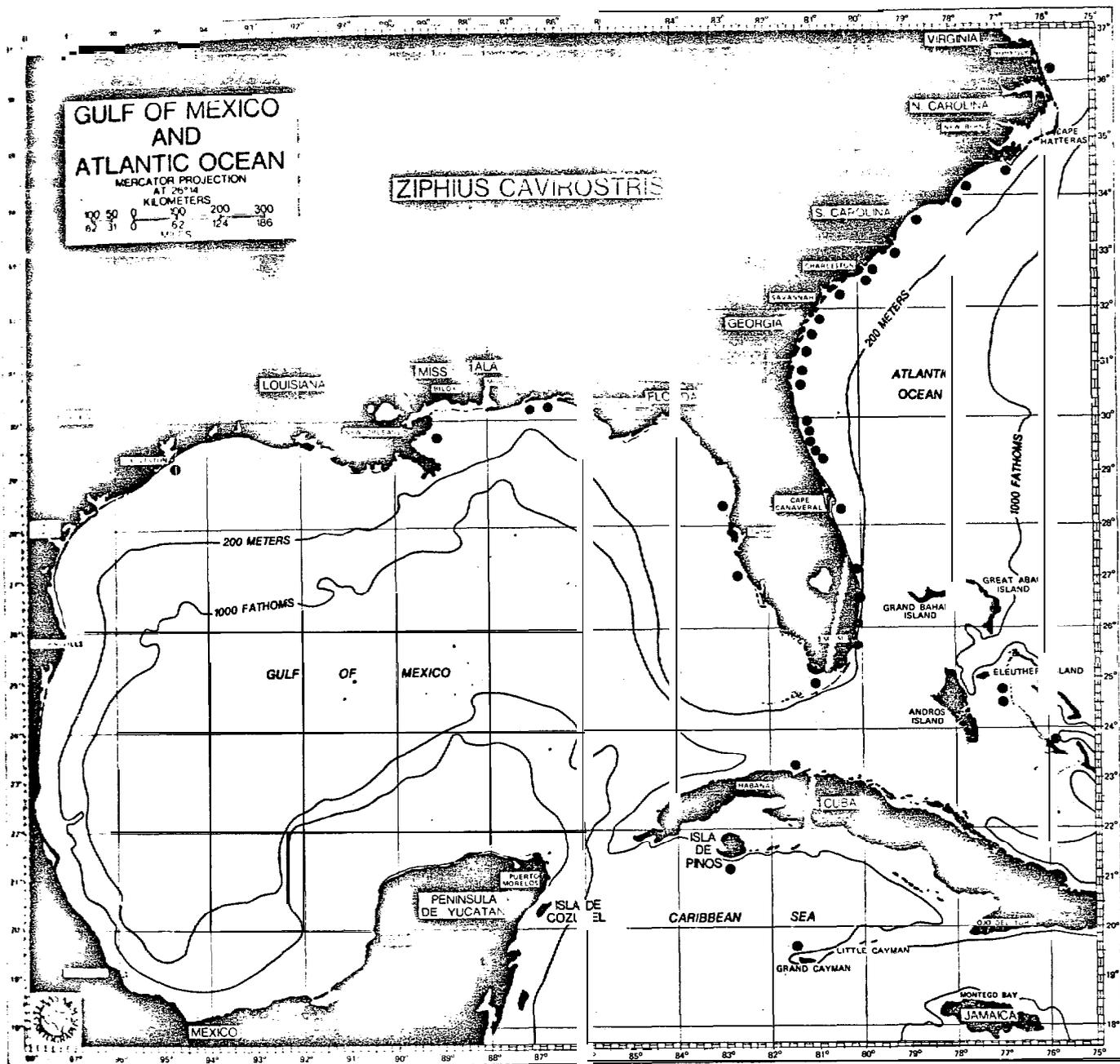


Figure 16. Distribution of the goosebeaked whale, Ziphius cavirostris. See legend for **Figure 1** and text for explanation of symbols.

Georgia: Chatham Co., Wassaw Island (47, 184); St. Catherine Island, N tip south Beach McQueen (176); St. Simon Island (154,41,37, 206); Camden Co., North Beach, Little Cumberland Island (47, 186); Cumberland Island (185); Florida: Fernandina Beach (37). Quad 12. Florida: Vilano Beach, near St. Augustine (167); St. John's Co., St. Augustine Beach (85); St. John's Co., N Anastasia Island (85); Volusia Co., N Daytona Beach (75, 202); Ormand Beach, 29°15' N, 80°57' W (170); Cape Canaveral (158, 104). Quad 16. Florida: Martin Co., Hobe Sound Beach (85); Palm Beach Co., Palm Beach, 26°33' N, 80°02' W (171). Quad 21. Florida: Pensacola, Santa Rosa Island (173, 185); Okaloosa co., near Fort Walton (48, 90). Quad 25. Texas: Galveston Co., Galveston's W Beach (90, 130). Quad 28. Louisiana: 5 mi S N end Chandeleur Island (70, 90, 191). Quad 31. Florida: Pasco Co., near Hudson (104, 206). Quad 39. Florida: Venice, 27°09' N, 82°27' W (104). Quad 48. Florida: Hallandale (206); Dade Co., Miami Beach, 25°52' N, 80°08' W (170); Monroe Co., Conch Key, 24°47' N, 80°53' W (104, 206). Quad 50. Bahamas: 10 mi N Norman's Cay (32); Norman's Cay, 24°38' N, 76°48' W (32). Quad 60. Cuba: Bahia de Matanzas (1, 160). Quad 63. Bahamas: Staniel Cay, 40mi SE Norman's Cay (32). Quad 71. Cuba: Carapachibey, 21°27' N, 82°56' W (160). Quad 84. Grand Cayman Island (173). Not Plotted. Yucatan, Mexico (173).

Family Delphinidae

Peponocephala electra (Gray 1846) . . .

· Many-toothed Blackfish

Other Common Names. - melon-headed whale.

Other Scientific Names. - none.

Description and Identification. - Many-toothed blackfish are at least 9 feet (2.7 m) in length. They resemble false killer whales and pygmy killer whales in body shape and general appearance. Their body is elongated and slim

with a narrow tail stock. They have no beak and a rounded forehead which curves smoothly from the anterior tip of the rostrum to the blowhole and overhangs the lower jaw. The dorsal fin is up to 10 inches (25.4 cm) tall and very distinctive. Peponocephala are a uncolored black on the back and slightly lighter on the belly. They also have a vertical pectoral blaze mark (Walker 1975) .

Distribution. - Peponocephala are distributed in the tropical Atlantic, Indian, and Pacific oceans (Rice 1977). They have not been recorded from the western North Atlantic or the study area, but are included herein because of their known tropical distribution in the Lesser Antilles. The likelihood of their occurring in the study area is very high.

Seasonal Movements. - Since they have not been recorded in the study area, no information is available.

Status and Abundance. - Many-toothed blackfish are presumably rare throughout their range.

Life History. - Virtually nothing has been reported on their habits. A large number of pregnant females were collected in Australia in August, 1958 (Dawbin et al. 1970). Stomach contents of a stranded animal in the Lesser Antilles included partially-digested fish and squid, cephalopod beaks, fish otoliths, and fish bones (Caldwell et al. 1976).

Records of Occurrence, none.

Feresa attenuata Gray 1874

Pygmy' Killer Whale

Other Common Names. - slender blackfish.

Other Scientific Names. - none.

Description and Identification. - Pygmy killer whales are relatively

slender-bodied animals that reach a **length** of about 8-9 feet (2.4-2.7 m). Their head is blunt and evenly rounded, without a beak, and the snout overhangs the tip of the lower jaw. The **falcate** dorsal fin, located in the center of the back, is tall (between 8-12 inches, 20.3-30.1 cm) and usually distinctive. The flippers are slightly rounded on the tips. Body coloration is dark gray, almost black, except for margins of white about the lips and a white area in the anal region. A **pale** gray or whitish area lies between the flippers.

Distribution. - F. attenuata occurs in the tropical and warm temperate waters of the Atlantic, Indian, and Pacific oceans (Rice 1977). In the western North Atlantic they are known from tropical and subtropical waters in southeastern and northwestern Florida, extreme south Texas, and the West Indies (Figure 17). They have not been recorded from the Atlantic portion of the study area between Cape Hatteras, North Carolina, and Cape Canaveral, Florida. Their distribution suggests they are an offshore species restricted to warmer waters (Winn et al. 1979) .

Seasonal Movements. - Records in the study area are from winter, spring, and summer (Table 4) , but these data are too meager for a pattern to emerge.

Status and Abundance. - No population estimates are **available** from the study area. The sparse records are probably a **reasonable** indication they are rare in the study area. All six are from the southern area (Texas, Florida), which is consistent with the apparent tropical distribution of the whales in other oceans. Populations are believed to be stable and not endangered, although data are very limited (Caldwell and Caldwell 1974).

Life History. - No data are available on life history parameters from the study area. A young juvenile", possible newborn, was 82.2 cm in length when captured in May, 1967, off Costa Rica (Mitchell 1975). In captivity these whales are known to eat sardines, squid, **sauries**, and **mackerel** (Nishiwaki

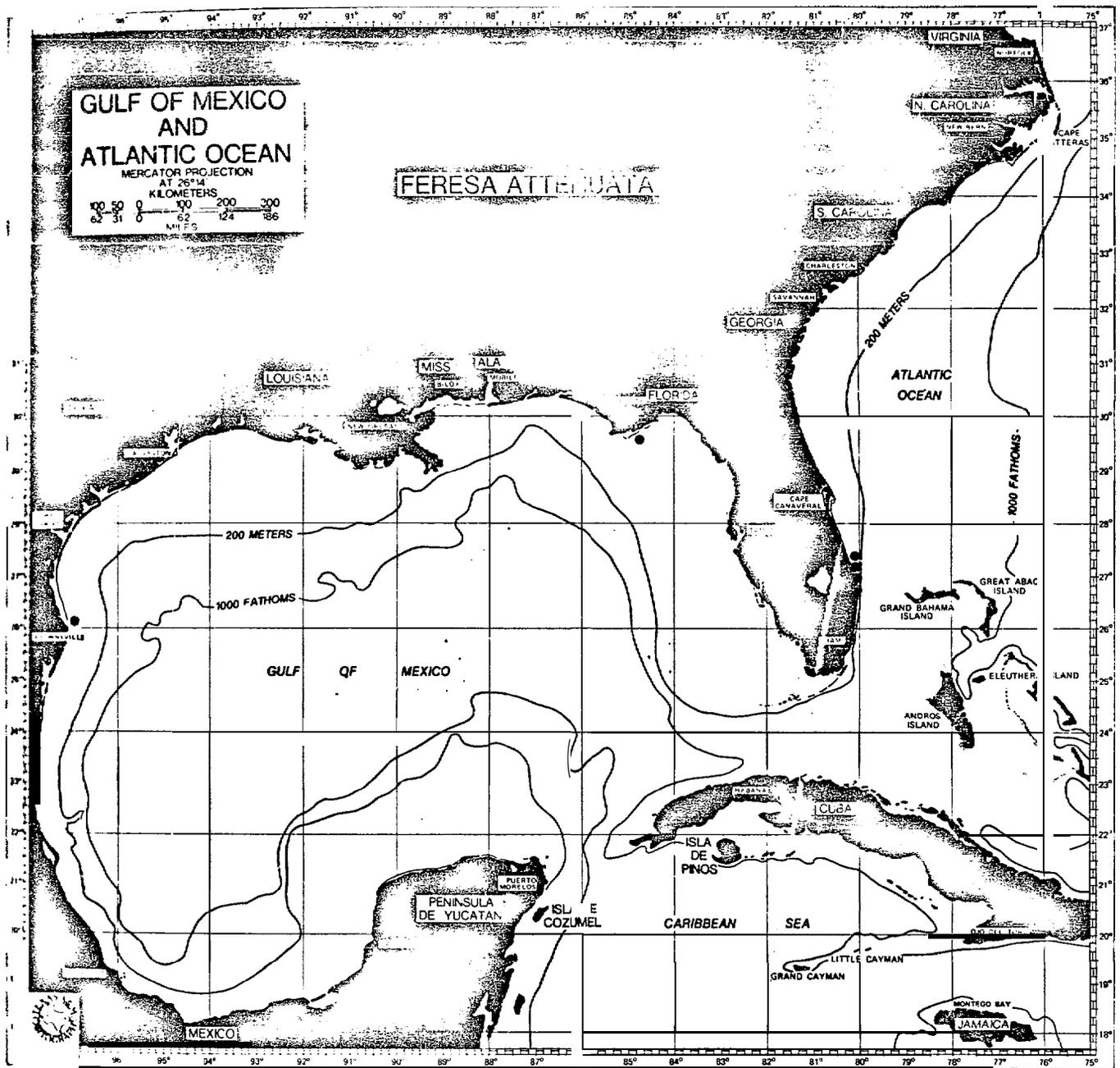


Figure 17. Distribution map of the pygmy killer whale, *Ferusa attenuata*. See legend for Figure 1 and text for explanation of symbols.

1966). They have been reported to attack other species of dolphins (Mitchell 1975):

Records of Occurrence. - Quad 16. Florida: **Hutchinson's** Island (94); Jupiter Island, 26°57'N, 80°08'W (170); Palm Beach Co., Singer Island, near Riviera Beach (38, 206); Lake Worth, 26°37'N, 80°02'W (94, 165, 206). Quad 30. Florida: St. George Island, 29°40'N, 84°50'W (168, 173, 185). Quad 32. Texas: Cameron Co., Isla Blanca Park, Brazes Santiago Pass, 26°04'N, 97°09'W (80, 90, 131).

Pseudorca crassidens (Owen 1846)

False Killer Whale

Other Common Names. none.

Other Scientific Names. - none.

Description and Identification. - **Male** false killer whales reach a length of 19.7 feet (6 m); females are slightly smaller, reaching a length of **15.6** feet (4.75 m). These whales are easily recognized by a combination of salient features: (1) the body is ~~slender~~ and uniform black in color except for varying amounts of white on the lips, chin, and belly; (2) the head **is** narrow and gently tapered from the area of the blowhole forward with no evidence of a beak such as that possessed by many **delphinids**, and it lacks the bulbous swelling possessed by species of Globicephala; (3) the dorsal fin is from 7 to 16 **inches (17.8 to 40.6 cm)** tall, **falcate**, and located about midway of the body" length; and (4) the flippers are characterized by a broad hump on the front margin near the middle.

Distribution. - False killer whales have been recorded from **all** the main bodies of water with the exception of the polar seas (Rice 1977). Stranding records and incidental sightings suggest they are widely distributed in **the** tropical, subtropical, and warm temperate waters of the western North Atlantic.

Several strandings have been recorded from the Atlantic portion of the study area, but there are only seven records from the Gulf of **Mexico** which suggests they are uncommon there (Figure 18). Apparently Pseudorca is a pelagic form which does not occur frequently in coastal waters, sandy bays, or estuaries, although entire herds have stranded in **such areas** (Leatherwood et al. 1976). Records from throughout their **range** suggests they have **an** oceanic distribution.

Seasonal Movements. - No population estimates are available from the study area, but the number of strandings and sightings would suggest that false killer whales are more common in the study area than pygmy killer whales (Feresa attenuata) or killer whales (Orcinus orca). Pseudorca may be more common as a stranded animal than suspected, since it is commonly mistaken for Globicephala, and some of the G. macrorhynchus records may actually be Pseudorca (Mead 1975a). Populations are believed to be stable and not endangered (Caldwell and Caldwell 1974).

Life History. - No data are available for **life** history parameters in the study area. False killer whales are thought to travel in groups of several hundred individuals, containing males and females of different ages, and to feed on cephalopods and fish (Walker 1975). They are notorious for stealing large fishes from the **lines** of snapper and grouper fishermen (Brown et al. 1966). Their breeding season is apparently not confined to a definite season. Young are between **1.7-2.0 m** long **at birth** (Walker 1975). This is one of the cetaceans which commonly mass strands. The largest mass stranding in the study area occurred on 11 January 1970 when between 150-175 false killer whales stranded at three different **places** along the southeast Florida coast (Caldwell et al. 1970).

Records of Occurrence. - Quad 1. North Carolina: NE Hatteras, 36°02'N, 74°06'W (21). Quad 3. North Carolina: .5 mi E Hatteras Inlet (196). Quad 5. South Carolina: presumably near Charleston (41, 61, 179). Quad 8. Georgia:

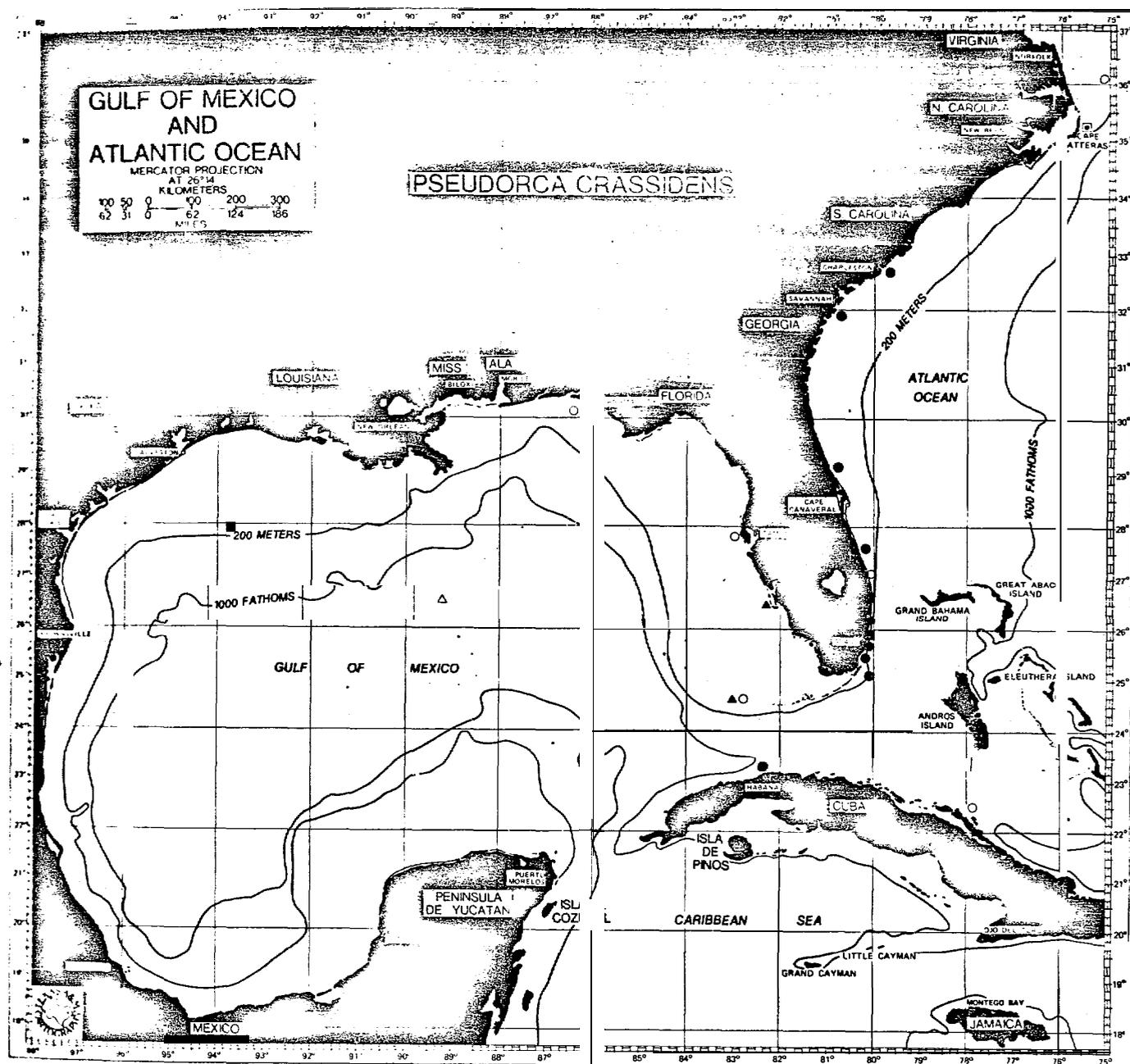


Figure 18. Distribution map of the false killer whale, *Pseudorca crassidens*.

See legend for Figure 1 and text for explanation of symbols.

Chantham Co., Tybee Island (41), Quad 12. Florida: 5 mi N Ponce de Leon Inlet "near Daytona Beach (37,42). Quad 16. Florida: 15 mi N Verc Beach; Ft. Pierce Inlet near Ft. Pierce (42, 206); 3 mi off Jupiter lighthouse, 26°57' N, (54, 104); Broward Co., Hillsboro lighthouse near Deerfield (16, 67, 104); Pompano Beach (42). Quad 21. Florida: 50 mi offshore between Pensacola and Panama City (20}. Quad 34. Texas: Galveston, vie. Flower Garden Bank, 120 mi SSE Galveston (130}. Quad 36. 150 nautical mi S of Mississippi River (22, 90). Quad 39. Florida: offshore, general region of St. Petersburg (20): Lee Co., Captiva Island, 26°31' N, 82°11' W (168). Quad 47. Florida: Loggerhead key (168); 16 km E Dry Tortugas (168). Quad 48. Florida: Dade Co., Bear Cut, 25°44' N, 80°03' W (22, 104); Miami Beach, Amberjack Hole, offshore (22); Dade co., Biscayne Bay, 25°35' N, 80°20' W (42, 98, 104, 206); Cape Sable, 25°08' N, 80°07' W (168). Quad 59. Cuba: Cojimar, 23°10' N, 82°18' W (1, 22, 50). Quad 62. Cuba: 25°05' N, 77°80' W (21). Not Plotted. Cuban waters (50).

. . . orca (Linnaeus 1758)

Killer Whale

Other Common Names. - none.

Other Scientific Names. - Grampus orca.

Description and Identification. - Adult **male** killer **whales** have a robust body shape and may reach a length of at least 30 feet (9.1 m); females are considerably smaller and less stocky,. Their most distinctive field character is the dorsal fin which is high (6 feet, 1.8 m, tall in males; 3 feet, 0.9 m, in females) sharply erect, distinctly **falcate**, and pointed on the tip. Externally, **killer whales** are distinguished by their bluntly rounded snout, the oval white patch just above and behind the **eye**, and the contrast of the black upper parts with the white under parts.

Distribution. - Killer whales are pelagic animals that occur in **all** oceans

from the Arctic to the Antarctic and even ascending large rivers (Marcuzzi and Miller 1971). They are most common in the cooler coastal seas around the world (Rice 1977). In the western North Atlantic, they occur from the polar pack ice south to Florida, the Lesser Antilles, and into the Gulf of Mexico (Leatherwood et al. 1976). Strandings are relatively uncommon along the Atlantic Coast portion of the study area, and the bulk of the records represent sightings from the Florida area near the Gulf Stream (Figure 19). There are a few records from the southeastern part of the Gulf of Mexico, in the vicinity of the Keys and off the southern tip of the peninsula. Evidence of their occurrence in the northern and western parts of the Gulf is limited to one specimen (Caldwell et al. 1956), an unverified stranding (Schmidly and Shane 1978), and an unverified sighting (Gunter 1954). Killer whales seem to prefer coastal areas, and they may enter large shallow bays, estuaries, and river mouths in search of food, although such inshore behavior has not been reported from the study area.

Seasonal Movements. - No data are available from the study area. Winn et al. (1979) suggest that migrations occur in association with the abundance and movement of prey species. According to these authors, killer whales are found in more northern waters in warmer months and in the Caribbean most often in summer. The only apparent consistency in the records from the study area is that most of them are from the winter months, although there are isolated records from May, June, and September (Table 4).

Status and Abundance. - No estimates of population abundance are available from any portion of the study area. Killer whales appear to be modestly common north of Cape Cod and in the Caribbean, and relatively rare in between (Mead 1975a). According to Winn et al. (1979), the West Indian population is stable and there is no evidence that the species is endangered anywhere in

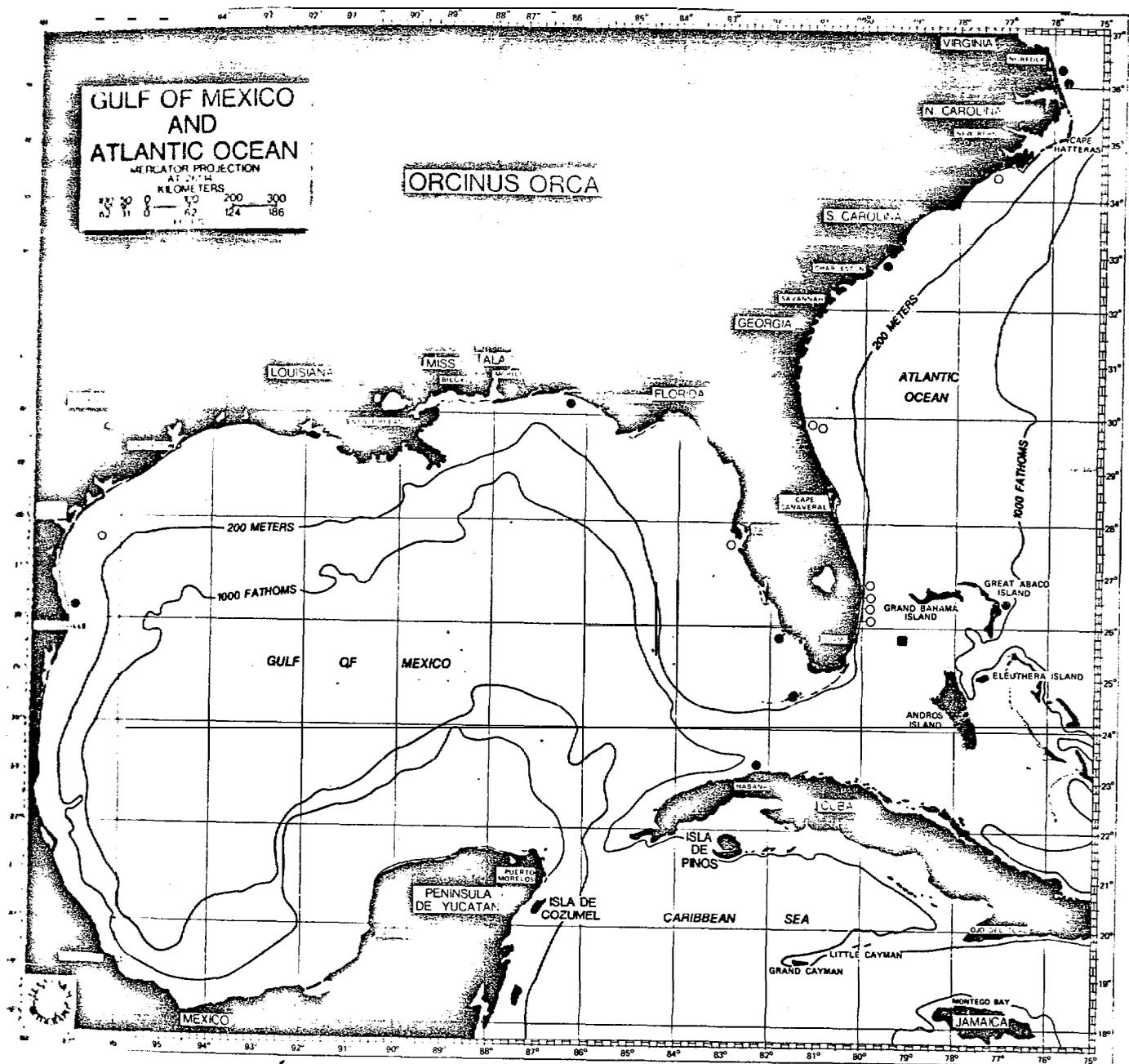


Figure 19. Distribution map of the killer whale, Orcinus orca. See legend for Figure 1 and text for explanation of symbols.

the western North Atlantic.

Life History. - No data are available for life history parameters in the study area. Males are polygamous and mating may occur throughout the year (Winn et al. 1979). The gestation period is about 1 year, and the young at birth are about 2 m long (Walker 1975). Killer whales feed on squid, fishes, sea turtles, seabirds and other marine mammals (Caldwell and Caldwell 1974). They travel in groups of from a few to 25 or 30 individuals, though herds of 150 have been reported (Leatherwood et al. 1976). Females and young may form separate groups from young bachelors and bulls.

Records of Occurrence. - Quad 1. North Carolina: Waterlily (173, 206); Killdevil (94). Quad 2. North Carolina: Onslow Co., New River Inlet (14 as Grampus orca, 41, 61). Quad 5. South Carolina: Bulls Island (45, 61, 179). Quad 12. Florida: Marineland (85); .5 mi off Marineland (85); 15 mi off St. Augustine (104). Quad 16. Florida: off Palm Beach, lat. 26°43' (104); Boynton, lat. 26°32' (104); Hollywood, lat. 26°02' (104). Quad 17. Florida: 2 mi off Boca Raton, lat. 26°21' (104). Quad 18. Bahamas: Great Aboco Island, Man O'War Cay (10). Quad 21. Florida: Okaloosa Co., 6.5 mi E East Pass, Destin (10, 45, 185). Quad 32. Texas: 35 mi SE Port Aransas (52, 67 as Grampus orca, 130, 131); Cameron County Park, South Padre Island (131). Quad 39. Florida: Anna Marie Island, near Tampa Bay (171). Quad 48. Florida: Collier Co., Holloway Creek, near Everglades (10, 104); Monroe Co., Summerland Key, 24°41'N, 81°26'W (104, 193). Quad 49. Gulf "Stream between Miami Beach and Bahamas (104, 112). Quad 59. Cuba: Cojimar, 23°10'W, 82°18'N (50).

Globicephala _ (Train 1809)

Atlantic Pilot Whale

Other Common Names. - northern pilot whale, long-finned pilot whale, pothead, blackfish.

Other Scientific Names. - none.

Description and Identification. - Male Atlantic **pilot** whales are at least 20 feet (6.2 m) in length, whereas females are slightly smaller and do not exceed 18 feet (5.5 m). Their head is thick and bulbous, prompting the common name "**pothead**," and the flippers are long (about one-fifth of the body length) and sickle-shaped (Leatherwood et al. 1976). Their most distinctive characteristic is the dorsal fin which is low in profile and set far forward on the animal's back. The dorsal fin has a long base and is **falcate** to "**flaglike**" in appearance (Leatherwood et al. 1976). These whales are black on the back and sides, prompting the common name "blackish," with a patch of grayish white on the chin and a gray area on the belly.

Distribution. - Atlantic **pilot whales** occur in the cool temperate North Atlantic Oceans as well as throughout the cool temperate waters of the Southern Hemisphere. Two subspecies are recognized, G. m. melaena from the North Atlantic and G. m. edwardii from the Southern Hemisphere, but their validity has been questioned (Rice 1977).

In the western North Atlantic these whales occur from Iceland and Greenland south to North Carolina (Leatherwood et al. 1976). They might be expected to straggle into the northern portions of the study area since one verified record is known from just a few miles to the north of the region (Figure 20). The questionnaire we sent to museums produced records of two skulls obtained from the study area. However, these have not been examined and, consequently, their identification are not verified. One specimen, a male from Beaufort, Carteret County, North Carolina, was obtained on 18 February 1951 and is deposited in the collections of the Department of Zoology, North Carolina State University (catalogue number NCS 1491). The other, an unsexed individual from St. Catherine Island, Liberty County,

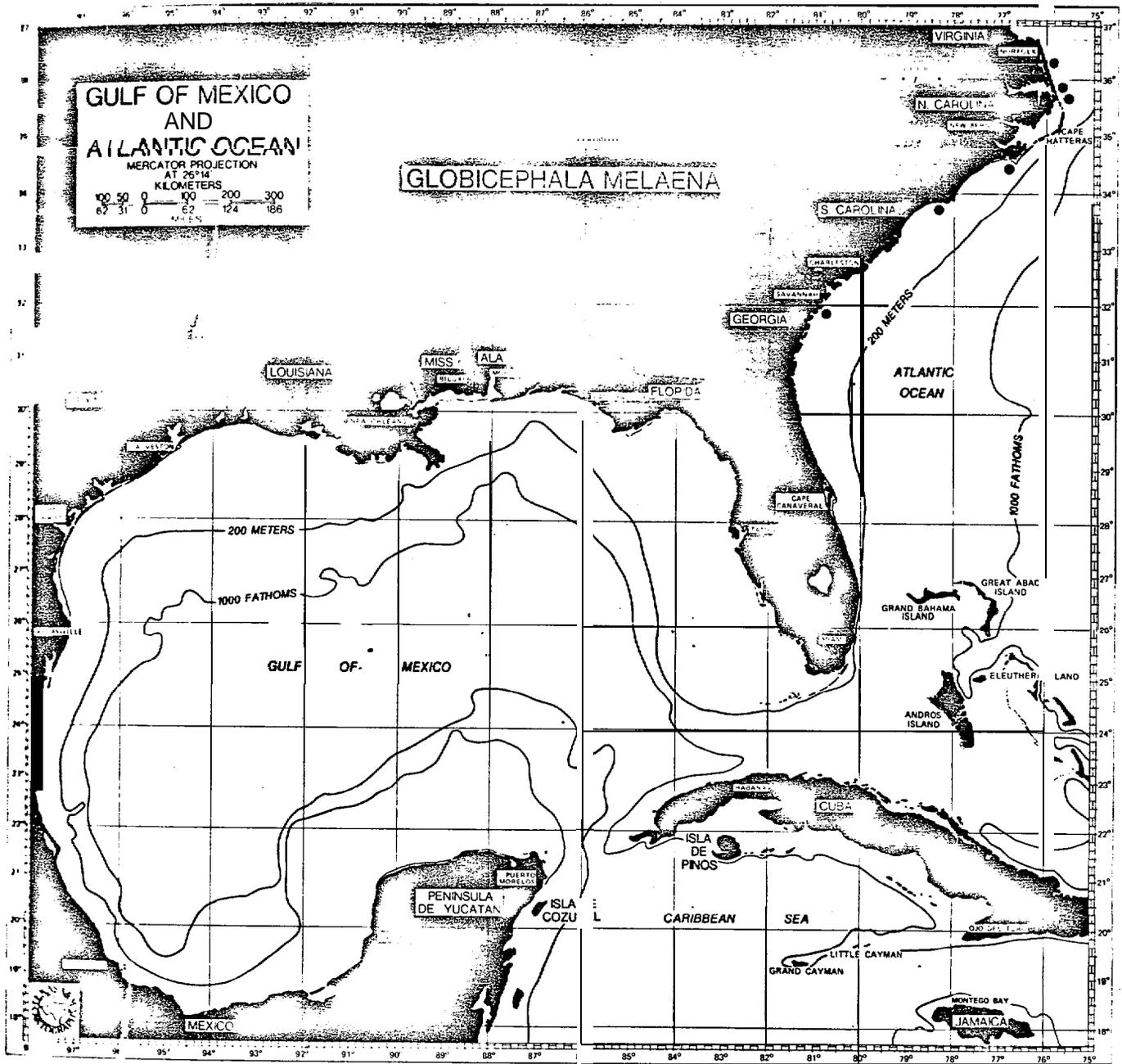


Figure 20. Distribution map of the 'Atlantic pilot whale, *Globicephala melaena*.

See legend for Figure 1 and text for explanation of symbols.

Georgia, for which the collection date is unknown, is deposited in the American Museum of Natural History, New York City, N. Y. (catalogue number AMNH 238446). Should these two records prove to be G. melaena, they will constitute the southernmost records for this species in the western North Atlantic as well as the first verified records from the study area.

Seasonal Movements. - Atlantic pilot whales winter offshore from Newfoundland south to the latitude of New Jersey, and generally summer north of Cape Cod to Greenland. During the summer, they are often seen in the bays and inshore waters of the Gulf of Maine and the Maritime Provinces (Sergeant 1962). The records just north of Cape Hatteras, North Carolina, are from March, July, and November (Table 4).

Status and Abundance. - The ~~pre-exploitation~~ population of the stock from Newfoundland has been estimated at approximately 50,000 individuals (Mitchell 1975). No recent population estimates are available for the western North Atlantic, but they are probably still recovering from overexploitation in Newfoundland in the 1950's and 1960's. (Mitchell 1975). Populations are not presently considered endangered.

Life History. - Life history data are not available from the vicinity of the study area. The following information is taken from Walker (1975) and Mitchell (1975). Females become sexually mature at about 6 years of age when they are about 3.6 m in length, and the males mature at about 13 years and when 4.75 m long. This disparity between sexually mature bulls and cows in a single school is compensated for by the polygamous practices of this genus. Pregnancy lasts 16 months, followed by a 20-22 month lactation period. The calving season lasts 6 months with a mid-August peak. Females complete a breeding cycle approximately every 40 months until old age is reached. Females become barren at an average age of 18 years, and estimates of age,

based upon growth in the roots of the teeth, indicate a maximum life span of about 50 years in males and females. Their preferred food is squid, although cod, **flatfish**, and a limited variety of other fishes are taken when squid is scarce. These **whales** are prone to mass strandings, perhaps partly due to their strong, cohesive social order. They are often seen in the company of other small cetaceans, particularly Tursiops truncatus and Lagenorhynchus acutus. Atlantic pilot whales may occur in herds of 200 or more animals, though herds of 50 or fewer (4-6) are more common.

Records of Occurrence. - Quad 1. North Carolina: Corolla, 20 mi N Kitty Hawk (173). Quad 2. North Carolina: Carteret Co., Beaufort (196). Quad 3. North Carolina: Nags Head (94 incorrectly as G. macrorhynchus, 206); Oregon Inlet, 35° 46' N, 74° 32' W (169, 206); Quad 5. North Carolina: Ocean Island, 33° 54' N, 78° 24' W (170). Quad 8. Georgia: Liberty Co., St. Catherine Island (176) .

Globicephala macrorhynchus Gray 1846

Short-finned Filet Whale

Other Common Names. - **blackfish**, pothead, pilot whale, **shortfin pilot whale**.

Other Scientific Names. - G. brachyptera, G. melas, G. brachypterus, G. ventricosa, G. macrorhynchus.

Description and Identification - Males generally reach a total length of no more than 15-17.5 feet (4.6-5.3 m); females average slightly smaller (15.5 feet, 4.7 m). These **whales** are identifiable by the following characters: (1) the bulbous, globular shaped head which lacks a beak; (2) the position of the blunt, posteriorly curved dorsal fin, which is located well anterior to the middle of the body; and (3) the slender, short (reaching only one-sixth of the body length or less), and pointed flippers (Lowery 1974). Coloration

is all black on **the** back, sides and most of the belly, with an anchor-shaped **patch** of gray on the chin and a gray area of varying extent and intensity on the belly (Leatherwood et al. 1976).

Distribution. - Short-finned pilot whales occupy the tropical and warm temperate waters of the Atlantic, Indian, and Pacific oceans (Rice 1977). Their **normal** range in the western North Atlantic apparently extends from Bermuda and Cape Hatteras (Virginia in **summer**) south to northern **South** America, and including the Gulf of Mexico (Caldwell and Caldwell 1974). They occur throughout the study area, although there are many more records for the Atlantic Coast than for the Gulf of Mexico (Figure 21). During the **NWFL-BLM** aerial surveys, short-finned pilot whales were sighted in both the Corpus **Christi** (in August) and Brownsville (in November), Texas, study areas.

These whales normally live in deep waters from **the** continental slope seawards. Almost all of the sightings at sea in the study area are beyond the 200 m curve. Sightings from **National** Marine Fisheries vessels are summarized in Table 8; all are from 30 to 200 miles (48.2-321.8 km) offshore and in water ranging from 60 to 700 fathoms (109.8-1,281.0 m). These **whales** often strand in large numbers, **and** there are reports that in some cases herds move close to the shore (Winn et al. 1979). Of the 149 observations in the study area, 64 (42.9%) involved **sightings** or strandings of more than a **single** individual.

Seasonal Movements. - "Based on **the** monthly distribution of stranding and sighting records (Table 4), short-finned **pilot** whales are present within the study area **at** all times of the year. There is not much evidence that seasonal movements occur, although systematically collected data are not available to support this contention.

Status and Abundance. - Based on sighting and stranding records, these

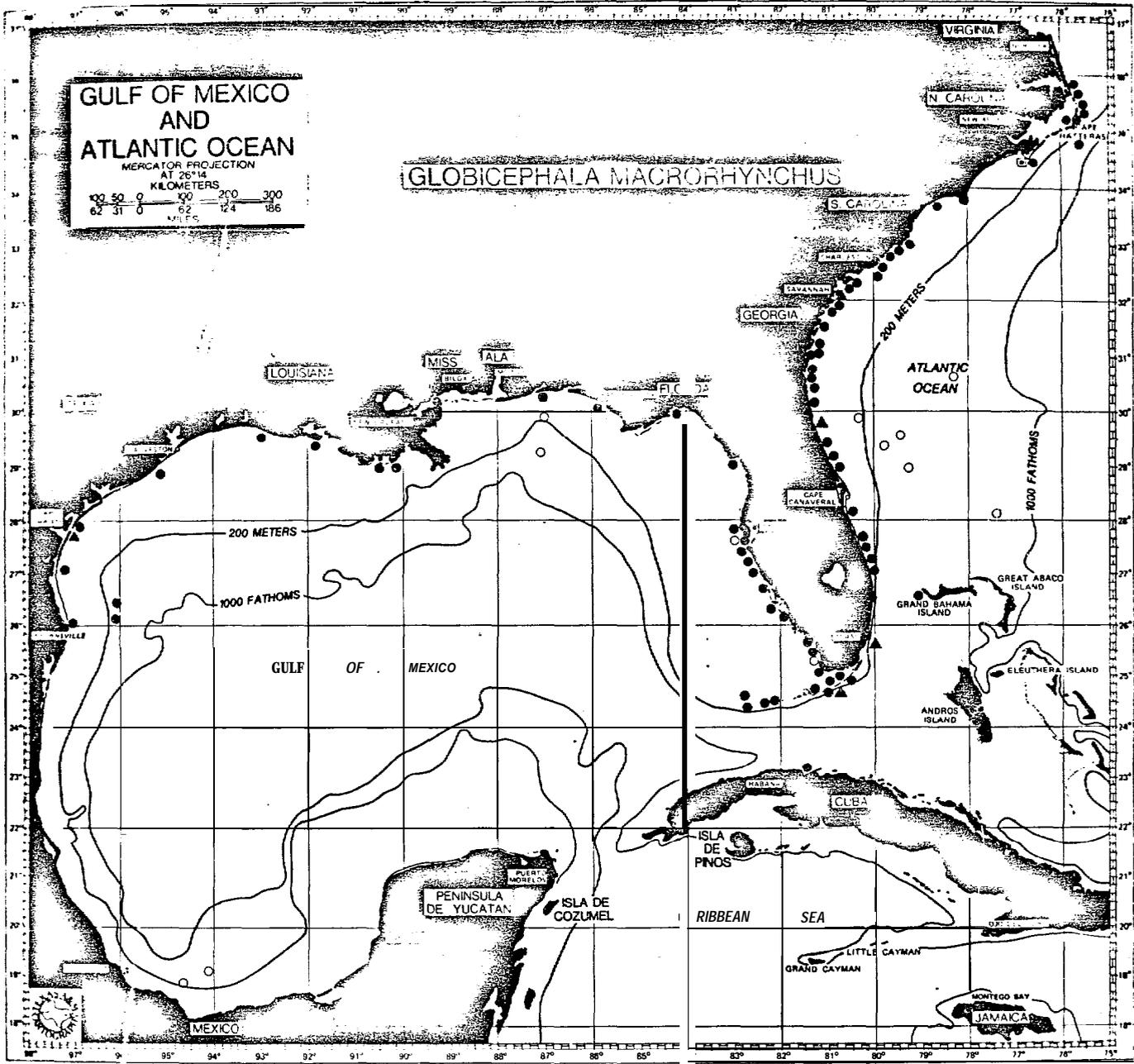


Figure 21. Distribution map of the short-finned pilot whale, Globicephala macrorhynchus. See legend for Figure 1 and text for explanation of symbols.

Table 8. Observations of short-finned pilot whales recorded from NMFS vessels in the study area.

<u>Date</u> Mo/Day/Yr	<u>Geographic Position</u>		Depth in Fathoms (m)	Approx. Miles to Land (Km)	Number of Individuals
	Lat. N	Long. W			
09/27/61	30 36'	78 28'	450 (823)	200 (322)	20
05/09/67	29 34'	79 31'	432 (790)	120 (193)	6
11/19/65	29 20'	79 50'	300 (549)	75 (121)	single school, small size
06/14/50	29 56'	87 03'	60 (110)	30 (48)	single school
05/17/54	19 05'	94 10'	700 (1281)	60 (96)	30
06/05/70	18 54'	94 48'	200 (366)	30 (48)	few schools
12/17/64	28 05'	77 27'	600 (1098)	200 (322)	single school, small size
05/11/65	28 54'	79 22'	430 (787)	105 (169)	single school, small size

whales are apparently one of the more common cetaceans in the study area. Moore (1953) and Layne (1965) , on the basis of known strandings, consider them the commonest cetacean in Gulf waters adjacent to Florida, and there are also numerous records from the coast of Texas (Schmidly and Melcher 1974) and Louisiana (Lowery 1974). There are no population estimates available for the study area, but populations are probably stable despite a fishery for this species in the Lesser Antilles (Caldwell and Caldwell 1974).

Life History, - Very few details are known about life history parameters, but they are probably very similar to those for G. melaena. Short-finned pilot whales are thought to have an extended breeding and calving season in warm waters during the winter; the gestation period is about 1 year and the calving interval is probably about 3 years, Calves are about 1.4 m long (Mitchell 1975). Females become sexually mature when they are about 3.2 m long and males when 4.8 m long. They feed on squid and fish (Mitchell 1975}. Sport fishermen claim to have seen pilot whales chasing and feeding on tuna, and their appearance coincides with the apparent increased abundance of tuna around Puerto Rico in summer (Caldwell and Erdman 1963) . They are known to occur in groups of 60 animals or more, but smaller groups are more common (Leatherwood et al. 1976).

Records of Occurrence. - Quad 2. North Carolina: Beaufort (14 originally identified as G. melas, 37, 83 84, 104); Beaufort (14 originally identified as G. melas or G. brachypterus, 41, 94, ~~106~~)3. North Carolina: Nags Head (173); Cape Hatteras National Seashore, Bodie Island, Coquina Beach (168); Hatteras Island (170); Oregon Inlet (170); Rodanthe, 35°35' N, 75°28' W (170); Hatteras Island, 35°14' N, 75°37' W (171); Buxton, 35°17' N, 75°31' W (170); near Cape Hatteras (14 originally identified as G. brachypterus, 41). Quad 4. South Carolina: Wadamalaw Island, near Rockville, 32°37' N, 80°12' W (169);

Hunting Island (176, 206); Beaufort Co., Broad River (179, 206); Daws Island, 80°45" N, 32°20' W (37); Beaufort Co., Fripp's Inlet (41, 186); Beaufort Co., Bay Point Island (186); Beaufort Co., Hilton Head Island (85); Bull River near Wassau Sound (41). Quad 5. North Carolina: Baldhead Island, Cape Fear River (41); White Banks, Bull's Bay (206); South Carolina: Cherry Grove Beach (41, 61); Bull's Island (41, 61); Charleston Co., Bird Island, Bull's Bay (85); Caper's Island (41, 61); Folly Beach (41, 61); Kiawah Island (94); Kiawah Island (206); Kiawah Island {206}. Quad 8. Georgia: Chatham Co., N end of Wassau Island, 80°20' W (41); Chatham Co., Ossabaw Island (85); Ossabaw Island (41); Ossabaw Island (41); Scapelo Island (37); N end Little St. Simon's Island (41); Little Simon's Island (41); seaward side S end Little Simon's Island (41); S end Jekyll Island (41); Glynn Co., mid-length Little St. Simon's Island (47); S end Little St. Simon's Island, 31°13' N, 81°19' W (170); Glynn Co., Little St. Simon's Island (185); Glynn Co., Little St. Simon's Island (185); Glynn Co., Little St. Simon's Island (185); Camden Co., W side Little Cumberland Island (85); Camden Co., W side Little Cumberland Island (85); Cumberland Island National Seashore, 30°50' N, 81°26' W (169); Florida: St. John's Inlet off Amelia Island (186); Nassau Co., Amelia Island (85); Atlantic Coast, east of Jacksonville (184); Ft. George Island, 30°13' N, 81°23' W (169); St. John's Co., S Ponte Vedra Beach (85); St. John's Co., S Ponte Vedra Beach (85); St. John's Co., Ponte Vedra Beach (185). Quad 9. 30°36' N, 78°28' W (175). Quad 12. "Florida: 50 mi off Marineland (85); St. Augustine Beach, 8 mi N of Marineland, 29°43' N, 81°25' W (83, 84, 104); St. John's Co., 6 mi off St. Augustine (85); St. Augustine (187); Volusia Co., 5 mi S of Flagler Beach (85); Volusia Co., Daytona Beach (85); Daytona or New Smyrna (104); Volusia Co., between S Daytona Beach and New Smyrna Beach (85); Brevard Co., Melbourne at 28 05' N east coast (104). Quad 13. 29°34' N,

79°31' W (175); 29° 20' N, 79°50' W (175); 28° 54' N, 79° 22' W (175). Quad 14.
 28° 05' N, 77°27' W (175). Quad 16. Florida: Brevard Co., 11 mi S Melbourne
 (85); Florida: Indian River Co., South Ocean Beach Park, near Vero Beach (85);
 St. Lucie Co., near St. Pierce (85); Martin Co., .5 mi N Jensen Beach,
 Hutchinson's Island (85); Jensen Beach, 27°14' N, 80°15' W (168); Palm Beach
 co., Jupiter Inlet (85); 7 mi S Jupiter, 26°50' W (104); Palm Beach Co., either
 West Palm Beach or Delray Beach (85). Quad 17. W end Grand Bahama Island, in
 the western Bahamas (adjacent to Gulf Stream) (39). Quad 21. Florida:
Pensacola (101). ~~Quad 27~~. Gulf coast of Florida, 85°50' N, 30°10' W (36);
 Florida: Wakulla Co., Shell Point, 84° 27' N, 30° 05' W (104). Quad 25.
 Texas: Brazoria Co., Velasco (64); Brazoria Co., Freeport (64). Quad 26.
 Louisiana: Cameron Parish, 5 mi "E mouth Mermentau River (90). Quad 27.
 Louisiana: Iberia Parish: Marsh Island, near Oyster Bayou (90); Terrebonne
 Parish: marsh below Houma (90); LaFourche Parish: mouth of Bayou LaFourche
 (67, 89, 90, 191). Quad 28. Louisiana: W shore Lake Borgne, near New Orleans,
 29°30' N, 89°50' W (170). Quad 29. 29°56' N, 87°03' W (175); NE Gulf,
 87° 15' N, 29°10' W (36). Quad 31. Florida: Cedar Key (206). Quad 32.
 Texas: Aransas Co., Gulf Beach, St. Joseph Island (64, 206); Aransas Co.,
 beach, St. Joseph Island (64, 203); Aransas Co., Aransas Pass (64); Mustang
 Island (64); off Mustang Island (67); Padre Island (67); Gulf of Mexico:
 Corpus Christi study area, 96°12' N, 26°28' W (208); Gulf of Mexico: Brownsville
 study area, 96°10' N, 26°14' W (208); southern tip Brazos Santiago (67).
Quad 39. Gulf coast of Florida, 27°45' N, 82°50' W (36); Florida: Pinellas
 co., Pass-a-grille, 27°40' N (104) ; Tampa Bay off Sunshine Parkway (85);
 Manatee Co., Holmes Beach on the Gulf (85); Gulf coast of Florida, 27°15' N,
 82°35' W (36); Sarasota Co., Osprey, 27°12' N, 82° 30' W (104, 206); Gulf coast
 of Florida, 27°00' N, 82°30' W (36); Gulf coast of Florida, 82° 25' N, 26°40' W

(36); Florida: Lee Co., near Boca Grande (185); Lee Co., Caloosahatchee River, severs'1 mi above Ft. Myers(74); pass between Sanibel and Captiva Islands, 26°29' N, 82°11' W (104); Sanibel Island, 26°25' N (104); Lee Co., bay at Ft. Meyers beach, 26°20' N (74); Gulf coast of Florida, 81°55' N, 26°10' W (36).

Quad 47. Florida: Bush Key Beach, Dry Tortugas, 82°50' N, 24°37' W (101, 173, 206); Monroe Co., Marquesas Key, 24°25' N, 82°11' W (185); 30 mi W Key West (85); Loggerhead, Dry Tortugas, 24°30' N, 82°55' W (104, 206). Quad 48.

Florida: Monroe Co., coast of Everglades National Park between Highland Beach and Seminole Point (85); NW Everglades National Park, Pavilion Key, 25°42' N, 81°21' W (101, 104, 206); Dade Co., oceanside beach of Key Biscayne (101, 104); 2 mi off Gould's Canal, Biscayne Bay, 25°36' N (104); Gulf off Everglades National Park, near Lostman's River (85); Everglades National Park, Tarpon Bay, 8 mi up Shark River (104); Everglades National Park, NW Cape Sable (104); Cape Sable (171); Everglades National Park, off Cape Sable (116); Gulf coast of Florida, 81°25' N, 25 00' W (36); Everglades National Park, 3 mi W Flamingo, 7 mi stretch from East Cape Sable E to Cormorant Point (104); Harbor Key Bank, N end Big Spanish Channel, 24°50' N, 81°05' W (101, 104, 206); SW end Plantation Key, 24°57' N, 80°35' W (101, 104); Monroe Co., Paradise Key, 24°43' N, 81°21' W (104); Monroe Co., Marathon Key (85); bayside Vaca Key, 24°43' N, 81°05' (101, 104); Monroe Co., shallow water off Grassy Key near Marathon (85); Grassy Key (94). Quad 60. Cuba: Bahia de Matanzas, 23°02' N, 81°34' W (1, 50). Quad 77. 19°05' N; 94°10' W (175, 25); 18°54' N, 94°48' W (175). Not plotted. North Carolina: Poyners Hill (174); Georgia: Hunting Island (41). Florida: no specific location (202); Cuban waters: no specific locality (1, 50).

Steno bredanensis (G. Cuvier in Lesson 1828)

Rough-toothed Dolphin

Other Common Names. - rough-toothed porpoise.

Other Scientific Names. - Steno rostratus.

Description and Identification. - Rough-toothed dolphins reach a length of 8 feet (2.4 m). Their coloration is purplish-black above with yellowish-white spots on the sides; the beak and ventral surfaces are white, tinged with purple and rose color. Their most distinctive characteristic is the beak or snout which is not **set** off from the head by a groove or angle of demarcation surrounding the base, as in Tursiops, but **instead** is long, narrow, and laterally compressed (Lowery 1974). Because the forehead and sides of the head slope smoothly into the rostrum, the entire head appears very long and nearly conical (Leatherwood et al. 1976). The sandpaper-like lateral surfaces of the teeth are also highly diagnostic.

Distribution. - Rough-toothed dolphins have been recorded in warmer waters of **the** Atlantic, Pacific, and Indian "oceans, the Bay of Bengal, and the Red, Mediterranean, and Caribbean seas (Walker 1975). **In** the western North Atlantic they have been reported from Virginia south to the West Indies and northeastern South America" as **well** as the Gulf of Mexico (Leatherwood et al, 1976) . Within the study area, stranding records are from North Carolina (2), Georgia (1), Florida (4), and Texas (1); only a single sighting has been recorded at sea (Figure 22). **No** specific data are available concerning their distribution **with** regard to oceanographic-features. In the West Indies, they are found in deep **water**, often near islands (Winn et al. 1979). Apparently they prefer deep, offshore, tropical to temperate waters (Leatherwood et al. 1976) .

Seasonal Movements. - Records for which data are available are from March

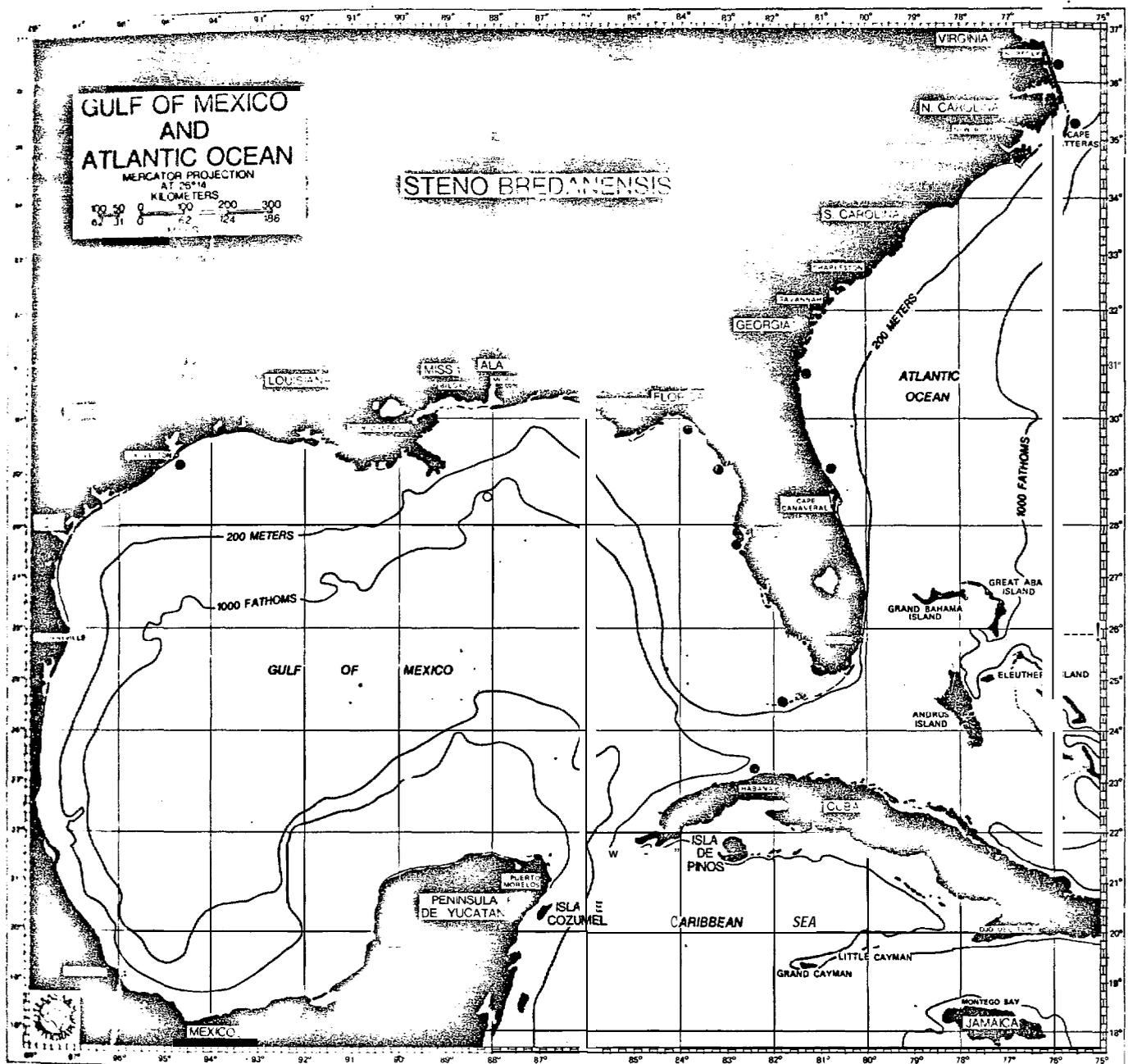


Figure 22. Distribution map of the rough-toothed dolphin, *Steno bredanensis*.

See legend for Figure 1 and text for explanation of symbols.

(1), May (1), June (1), October (1), and November (1). These data are too meager for any pattern to be apparent.

Status and Abundance. - The scarcity of stranding records suggests these dolphins are uncommon, although they may be easily confused with Tursiops truncatus, and, for that reason, are probably more abundant than stranding records indicate. Many of the records represent mass strandings, although only one of these (Rock Island, Florida, 29 May 1961) has been verified (Mead 1975a). Layne (1965) recorded a mass stranding of 30 Tursiops from Key West, Florida, but Mead (1975) considers this more likely to be Steno because, as common as Tursiops is in inshore waters, there are no documented mass strandings of it. Rough-toothed dolphins are rarely found in large numbers. They are believed to be **stable** everywhere in their range, and they are not considered endangered anywhere (Winn et al. 1979). No data on abundance are available from the study area.

Life History. - Virtually nothing is known about the life history of these dolphins in the study area or any other geographic region. They are thought to feed primarily on squid (Caldwell and Caldwell 1974), but Layne (1965) found pelagic octopus in the stomachs of stranded animals in Florida. Supposedly, they **travel** in schools of "50 animals or less and occasionally ride bow waves (Leatherwood et al. 1976). They **also** occur from time to time in schools of bottlenose dolphins (Mitchell 1974). Nothing is known of their breeding biology.

Records of Occurrence. - Quad 1. North Carolina: Corolla, 36°26'N, 76°01'W (168, 206). Quad 3. North Carolina: Cape Hatteras (37, 94). Quad 8. Georgia: Camden Co., Little Cumberland Island (128, 186). Quad 12. Florida: New Smyrna Beach (37). Quad 25. Texas: Galveston (90, 130). Quad 28. Northeastern Gulf : 28° 30'N, 88°05'W (36). Quad 31. Florida: Taylor Co., 1 mi NNW of

Rock Island (85, 206); Cedar Key (94). Quad 39. Florida: Tampa (67, 99, 101, 104). Quad 48. Florida: Key West (85 incorrectly as Tursiops truncatus, 172). Quad 59. Cuba: near Habana (1).

Lagenodelphis hosei Fraser 1956

Fraser's Dolphin

Other Common Names. - **shortsnouted whitebelly** dolphin.

Other Scientific Names. - none.

Description and Identification. - These small dolphins have a robust **build**, rather **small** flippers and dorsal fin, and reach a total length of only 8 feet (2.4 m). They are extremely short-beaked and have a pronounced dark stripe extending from the rostrum to the area of the anus. Coloration of the body is gray on the back, white on the belly, and with a striping pattern on the sides. A cream-white band beginning high on the rostrum extends above and past the eye, continues toward the **tail**, and disappears "in the body **color** above the anus. A black stripe extends just below and parallel to this cream-white band and passes from the eye to the anus. A similar band is located below and parallel to this black stripe and extends and separates the darker gray coloration of the side from the white coloration of the **belly** (Leatherwood et al. 1976).

Distribution. - Known **only** from the tropical and warm temperate waters of the Indian and Pacific oceans (Rice 1977) until **Caldwell et al.** (1976) reported a specimen from the western North Atlantic from the Lesser **Antillean** island of St. Vincent. Their occurrence in the warm, tropical waters of the Lesser Antilles makes them a **likely candidate** to occur in or stray into the study area.

Status and Abundance. - They are apparently rare and limited to offshore

tropical waters.

Life History. - The stomach of a female taken at St. Vincent on 15 May 1976 contained a large, very red shrimp, fish otoliths, cephalopod beaks, and two isopods (Caldwell et al. 1976). Nothing else is known of their life history in the western North Atlantic.

Records of Occurrence. - none.

Delphinus delphis Linnaeus 1758

Saddleback Dolphin

Other Common Names. - saddleback porpoise, common dolphin, saddlebacks.

Other Scientific Names. - none.

Description and Identification. - Saddleback dolphins measure up to 8.5 feet (2.6 m), although most individuals are less than 7.5 feet (2.3 m) long. Males average slightly larger than females of the same age. Field identification is best facilitated by four characteristics of body coloration: (1) the back is brownish-gray to black with a white belly and a crisscross pattern of bands and stripes of gray, yellow, and tan on the sides; (2) a distinct black stripe extends from the center of the lower jaw to the flipper; (3) the eyes are surrounded by black circles (on a grayish background) from which the black lines run forward to the base of the snout; and (4) the rostrum is usually black with a white tip.

Distribution. - Saddlebacks are widely distributed in warm temperate and tropical waters of all oceans, including the Black Sea (Rice 1977). In the western North Atlantic, they occur in temperate, tropical and subtropical waters from Newfoundland, Iceland, and Nova Scotia south to northern South America, and including the Gulf of Mexico (Leatherwood et al. 1976). They occur throughout the study area (Figure 23), As with many species, an inordinate number of records are from Florida, owing to the greater degree

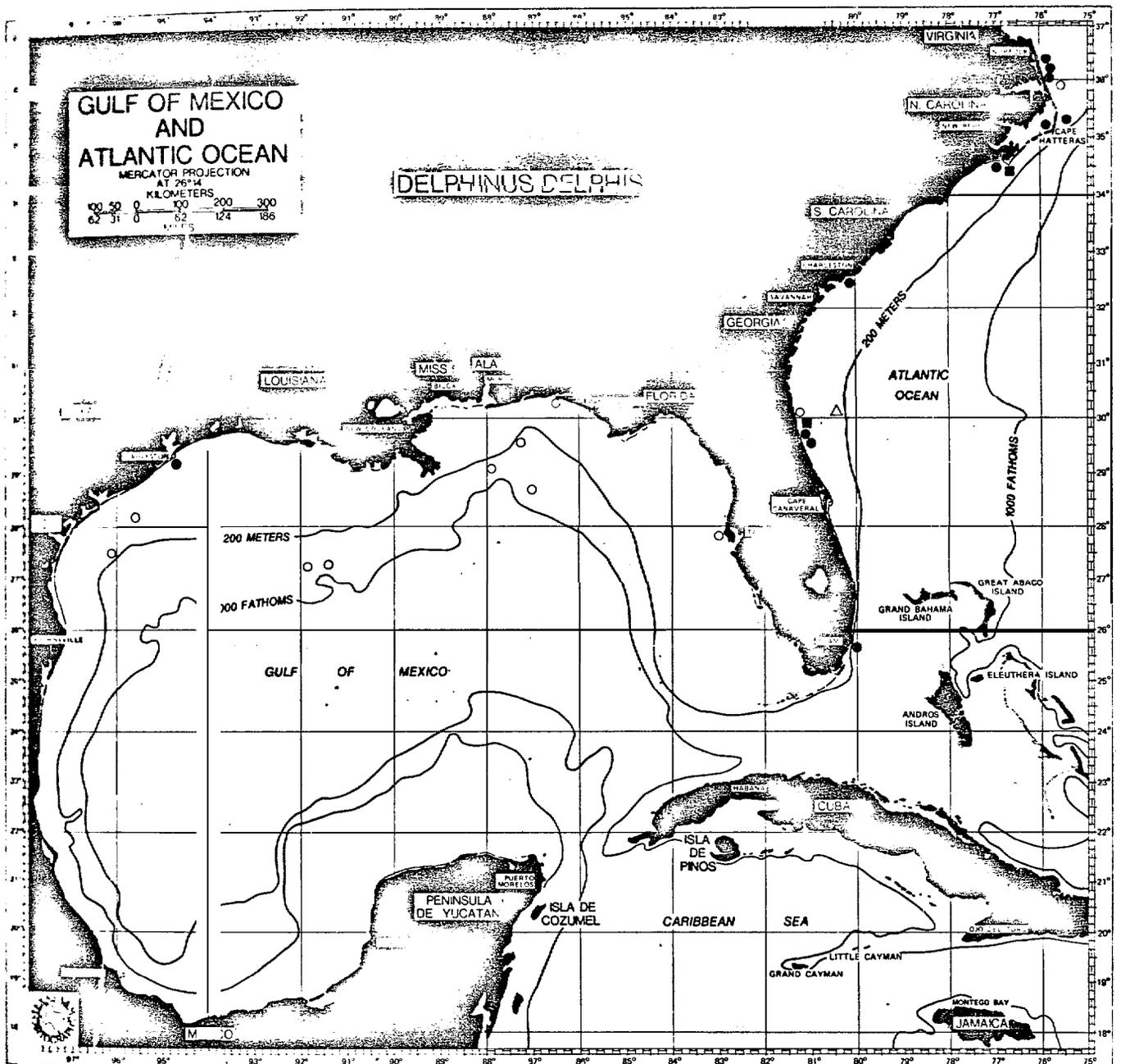


Figure 23. Distribution map of the saddleback dolphin, Delphinus delphis.

See legend for Figure 1 and text for explanation of symbols.

of cytological activity in that area. Stranding records are uncommon but numerous sightings at sea have been reported by competent observers (see for example, Lowery 1974, Caldwell 1955, and Mercer 1973). These dolphins appear to prefer offshore habitats where they often appear on the continental slope and in association with other topographic features such as ridges (Winn et al. 1979). They seldom stray into coastal waters and wind up on the beach.

Seasonal Movements. - Saddlebacks appear responsive to movements by their prey and to temperature gradients, leading to speculation that they might migrate (Winn et al. 1979). Records from the study area are scattered throughout the year and do not permit any conclusions as to seasonal distribution. Strandings or sighting from the Atlantic Coast are from January through June; records from the Gulf are from March, June, August, and November (Table 4).

Status and Abundance. - No population estimates are available from the study area. Populations are apparently stable in the western North Atlantic, although some local stocks may be depleted for unknown reasons (Mitchell 1975). For example, in previous years saddlebacks were frequently encountered off the northeastern coast of Florida and were even seen from several second-story balconies as they moved along close to shore. Since about 1960, however, they have been conspicuously absent from the area although still seen to the north and south. Reasons for their disappearance are unknown (Winn et al. 1979). They are hunted in the Azores, and may be taken incidentally in net fisheries in the tropical-Atlantic. No data are available on incidental take from the U. S. Atlantic Coast (Prescott et al. -1979).

Life History. - No data are available from the study area, but the following information from other geographic regions has been summarized from Mitchell (1975). Length at birth is 75-85 cm. Age at first reproduction has been estimated at about 3 years. Calving interval is thought to be 1.3 years.

Breeding is seasonal, with calving peaks in spring and fall. Gestation is estimated at 10-11 months. Diet varies seasonally, and they have been reported to feed on epipelagic and mesopelagic fishes, squids, and demersal fishes. Aggregation with tuna in the eastern tropical Pacific and eastern tropical Atlantic involves them in seine fisheries for tuna in those areas. Segregation in schools by age and sex has been reported. These dolphins are known to approach vessels and to bowride.

Records of Occurrence. = Quad 1. North Carolina: Corolla, 36°20'N, 75°49'W (171, 206); Corolla (94, 206); Kitty Hawk (173). Quad 2. North Carolina: Morehead⁽¹⁷⁶⁾; Beaufort (14, 41, 206). Quad 3. North Carolina: 35°59'N, 75°48'W (96); 5 km N Buxton, " 35°16'N, 75°32'W (168, 206); Buxton, 35°16'N, 75°30'W (171, 206); Buxton, 35°16'N, 75°32'W (171); Cape Hatteras (173, 206); Cape Hatteras (206). Quad 4. South Carolina: Edisto Island (41, 61, 179). Quad 8. Florida: off St. Augustine, 30°05'N, 80°25'W (116). Quad 12. Florida: 5-7 mi off beach, St. Augustine (104); 10 mi off beach, St. Augustine (104); 10 mi off beach, St. Augustine (56); N Marineland (85); St. John's Co., Crescent Beach (85). Quad 21. Florida: Okaloosa Co., 30°20'N, 86°30'W (36). Quad 25. Texas: Galveston (203); 31 nautical mi off Matagorda Peninsula, 28°14'N, 95°34'W (90, 206). Quad 29. Florida: 41 nautical mi S entrance to Pensacola Bay, 29°35'N, 87°18'W (90, 206); Mississippi: 63 mi E mouth of Pass a Loutre of the Mississippi Delta, 69 mi S entrance to Mobile Bay, Alabama, 29°05'N, 87°55'W (90, 206); 98 nautical mi S Santa Rosa Island, 28°43'N, 87°00'W (90, 206). Quad 32. Texas: 36 nautical mi off Mustang Island, 27°27'N, 96°04'W (90, 206). Quad 35. "Central Gulf: 27°00'N, 92°00'W (25); Central Gulf: 27°10'N, 91°22'W (25). Quad 39. Florida: near Tampa Bay, 27°50'N, 82°50'W (36). Quad 48. Florida: Dade Co., Miami Beach (104, 206). Not plotted. Cuban Waters: (1,50): Florida (206).

Tursiops truncatus (Montague 1821)

Atlantic Bottlenose Dolphin

Other Common Names. - common **bottlenose** dolphin, **bottlenosed** dolphin.
bottlenosed porpoise, common porpoise, **bottlenose**.

Other Scientific Names. - none.

Description and Identification. - Atlantic **bottlenose** dolphins reach a total length of about 12 feet (3.7 m), although most individuals in the study area are less than 9 feet (2.7 m) in length. They may weigh in excess of 1,430 pounds (650 kg). Their color is purplish gray to clear gray dorsally, and whitish **ventrally** except for the **underside** posterior to the vent, which is dark like the back; the sides are light gray (Lowery 1974). No true **color** phases are known, but an **albino** has been recorded in waters off South Carolina (Essapian 1962). Their head tapers abruptly into a relatively **short**, robust snout with a groove, **or** crease, surrounding its base. The dorsal fin, located in the middle of the **back**, is moderately high and back-curved.

Distribution. - **Bottlenose** dolphins are widely distributed throughout tropical and temperate waters of the world (Rice 1977). They occur in coastal waters of the western Atlantic from Massachusetts to Florida, the Gulf of Mexico, the Lesser Antilles, and Venezuela (Lowery 1974). They occur throughout the study area (Figure 24). Dead animals have stranded along the coastline of every state in the region and numerous sightings of live animals at sea are **available** as **well**. Live" bottlenose dolphins rarely strand. Most animals found on the beach are dead, and 'a major percentage of these seem to - . - have died of such things as "drowning in fishermen's nets, being shot, newborn calves that have been **stillborn**, or **young juveniles** that perhaps lost their mothers before they were weaned. During the NFWL-BLM aerial surveys, Tursiops were sighted in both August and November at both study sites in Florida.

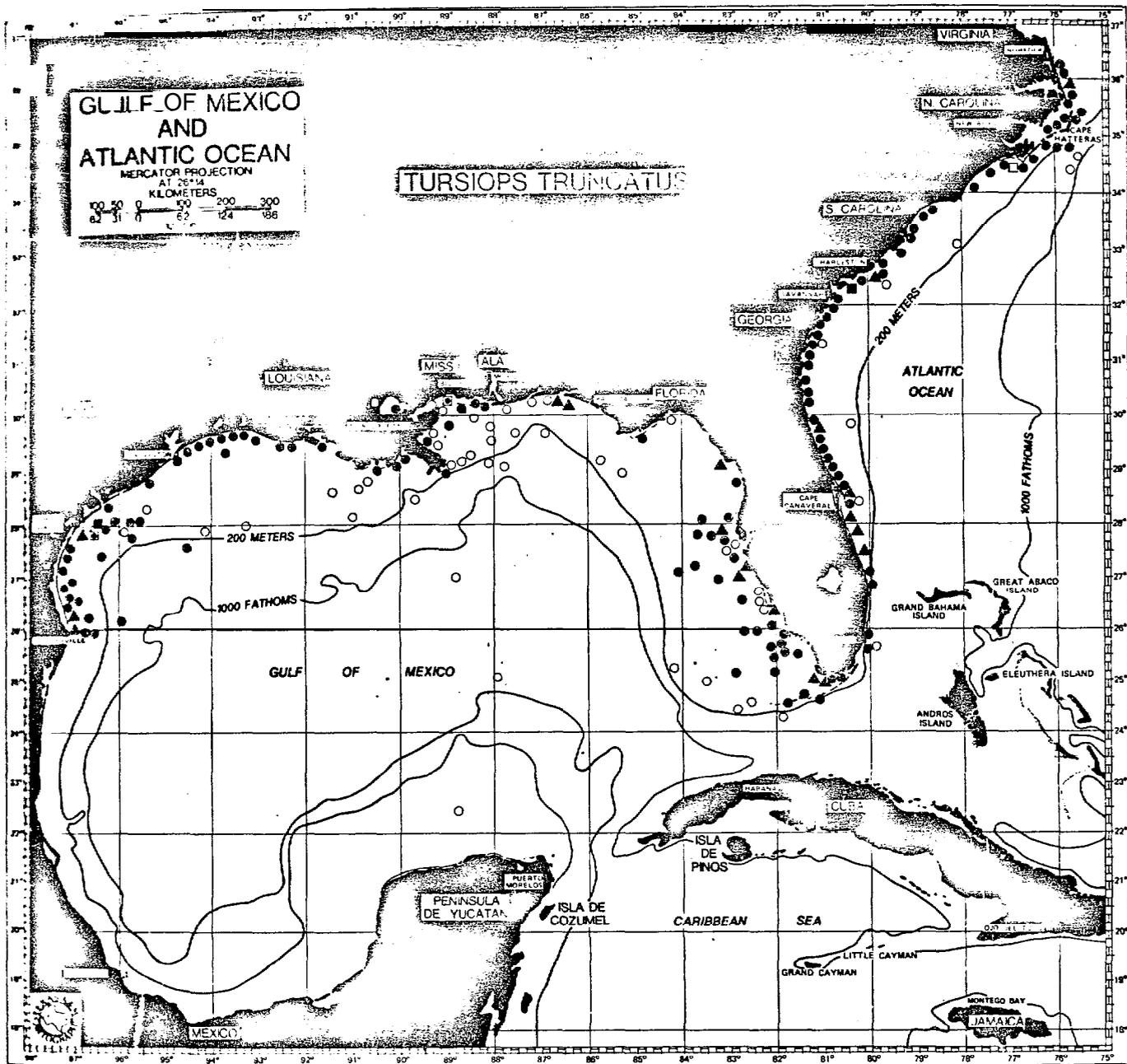


Figure 24. Distribution of the Atlantic bottlenose dolphin, *Tursiops truncatus*. See legend for Figure 1 and text for explanation of symbols.

In Texas, sightings were made in the Corpus Christi study area during both month's, but in the Brownsville area only in November.

These dolphins primarily inhabit inshore waters. They are found in greatest numbers in the vicinity of the passes connecting the larger bays with the ocean, but they are likewise present in back bays and there are even reports of animals ascending far up rivers. Bottlenose dolphins occur frequently just beyond the surf in the open ocean and occasionally wander much farther offshore, although they are seldom found beyond the 200 m curve (Figure 24). There is some evidence that dolphins living offshore may represent a separate stock that is much larger in body size and has a different parasite load than those living inshore, but this is uncertain. There is also evidence (Winn et al. 1979) in some areas to suggest that inshore populations are divisible into two subgroups, one that is confined to open ocean waters (called "ocean porpoises") and one restricted to inlet, lagoon and confined saltwater river waters (called "river porpoises"). The extent to which these subgroups intermingle is unclear, but Caldwell et al. (1975) have presented evidence that the greater susceptibility of "Lobos" disease (lobomycosis) in riverine-estuarine stocks, as compared to ocean stocks, may be indicative of isolation between the two subgroups. Shane (1977) reported that the offshore population of bottlenose dolphins off Texas rarely interacted with the bay population but that the winter population in the Port Aransas, Texas, area was at least twice as large as that in summer because the bay population was augmented by large numbers of dolphins entering that area for the winter either from the adjacent gulf or from adjacent bay systems.

Seasonal Movements. - The general consensus of cytologists is that bottlenose dolphins around the coastline of the southeastern United States are organized into local populations, each occupying a small region of the coast, and that a

certain amount of migration occurs to and from inshore and offshore areas and probably linearly along the coastline (Odell et al. 1975). However, information is almost totally lacking on the extent and magnitude of such movements. Strandings or sightings are available from every month of the year in all of the major regions of the study area (see Table 4), which would suggest that seasonal migrations of entire populations between major geographic areas probably do not occur. On the other hand, there appears to be some evidence that in certain places localized seasonal movements do occur. Seasonal migrations have been documented for Tursiops on the Atlantic coastline (True 1890, Caldwell and Caldwell 1972, Hogan 1975). According to Hogan (1975), these migrations involve regional seasonal movements (not long range), perhaps 160 to 320 km or so at most, along shore by local populations to the north in summer and south in winter. Irvine and Wells (1972) found no evidence for seasonal migrations in west-central Florida, but Irvine et al. (1977) noted fewer dolphins in their study area during the winter than during the summer, although they did not consider this strong evidence for seasonal migrations. Irvine et al. (1977) did note, however, a distinct difference in habitat utilization according to season. During the winter the dolphins congregated in the passes and along the Gulf shore, while they were seen mostly in the bays and inshore channels during the summer. Gunter (1942) stated that no seasonal migration of Tursiops occurred in Texas waters, but subsequently Shane and Schmidly (1979) have shown that seasonal migrations are evident in some bay systems. The pattern of movement for Tursiops in the western Gulf is not known, but Shane (1977) has suggested that water temperature may be a major factor in determining seasonal movements along the Texas coast.

Most of the available information concerning the movements of individual bottlenose dolphins has come from studies of naturally or mechanically tagged

individuals in local herds. Caldwell (1955) cited the first evidence for a home-range for Tursiops. Caldwell and Caldwell (1972) elaborated on this and proposed that Tursiops may have two or more home ranges connected by traveling ranges. Studies by Irvine and Wells (1972), Saayman and Tayler (1973), Hogan (1975), and Shane (1977) support this theory to some extent, although none of these investigators have been able to specifically define the home ranges of the dolphins they were studying.

Several observers have reported on the influence of environmental factors, such as tides and temperature, on the daily movements of Tursiops. Hogan (1975), Irvine et al. (1977), and Shane (1977) observed that Tursiops seem to follow a set movement pattern for a few days or even weeks and then adopt a new movement pattern. Irvine and Wells (1972) and Irvine et al. (1977) found that T. truncatus along the Gulf Coast of Florida moved with the tides. Shane (1977) noted that both tidal flow and time of day played significant roles in affecting the daily movements of Tursiops in the Aransas Pass area of the Texas Coast. In general, she found that tides were the most significant factor in the lower parts of the study area where they were strongest, and that time of day was a more significant factor in the upper parts of the study area where tidal flow was weaker. In the Mississippi Sound, Leatherwood et al. (1978) sighted herds of similar size and composition at the same location on successive days, suggesting that short-term movements do not occur in this region.

Status and Abundance." - There are no estimates of population size for the entire study area, but some estimates are available for specific regions. Mitchell (1975) estimated the pre-exploitation stock for the mid-Atlantic Tursiops (offshore and coastal combined) population to be 17,000, based on cumulative catch records from the Hatteras fishery. A summation of recent coastal surveys and estimates for all of Florida and the Gulf of Mexico

resulted in a cumulative estimate of approximately 10,000 \pm 3,700 (Prescott et al. 1979). Orr (1977) included some offshore populations and estimated about 20,000 animals for the same area.

Several aerial surveys have been conducted by LeatherWood and associates (1978, 1979) with the following relative index of numbers provided for specific locations:

<u>Location</u>	<u>Dolphins per km²</u>	<u>Dolphins per nautical mi</u>
Mississippi Gulf Coast	0.23	0.57
Louisiana Gulf Coast	0.44	1.08
Florida Gulf Coast	0.23	0.57
Texas Gulf Coast	0.65	1.61
Florida, Indian River	0.68	1.77

These results suggest that population sizes are uneven and vary considerably from one place to another. Reasons for these differences are unknown. Food abundance is a likely candidate, but other factors such as geographic structure of habitats as well as relative amount of human activity and pollution may also be involved. Actual population estimates for some of these same geographic areas are as follows (data from Leatherwood et al. 1978, and Leatherwood 1979): western Louisiana (1975), 897 \pm 461; Mississippi, Chandeleur and Breton sounds, marshland habitats (1974), 438 \pm 294; Florida, Indian and Banana rivers (1977), 438 \pm 127.

Boat and land observations have also been used in a few places to determine dolphin densities. Shane and Schmidly (1979), using these techniques, estimated the number of Tursiops in Aransas Bay (near Corpus Christi, Texas) to vary from 48-104 individuals in October to 164-281 individuals in January. Similarly, Hogan (1975) made a crude estimate of 150 to 300 animals at and to the north of the mouth of the Savannah River along the Atlantic Coast.

Concern about the status of Tursiops populations in the study area seems to vary from one region to the next as well as from one investigator to another. According to Caldwell and Caldwell (1974) and Winn et al. (1979), stocks along the Atlantic Coast from Cape Hatteras to Cape Canaveral do not seem depleted, even though there have been organized fisheries in years past, such as the one at Cape Hatteras, North Carolina (Mead 1975b). Extensive commercial fishing in the region of Cape Hatteras around the turn of the century and before apparently had no effects on the species in that region (Caldwell and Caldwell 1974).

According to Caldwell and Caldwell (1972), the population of bottlenose dolphins in Florida waters is healthy and not impacted by the live capture fishery. However, there apparently are some places in Florida where Tursiops populations are being locally depleted. An apparent decrease in Tursiops abundance in the St. John's River correlates with increased commercial shipping. An apparent decrease in the number of animals in Biscayne Bay in recent years may be related directly to intense boating activities or indirectly through decreased food abundance due to pollution or other factors (Odell et al. 1975). However, much of this is subjective and speculative, and hard data do not exist to support these contentions,

Information from the western Gulf is less favorable and suggests that stocks have been depleted. According to Lowery (1974), the number of Tursiops in Louisiana waters now appear to be reduced in comparison with their former abundance. The decline is attributable to a variety of factors, two of which are slaughter with rifles by deep-sea commercial and sports fishermen and by deaths resulting from the explosion of seismographic charges in offshore waters (Lowery 1974). Gunter (1942) contends that the number of Tursiops in Texas has declined drastically during the 20th century, and a newspaper

article by an **old** sea-captain (Shane 1977) also implies that there has been a large decline **in the** number of **bottlenose** dolphins in inshore Texas waters.

Life History. - More **is** known about the life history of Tursiops than any other species living in the study area. Undoubtedly this is because of the inshore habits of this species and its propensity for stranding as **well** as its popularity in marine shows and aquaria. A tremendous amount of information is known about bottlenose dolphins in captivity, but much less is know-n about habits and behavior in natural habitats. Much of the following information is taken from Odell (1975), who summarized the important life history aspects of this species in the **study** area.

Reproduction

Males mature at lengths from 2".45 to 2.6 m or 10 to 13 years **cf** age; females mature at lengths ranging from 2.2 to 2.35 m or 5 to 12 years of age. Gestation **lasts** about 12 months **and** the calving interval is either 2 or 3 years, with a lactation period of up **to** 18 months. Ovulation may be induced rather **than** spontaneous. Most of **the** calving and mating occurs from February to May in Florida waters, but there is **also** some evidence for a calving and mating period from September to November in south Florida waters. Reported" birth lengths are from 98 to 126 cm and weights from 9.1 to 11.4 kg. Fishermen from the Cape Hatteras, North Carolina, fishery noted **that** fetuses were generally small in September and increased in size as the season progressed (**True 1889**). "A female has been estimated to give birth to **about** eight calves in her lifetime (McBride **and** Kritzler 195"1).

Little is known about mating and birth processes in the wild, but McBride and Hebb (1948) provide a **summary** of **these** behaviors in captive bottlenose dolphins. These authors **also** noted homosexual behavior among dolphins and the -process of raising newborns to the surface for their first **breath** of

air, which was observed in both captive and wild dolphins.

The percentage of calves in a population is indicative of a population's reproductive viability, and knowledge of this parameter is important for management purposes. Irvine et al. (1977) report that in spring calves composed as much as 14% of the bottlenosed dolphin population near Tampa Bay, Florida. Shane (1977) reported that calves constituted from 3.65% (February) to 12.92% (May) of the dolphins near Port Aransas, Texas ($\bar{X} = 7.61\%$). Leatherwood et al. (1978) reported summer figures from 7.7 to 7.9% calves for coastal Alabama, Mississippi, and Louisiana. Leatherwood (1979) observed 8.1 to 10.1% calves during his August 1977 surveys in the Indian and Banana rivers of Florida. These percentages of calves indicate a healthy population, if the calving interval is 3 years, but below maximum productivity if the calving interval is 2 years (Leatherwood and Platter 1975, Shane 1977).

Food Habits

Tursiops feed on a variety of fishes, molluscs, and arthropods. Specific items in their diet in the study area are listed by True (1885a), Townsend (1914, 1915), Gunter (1938, 1942, 1951, 1954), Harris (1938), Golley (1966), Hoese (1971), Caldwell and Caldwell (1972), and Leatherwood and Platter (1975). Apparently, bottlenosed dolphins are catholic and remarkably flexible in their feeding tastes and opportunistic in the sense that they tend at any given time and location to feed on the most abundant species. During an aerial survey over the northern Gulf, Tursiops were observed to feed at least once every daylight hour on a variety of organisms under a wide variety of circumstances (Leatherwood and Platter 1975). Leatherwood (1975) concludes that, if bottlenose dolphins are relatively limited in their ranges and have rather short term movements, plasticity in food habits is necessary for survival.

Leatherwood (1975) recorded seven recurrent feeding patterns in the northern Gulf: (1) foraging behind working shrimp boats and eating organisms disturbed by the nets; (2) feeding on trashfish dumped from the decks of shrimp boats; (3) feeding on fish attracted to nonworking shrimpers; (4) herding schools of fish by encircling and charging the school or feeding on stragglers; (5) sweeping schools of small bait fish into shallow water ahead of a line of dolphins charging into the school or feeding on stragglers; (6) crowding small fish onto shoals or mud banks at the base of grass flats, driving fish completely out of the water and then sliding onto the banks to retrieve them; and (7) individual feeding. Shane (1977) recorded six distinctive feeding behaviors in Aransas Bay along the Texas Coast, most of which were similar to the behaviors recorded by Leatherwood (1975). These are (the number in parenthesis refers to the equivalent behavior described by Leatherwood): random feeding (=3); circle feeding (=7); shallow water feeding ; cooperative feeding (=5); shrimp bait feeding (=1); and feeding on "trashfish" discarded by shrimpers (=2). Hogan (1975) described four types of feeding behavior in the Savannah River area: deepwater herding, individual shallow water feeding, shore or bank feeding, and shrimp boat feeding.

Behavior

These dolphins often occur in groups of up to several hundred individuals which usually consist of subgroups of no more than a dozen animals (Leatherwood et al. 1976). Mean herd sizes off eastern Florida and in the Gulf of Mexico vary considerably from one area to another. Groups apparently decrease in size with distance from shore; they tend to be larger in deeper and in open water areas than in shallow embankments, lagoons and marshlands (Leatherwood and Platter 1975, Leatherwood et al. 1978, Shane and Schmidly 1979); and tend to fluctuate seasonally with little pattern discernible (Shane and Schmidly

1979). Bottlenose dolphins frequently associate with Atlantic pilot whales as well as right and humpback whales along the Atlantic Coast of Florida. Bow wave and surf riding have been observed in South Carolina and Florida (Leatherwood et al. 1976, Caldwell and Fields 1959). Gunter (1954) reports swimming speeds of 22 miles per hour. In herds of wild bottlenose dolphins, Leatherwood (1977) observes that calves may be left with "babysitters" when the adult leaves the surface to feed. Adult animals have been observed supporting an injured companion at the surface so that it may continue to breathe until it has recovered. Scouting behavior, in which an individual dolphin leaves the herd to make echolocation runs on barriers and then returns, thereby guiding the school, was observed by Caldwell et al. (1965). Also noted was ingestion of foreign objects for unknown purposes. McBride and Hebb (1948) report that vocalizations take the form of whistles, barks, moans, and squeaking doors; these are as yet incompletely understood. Echolocation ability in Tursiops is well known and is used in locating food, identifying objects and in some cases maintaining orientation in shallow water.

Records of Occurrence. - Quad 1. North Carolina: Currituck Banks, 36°31'N, 75°52'W (170, 206); Currituck Co., offshore (206); Currituck Co., Bailey Island (206); near Washwood Lifesaving Station, Currituck Banks, 36°30'N, 75°52'W (170); Corolla, 36°25'N, 75°50'W (206); Corolla, 36°23'N, 75°50'W (170); Corolla, 1.7 mi N Currituck Light (206); Corolla, approx. 6 mi S Currituck Light, 36°17'N, 75°47'W (206); Duck Island, 7 mi N Route 158, 36°12'N, 75°45'W (206); Kill Devil Hills, 36°00'N, 75°39'W (170). Quad 2. North Carolina: Portsmouth Island, 35°03'N, 76°07'W (169); 0.8 km E Core Banks, CapeLookout National Seashore (171, 206); Core Banks, 34°45'N, 76°25'W (171); Core Banks, 34°43'N, 76°28'W (170); Core Banks, 19 km N lighthouse, Hatteras National Seashore (171); Core Banks, 16 km N light-

house, 34 °44'N, 72 °26'W (171); Core Banks, N lighthouse, Cape Lookout National Park Seashore, 34°41'N, 76°31'W (171); 16.5 km N Cape Lookout lighthouse, 34°41'N, 76°27'W (169); Shackleford Banks, Cape Lookout, 34°40'N, 76°38'W (169, 206); Core Banks, 5 km N lighthouse, Cape Lookout National Park, 34°40'N, 76°29'W (171); 8 km N lighthouse, Cape Lookout National Park Seashore, 34°41'N, 76°31'W (171); Core Banks, 3.5 km N lighthouse, Cape Lookout National Seashore, 34°39'N, 76°30'W (171); Cape Lookout Bight, 34°37'N, 76°32'W (170); Cape Lookout, 34°34'N, 76°34'W (169, 206); S section Core Banks, 9 km N Cape Lookout lighthouse, 34°34'N, 76°27'W (170); Core Banks, 6.5 km N lighthouse, 34°31'N, 76°29'W (171); Lookout National Seashore" (168, 206); Cape Lookout (14); Atlantic Beach, Morehead City, 34°43'N, 76°44'W (168, 206); Morehead City (176); Beaufort (196); Beaufort (206); Ft. Macon State Park (40); Ft. Macon State Park, 34°42'N, 76°41'W (170); Beaufort Inlet, Ft. Macon, 34°42'N, 76°41'W (170); Ft. Macon (206); Ft. Macon (206); Beaufort (206); Boque Sound, 180 mi E Atlantic Beach, 34°42'N, 76°44'W (170); Emerald Island, 34°41'N, 76°57'W (168, "206); Salter Path, 34°40'N, 76°52'W (171); Cape Hatteras, 1.2 mi S Ramp 6 (168, 206); Surf City (206); 2.5 km N Topsail Inlet, 34°22'N, 77°36'W (171). Quad 3. North Carolina: near milepost 16, Nags Head, 36°58'N, 75°40'W (171); Nags Head, Nags Head pier, 35°57'N, 75°38'W (168, 206); Nags Head, 35°57'N, 75°37'W (170); 100 mi N Ramp 1, S Nags Head, 35°51'N, 75°35'W (171); 50 mi off beach, 20 mi S North Carolina/Virginia State Line, Corolla (168, 206); S Nags Head (171); Pea Island, Pea Island Refuge, 35°46'N, 75°31'W (200); N end Pea Island, National Wildlife Refuge, E Oregon Inlet Eridge, 35°46.8'N, 75°30.5'W (171); Pea Island, 35°45'30"W, (169,-206); 2.6 km N Pea Island, National Wildlife Refuge Headquarters, 35°42'N, 75°29'W (171); Oregon Inlet, 35°55'N, 75°54'W (168); 2 mi N Oregon Inlet, 35°49'N, 75°33'W (206); Dare Co., Oregon Inlet, 35°46'N, 75°32'W (206); Pamlico Sound side of Rodanthe, 35°37'N, 75°28'W (170); Rodanthe, 35°34'N, 75°28'W (170, 206); Rodanthe, KOA campground (206);

between Rodanthe, 34°34'N, 75°28'W and Waves, 35°35'N, 75°35'W (168, 206); Salvo, 35°33'N, 75°29'W (169); Salvo, 35°32'N, 75°28'W (170); 1 km S Salvo campground, Hatteras Island, 35°30'N, 75°29'W (171); Pamlico Sound side of Cape Hatteras National Seashore (170); Hatteras Island, 35°31'N, 75°28'W (170); Hatteras Island, 35°26'N, 75°30'W (169, 206); Hatteras Island, 35°26'N, 75°29'W (169, 206); Hatteras Island, 35°25'N, 75°29'W (169); Hatteras Island, 35°20'N, 75°30'W (169); Hatteras Island, 35°18'N, 75°31'W (169); Hatteras Island, 35°14'N, 75°34'W (170); W end Hatteras Island, 33°12'N, 75°44'W (169, 206); Hatteras Island, 1.2 mi S Ramp 6 (168, 206); 1.5 km S Cape' near Ramp 30, Cape Hatteras National Seashore (171); Dare Co., Nags Head (206); 9.6 mi N Avon Pier, Hatteras Island, 35°27'N, 75°29'W (170); Hatteras Island, 3 km N Avon Pier, 35°23'N, 75°30'W (169, 206); Avon, 35°23'N, 75°29'W (170, 206); 8 km N Avon, 35°22'N, 75°31'W (168); N Avon Pier, Avon, 35°22'N, 75°30'W (169); Avon, 35°21'N, 75°30'W (170); Avon, 35°21'N, 75°30'W (169); Avon, 35°21'34"N, 75°29'30"W (169, 206); Avon, 35°20'N, 75°30'W (170); Avon, 35°19'N, 75°31'W (170); Avon, 35°19'N, 75°30'W (170); 1 km SW US Coastguard Station in Hatteras, 35°12'04"N, 75°42'37"W (171); Dare Co., Cape Hatteras (206); S most canal, Hatteras Colony, Sound side, Avon, 35°02'N, 75°31'W (171); Buxton, 5 mi N Ramp 22, 34°17'N, 75°31'W (171); Buxton, 35°17'N, 75°31'W (170); Buxton, 35°14'N, 75°34'W (169); Cape Hatteras National Seashore, Buxton, 35°16'N, 75°32'W (170); Buxton, 35°16'N, 75°32'W (169, 206); Buxton, Cape Hatteras, 35°16'N, 75°32'W (170); Buxton, 35°14'N, 75°37'38"W (169, 206); 8 km W Cape Point, Buxton, 35°14'N, 75°33'W (169); Hatteras (206); near Hatteras Inlet, US Coastguard Station, Hatteras, 35°12'N, 75°42'W (170); Frisco, 35°15'N, 75°36'W (169); Frisco, 35°14'N, 75°37'W (170); Frisco, 35°14'N, 75°37'W (170); Frisco, 34°14'N, 75°37'W (206); Frisco, 35°14'N, 75°35'W (169, 206); Frisco, 35°13'N, 75°39'W (170); Frisco; 35°13'N, 75°39'W (170); Cape Hatteras Island, 35°27'N, 75°29'W (170); Cape Hatteras lighthouse, 35°16'N, 75°31'W (169); Cape Hatteras lighthouse (93, 94, 206); Cape

Hatteras lighthouse, 35°13'N, 75°31'W (169, 206); Cape Hatteras, 35°31'N, 75°31'W (169); Cape Hatteras, 35°15'N, 75°31'W (169); Cape Hatteras, 35°14'N, 75°34'W (170); Cape Hatteras, 35°14'N, 75°34'W (169); Cape Hatteras, 35°14'N, 75°33'W (169); 1 km W Cape Point, Cape Hatteras, 35°14'N, 75°33'W (170); 1.5 km W Cape Point, Cape Hatteras National Seashore, 35°14'N, 75°32'W (169); Cape Hatteras, 35°14'N, 75°32'W (171) Cape Hatteras, 35°14'N, 75°32'W (171); Cape Hatteras Island, 35°12'N, 75°44'W (169); Cape Hatteras Island, 35°12'N, 75°44'W (169); Cape Hatteras (145); Cape Hatteras (152); Cape Hatteras (152); Cape Hatteras (176, 206); Cape Hatteras (206); off Cape Hatteras (206); Cape Hatteras (206): Cape Hatteras, between Ramps 30 and 32, S Cape Hatteras lighthouse (206); Cape Hatteras (206); Cape Hatteras (187); Cape Hatteras (206); Ocracoke Island, 35°11'03"N, 75°46'32"W (171); Ocracoke Island, 35°10'N, 75°50'W (169); Ocracoke Island, 35°10'N, 75°50'W (170); Ocracoke Island, 35°10'N, 75°49'W (170); Ocracoke Island, 35°09'N, 75°52'W (170); Ocracoke Island, 35°09'N, 75°51'W (170); Ocracoke Island, 35°09'N, 75°51'W (170); Ocracoke, 35°08'N, 75°54'W (169); Ocracoke Island, 35°08'N, 75°53'W (169, 206); Ocracoke Island, 35°08'N, 75°53'W (169); Ocracoke Island, 35°07'N, 75°55'W (170); Ocracoke, 35°06'N, 75°59'W (168, 206); Ocracoke, 35°06'N, 75°59'W (168, 206); 0.8 km S Ramp50, Ocracoke Island, 35°06'N, 75°59'W (171); Ocracoke Island, 35°06'N, 75°59'W (170); Ocracoke Island, 35°06'N, 75°59'W (169); Ocracoke Island, 35°06'N, 75°38'W (169); Ocracoke, 35°06'N, 75°58'W (169); Ocracoke 35°06'N, 75°58'W (169); Ocracoke Island, 35°06'N, 75°57'W (170); 34°55'N, 75°58'W (206); Cape Hatteras National Seashore (171); Raleigh Bay, 34°40'30"N, 75°31'15" W (96); Raleigh Bay, 34°27'15"N, 75°41'30W (96). Quad 4. South Carolina: Seabrook's Island (61); Edisto Island, 32°33'N, 80°19'W (170); St. Helena Sound (58); St. Helena Sound (47); Hilton Head Island (37); Georgia: Chatham Co., McQueen's Island (41); McQueen's Island marshes (41); N end Tybee Island, 32°00'14"N, 80°50'00"W (170). Quad 5. South Carolina: 47th Ave., N. Myrtle Beach, 33°41'5"N, 78°53'00"W (171); Horry Co., Myrtle Beach, 33°42'N, 78°

54'N, (169); Myrtle Beach (171); S. Myrtle Beach, 33°42'N, 78°54'W (169, 206);
 Debidue Beach, 33°23'N, 79°09'W (171); Middle of North Island, 33°15'N, 79°10'W
 (171); Clam Bank Creek, North Inlet, Georgetown, 33°23'N, 79°18'W (170); 4.8
 km from jetty S end North Island, 33°15'N, 79°11'W (171); Cape Island
 (31, 61, 179); Sullivan's Island, Charleston, 34°44'N, 79°49'W
 (170); Sullivan's Island (41, 61, 179); Sullivan's Island (41, 61, 179): Sullivan's
 Harbor, north end (61); Charleston Harbor (37); Charleston Co., Morris Island (41,
 61, 179); near Charleston, Steno River, 32°48'N, 79°58'W (169); Folly Island (206);
 Folly Beach (61); Folly Beach (41, 61, 179); Folly Beach (179, 206). Quad 6.
 South Carolina: off Charleston, 33°08'N, 78°00'W (96). Quad 8. Georgia: Half
 Moon River adjacent Cabbage" Island, 31 57.5'N, 80 58.5'W (171); Wassaw (37);
Chatham Co., Ossabaw Island (37, 186); Liberty Co., St. Catherine's Island (176);
 McIntosh Co., Sapelo Island (41); McIntosh Co., Sapelo Island, Nannygoat Beach
 (37, 186); Sapelo Island (206); McIntosh Co., near Dane Creek, Sapelo Island,
 (47); McIntosh Co., Atlantic side of Blackbeard Island
 (41, 47); McIntosh Co., Blackboard Island (41, 47, 186); McIntosh Co., Blackboard
 Island (206); Doboy Sound, NE branch Duplin River (77); McIntosh Co., Wolf Island
 (41, 206); St. Simons (37); Glynn Co., Jekyll Island (185); Glynn Co., Jekyll
 Island (41, 185); Camden Co., Cumberland Island, 30°57'N, 81°25'W (172); Cumberland
 Islands, 30°56'00", 81°24'15"W (171); Cumberland Islands, 30°54'N, 81°25'W (170);
 Cumberland Island, 30°53'15"N, 81°24'45"W (171); Cumberland Islands, 30°50'N,
 81°26'W (170); Cumberland Islands, 30°43'N, 81°30'W (171); Camden Co., Cumberland
 Island, 30°43'N, 81°27'W (170); Little Cumberland (186); Cumberland Islands (186);
 Florida: Fernandina Beach, 30°40'N, 81°26'W (171); Fernandina Beach (37); Mayport,
 30°13'N, 81°23'W (170); Mayport (37); Jacksonville (206); Volusia Co., Live Oak
 Point, intercostal waterway; 30°19'N, 82°59'W (170); 6.5 km S Mickler's Beach,
 approx. 30°15'N, 81°25'W (170). Quad 12. Florida: St. John's Co., 1.5 km N

Crescent Beach boat ramp (171); St. John's Co., between Crescent beach and St. Augustine (37); Augustine Beach (85); St. John's Co., St. Augustine Beach (85); Volusia Co., Ponce de Leon Inlet, near St. Augustine (170); N St. Augustine Inlet, St. Augustine, 29°54'N, 81°19'W (168); St. John's Co., Summer Haven Beach (85); 40 mi offshore St. Augustine (29); Flagler Co., Marineland Beach (85); Flagler Co., Marineland (92, 104); St. Augustine Beach, 29°50'N, 81°16'W (170); Marineland (185); Flagler co., Marineland (185); Marineland (187); St. John's Island, Anastasia State Park (85); Anastasia Park, 29°50'N, 81°17'W (171); area between St. Augustine and New Smyrna Beach (43); Putnam Co., St. John's River, Shands Bridge at Green Cove Springs (103); St. John's Co., Ft. Matanzas Inlet (185); St. John's Co., Matanzas River (185); Putnam Co., bridge across St. John's River at Palatka, 29°20'N, 81°20'W (103, 104); Flagler Beach (37); 2 mi S Flagler Beach (37); Ormond Beach (37); Daytona Beach shores, 29°11'N, 81°01'W (170); Daytona Beach (85); Brevard co., New Smyrna Beach, 29°02'N, 80°55'W (171); New Smyrna Beach (37); small island in Indian River near New Smyrna (85); Indian River (206); Oak Hill, 28°52'N, 80°52'W (168); Haulover Canal, 28°44'N, 80°46'W (170); Brevard Co., Canaveral National Seashore, 28°45'N, 80°36'W (169); Brevard Co., Titusville Marina Park, 28°39'N, 80°49'W (170); Brevard Co., Titusville, Indian River, 28°38'N, 80°47'W (171); Merritt Island Wildlife Refuge, 28°38'N, 80°45'W (170); 1.5 km W FMP station, Titusville, 28°37.8'N, 80°48.5'W (171); Brevard Co., Indian River near Titusville (172); Canaveral, 28°44'N, 80°50'W (87); Canaveral, 28°42'N, 80°49'W (87); Canaveral, 28°39'N, 80°48'W (87); Canaveral, 28°38'N, 80°48'W (87); Canaveral, 28°36'N, 80°47'W (87); Canaveral, 28°36'N, 80°47'W (87); Canaveral, 28°36'N, 80°45'W (87); Canaveral, 28°36'N, 80°44'W (87); Canaveral, 28°36'N, 80°44'W (87); Canaveral, 28°34'N, 80°44'W (87); Canaveral, 28°33'N, 80°48'W (87); Canaveral, 28°33'N, 80°47'W (87); Canaveral, 28°33'N, 80°46'W (87); Canaveral, 28°33'N, 80°45'W (87); Canaveral, 28°33'N, 80°44'W (87); Canaveral, 28°31'N, 80°45'W (87); Canaveral,

28°29'N, 80°45'W (87); Canaveral, 28°28'N, 80°45'W (87); Canaveral, 28°31'N,
 80°44'W (87); Canaveral, 28°26'N, 80°46'W (87); Canaveral, 28°26'N, 80°45'W (87);
 Canaveral, 28°26'N, 80°45'W (87); Canaveral, 28°26'N, 80°44'W (87); Canaveral,
 28°34'N, 80°36'W (87); Canaveral, 28°31'N, 80°36'W (87); Merritt Island, 28°30'N,
 80°30'W (170); Canaveral, 28°29'N, 80°36'W (87); 1710 Banana River Drive, 28°20'N,
 80°45'W (171); Canaveral, 28°28'N, 80°38'W (87); Brevard Co., Ft. Sharpes, 28°26'N,
 80°46'W (170); Canaveral, 28°21'N, 80°43'W (87); Merritt Island, 28°8.5'N, 80°36.5'W
 (87); Canaveral, 28°26'N, 80°37'W (87); Canaveral, 28°24'N, 80°38'W (87); Canaveral,
 28°21'N, 80°38'W (37); Canaveral, 28°21'N, 80°38'W (87); Canaveral, 28°21'N,
 80°37'W (87); Canaveral, 28°19'N, 80°39'W (87); Cocoa Beach, 28°25'N, 80°44'W (170);
 Cape Canaveral, Jetty Park 28°24'N, 80°36'W (170); Cape Kennedy, 28°24'N, 80°36'W
 (168); Kaiwanis Island, 28°23'N, 80°41'W (170); N end first island NW Rte. 528, bridge
 over Banana River, 28°22'N, 80°47'W (170); Cocoa Beach, 28°22'N, 80°43'W (170);
 Cocoa Beach, Banana River, 28°22'N, 80°40'W (170); Cocoa Beach, 28°19'N, 80°36'W
 (169); Cocoa Beach 28°19'N, 80°36'W (169); Cocoa Beach, Sykes Creek, 28°19'N,
 80°36'W (169); Cape Canaveral (37); Brevard Co., Indian River, intercostal
 waterway, 28°39'N, 80°49'W (171); Merritt Island, S. Cocoa Beach, 28°30'N, 80°30'W
 (169); Merritt Island, S Cocoa Beach, 28°30'N, 80°30'W (169); Brevard Co., 28°20'N,
 80°43'W (170); Brevard Co., Indian River, S Pineda Causeway, 28°12'N, 80°39.5'W
 (171); Brevard co., Indiatlantic, 28°06'N, 80°34'W (170); Indiatlantic, 28°05'N,
 80°36'W (170); Melbourne, 28°04'N, 80°38'W (169); Melbourne Beach, 28°04'N, 80°33'W
 (169); Brevard -co., Melbourne Beach (85); Canaveral, 28°17'N, 80°40'W (87); Canaveral,
 28°16'N, 80°40'W (87); Canaveral, 28°16'N, 80°39'W (87); Canaveral, 28°16'N, 80°37'W
 (87); Canaveral, 28°14'N, 80°38'W (87); Canaveral, 28°13'N, 80°38'W (87); Canaveral,
 28°11'N, 80°38'W (87); Canaveral, 28°11'N, 80°37'W (87); Canaveral, 28°10'N, 80°37'W
 (87); Indian River (187); Cape Kennedy, 29°09'N, 80°36'W (87); Cape Kennedy, 28°04'N,
 80°34'W (87); Cape Kennedy, 28°02'N, 80°33'W (87); Cape Kennedy, 28°02'N, 80°33'W

(87); Cape Kennedy, 28°02'N, 80°33'W (87). Quad 16. Florida: Brevard Co., Palm Bay, 28°25'N, 80°35'W (170); Cape Kennedy, 28°02'N, 80°33'W (87); Cape Kennedy, 27°57'N, 80°29'W (87); Cape Kennedy, 27°51'N, 80°29'W (87); Cape Kennedy, 25°51'N, 80°27'W (87); Brevard Co., 12 mi S Melbourne Beach (85, 185); Grant, 27°56'N, 80°43'W (170); Indian River Co., Inlet Marina, Sebastian, 27°51'N, 80°30'W (172); Sebastian Inlet, 25°50'N, 80°29'W (169); Cape Kennedy, 27°44'N, 80°25'W (87); Sebastian (187); Sebastian (187); Vero Beach, 27°38'N, 80°22'W (170); Cape Kennedy, 27°32'N, 80°15'W (87); Cape Kennedy, 27°28'N, 80°16'W (87); Cape Kennedy, 27°28'N, 80°16'W (87); Cape Kennedy, 27°24'N, 80°11'W (87); Cape Kennedy, 27°21'N, 80°10'W (87); Port Salerno, 27°08'N, 80°13'W (170); Jupiter, 26°57'N, 80°08'W (170); Jupiter, 26°57'N, 80°08'W (170); Lee Co., Ft. Myers Beach, 26°27'N, 81°55'W (171); Lee Co., Ft. Myers Beach (85); Lee Co., Ft. Myers Beach (74, 104): Gulf of Mexico: Naples Study Area, 25°59'00"N, 82°02'4"W (208); Gulf of Mexico: Naples Study Area, 25°59'0"N, 81°49'25" (208); Gulf of Mexico: Naples Study Area, 25°53'1"N, 81°43'2"W (208). Quad 20. Alabama: Mobile Bay" (93); Mississippi: 5 km E Edgewater, 30°25'N, 89°55'W (171); Biloxi, 30°24'N, 88°55'W (170); Biloxi (93): Harrison Co., Biloxi Beach, 30°22'N, 89°05'W (170); Biloxi Bay (93); Biloxi Bay, Mississippi Sound (191): Ocean Springs, Front Beach, 30°25'N, 88°50'W (169); Harrison Co., Gulfport, 30°23'N, 89°03'W (171); Harrison Co., Gulfport, Naval Retirement Home, 30°23'N, 89°03'W (171); Harrison Co., Gulfport, 30°22'N, 89°05'W (170); Gulfport, 30°21'N, 89°05'W (48); Gulfport (93); Gulfport (93); Gulfport (48); Gulfport (206); Harrison Co., Gulfport, 30°21'N, 89°3.5'W (170); Harrison co., Gulfport, 30°21'N, 89°08'W (171); Gulfport, Shrimpboat Harbor, 30°21'N, 89°06'W (171); Henderson Point, Pass Christian, 30°20'N, 89°15'W (169); Pass Christian, 30°20'N, 89°15'W (169); Pass Christian Yacht Harbor, Pass Christian, 30°19'00"N, 89°15'05"W (171); Harrison co., Pass Christian, 30°19'N, 89°15'W (170); Louis, approx. 135 m off American Legion Pier, Bay St., 30°18'05"N,

89°19'05'W(171); Pass Christian (86); N. Beach, Horn Island, 30°15'N, 88°40'W
 (170); South Beach, Louis, Bay St. , 30°20'N, 89°20'W (171); S Beach, West
 Point Island, approx. 30°14'N, 88°39'W (170); 30°16'N, 88°19'W (175); Jackson
 co., Pascagoula, 30°20'N, 88°10'W (170); Ship Island (93); Ship Island (93);
 Ship Island (93); Ship Island, 30°17'N, 88°56'W (168); Ship Island, 30°14'N, 88°
 56'W (170); Ship Island, 30°14'N, 88°56'W (170); Ship Island, 30°14'N, 88°56'W,
 (170); Ship Island, 30°14'N, 88°56'W (170); Ship Island, 20°14'N, 88°56'W (170);
 S Beach, Ship Island, 30°14'N, 88°56'W (169); N beach Ship Island, 30°14'N,
 88°56'W (171); W. Ship Island (171); Ship Island (168); Ship Island, 30°13'N,
 88°55'W (170); Harrison Co., Ship Island (200); N shore Horn Island, 30°15'N,
 88°40'W (170); N shore Horn Island, 30°15'N, 88°40'W (170); S beach, Horn Island,
 Gulf Island National Seashore, 30°13'N, 88°40'W (169); Mississippi Sound, 1.6
 km off Horn Island, 30°13'N, 88°40'W (169); N beach, Horn Island, Gulf Island
 National Seashore, 30°13'N, 88°40'W (169); N beach Horn Island, 30°13'N, 88°40'W,
 (171); Horn Island (93); Horn Island, 30°13'N, 88°40'W (168); W end Horn Island,
 (91); petit Bois Island, Gulf Island National Seashore, 30°12'N, 88°26'W (171);
 Alabama: W end Dauphin Island, 30°15'N, 88°10'W (169); Dauphin Island, 31°15'N,
 88°10'W (168); Dauphin Island, 31°15'N, 88°10'W (168); Dauphin Island (93): Sand
 Island, N Dauphin Island, 30°15'N, 88°10'W (169); Cat Island, Mississippi Sound,
 30°10'N, 89°06'W (86); 30°02'N, 88°28'W (175). Quad 21. Florida: Gamier's Bay (93):
 Choctawatchee River, Ft. Walton Beach, 30°25'N, 86°38'W (170); Gulfarium, Ft.
 Walton Beach (40); Gulfarium, Ft. Walton Beach (48); .25 mi off beach, Mary Ester
 (137); Destin (137); East Pass, Destin (48): East Pass, Destin (206); 30°20'N,
 87°15'W (175); Alabama: Ft. Morgan Beach, Gulf Shores, 30°15'N, 87°55'W (171);
 Romer Beach, Gulf Shores, 30°15'N, 87°45'W (171); 30°13'N, 88°00'W (175); 30°02'N,
 88°00'W (175). Quad 22. Florida: Wakulla Co., St. Mark's National Wildlife
 Refuge (85). Quad 24. Texas: Victoria Co., Victoria (130); Calhoun Co.,

Indianole Beach, Port Lavaca (194); Matagorda Co., 3 mi W Palacios (131); San Antonio Bay (63); Calhoun Co., 3 mi S Coast Guard Station, Port O'Connor (131); Goose Island, 28°08'N, 96°59'W (169); Goose Island, 28°08'N, 96°59'W (169); Aransas Co., Aransas Bay (63); Aransas Co., Aransas Refuge (130); Aransas Co., St. Charley Bay (63); Matagorda Island, 28°01'N, 97°54'W (171); Calhoun Co., Matagorda Island, Matagorda Air Force Base (131); Aransas Co., Copano Bay near Hwy 35 Causeway (199); Aransas Co., 2 mi NNE Fulton (130); Gulf of Mexico: Corpus Christi Study Area, 28°10'5"N, 96°36'6"W (208); Gulf of Mexico: Corpus Christi Study Area, 28°06'8"N, 96°34'5"W (208); Rockport (29). Quad 25. Texas: Jefferson Co., 13 mi N High Island (131); Chambers Co., between Gilchrist and High Island (131); Galveston Co., 2 mi S High Island (130); Crystal Beach, 29°25'N, 94°35'W (169); Galveston Co., Stewart Beach, Galveston (131); Galveston Co., Galveston Island, 7 mi W Galveston (130); Brazoria Co., Quintana, mouth of Brazos River (130); 28°15'N, 95°30'W (175); Gulf of Mexico: Corpus Christi Study Area, 27°59'9"N, 95°58'0"W (208). Quad 26. Texas: Port Arthur, 29°54'N, 93°56'W (168); Port Arthur, McFaddens Beach (206); Louisiana: Cameron Parish, 3 mi W Holly Beach (90); Cameron Parish, 2.5 mi W Holly Beach (201); Cameron Parish, 1.5 mi W Holly Beach (201); Cameron Parish, 1 mi W Holly Beach (90); Cameron Parish, 4 mi W Holly beach (90); Cameron Parish, 2 mi S Cameron (90); Cameron Parish, E Jetty Beach (90, 91, 201); Cameron Parish, E Jetty (90, 181, 191); Cameron Parish, .25 mi E E. Jetty (90); Cameron Parish, 4 mi SW Creole (90); Cameron Parish, 10 mi W Sabine Pass (192); Texas: Jefferson Co., 9 mi W Sabine Pass, Sea Rim State park (131); Jefferson Co., .75 mi W Sea Rim State Park, Sabine Pass (131); Jefferson Co., Sea Rim State Park (131); Jefferson Co., 24 mi N High Island (131); Louisiana: St. Mary Parish, Cypremont Point (90); Southwest Pass between Marsh Island and the Mainland

connecting Vermilion Bay and the Gulf (66, 90); Cameron Parish, Rockefeller Refuge Beach '(191); Cameron Parish, St. Joe Harbor, Rockefeller Refuge (201); Cameron Parish, 1 mi E Joseph's Harbor Bayou, Rockefeller Refuge (201); Vermilion parish, 1 mi E Cheniere an Tigre (90, 201); Vermilion parish, 3 mi E Cheniere an Tigre (90, 201); Cameron Parish, 17 mi S, 12 mi W Holly Beach (90, 192). Quad 27. Louisiana: Canal Street Ferry, New Orleans (90); Thivodeaux near N. Atlantic (206); Caminada Bay, 29°40'N, 90°00'W (86); Jefferson Parish, Grande Isle (90, 191); Jefferson Parish, Caminada Bay, Bayou St. Honore (90, 191); Terrebonne Parish, Timbalier Isle (90, 191) ; 28°45'N, 90°45'W (175); 28°37'N, 90°58'W (175); 28°33'N, 91°30'W (175); 28°08'N, 91°06'W (175). Quad 28. Louisiana: Meraux, Velou Chalmette, 29°55'N, 89°55'W (90); Mississippi: Chandeleur Island (93); 29°50'N, 38°14'W (175); 29°45'N, 88°00'W (175); Point a la Hache (90, 191); Louisiana: Plaquemines Parish, Telegraph Point, Breton Sound (90); 29°28'N, 89°15'W (175); 29°35'N, 88°06'W (175); 29°19'N, 88°36'W (175); Grand Isle, 29°14'N, 90°00'W (168); 29°08'N, 89°02'W (175); 29°15'N, 88°45'W (175); 29°12'N, 88°35'W (175); 29°05'N, 89°55'W (175); Plaquemines parish, port Eads (90); 29°05'N, 89°55'W (175); 28°25'N, 89°48'W (175). Quad 29. 29°43'N, 87°35'W (175); 29°44'N, 86°57'W (175); 29°09'N, 87°55'W (175). Quad 30. Florida: Franklin Co., St. George Island (85, 185); St. George Island (185); 29°10'N, 85°55'W (175); 28°57'N, 85°18'W (175). Quad 31. Florida: Levy Co., Deer Island near Cedar Key (85); Lew Co., Atsena Otie Key at Cedar Key (85); Levy Co., Cedar Key (85); Levy CO., Cedar Key (85); Levy Co., 'Cedar Key' (24); Levy Co., Cedar Key (206); Levy Co., Cedar Key (206); region between Steinhatchee and Cedar' Key (43); Hornosassa River (206); Gulf of Mexico: . Clearwater Study Area, 27°59'N, 83°32'W (208). Quad 32. Texas: St. Charles: Bay Area near Rockport (131); Aransas Co., Fulton Beach Road, 2 mi S Rockport (131); Gulf of Mexico: Corpus Christi Study Area, 27°51'7"N, 96°55'5"W (208); Aransas Co., San Jose Island, 28°05'??, 98°50'W (171);

St. Joseph Island (130); St. Joseph Island (134, 135); Aransas Pass, St. Joseph Island, 27°55'N, 97°10'W (169); Nueces Co., ferry crossing at Port Aransas (131); intercostal waterway, Aransas Pass (135, 135); Corpus Christi Bay (34); Corpus Christi Bay, 1.1 km S Caye del Oso Bridge (134); Nueces Co., Corpus Christi (184); Nueces Co., Port Aransas, National Marine Science Institute (131); Nueces Co., Port Aransas, National Marine Science Institute (131); Nueces Co., Port Aransas, 27°50'N, 97°05'W (169); Port Aransas (204); Lydia Ann Channel (134, 135); Mustang Island (134, 135); Mustang Island (134); Mustang Island (204); Gulf of Mexico: Corpus Christi Study Area, 27°42'6"N, 96°57'27"W (208); Nueces County Park, Padre Island, 27°34'N, 97°15'W (169); Nueces County Park, padre Island (134); Kleberg Co., 5 mi S National Park Service Malaquite Beach Ranger Station, Padre Island National Seashore (131); Padre Island National Seashore (168); Gulf of Mexico: Corpus Christi Study Area, 28°05'5"N, 96°24'1"W (208); Gulf of Mexico: Corpus Christi Study Area, 27°30'5"N, 96°16'4"W (208); Padre Island, 65.5 km S Corpus Christi, 27°47'N, 97°26'W (171); Gulf of Mexico: Corpus Christi Study Area, 27°03'8"N, 96°54'6"W (208); Gulf of Mexico: Brownsville Study Area, 26°50'0"N, 97°22'3"W (208); Gulf of Mexico: Corpus Christi Study Area, 26°42'0"N, 97°06'8"W (208); Gulf of Mexico: Brownsville Study Area, 26°40'0"N, 96°40'3"W (208); 5 mi N Mansfield Channel, Padre Island, Big Shell (134); Brazes Santiago Island (63); Gulf of Mexico: Corpus Christi Study Area, 26°22'1"N, 96°58'2"W (208); Gulf of Mexico: Corpus Christi Study Area, 26°22'1"N, 96°58'2"W (208); Gulf of Mexico: Corpus Christi Study Area, 26°12'0"N, 96°41'1"W (208); Gulf of Mexico: Brownsville Study Area, 26°10'0"N, 97°06'9" (208); Gulf of Mexico: Brownsville Study Area, 26°04'0"N, 97°06'5"W (208); Cameron Co., Port Isabel (139, 188).

Quad 33. 27°58'N, 94°09'W (175); 27°55'N, 94°10'W (175); 27°56'N, 97°57'W (175); Gulf of Mexico: Corpus Christi Study Area, 28°14'4"N, 96°09'1"W (208); Gulf of Mexico: Corpus Christi Study Area, 28°08'0"N, 95°49'9"W (208); Gulf of Mexico:

Corpus Christi Study Area, 28°05'5", 95°42'7" (208); 27°56'N, 95°33'W (175);
 Gulf of Mexico: Corpus Christi Study Area, 27°47'2"N, 96°12'9"W (208); Gulf of
 Mexico: Corpus Christi Study Area, 27°39'7", 94°27'4" (208); Gulf of
 Mexico: Corpus Christi Study Area, 28°04'6"N, 95°48'7"W (208). Quad 34. 27°58'N,
 93°22'W (175); 27°55'N, 92°25'W (175). Quad 36. 27°00'N, 88°55'W (175). Quad
39. Florida: Pinellas Co., Dunedin, Honeymoon Island (185, 206); Gulf of Mexico:
 Clearwater Study Area, 27°49'0"N, 83°53'9"W (208); Gulf of Mexico: Clearwater
 Study Area, 27°46'9"N, 83°44'9"W (208); Pinellas Co., Safety Harbor, 1 mi NE Old
 Tampa Bay (185); Gulf of Mexico: Clearwater Study Area, 27°37'0"N, 83°22'3"W
 (208); Gulf of Mexico: Clearwater Study Area, 27°46'0"N, 83°00'0"W (208):
 Tampa Bay (104, 206); Old Tampa Bay, W end Howard Frankland Causeway (85); Gulf
 of Mexico: Clearwater Study Area, 27°36'0"N, 82°46'5"W (208); Gulf of Mexico:
 Clearwater Study Area, 27°9'0"N, 82°35'5"W (208); Pinellas Co., John's Pass,
 about 2 mi SE Madeira Beach (85); Gulf of Mexico: Clearwater Study Area, 27°39'0"N,
 82°46'2"W (208); Gulf of Mexico: Clearwater Study Area, 27°37'0"N, 82°45'4"W
 (208); Pinellas Co., near John's Pass, St. Petersburg (85); Gulf of Mexico:
 Clearwater Study Area, 27°41'8"N, 82°44'4"W (208); Gulf of Mexico: Clearwater
 Study Area, 27°39'0"N, 82°42'5"W (208); Ft. DeSoto Beach near St. Petersburg,
 27°42'N, 82°45'W (169); N end Egmont Key at mouth Tampa Bay (85); Bird Island,
 Tampa Bay (206); Manatee Co., Manatee River, Bradenton (85); Manatee Co., Bradenton
 Beach (85); Gulf of Mexico: Clearwater Study Area, 27°23'N 82°44'W (208); Gulf
 of Mexico: Clearwater Study Area, 27°19'0"N, 82°35'5"W (208); "Gulf of Mexico:
 Clearwater Study Area, 27°13'0"N, 84°02'4"W (208); Flagler Co., Marineland (185);
 Gulf of Mexico: Clearwater Study Area, 27°22'3"N, 82°38'0"W (208): Gulf of Mexico:
 Clearwater Study Area, 27°20'0"N, 82°36'3"W (208); Gulf of Mexico: Clearwater
 Study Area, 27°20'3"N, 82°36'6"W (208); Gulf of Mexico: Clearwater Study Area,
 27°12'0"N, 82°32'5"W (208); Gulf of Mexico: Clearwater Study Area, 27°12'0"N,

82°32'5"W (208); Gulf of Mexico: Clearwater Study Area, 27°13'0"N, 83°08'4"W
 (208); Gulf of Mexico: Clearwater Study Area, 27°07'2"N, 83°11'7"W (208);
 Louisiana: Isla an Pitre, Mississippi Sound, 30°08'N, 89°13'W (86); Gulf of
 Mexico: ClearWater Study Area, 27°25'7"N, 82°41'6"W (208); Ft. Myers, S Ft.
 Myers Beach, 20°39'N, 81°52'W (168); Lee Co., Calooschatchee River at Ft. Myers
 (85); Lee Co., Punta Rassa, mouth of Caloosahatchee River (74, 104); Lee Co.,
 Ft. Myers (185); Lee Co., Captiva Island (85); Lee Co., Sanibel Island (85);
 Sanibel Island (104). Quad 40. Gulf of Mexico: Corpus Christi Study Area,
 28°36'0"N, 96°26'6"W (208); Gulf of Mexico: Brownsville Study Area, 26°04'0"N,
 96°35'6"W (208); Gulf of Mexico, Brownsville Study Area, 26°04'0"N, 96°35'6"W
 (208) .Quad 45. 25°00'N, 88°00'W (175). Quad 46. 25°12'N, 84°05'W (175).
Quad 47. Gulf of Mexico: Naples Study Area, 26°07'0"N, 82°27'0"W (208); Gulf
 of Mexico: Naples Study Area, 25°37'N, 82°57'W (208); Gulf of Mexico: Naples
 Study Area, 25°53'N, 82°40'W (208); Gulf of Mexico: Naples Study Area, 25°37'0"N,
 82°01'3"W (208); Gulf of Mexico: Naples Study Area, 25°13'0"N, 82°49'1"W (208);
 24°59'N, 83°35'W (175); Dry Tortugas, 7 mi NW Rebecca Shoal light (130); Dry
 Tortugas, 3 mi N Rebecca Shoal light (130); between Dry Tortugas and Key West,
 halfway between Rebecca Shoal light and Marquessas (104); Dry Tortugas between
 Loggerhead Key and Garden Key, 24°20'N, 82°50'W (104); Dry Tortugas, harbor at
 Garden Key (104). Quad 48. Florida: Collier, Marco Beach (185); Dade Co.,
 Miami Beach (180); Nante Lake, N Miami (104); Gulf of Mexico: Naples Study Area,
 25°47'0"N, 81°48'5"W (208)-; Dade Co., S Miami Beach, 25°47'N, 80°08'W (170);
 Dade Co., Miami Beach, 25°46.7'N, 80°7.9'W (170, 172); Biscayne Bay, 25°46'N,
 80°10'W (169); Biscayne Bay, "Indian Creek (206); Miami vicinity (184); 11 mi E
 Miami Harbor entrance (104); Gulf of Mexico: Naples Study Area, 25°32'3"N, 81°
 42'7"W (208); Gulf of Mexico: Naples Study Area, 25°29'4"N, 81°44'5"W (208);
 Biscayne Bay, near Key Biscayne and Virginia Key, 25°44'N, 80°00'W (169); Gulf

of Mexico: Naples Study Area, 25°39'0"N, 81°45'6"W (208); Gulf of Mexico: Naples Study Area, 25°39' 0"N, 81°43'4"W (208); Dade Co., Miami Beach, 25°38.5'N, 80°9.7'W (170, 172); Gulf of Mexico: Naples Study Area, 25°33'0"N, 81°46' 8"W (208); Biscayne Bay (104); Biscayne Bay (104); Everglades National Park (104); Everglades National Park, Whitewater Bay, between East Cape Sable and Lostman's River (104); 25°17'N, 80°59'W (105); North River (187); Gulf of Mexico: Naples Study Area, 25°17'0"N, 82°02'6"W (208); Madeira Bay, N portion Florida Bay, approx. 25°17'N, 80°30'W (170); Everglades National Park (116); beach Cape Sable (85); Cape Sable (85); Florida Bay Coast (183); Florida Bay, Whipray Channel, Whipray Basin (104); Florida Bay (85): Florida Bay (104); Monroe Co., offshore from Grassy Key, 24°40'N, 80°55'W (171); Monroe Co., Big Pine Key, 24°41'N, 81°21'W (170); Big Pine Key (206); Big Pine Key (206); Monroe Co., Coco Plum Area, Marathon, 24°44'N, 81°00'W (170); Monroe Co., Key Colony Beach, 24°43'N, 81°01'W (170); Monroe Co., Key West (85); between Dry Tortugas and Key West, 5 mi SW Key West (104) 9' Quad 56. 22°25'N, 88°45'W (175). Not Plotted. North Carolina: no specific locality (41, 61) ; South Carolina: no specific locality (61, 179); no specific locality (61, 179); Georgia: Chatham Co., Turner's Creek (41); Florida: Broward Beach, State Recreation Area (168); no specific locality (184); near Marine Studios (185); Dade Co., Maul Lake, E coast (185); no specific locality (206); no specific locality (187); Mississippi: Belle Fontaine Beach. (191); Louisiana: Cameron Parish, Rutherford Beach (90, 91); no specific locality (176); Vermilion Parish, E mount Freshwater Bayou (201); Cuban Waters: no specific locality (1, 50).

Grampus griseus (G. Cuvier 1812)

Grampus

Other Common Names. - Risso's dolphin.

Other Scientific Names. - none.

Description and Identification. - Adult grampus have a robust body and are about 13 feet (4 m) long. A beak is lacking, and the front of the head rises vertically from the tip of the upper jaw. The head is blunt and marked on the front by a V-shaped crease which divides the melon into two parts. Coloration varies with age, but adults are usually slaty or black above, tinged with blue or purple, and lighter beneath; the fins and tail are black (Walker 1975). The body of older adults is covered by numerous whitish scars which are thought to represent healed scars from attacks by other Grampus and by squid. Characters useful for field identification include the blunt snout and the pale gleam of the back in front of the tall, pointed, distinctly falcate dorsal fin.

Distribution. - These dolphins are distributed worldwide in tropical to temperate seas and generally in water greater than 100 fathoms (183 m) (Mitchell 1975). In the western North Atlantic they have been reported from eastern Newfoundland south to the Lesser Antilles and in the Gulf of Mexico (Leatherwood et al. 1976). They have been recorded from North Carolina and Florida in the Atlantic portion of the study area and from three separate localities on the west coast of Florida in the Gulf of Mexico (Figure 25). They are not known from the central and western Gulf of Mexico.

Seasonal Movements. - A north-south, summer-winter migration has been suggested for the Northern Atlantic with the range limits north to Newfoundland and south to the Lesser Antilles, but this point is still in question (Mitchell 1975). No data are available for the study area. The few strandings that have occurred are spread over all seasons (Table 4).

Status and Abundance. - There are no population estimates available for the study area. Based on strandings these dolphins would appear to be rare. There are only 13 records from the study area and 11 of these are from

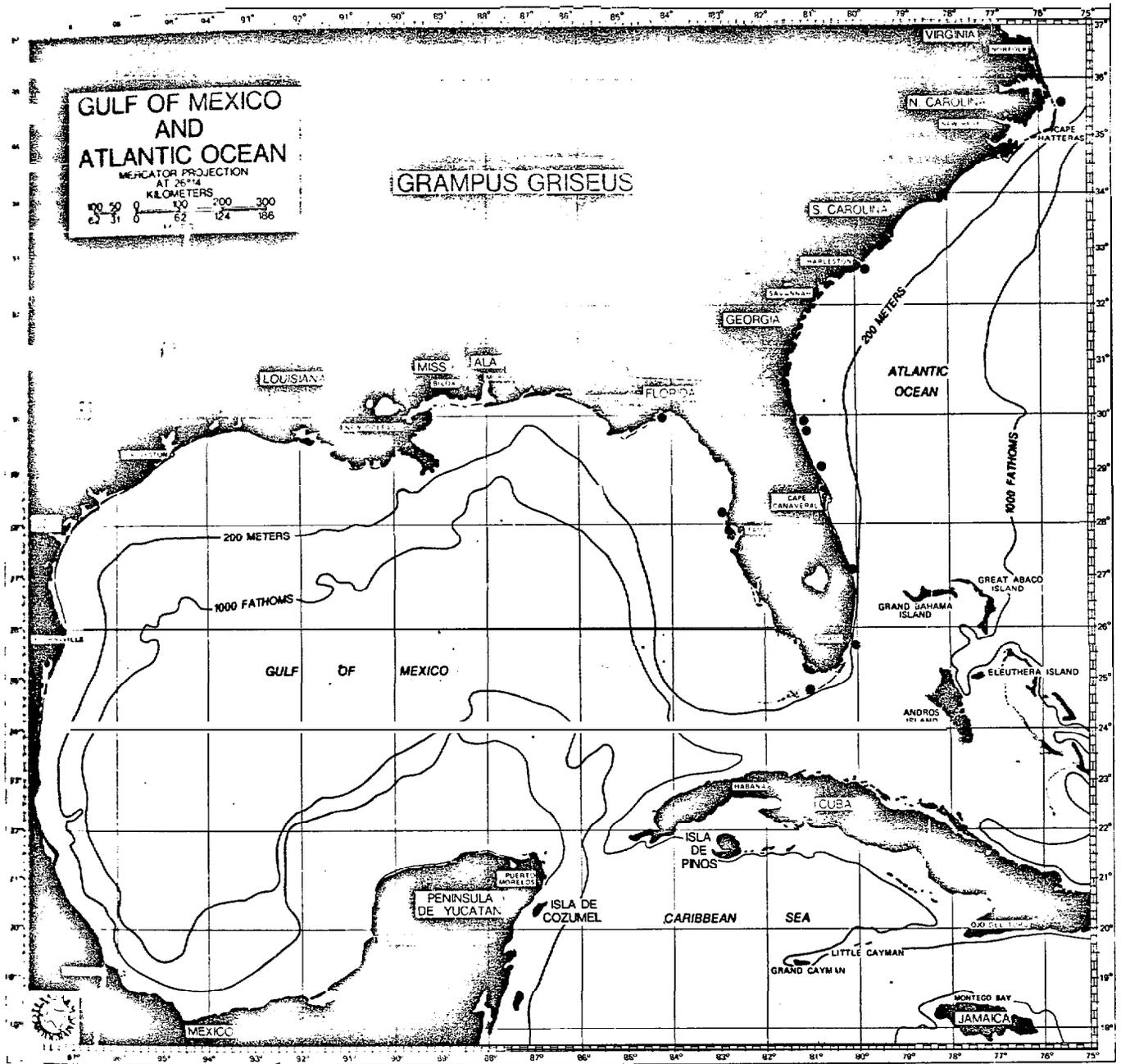


Figure 25. Distribution of grampus, *Grampus griseus*. See legend for Figure 1 and text for explanation of symbols.

Florida (8 from the east coast). However, they might not be as rare as the paucity of records suggests. Grampus generally have an oceanic range and, along the Atlantic Coast of North America, they may be distributed from the Gulf Stream seaward, which is outside the theater of normal boating traffic (Leatherwood et al. 1976). Populations appear to be stable everywhere and not endangered at the present time (Caldwell and Caldwell 1974).

Life History. - No data on life history parameters are available from the study area. The following information from other geographic areas is taken from Mitchell (1975). Males are sexually mature at lengths of 3 m or more. A pregnant female, with a "nearly full-term fetus, was noted in December (Walker 1975). These animals may live for at least 24 years. They feed primarily on cephalopods and fish. Grampus are found in herds of up to several hundred individuals and may be seen "porpoising," as they surface to breathe, and breaching. They sometimes ride bow waves (Leatherwood et al. 1976).

Records of Occurrence. - Quad 3. North Carolina: Pea Island National Wildlife Refuge (168, 206). Quad 5. South Carolina: Folly Island, near Charleston (61, 73, 179). Quad 12. Florida: St. John's Co., Vilano Beach (37, 168, 174, 185); vicinity of St. Augustine (43); near Crescent beach (117); New Smyrna Beach, 29°01'N, 80°56'W (168). Quad 16. Florida: Jupiter Island, 27°04'N, 80°09'W (169). Quad 22. Florida: mouth of Wakulla, Saint Marks Light (206). Quad 31. Florida: Pinellas Co., mouth Anclote River, Tarpon Springs (117). Quad 48. Florida: Key Biscayne, Cape Florida State Park, 25°42'N, 80°12'W (169); Marathon, Vaca Key, 24°43'N, 81°07'W (169).

Stenella frontalis (G. Cuvier 1829)

Bridled Dolphin

Other Common Names. - bridled porpoise, Cuvier's dolphin.

Other Scientific Names. - Prodelphinus froenatus, Stenella froenatus,
Stenella attenuata.

Description and Identification. - Bridled dolphins reach an **adult** length of about 7 feet (2.1 m). Their body coloration is dark gray on the back, grading to lighter gray on the sides and belly. Light grayish-white **spots** characteristically appear on the dorsal portions of the body and dark spots are evident on the light ventral surface (Leatherwood et al. 1976). Other distinctive features **include a cape**, or dark colored region on the top of the head, **and** the presence of dark **lines** which pass from the eye to the rostrum and from the flippers to the gape of the mouth. A black circle is evident around the eye with an extension to the **junction** of the rostrum and the melon (Leatherwood et al. 1976). This black circle, together with the dark stripe mentioned above, constitute the markings from which the species derives its common name, "bridled dolphin." The rostrum is black with white lips.

Distribution. - Bridled dolphins occur in the tropical waters of the Atlantic, Indian, and Pacific oceans. **In** the western North Atlantic, they have been reported from the Antilles, and from Florida north to North Carolina (Leatherwood et al. 1976). Apparently, this is an offshore species which prefers tropical **and** subtropical waters. It is known from throughout the study area, **but** nowhere is it **common** (Figure 26). **Schmidly** et al. (1972a) reported several stranded individuals along the Texas Coast, but these specimens have subsequently (Perrin et al. 1977) been referred to a different species (Stenella clymene). The only record from the western Gulf is of a stranded animal from Padre Island National Seashore which was reported in

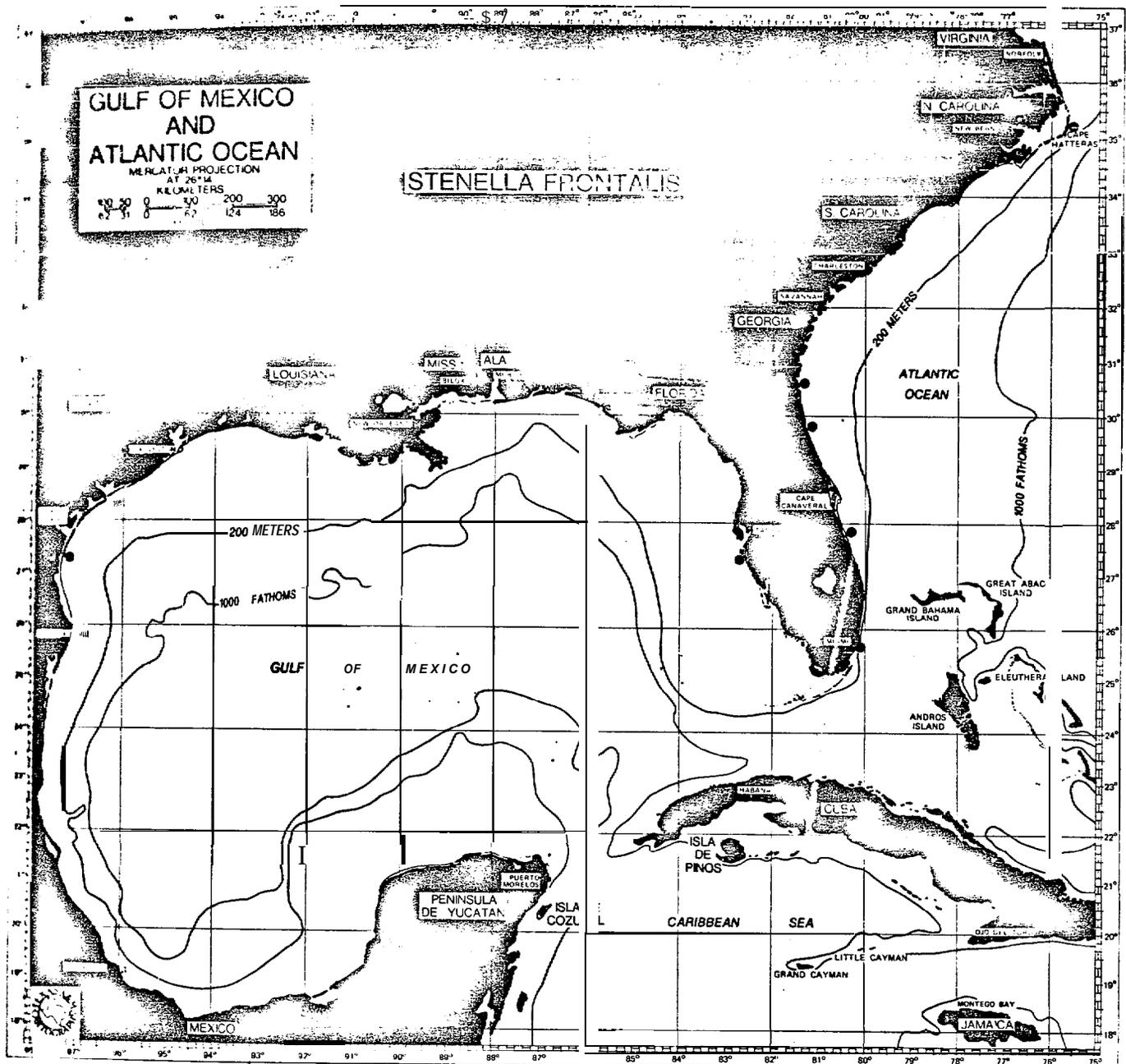


Figure 26. Distribution of the bridled dolphin, *Stenella frontalis*. See legend for Figure 1 and text for explanation of symbols.

SEAN Bulletin 2 (6; 1977). The identification of this specimen was not verified and, hence, the occurrence of this species in the western Gulf must be considered tentative. Similarly, the record from Cape Hatteras, North Carolina, appeared in SEAN Bulletin 3 (1; 1978), and the identification of this specimen has **not** been verified.

Seasonal Movements. - Data available from the study area are too meager to ascertain a definitive pattern. Strandings in the study area have occurred in January, May, September, and November (Table 4).

Status and Abundance. - Bridled dolphins usually occur in small herds of from 5 to 30 individuals (Leatherwood et al. 1976). No data are available concerning abundance of this species in the study area. **However**, there is no evidence that the populations in the study area are not stable or **that** they are endangered (Caldwell and Caldwell 1974).

Life History. - Virtually nothing is known of the life history of this species either in the study area or other geographic regions. In the West Indies, and presumably elsewhere, bridled dolphins feed on squid, fish and shrimp (Winn et al. 1979).

Records of Occurrence. - Quad 3. North Carolina: Cape Hatteras, 35°14'N, 75°34'W (170 as S. attenuate). Quad 8. Florida: Fernandina Beach, 30°37'N, 81°20'W (166). Quad 12. Florida: Crescent Beach, 29°50'N, 81°12'W (166). Quad 16. Florida: Indian River Co., Sebastian (3, 104). Quad 32. Texas: Little Shell, Padre Island National Seashore, 27°20'N, 97°30'W (169). Quad 39. Florida: near Sarasota Bay (36). Quad 48. Florida: Dada Co., Coconut Grove (3, 104, 206).

Stenella plagiodon (Cope 1866)

Atlantic Spotted Dolphin

Other Common Names. - spotted dolphin, spotted porpoise, spotter.

Other Scientific Names. - Prodelphinus doris, Prodelphinus plagiodon,
Stenella pernettyi.

Description and Identification. - Spotted dolphins reach a maximum adult length of between 7.5-8 feet (2.3-2.4 m). Compared to other species of Stenella they are generally more robust in body shape, and their dorsal fin is distinctly back-curved and pointed on the tip (Leatherwood et al. 1976). As the common name implies, spotted dolphins are dark purplish gray above, paler below, and specked with small spots of white on the dorsum; the ventor is densely spotted or blotched with gray (Lowery 1974). The extent of spotting and other details of coloration change with age, and immature animals lack spots completely (Caldwell and Caldwell 1966). These dolphins have a spinal blaze and a light line extending from the flipper to the eye. The lower jaws as well as the tips and edges of the upper jaws are white, which may aid in identification at sea (Leatherwood et al. 1976) .

Distribution. - Spotted dolphins are found in the Atlantic Ocean from New Jersey southward to the Gulf of Mexico and the mainland shores of the Caribbean Sea to Panama (Caldwell and Caldwell 1966). They occur throughout the study area (Figure 27). Numerous sightings at sea have been made in the Gulf of Mexico by personnel on U.-S. National Marine Fisheries Service research vessels. Caldwell (1955, 1960), Caldwell and Caldwell (1973), and Lowery (1974) have published these records which are included on the distribution map. Sutherland and May (1977) and Mercer (1973) have also made observations "of this dolphin off the Atlantic Coast along the western-edge of the Gulf Stream from North Carolina to Florida and these records are also plotted. During the NFWL-BLM aerial surveys, spotted dolphins were observed in the Brownsville and Corpus Christi study areas in August but not in November, and in the Clearwater, Florida, study area in November.

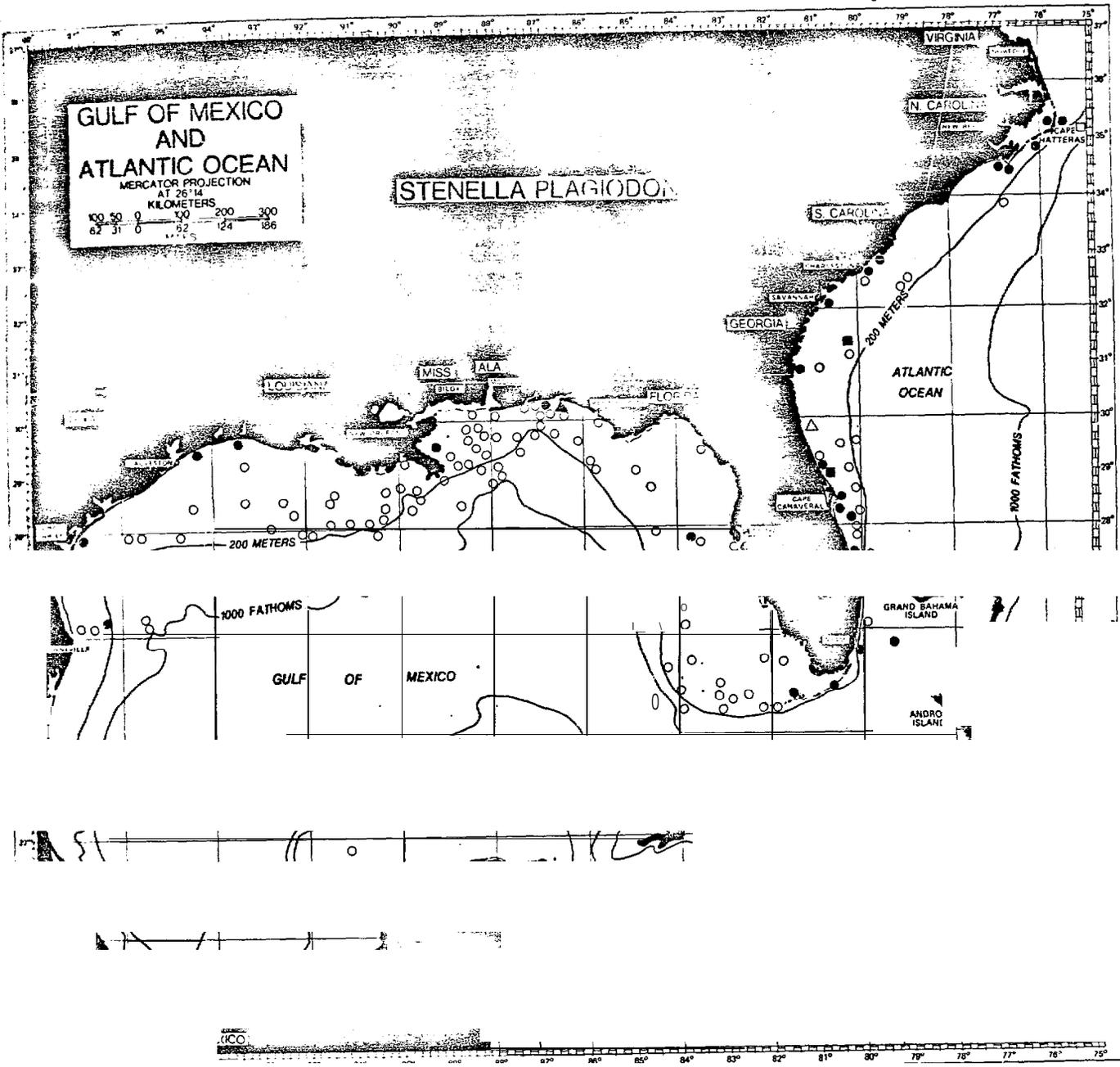


Figure 27. Distribution of the Atlantic spotted dolphin, *Stenella plagiodon*.

See legend for Figure 1 and text for explanation of symbols.

The available evidence suggests that spotted dolphins are primarily an offshore species (5 miles, 8.04 km, or more and about 5 fathoms, 9.15 m, or more) in the Gulf of Mexico and elsewhere in their range (Caldwell 1960, Caldwell and Caldwell 1966). They are typically replaced inshore of these general points by Tursiops. Observations in the study area (shown in Figure 27) are most common from the shoreline to the 200 m curve; a few records are known between the 200 m and 1000 fathom (1,830 m) curves, but there are very few sightings outside of the 1000 fathom (1,830 m) curve (Figure 27). Although they inhabit offshore waters at distances greater than about five miles from the nearest land, there appears to be a general maximum limit to their distribution of about 150 to 200 miles (241.3-321.8 km), with a usual maximum of some 75 to 100 miles (120.6-160.9 km) (Caldwell and Caldwell 1966). Further evidence for a primarily offshore occurrence comes from the fact that there are so few stranding records of this species. Of the 206 records from the study area, only 23 (11%) represent verified stranding reports.

Seasonal Movements. - Spotted dolphins are thought to move inshore in the late spring and to approach close to shore during spring and summer (Caldwell and Caldwell 1966). This conclusion is based primarily on observations made by these authors and information they obtained from sport fishing captains in the vicinity of Destin and Fort Walton Beach, Florida. According to Caldwell and Caldwell (1966:5), "The Destin sport fishery captains were of the opinion that spotted dolphins are found all year round in that region offshore, but that the numbers markedly increase during the spring and summer months. This information, along with the especially noteworthy occurrence of the species close inshore in late spring, suggests corroboration for the suggestion by Moore (1953:132) that there is an annual migration by this species into the waters of northern Florida during the warmer months, or even in the

winter months when the water is unusually warm. " Data given to the **Caldwells** by Mr. Cliff Townsend, who collected spotted dolphins off St. Augustine for Marineland of Florida, indicate that the migration more likely is a matter of inshore-offshore movements in the same latitudes rather than an along shore migration between different latitudes. A commercial seine fisherman also indicated to the **Caldwells** that the arrival of spotted dolphins along the beach near Destin in May coincided with the late spring arrival of large numbers of "hardtail" fishes (Caranx crysos). However, while feeding could be considered as a motive for the movement inshore, this possible source of food may be coincidence rather than the reason for the movement by the dolphins into shallow waters (**Caldwell and Caldwell**, 1966). Whether similar movements occur and whether similar factors govern movements in other portions of the study area cannot be ascertained from the data at hand. Seasonal records of strandings and sightings are summarized in Table 4. Observations have been recorded in every month of the year, but they are notably scarce in October and February.

Status and Abundance. - No estimates of abundance are available, but the number of observations recorded suggests that spotted dolphins are probably the most common offshore species in the study area, although records of cetaceans from offshore are so poor that one cannot make this statement with certainty. All indications are that populations are stable and not endangered.

Life History. - Very little is known of life history parameters, and in particular reproduction, for spotted dolphins in the study area. Most of the following information is taken from **Caldwell and Caldwell** (1966). Young are born offshore and not brought close inshore by their parents until they are weaned. Young animals are included in schools that move close inshore in the late spring in Florida. An adult female captured on 10 May 1965 gave

birth to an unspotted calf on the same day which immediately died. Caldwell (1960) observed sexual behavior in several adult spotted dolphins in the western Gulf of Mexico, and one pair was actually seen copulating in July.

Spotted dolphins are believed to feed primarily on squid, but they have also been observed in Florida feeding on small fishes of the families Clupeidae (herrings), Engraulidae (anchovies), and somewhat farther offshore, on carangid fish of the genera Caranx, Decapterus, or Selar. In the western Gulf of Mexico, Caldwell (1955) reported a school of spotted dolphins feeding on the remains of a large squid probably killed by the school. Groups have also been seen following shrimp trawlers and feeding on trash fish thrown overboard, including squid (Doryteuthis plei), flounder (Syacium micrurum), and a mojara-like fish (Eucinostomus goula) (Moore 1953). Small fishes seem to usually be taken from the surface or epipelagic zones (Winn et al. 1979).

These dolphins occur in herds of up to 50 individuals, although smaller groups (6-10) are more common (Leatherwood et al. 1976). Spotted dolphins commonly ride the bow waves of moving vessels.

Records of Occurrence. - Quad 2. North Carolina: Beaufort, Shackleford Banks (196); Morehead City (176); Cape Lookout (176); SE coast of U.S., 33°02'N, 77°00'W, 33 m depth, 63 km offshore (142). Quad 3. North Carolina: Avon, 35°21'N, 75 30'W (170, 206); 2 km W Frisco Pier, Hatteras Island, 35°13'N, 75°40'W (170, 206); S. Diamond Shoals Lightship, Cape Hatteras (13, 41, 115); Cape Hatteras (14, 41); Cape Hatteras (29, 151 originally identified as Prodelphinus plagiodon, 206); Cape Hatteras (102); Cape Hatteras, 35°14'N, 75°33'W (206); Ocracoke, Hatteras Inlet, 35°11'N, 75°46'W (170, 206); Ocracoke, 35°11'N, 75°47'W (170, 206); Ocracoke, Hatteras Inlet, 35°11'N, 75°46'W (171, 206); Ocracoke, 35°06'N, 75°59'W (168, 206); Ocracoke, 35°06'N, 75°59'W (168); Portsmouth Island, oceanside (206). Quad 4. South Carolins: Hilton Head (94, 206). Quad 5, South Carolina: Bull's Bay (41, 61, 179); Charleston

(41, 61, 179); Charleston (101, 206); Charleston (187); 32°34' N, 79°03' W (175); Folly Island (61); SE coast of U.S., 32°19' N, 79°08' W, 45 m depth, 76 km offshore (142). Quad 8. 50 mi off Georgia coast, 80°15' N, 31°20' W (37, 41, 101, 206); 31°09' N, 80°10' W (175); SE coast of U.S., 30°59' N, 81°01' W, depth 18 m, 37 km offshore (142); SE coast of U.S., 30°58' N, 81°00' W, depth 20 m, 37 km offshore (142); Georgia: N outlet on Cumberland Island, 30°54' N, 81°25' W (170). Quad 12. Florida: 10 mi off coast, vicinity of St. Augustine (104); 12 mi off beach at St. Augustine (104); 20 km off St. Augustine (35); SE coast of U.S., 29°37' N, 80°30' W, depth 31 m, 61 km offshore (142); E St. Augustine, 29°41' N, 80°15' W, depth 91 m (96); Daytona Beach (37); Volusia Co., New Smyrna Beach, 29°01' N, 80°56' W (170); 2 mi outside Whistling Buoy off Cedar Key (104); 12 mi off beach at St. Augustine (104); SE coast of U.S., 29°12' N, 80°20' W, depth 38 m, 57 km offshore (142); SE coast of U.S., 28°48' N, 80°13' W (142); SE coast of U.S., 28°47' N, 80°12' W, depth 43 m, 44 km offshore (142); 28°43' N, 80°07' W (175); Florida: Brevard co., Port Canaveral, 28°24' N, 80°36' W (172); Port Canaveral, 28°22' N, 80°37' W (170); SE coast U.S., 28°15' N, 80°03' W, depth 57 m, 51 km offshore (142); 28°15' N, 80°12' W (175); SE coast of U.S., 28°07' N, 80°12' W, depth 32 m, 33 km offshore (142); 28°05' N, 80°01' W (175). Quad 16. SE coast of U.S., 27°51' N, 80°10' W, depth 29 m, 24 km offshore (142); SE coast of U.S., 27°51' N, 80°07' W, depth 33 m, 28 km offshore (142); SE coast of U.S., 27°50' N, 80°07' W, depth 40 m, 28 km offshore (142); Florida: 'Pierce Inlet, approx. 27°28' N, 80°19' W (170); Martin Co., Port Salerno, Manatee Marina (175); Riveria Beach (168); Broward Co., New River at Summerset Boat Works (175). Quad 17. Florida: E Ft. Pierce, 27°27' N, 79°53' W, depth 183 m (96). Quad 20. Gulf of Mexico, 30°05' N, 88°28' W, depth 10 fathoms, 7 mi to nearest land (26); 30°00' N, 88°00' W (175). Quad 21. Florida: off Destin (29);

beach vicinity of Destin (29); Crystal Beach pier, 5 mi E Destin (29); 10 km E Destin (35); Okaloosa Co., Eglin Air Force Base, 30°24' N, 86°43' W (169)"; Ft. Walton Beach (29); Escambia Co., Pensacola, 30°19' N, 87°12' W (29, 148 originally identified as P. doris, 151 originally identified as P. plagiodon); Pensacola (101, 206); 30°15' N, 87°20' W (175); 30°15' N, 87°20' W (175); 30°10' N, 86°30' W (175); 30°04' N, 86°56' W (175). Quad 22. Gulf of Mexico, 30°05' N, 85°46' W, depth 11 fathoms, 3 mi to nearest land (26). Quad 25. Texas: Galveston Co., 2 mi W High Island (130, 131, 203); 28°24' N, 94°30' W (175); 28°23' N, 94°30' W (175). Quad 26. Louisiana: Cameron Parish, Holly Beach, Johnson Bayou (90); 29°10' N, 93°18' W (175); 29°10' N, 93°26' W (175); 28°-28' N, 93°28' W (175); 28°28' N, 94°30' W (175); 28°16' N, 92°15' W (175). Quad 27. 28°45' N, 90°02' W (175); 28°40' N, 90°18' W (175); 28°35' N, 91°28' W (175); 28°33' N, 91°30' W (175); Gulf Of Mexico, 28°19' N, 90°19' W, 40 fathoms, 67 mi to nearest land (25); 28°03' N, 90°21' W (175); 28°02' N, 91°30' W (175); 28°03' N, 91°06' W (175); 28°02' N, 90°42' W (175); 28°05' N, 90°30' W (175). Quad 28. 29°53' N, 88°22' W (175); 29°50' N, 88°33' W (175); 29°45' N, 88°12' W (175); 29°40' N, 88°10' W (175); 29°35' N, 88°33' W (175); Louisiana: Plaquemines Parish, Breton Island (201); 29°06' N, 88°24' W (175); 29°17' N, 88°59' W (175); Gulf Of Mexico, 29°22' N, 88°05' W, depth 50 fathoms, 51 mi to nearest land (26); 29°19' N, 88°53' W (175); 29°16' N, 88°20' W (175); 29°15' N, 88°45' W (175); 29°09' N, 88°33' W (175); 29°10' N, 88°35' W (175); 29°12' N, 88°14' W (175); Louisiana: off Grande Isle (90); mouth of Mississippi River (90); 28°43' N, 89°39' W (175); 28°40' N, 89°33' W (175); Gulf of Mexico, 28°45' N, 87°58' W, depth 800 fathoms, 70 mi to nearest land (26); 28°46' N, 89°41' W (175); 28°46' N, 89°41' W (175); "Gulf of Mexico, 28°35' N, 88°10' W, depth 1160 fathoms, 59 mi to nearest land (26); 28°34' N, 89°46' W (175); Gulf of Mexico, 28°20' N, 88°37' W, depth 900 fathoms, 53 mi to nearest land (26); 28°20' N, 89°48' W (175). Quad 29. 29°59' N, 87°05' W (175); 29°55' N,

86°58' W (175); 29°44' N, 87°07' W (175); 29° 47' N, 86° 58' W (175); 29° 47' N, 86°58' W (175); 29°44' N, 86°59' W (175); 29°45' N, 86°45' W (175); 29°47' N, 88°00' W (175); 29°47' N, 88°00' W (175); 29°34' N, 86°08' W (175); 29°38' N, 87°27' W (175); 29°25' N, 87°26' W (175); 29°09' N, 87°55' W (175); Gulf of Mexico, 28°59' N, 87°49' W, depth 800 fathoms, 70 mi to nearest land (26); Gulf of Mexico, 28°53' N, 87°57' W, depth 850 fathoms, 65 mi to nearest land(26); Gulf of Mexico, 28°50' N, 87°58' W, depth 900 fathoms, 64 mi to nearest land (26).

Quad 30. 29°10' N, 85°55' W (175); 29°12' N, 85°54' W (175); 29°12' N, 85°54' W (175); 29°05' N, 85°00' W (175); 29°04' N, 84°48' W (175); 28°44' N, 84°35' W (175); 28°05' N, 84°30' W (175); 28°00' N, 84°30' W (175). Quad 31.

Florida: Taylor Co., near Deadman's Bay, 29°30' N, 83°30' W (36). Quad 32.

Texas: Port Aransas, 27°50' N, 97°05' W (169); Port Aransas (62); Port Aransas (206); Kleberg Co., Padre Island, 19 mi SE Corpus Christi (130); Gulf of Mexico, 27°20' N, 96°20' W, depth 85 fathoms, 53 mi to nearest land (25); Padre Island National Seashore, Yarbrough Pass (131, 132); Gulf of Mexico: Brownsville study area, 96°17' N, 26°17' W (208); Gulf of Mexico: Corpus Christi study area, 95°53' N, 27°27' W (208); Gulf of Mexico: 26°10' N, 97°00' W, depth 11 fathoms, 10 mi to nearest land (25); Gulf Of Mexico: 26°10' N, 96°54' W, depth 18 fathoms, 16 mi to nearest land (25); Gulf of Mexico: 26°10' N, 96°40' W, depth 29 fathoms, 31 mi to nearest land (25). Quad 33. 27°55' N, 95°55' W (175); 27°56' N, 95°37' W (175); 27°58' N, 94°45' W (175); Gulf of Mexico: Corpus Christi study area, 95°53' N, 27°27' W (208); Gulf of Mexico: Corpus Christi study area, 94°46' N, 27°27' W (208); Gulf of Mexico: 26°15' N, 95°30' W, depth 1000 fathoms, 100 mi to nearest land (25); 26°10' N, 95°25' W (175). Quad 34. 27°57' N, 92°02' W (175); 27°54' N, 92°48' W (175); Gulf of Mexico, 27°50' N, 92°00' W, depth 170 - 235 fathoms, 166 mi to nearest land (25). Quad 38. 27°10' N, 84°30' W (175). Quad 39. Gulf of Mexico: Clearwater study area, 83°44' N, 27°46' W (208); 27°45' N, 83°30' W (175);

Florida: **Pinellas Co.**, Tampa Bay, 27°50' N, 82°50' W (36); **Manatee Co.**, Sarasota Bay, Jewish Key (185); **Manatee Co.**, Sarasota Bay, Jewish Key (185)"; 27°02' N, 83°32' W (175); ~~12 mi offshore Cedar Key~~, 29°05' N (104); 26°30' N, 83°53' W (175); ~~25°10' N~~, 83°55' W (175). Quad 46. 25°20' N, 84°16' W (175); E Gulf of Mexico, 24°40' N, 84°30' W (36); E Gulf of Mexico, 24°40' N, 84°30' W (36). Quad 47. 25°28' N, 83°42' W (175); E Gulf of Mexico, 25°30' N, 81°40' W (36); 25°00' N, 83°05' W (175); 24°50' N, 84°00' W (175); 24°46' N, 83°05' W (175); ~~24°46' N~~, 83°05' W (175); Florida: 1 - 5 mi NE **Dry Tortugas**, 16 - 25 mi N **Marquesas Keys** (104); **Dry Tortugas** and vicinity (104); E Gulf of Mexico, 24°30' N, 84°00' W (36); E Gulf of Mexico: 24°30' N, 83°00' W (36); E Gulf of Mexico, 24°30' N, 82°10' W (36). Quad 48. Florida: **Dade Co.**, Miami (104); 25°30' N, 81°45' W (175); **Content Key** (206); **Islamorada**, Upper **Matecumbe Key**, 24°56' N, 80°37' W (168, 206); E Gulf of Mexico, 24°30' N, 81°50' W (36). Quad 49. ~~Bahamas~~, **Lerner Marine Laboratory**, N **Bimini Island**, 25°45' N, 79°17' W (171). Quad 57. 22°13' N, 87°23' W (175). Quad 58. E Gulf of Mexico, 25°10' N, 83°55' W (36). Quad 67. Gulf of Mexico, 21°44' N, 91°05' W, depth 36 fathoms, 62 mi to nearest land (25); Gulf of Mexico, 21°39' N, 90°59' W, depth 19.5 fathoms, 52 mi to nearest land (25); Gulf of Mexico, 21°07' N, 91°33' W, depth 17 fathoms, 64 mi to nearest land (25). Quad 78. Gulf of Mexico, 18°43' N, 93°30' W, depth 35 fathoms, 20 mi to nearest land (25). Not plotted. ~~South Carolina~~: no specific locality, Old Museum Collection (41, 61); **South Carolina** (187); **Texas**: waters off **Rockport** (29, 51, 52); **Florida**: no specific locality (185); **Gulf of Mexico**: no specific locality (185); **Cuban waters**: no specific locality (1, 50).; 29°28' N, 90°08' W (coordinates fall on land) (175).

Stenella coeruleoalba (Meyer 1833)

Striped Dolphin

Other Common Names. - euphrosyne dolphin, Gray's dolphin, streaker porpoise.

Other Scientific Names. - Stenella styx, Stenella coeruleoalbus.

Description and Identification. - Striped dolphins closely resemble saddleback dolphins (D. delphis) in having a dark gray back, gray sides, and a white belly. They reach a maximum length of about 9 feet (2.7 m) and are characterized by a series of distinctive black stripes along the side of the head and body. A narrow dark band runs from the eye along the side to the area of the anus, with a short stripe branching off above the base of the pectoral appendage. A second band of black extends from the eye to the flipper. Some workers have contended that striped dolphins are separable into distinct species depending on whether the eye-to-flipper stripe has one (S. coeruleoalba) or two (S. styx) components (Leatherwood et al. 1976). Most individuals are also characterized by an additional blaze of black coloration which extends from behind the dorsal fin above the flipper towards the eye. This feature is distinctive on animals riding the bow or leaping out of the water (Leatherwood et al. 1976).

Distribution. - Striped dolphins are widely distributed throughout the temperate and tropical waters of the world (Rice 1977). In the western North Atlantic they have been reported from Halifax, Nova Scotia, to as far south as Jamaica and including the Gulf of Mexico (Leatherwood et al. 1976). Within the study area, strandings are known from North Carolina, South Carolina, Florida (Gulf and Atlantic coasts), and Louisiana (Figure 28). Despite this wide distribution, striped-dolphins appear to prefer warmer, offshore (deeper) waters and are normally confined to the Gulf Stream or the waters off the continental slope (Leatherwood et al. 1976). During the NFWL-BLM aerial

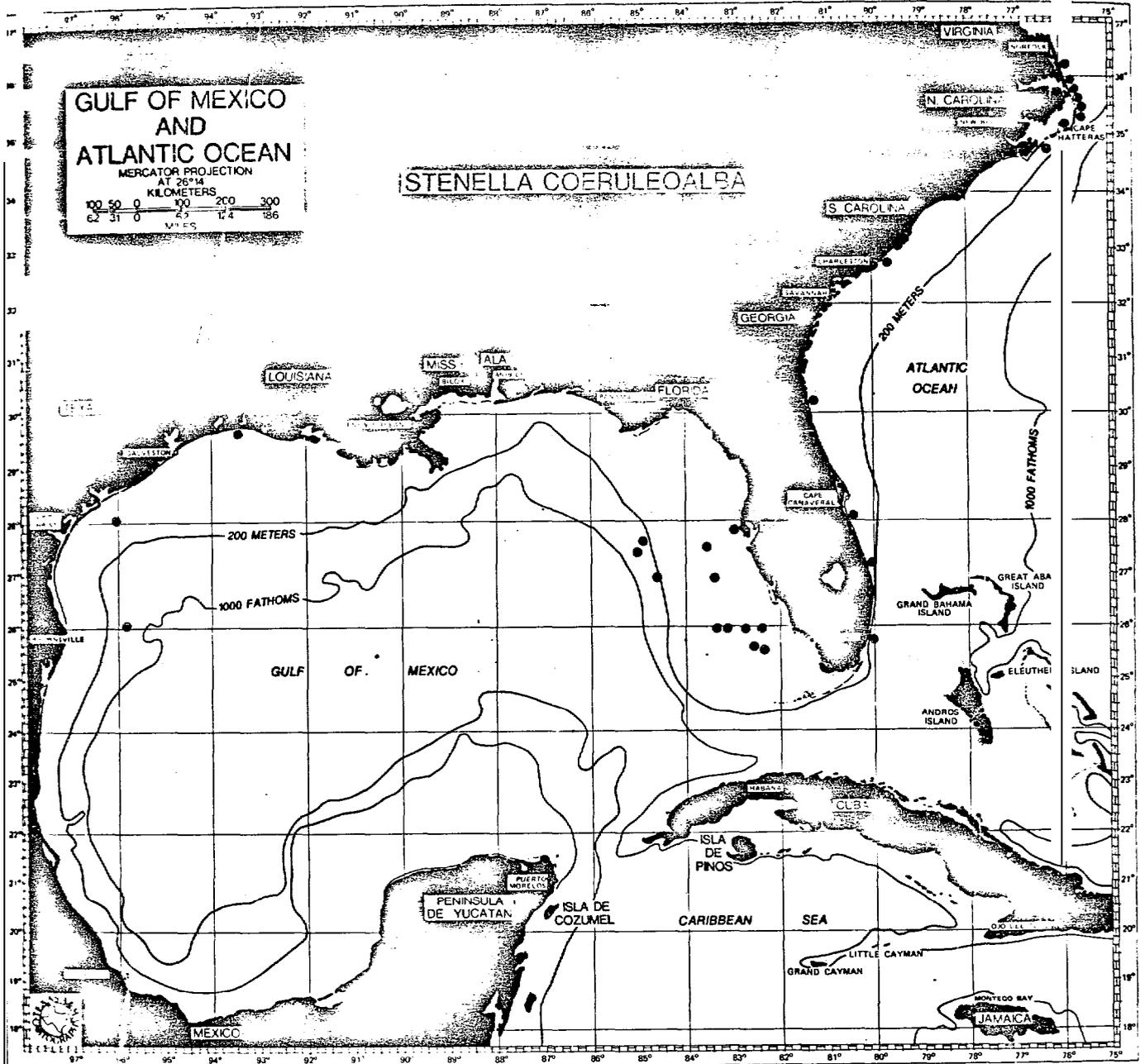


Figure 28. Distribution of the striped dolphin, *Stenella coeruleoalba*. See legend for Figure 1 and text for explanation of symbols.

surveys, striped dolphins were observed in the Corpus Christi, Texas, and Naples and Clearwater, Florida, study areas.

Seasonal Movements. - Very little information is available from the study area, but those data that are available pose an interesting trend (Table 4). With one exception, all records from the Atlantic Coast are from the fall and early spring, whereas, with one exception, all records from the Gulf of Mexico are from summer and fall. Whether this results from seasonal movements of striped dolphins or whether it is indicative of two separate stocks in the study area cannot be determined at this time. Winn et al. (1979) have suggested that individuals appearing in the northernmost localities ventured there from the south with intrusions of warm water rather than through an organized migration.

Status and Abundance. - No estimates of abundance are available for the study area, but apparently, striped dolphins are relatively abundant along the edge of the Continental Shelf in the North Atlantic, north to Georges Bank and south through the Caribbean (Prescott et al. 1979). Populations are thought to be stable and not endangered (Caldwell and Caldwell 1974).

Life History. - No data on life history parameters are available from the study area. Most of the following information from other geographic regions is taken from Mitchell (1975). Mean length at birth is 1 m, and length at attainment of sexual maturity is 2.2 and 2.1 m for males and females, respectively. Average age at sexual maturity of males and females has been estimated at about 9 years and 5-7 years, respectively. Calving interval is estimated at about 3 years; gestation period is 12 months. These dolphins are known to feed on squid in Florida, fish and shrimp in the Lesser Antilles (Winn et al. 1979), and various fin fish and squid in Rhode Island (Pilson and Goldstein 1973). They often occur in large herds of up to

several hundred individuals which may be segregated by sexual age.

Records of Occurrence. - Quad 1. North Carolina: Corolla, 36°21' N, 75°48' W (94, 206). Quad 2. North Carolina: Core Banks, Cape Lookout National Seashore, 34°44' N, 76°26' W (170). Quad 3. North Carolina: .4 km S Coquina Beach, **Bodie Island**, 35°49' N, 75°33' W (170, 206); Nags Head, 35°57' N, 75°38' W (168, 206); Nags Head, 35°57' N, 75°38' W (168, 206); Nags Head, 35°55' N, 75°36' W (171, 206); Oregon Inlet, 35°47' N, 75°32' W (170, 206); Pea Island, 35°39' N, 75°28' W (170, 206); Salvo, 35°33' N, 75°28' W (169); 1.5 km S Avon, 35°20' N, 75°30' W (170, 206); 2.6 km N **Ramp 22**, Hatteras Island, Cape Hatteras National Seashore, 35°18' N, 75°30' W (171), **Ocracoke Island**, 35°07' N, 75°55' W (206). Quad 5. South Carolina: Sullivan's Island (168, 206). Quad 8. Florida: St. Johns Co., S **Ponte Vedra Beach**, 30°13' N, 81°23' W (170). Quad 12. Florida: Brevard Co., Melbourne Beach, 28°04' N, 80°55' W (170). Quad 16. Florida: **Stuart** (37, 94). Quad 25. Gulf of Mexico: **Corpus Christi** study area, 95°57' N, 28°05' W (208). Quad 26. Louisiana: Cameron Parish, 4 mi W **Holly Beach** (90, 191). Quad 33. Gulf of Mexico: **Corpus Christi** study area, 95°54' N, 26°09' W (208). Quad 37. Gulf of Mexico: **Clearwater** study area, 84°02' N, 27°37' W (208). Quad 38. Gulf of Mexico: **Clearwater** study area, 84°56' N, 27°30' W (208); Gulf of Mexico: **Clearwater** study area, 84°40' N, 27°13' W (208). Quad 39. Florida: **Indian Rocks Beach**, 27°52' N (31 as S. styx, 36, 90); Gulf of Mexico: **Naples** study area, 82°50' N, 26°07' W (208); Gulf of Mexico: **Naples** study area, 82°49' N, 25°57' W (208); Gulf of Mexico: **Naples** study area, 83°37' N, 26°08' W (208); Gulf of Mexico: **Clearwater** study area, 83°35' N, 27°17' W (208); Gulf of Mexico: **Clearwater** study area, 83°28' N, 27°27' W (208); Gulf of Mexico: **Naples** study area, 83°11' N, 26°08' W (208); Gulf of Mexico: **Naples** study area, 82°24' N, 25°58' W

(208). Quad 47, Gulf of Mexico: Naples study area, 82°26'N, 25°38'W (208); Gulf of Mexico: Naples Study area, 82°24'N, 25°37'W (208); Gulf of Mexico: Naples study area, 82°23'N, 25°27'W (208). Quad 48. Florida: Newport Fishing Pier, Miami Beach, 28°53'N, 80°07'W (171).

Stenella longirostris Gray 1828

Spinner Dolphin

Other Common Names. - long-snouted dolphin, spinner porpoise.

Other Scientific Names. - none.

Description and Identification. - These are slender-bodied dolphins that reach a maximum length of about 7 feet (2.1 m). Body coloration is dark gray on the back, tan on the sides, and white on the belly. The beak is extremely long and slender; it is black above and white below with a distinctly black tip and lips. A black stripe, which extends from the flipper to the eye, is evident. The dorsal fin is distinctly erect, triangular, and colored light gray near the middle, bordered by black or dark gray. Spinner dolphins derive their common name from their habit of leaping clear of the water and spinning on their longitudinal axis (Leatherwood et al. 1976).

Distribution. - These dolphins occur in tropical waters of the Atlantic, Indian, and Pacific oceans (Rice. 1977). In the western North Atlantic, they occur from North Carolina south to the west Indies and Venezuela and including the Gulf of Mexico. In the Atlantic portion of the study area, there are stranding records from the coasts of North Carolina, South Carolina, and Florida (Figure 29). In the Gulf, strandings are known from the coasts of Texas and Florida. The records from North Carolina represent the northernmost documented distribution of this species. Apparently, spinner dolphins are an offshore, deep-water species.

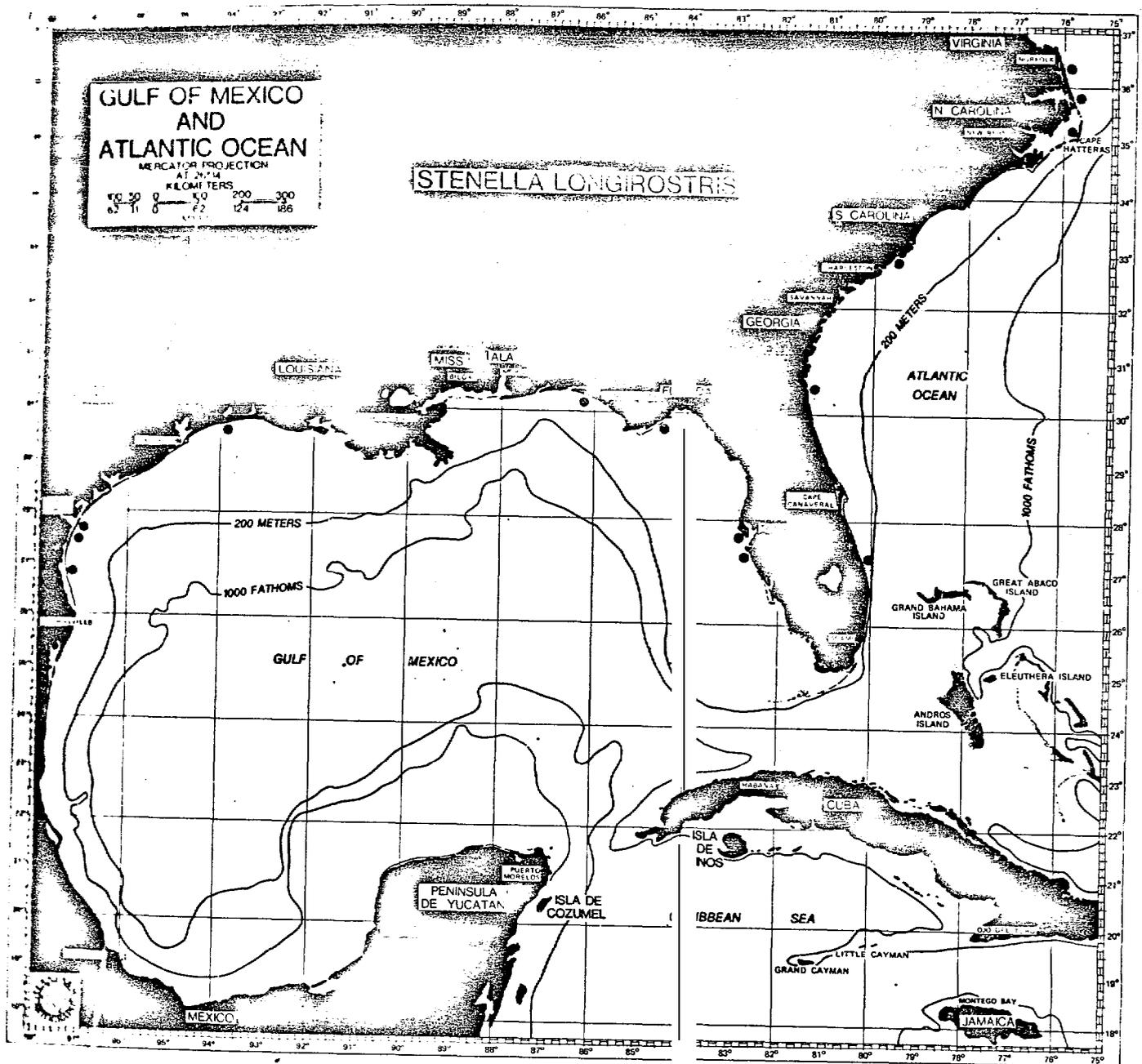


Figure 29. Distribution of the spinner dolphin, *Stenella longirostris*. See legend for Figure 1 and text for explanation of symbols.

Seasonal Movements. - The data available from the study area are too meager for any pattern to emerge. Stranding records are scattered throughout the year (Table 4).

Status and Abundance. - No data are available concerning abundance in the study area. The most that can be said is that these dolphins rarely strand. In the Pacific Ocean spinner dolphins occur in herds of up to several hundred individuals (Leatherwood et al. 1976). As a species, they are believed to be stable and not endangered (Winn et al. 1979). Presently, no pressure is exerted on stocks in the western North Atlantic, except in the Lesser Antilles dolphin fisheries, and there is no evidence that stocks are unstable there (Winn et al. 1979).

Life History. - Very little life history information is available from the study area. A pregnant female, part of a mass stranding of 36 animals, came ashore at Carabelle, Florida, on 23 September 1961. Another pregnant female with a near term fetus stranded near Malaquite Beach, Padre Island, Texas, on 3 March 1975. Two mass strandings of 36 and 29 individuals have been reported within the study area on the Gulf Coast of Florida, near Sarasota and Tallahassee. Spinner dolphins are known to feed on squid in Florida, and fish and shrimp in the Lesser Antilles (Winn et al. 1979).

The following information from other geographic regions is taken from Mitchell (1975). Females give birth to a single calf; length at birth is approximately 80 cm. Females are not known to be pregnant and lactating simultaneously. It has been suggested that two seasonal reproductive peaks occur, in spring and fall.

In the eastern tropical Pacific, spinner dolphins are closely associated with tuna schools, to such a degree that their presence is used by fishermen as an indication of tuna schools. Dolphins are captured in the purse seine net

with the tuna, and many die when they become entangled in the webbing.

Records of Occurrence. - Quad 1. North Carolina: Corolla, 36°22' N, 75°50' W {168}. Quad 3. North Carolina: .5 km S Coquina Beach, Bodie Island, 35°50' N, 75°33' W (169, 206); Cape Hatteras (206). Quad 5. South Carolina: Bull's Island (94, 206). Quad 8. Florida: mouth St. John's River, near Mayport (37, 166). Quad 16. Florida: Martin Co., Hutchinson's Island, 27°12' N, 80°11' W {170}. Quad 21. Florida: Okaloosa Co., E Fort Walton Beach (90, 191). Quad 26. Texas: Jefferson Co., Sabine Pass Beach (131, 203). Quad 30. Florida: Franklin Co., Dog Island, 4 mi off Carrabelle (85, 90, 185, 206). Quad 32. Texas: Nueces Co. Park, Padre Island (134); Kleberg co., 4 mi S Malaquite Beach, Padre Island (131, 203); Padre Island (134). Quad 39. Florida: Tampa Bay., near St. Petersburg (136); Siesta and Casey Key, 27°18' N, 82°33' W (168, 206). Quad 49. Turtle Rocks, W of Bahamas, 25°41' N, 79°20' W (104).

Stenella clymene (Gray, 1850)

Short-snouted Spinner Dolphin

Other Common Names. - none.

Other Scientific Names. - none.

Description and Identification. - Perrin et al. (1977) have recently shown that these dolphins are specifically distinct from the closely related spinner dolphin, Stenella longirostris. These authors describe external and cranial differences which distinguish the two species and the following description is taken from the abstract of a paper they presented at the Second Conference on the Biology of Marine Mammals in San Diego, California, in 1977. "S. clymene closely resembles S. longirostris in color pattern and tooth shape and size and is obviously closely related to it, but has a short, broad rostrum, is more robust in build, and has fewer teeth. Its skull is very much like that

of S. coeruleocalba in proportions, but smaller, and some specimens have been erroneously referred to that species, as well as to S. frontalis." The external differences between S. clymene and S. longirostris are so subtle that field identification, especially from an airplane, is virtually impossible.

Distribution. - S. clymene and S. longirostris are **sympatric**. Both have been recorded from the Southeast, the Gulf of Mexico, the Caribbean, and the coast of Africa (Perrin et al. 1977). Stranding records in the study area are available from the vicinity of St. Augustine and St. Petersburg, Florida, and from Padre Island National Seashore along the Texas Coast (Figure 30).

Seasonal Movements. - Stranding records in the study area for which dates are available are from the months of January, September, and October, but these data are too meager to discern a definite seasonal pattern (Table 4).

Abundance and Status. - No population estimates are available from the study area. These dolphins are widely distributed and well known to the fishermen of the Lesser Antillean dolphin fisheries. They have not noted any decrease in numbers over the years, which would suggest populations are stable and not endangered.

Life History. - No information on life history parameters is available either from the study area or other geographic regions.

Records of Occurrence. - Quad 12. Florida: Vilano Beach (37); St. Johns co., 1 mi N St. Augustine Inlet (38 as S. longirostris sensu late); Vie. St. Augustine (38 as, S. longirostris sensu late). Quad 32. Texas: Yarborough Pass, Padre Island National Seashore (132 as S. frontalis, 118, 191, 203). Quad 39. Florida: Pinellas Co., Bunces Pass near St. Petersburg Beach (38 as S. longirostris sensu late).

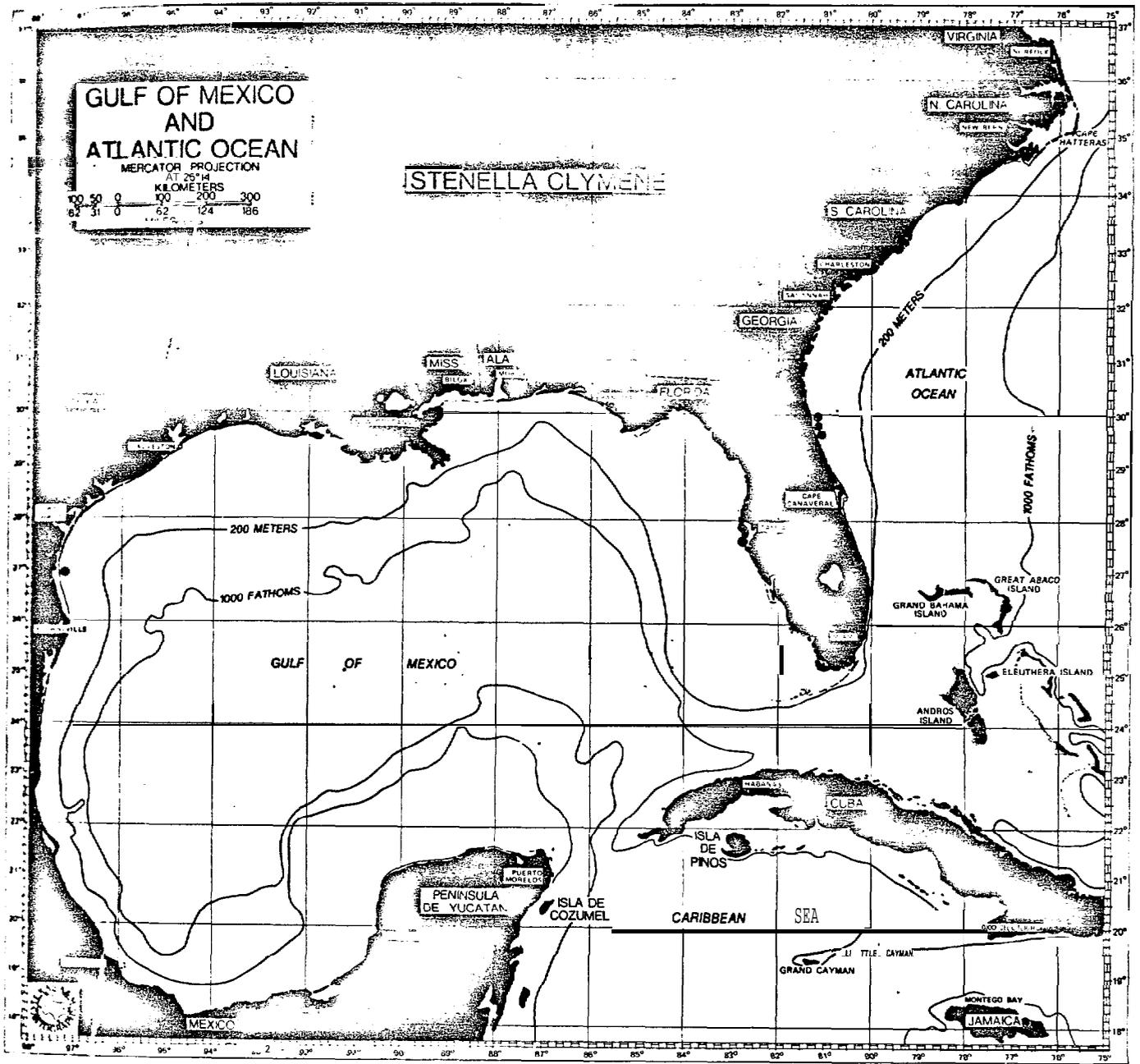


Figure 30. Distribution of the short-snouted spinner dolphin, *Stenella clymene*. See legend for Figure 1 and text for explanation of symbols.

Family Phocoenidae

Phocoena phocoena (Linnaeus 1758)

Harbor Porpoise

Other Common Names. - harbour porpoise.

Other Scientific Names. - none.

Description and Identification. - Harbor porpoises are the smallest of oceanic cetaceans. Average **adult** length and weights are about 4.9-5.2 feet (1.5-1.6 m) and 91-122 pounds (45-60 kg). Their body is robust, with a blunt snout and a small rounded head which lacks a distinctive beak. The dorsal fin is relatively small and triangular. A **prominent** dorsal ridge extends from the dorsal fin to the point of fluke insertion (**Gaskin et al.** 1974). Their color pattern is distinctive and may be best described as follows: dark brown to gray on the back, fading to lighter grayish-brown on the sides, often **with** speckling in the transition zone, and white on the belly extending farther up the sides in front of the dorsal fin (Leatherwood et al. 1976).

Distribution. - Harbor porpoises are a boreal-temperate zone species, and they commonly occur in the bays, estuaries, and tidal channels of the Atlantic Coast of Asia (**Rice 1977**). In the western North Atlantic, they have been reported from the Davis Straits and the waters from southwestern Greenland **to** North Carolina (Leatherwood et al. 1976). They barely enter the Atlantic portion of the study area where individuals have stranded along the coast of North Carolina **near** Hatteras Island, Royal Shoal, Cape Lookout, Corolla, and **Ocracoke** Island, (Figure 31). There have been numerous strandings along the North Carolina Coast north of Cape Hatteras. Apparently, these porpoises do not occur south of latitude 34°N and, consequently, they are absent from the remainder of the Atlantic portion of the study area as well as the Gulf of Mexico. Harbor porpoises prefer cold water and highly productive inshore or

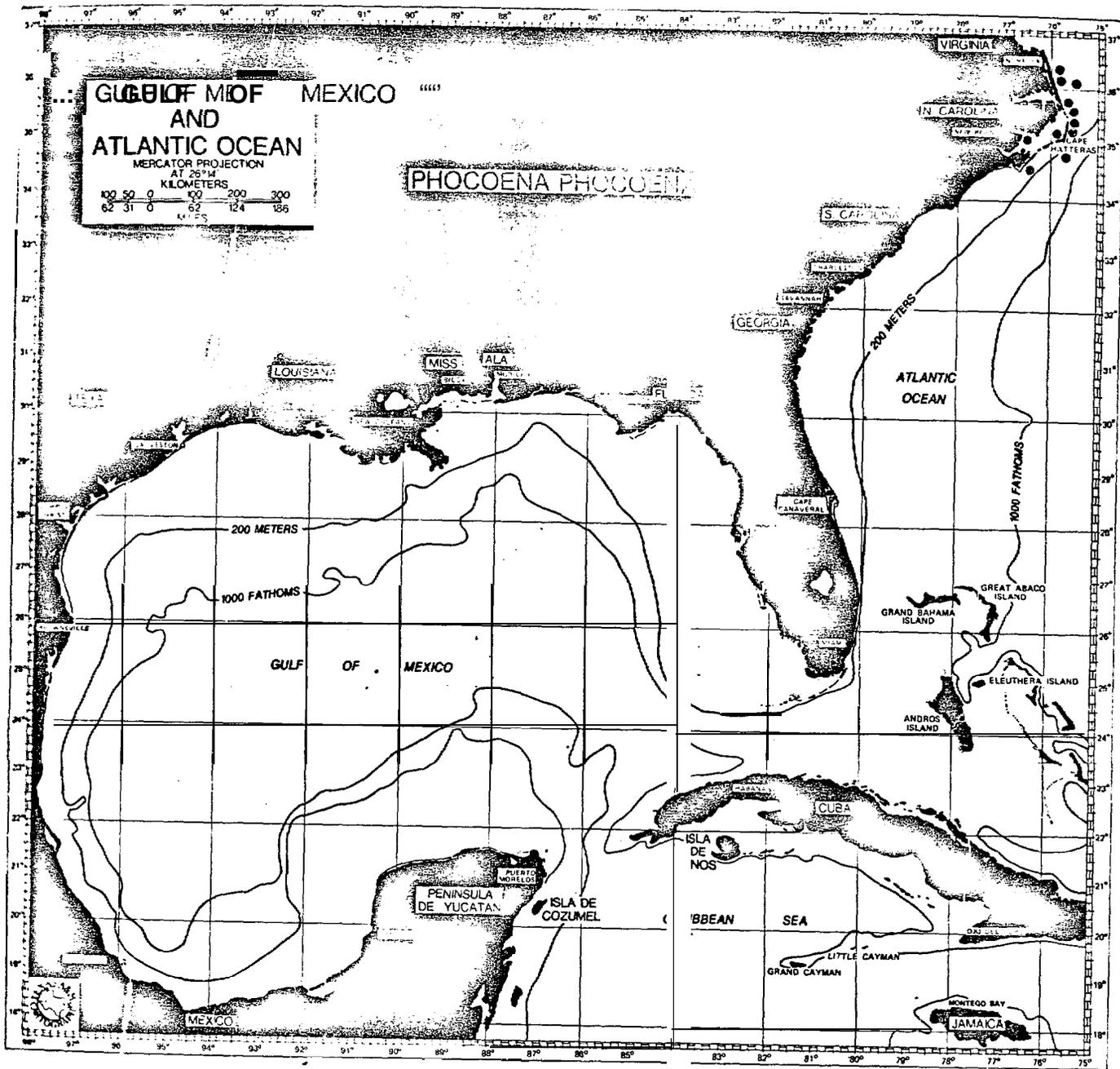


Figure 31. Distribution of the harbor porpoise, *Phocoena phocoena* See legend for Figure 1 and text for explanation of symbols.

shallow coastal banks and rarely occur offshore in deep waters (Winn et al. 1979).

Seasonal Movements. - According to Neave and Wright (1968), harbor porpoises exhibit a north-south annual migratory pattern on the eastern coast of North America, moving northward in late May and southward in early October. However, Gaskin et al. (1974) suggest an inshore-offshore movement of the same time scale, not a north-south movement. Sergeant et al. (1970) suggested wintering occurred near Sable Island. All strandings in the study area occurred from February to May (Table 4).

Status and Abundance. - No population estimates are available from the study area. Along the U.S. Atlantic Coast, they are most common in coastal waters from Cape Cod northward (Prescott et al. 1979). The recent records from North Carolina indicate they do extend that far south, although probably as strays; Long Island appears to be the normal southern limit of their range (Mead 1975a). It is perhaps significant that this is also the northern limit for Tursiops truncatus, which may compete directly with Phocoena (Mead 1975a).

Life History. - No data are available concerning life history parameters in the study area. The following information from the North Atlantic region is taken from Gaskin et al. (1974). Mating occurs from June to October. Implantation is immediate and gestation lasts about 8 to 10 months. Calving occurs from May to July. Lactation lasts about 8 months. Full sexual maturity is probably attained at an age of 3 to 4 years, supposedly at body lengths of about 1.3 m in males and 1.4 in females. Females do not bear a fetus every year. Little is known of breeding behavior in the wild, whether there is a single dominant male in a school, whether promiscuous mating is the rule, or whether long-term pairing occurs.

Their diet consists mostly of smooth, non-spiny rayed fish 100 to 250 mm

long, especially gadoids and clupeoids. The major dietary items in the western Bay of Fundy are herring (Clupea harengus), pollack (Pallachius virens), and mackerel (Scomber scombus). Population aggregations in the Bay of Fundy consist of several discrete schools containing up to nine individuals, and separated by only a few hundred yards.

Records of Occurrence. - Quad 1. North Carolina: Corolla, 36°30' N, 75°51' W (169, 206); Corolla Beach (171); Corolla, 36°28' N, 75°51' W (169, 206); Corolla Beach (171); Corolla (94, 206); Duck, 36°10' N, 75°44' W (169, 206); Kitty Hawk, 36°06' N, 75°42' W (169, 206). Quad 2. North Carolina: Royal Shoal, Pamlico Sound (14,41); Ocean Beach, 4 km S Cape Lookout (171); **Carteret CO. (196)**. Quad 3. North Carolina: Nag's Head, 35°59' N, 75°39' W (170, 206); Nag's Head, 35°57' N, 75°37' W (169, 206); Nag's Head, 35°57' N, 75°37' W (169, 206); Nag's Head, 35°56' N, 75°37' W (169, 206); Nag's Head, 35°56' N, 75°36' W (169, 206); North Carolina; Bodie Island, 35°50' N, 75°33' W (169, 206); Bodie Island, 35°50' N, 75°34' W (169, 206); N Pt. Oregon Inlet, 35°47' N, 75°32' W (169, 206); Bodie Island, 35°47' N, 75°32' W (169, 206); Pea Island, 35°47' N, 75°32' W (169, 206); Pea Island, 35°46' N, 75°31' W (169, 206); Pea Island, 35°44' N, 75°30' W (169, 206); Pea Island, 35°44' N, 75°30' W (169, 206); Pea Island, 35°45' N, 75°30' W (169, 206); Pea Island, 35°39' N, 75°29' W (169, 206); Pea Island, 35°39' N, 75°29' W (169, 206); Rodanthe, 35°36' N, 75°28' W (169, 206); Rodanthe, 35°35' N, 75°28' W (169, 206); Salvo, 35°32' N, 75°28' W (169, 206); Salvo, 35°32' N, 75°28' W (169, 206); Salvo, 35°30' N, 75°28' W (169, 206); Hatteras Island, 35°31' N, 75°28' W (170, 206); Hatteras Island, 35°29' N, 75°29' W (169, 206); Hatteras Island, 35°29' N, 75°29' W (169, 206); Hatteras Island, 35°27' N, 75°29' W (169, 206); Hatteras Island, 35°27' N, 75°29' W (169, 206); Hatteras Island, 35°26' N, 75°29' W (170, 206); Hatteras island, 35°25' N, 75°29' W (169, 206); Avon, 35°22' N, 75°30' W (169, 206); Avon,

35°22' N, 75°30' W (169, 206); Avon, 35°21' N, 75°30' W (169, 206); Avon, 35°21' N, 75°30' W (169, 206); Avon, 35°20' N, 75°30' W (169, 206); Avon, 35°20' N, 75°30' W (170, 206); Buxton, 35°17' N, 75°31' W (169, 206); Buxton, 35°17' N, 75°31' W (169, 206); Buxton, 35°15' N, 75°31' W (169, 206); Ocracoke Island 35°09' N, 75°42' W (169, 206); Ocracoke Island, 35°09' N, 75°51' W (170, 206); Ocracoke Island, 35°09' N, 75°52' W (169, 206); Ocracoke Island, 35°10' N, 75°50' W (169, 206); Ocracoke Island, 35°10' N, 75°51' W (169, 206);

Order Pinnipedia

Family Otariidae

Zalophus californianus (Lesson, 1828)

California Sea Lion

Other Common Names. - none.

Other Scientific Names. - none.

Description and Identification. - Unlike harbor seals (Phoca vitulina), California sea lions have **small**, pointed external ears and hind flippers that can **be** reversed and brought beneath the body for movement on **land**. Males are much larger than females and may reach a total length of 8 feet (2.4 m) and weigh up to 600 pounds (300 kg); females may reach a length of 6 feet (1.8 m) and weigh up to 200 pounds (100 kg). Males also have a conspicuous crest on top of **their** head. Body coloration is blackish when wet, varying from light buff to deep sepia when dry (Hall and Kelson 1959).

Distribution. - California sea lions occur normally only on the Pacific Coast, from British Columbia south to the Tres Marias Islands off Nayarit (Lowery 1974). They have been introduced (presumably by accident) into the western North Atlantic and are known there only from a few feral individuals. In the study area there are records from North Carolina southward around Florida

and into the northern Gulf of Mexico as far west as Louisiana (Figure 32). These animals are often seen on or near sea buoys for as long as several months. For example, Gunter (1968) reported California sea lions on buoys near the mouth of the Mississippi River in January 1966 and on the buoys of the ship channel leading into Mobile Bay, Alabama, in June 1966. Similarly, Lowery (1974) reports an animal that visited an oil company barge in the Gulf 32 miles (51.4 km) south of Cameron, Louisiana, daily for nearly a month in August and September 1971 and sunned itself on the deck in spite of the presence of workmen a few yards away.

Seasonal Movements. - Sightings that occur within short periods of time suggest movements by an individual. For example, of two seals present on Chandeleur Island in January, 1966, one was probably the same individual as the seal seen on the buoys in the Mobile Ship Channel in July of that year, when it was observed to have an identifying scar that showed it to be the seal found dead on Chandeleur Island on 11 August 1966 (Gunter 1968). According to Gunter, the second seal may have been the one observed on a channel buoy off Pensacola in April 1967. There seems to be no seasonal pattern to these movements (Table 4).

Status and Abundance. - There have been no estimates of California sea lions in the study area. However, their ability to live feral for months in the warm and temperate waters of the study area suggests that they could establish self-sustaining populations there.

Life History. - There are no data available on life history parameters within the study area. Breeding probably does not occur in the study area; in California breeding occurs in May and June. California sea lions are polygamous and have a single pup after a gestation period of 342-365 days (Hall and Kelson 1959). They feed on squid and small fishes (Winn et al. 1979).

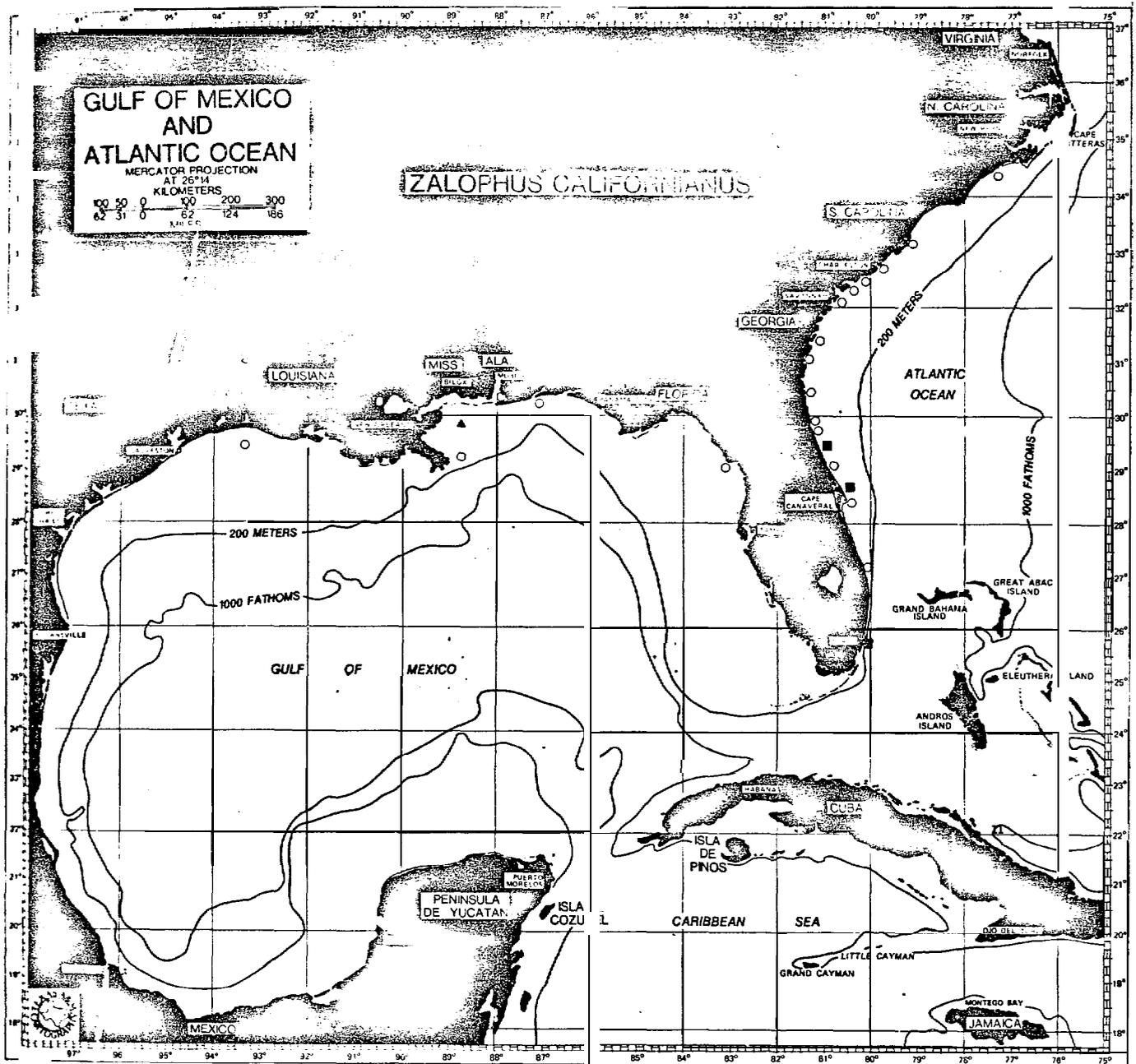


Figure 32. Distribution of the California sea lion, *Zalophus californianus*.

See legend for Figure 1 and text for explanation of symbols.

Records of Occurrence. - Quad 2. North Carolina: 34°28'N, 77°12'W (166).
Quad 4. South Carolina: Charleston Co., 18 km SE Kiawah Island (47); Beaufort (47); Georgia: Savannah (69). Quad 5. South Carolina: Winyah Bay (47); Charleston (47); Charleston (37) - Quad 8. Georgia: Sapelo Island (47); Brunswick (37); Florida: Mayport (37). Quad 12. Florida: St. Augustine (37); Summer Haven (37); Flagler Beach (69, 85); New Smyrna Beach (37); Brevard Co., Indian River near Titusville (85); Cape Canaveral Harbor (85). Quad 16. Florida: North Fork St. Lucie River, near Stuart (85) Quad 20. Alabama: Sand Point Light, Mobile Bay (69, 90). Quad 21. Florida: Pensacola (69, 90). Quad 26. Louisiana: 32 mi S Cameron (90). Quad 28. Louisiana: Chandeleur Islands (69, 90); mouth Mississippi River, 29°16'N, 88°45'W (90). Quad 31. Florida: Cedar Key (69). Quad 48. Florida: Miami (69).

Family Phocidae

Phoca vitulina Linnaeus, 1758

Harbor Seal

Other Common Names. - none.

Other Scientific Names. - none.

Description and Identification. - These are chunky, aquatic carnivores which lack external ears. The front flippers are small and the hind flippers point backward. The eyes are large. Males may be 5-6 feet (1.5-1.8 m) in total length and weigh several hundred pounds; females are slightly smaller. Their color pattern is variable. They are usually yellowish-gray dorsally varied with irregular spots of dark brown or black, yellowish-white ventrally, usually with small dark brown spots. Sometimes they are uniform brownish-yellow or grayish dorsally, paler ventrally, and lack spots (Hall and Kelson 1959).

Distribution. - Harbor seals are distributed around the world in the temperate and subarctic waters of the Northern Hemisphere. Four distinct

subspecies are recognized; animals from the Atlantic are referable to P. v. vitulina. In the western North Atlantic, they are commonly found from Labrador to Long Island. Strays have been recorded in the study area from South Carolina to as far south as Daytona, Florida (Figure 33). These seals have not been recorded from the Gulf of Mexico.

Seasonal Movements. - Harbor seals are believed to undergo seasonal migrations along the U.S. Coast (Pilson and Goldstein 1973). All records in the study area are from September, October, and January through April (Table 4); apparently these individuals are young animals that disperse from the north during the fall and winter months.

Abundance and Status. - Harbor seals occur in coastal waters, frequenting harbors and bays, and they frequently haul-out on rocks and beaches. There are no estimates for numbers straying into the study area, although the number of records from North Carolina suggests they are much more common there than in other southeastern Atlantic states. Population estimates from other areas in the North Atlantic include: (1) Gulf of Maine, 7,000 animals (Richardson 1976); and (2) Canadian Maritime (excluding Sable and Magdalen islands), between 10,000 and 15,000 individuals (Fisher 1949).

Life History. - No data on life history parameters are available from the study area. These animals are scattered during the summer, with late summer groups containing individuals of all ages; in September mature seals swim to secluded areas where they mate. Loosely organized colonies may be formed, but harbor seals do not establish harems (Walker 1975). One or two pups are born the following spring or summer after a gestation period of approximately 9 months (Hall and Kelson 1959). Sexual maturity is reached at 2 to 5 years in females and 3 to 6 years in males (Winn et al. 1979). Harbor seals eat fish and molluscs, taking a variety of species depending

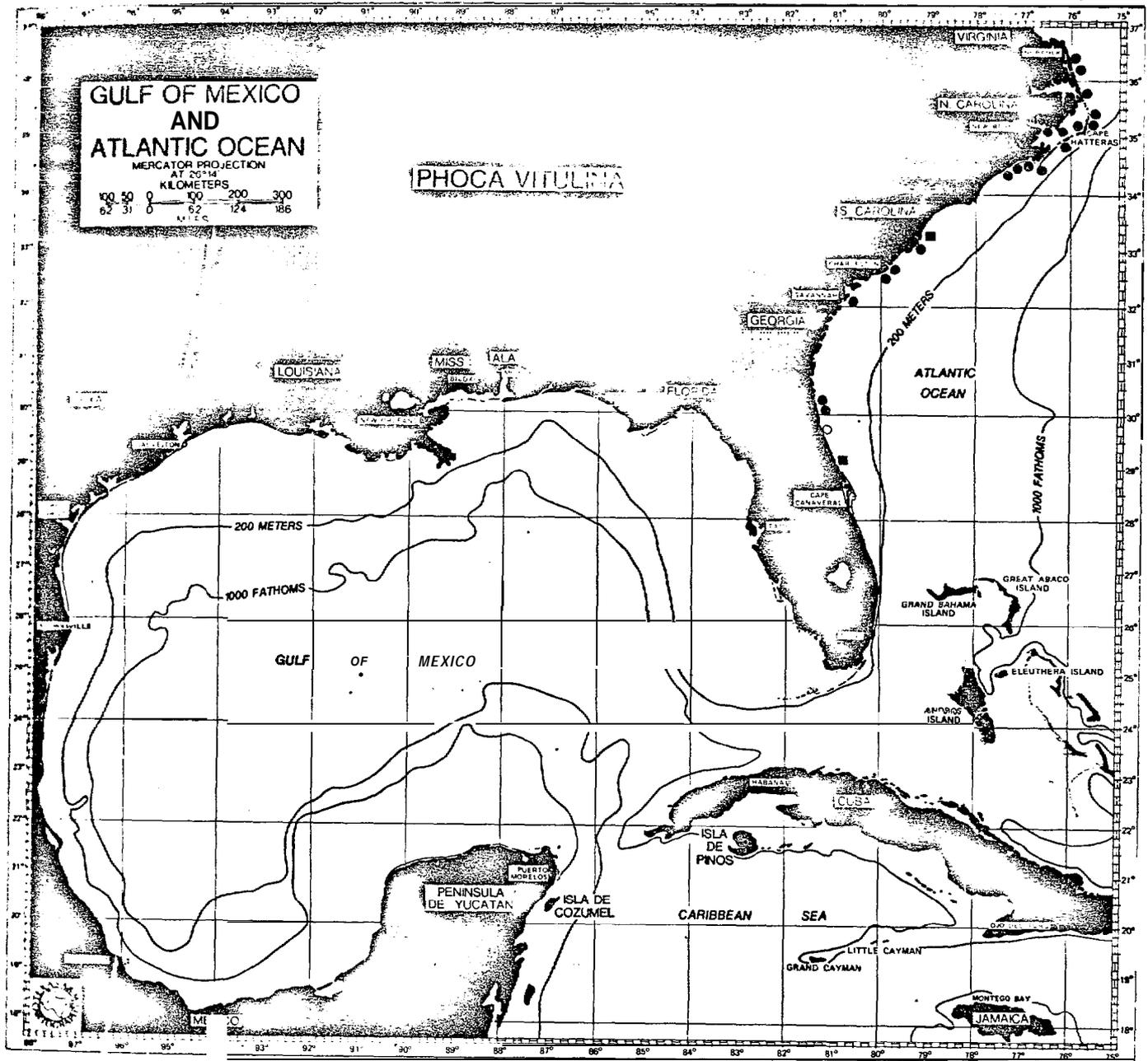


Figure 33. Distribution of the harbor seal, Phoca vitulina. See legend for Figure 1 and text for explanation of symbols.

on abundance (Pilson and Goldstein 1973).

Records of Occurrence. - Quad 1. North Carolina: Corolla, 36'20' N, , 75°49' W (171); Kitty Hawk (195). Quad 2. North Carolina: Judith Island, Pamlico Sound (13, 37, 41); Ocracoke Island (13, 37, 41); Lower Neuse River (13, 37, 41, 196); New River Inlet, Beaufort, 34°33' N, 77°21' W (171); Hammock's Beach State Park, 34°40' N, 77°10' W (170); Beaufort Inlet (13, 37, 41); Beaufort Inlet (13, 37, 41); between Cape Lookout Lighthouse and Ranger Station (171). Quad 3. North Carolina: Oregon Inlet, 35°55' N, 75°48' W (169); Cape Hatteras National Seashore, 35°16' N, 75°32' W (171) ; Cape Hatteras National Seashore (171); Cape Hatteras (13, 37, 41); near Hat-teras Lighthouse on Ocean Beach (171); S of Cape Point, CapeHatteras National Seashore (170). Quad 4. South Carolina: Folly Beach (27, 41); Hilton Head **Island** (27, 30, 61). Quad 5. South Carolina: Georgetown Co., South Island, Winyah Bay (37, 47); Santee River (27, 41, 179); Charleston Harbor (27, 41, 61, 179). Quad 8. Florida: 30°15' N, 81°15' W (166); Duval Co., Jacksonville Beach (185). Quad 12. Florida: 29°41' N, 81°05' W (166); Ponce de Leon Inlet (30).

Cystophora cristata (Erxleben, 1777)

Hooded Seal

Other Common Names. - bladdernose seal.

Other Scientific Names. - none.

Description and Identification. - Male hooded seals may reach a **total** length of 10.5 feet (3.2 m) and weigh up to 850 pounds (425 kg); females may reach a length of 8 feet (2.4 m) and weigh up to 400 pounds (200 kg). Males are **usually** colored bluish or darg gray above, and lighter on the sides and below; some have whitish spots on the sides , while others have dark spots or

blotches. The face and muzzle are blackish. Females are paler in color and have less distinct markings (Walker 1975). Both sexes have a nasal "hood" or a bladderlike protuberance on the nose, which is inflatable in times of danger or anger.

Distribution. - Hooded seals are associated with the ice pack in deep waters of the Atlantic and Arctic oceans where they normally occur from Greenland, Iceland, and the Denmark Strait to Labrador and Newfoundland. They are migratory and likely to wander which probably accounts for the few sightings in the study area from North Carolina in 1910 and 1944 and from Cape Canaveral, Florida, in 1910 (Figure 34). There have been no recent sightings in the study area.

Seasonal Movements. - No data are available from the study area. Hooded seals migrate in autumn from the east coast of Greenland and Baffin Bay to as far south as Sable Island Bank, Nova Scotia, returning north in spring (Hall and Kelson 1959).

Status and Abundance. - A total of about 400,000 hooded seals live in the North Atlantic along and to the south of the edge of the ice pack (Scheffer 1958). There are no population estimates available from the study area and none have been sighted recently; suggesting that a resident population does not occur in the region.

Life History. - There are no data available on life history parameters from the study area. Breeding occurs outside of the study area in Newfoundland. Hooded seals travel and breed in the same areas with harp seal, but the two species tend to remain apart and form separate breeding groups which usually consist of a bull, cow, and their offspring. The adult sexes usually remain in separate groups except during breeding (Walker 1975). A single pup is born in late February or early March on the ice floes (Hall and Kelson 1959).

2-4 weeks the pup is left on its own while the adults breed. Young animals tend to remain by themselves until sexually mature at about 4 years of age (Walker 1975). Hooded seals are solitary feeders with a diet consisting of fish, squid, shrimps, mussels and starfish (Pilson and Goldstein 1973).

Records of Occurrence. - Quad 2. North Carolina: Morehead City (14, 37, 41, 104). Quad 3. North Carolina: North Banks Beach (14, 37, 41, 104, 206). Quad 12. Florida: Brevard Co., Cape Canaveral, 28°27'N, 80°33'W (41, 73, 97, 104).

M_ tropicalis (Gray)

West Indian Seal

Other Common Names. - Caribbean monk seal.

Other Scientific Names. - none.

Description and Identification. - Large adult West Indian seals measure up to 7.5 feet (2.3 m) in total length. Externally they resemble their relative, the Mediterranean monk seal, but are a nearly uniform "brown tinged with gray, caused by the hairs being light at the extreme tip. The color becomes lighter on the sides, and gradually passes into pale yellow or yellowish-white on the ventral surface of the body" (Allen 1887:4). Consequently, they do not show the contrasting white belly of their eastern relative (Allen 1942).

Distribution. - West-Indian seals are the only seal native, to the Gulf of Mexico and the Caribbean area, but they are now extinct (Rice 1977). In historic times their range included the Gulf of Mexico and Caribbean Sea as far south as the coast of Honduras, eastward to Jamaica, Cuba and Hispaniola, thence northward throughout the Bahamas (Gunter 1947). Places in the study area where they occurred include the Florida Keys and along the Texas Coast from Brownsville to as far north as Galveston (Figure 35). A few were reported

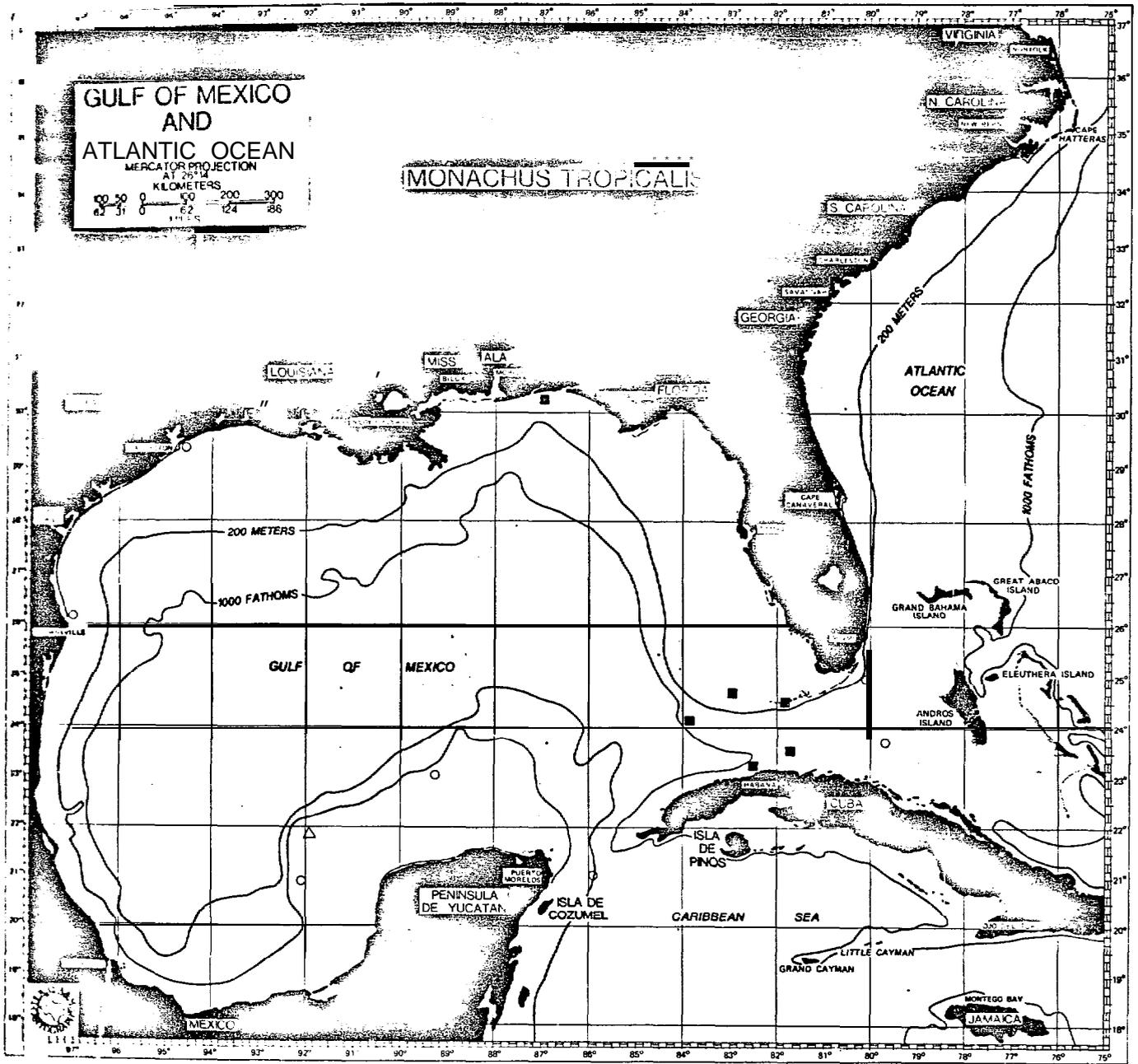


Figure 35. Distribution of the West Indian seal, *Monachus tropicalis*. See legend for Figure 1 and text for explanation of symbols.

from Pensacola, Florida, but these were brought there from the Triangle Keys in the Gulf of Campeche and released in the bay (Moore 1953).

Seasonal Movements. - Nothing definitive is known about movements of these seals. Records for which dates are available in the study area are from the months of January, February, March, April, and June (Table 4) .

Status and Abundance. - The decimation and extermination of West Indian seals has been reviewed by Allen (1887), Allen (1942), Kellogg (1943), Moore (1953), Gunter (1954), and Kenyon (1977). The last specimen in the study area was taken in 1922 (Townsend 1923) near Key West and since that time there have only been sight records" on the Texas Coast, one in 1932 (Gunter 1947) and one in 1957 near Galveston (Gunter 1968), which was only reported in an issue of a local weekly newspaper. The latter record cannot be verified and more than likely represents a sighting of an escaped California sea lion.

The Alacranes Islands and Triangle Keys off the coast of Yucatan were apparently the last remaining stronghold for West Indian seals (Allen 1942). Supposedly, residents of Carmen, Yucatan, reported seals in the Alacranes as late as 1948. Gilmore (1959) could find no seals or reports of them on a survey of the Caribbean region in 1951. The last authentic record was an observation in 1952 of a small colony on Seranilla Bank (Rice 1977), which is in the Caribbean Sea (out of the study area) midway between Honduras and Jamaica.

Kenyon (1977). participated in aerial surveys from 19 to 25 March 1973 around the islands and atolls off Campeche, Yucatan, Quintana Roo (Mexico), British Honduras, Honduras, Nicaragua, and the central Caribbean to Jamaica. At every island group visited, either fishing vessels or shrimp trawlers at anchor, or fishermen and their shacks on shore, or the remains of abandoned fishermen's camps were observed. However, there was no indication of the

existence of monk seals. **Kenyon's** conclusion (1977) from the 1973 survey is that Caribbean monk seals have been extinct since the early 1950's.

The early **decimation** of West Indian seals was brought about by overhunting because they were the best source of **oil** in the southern islands during colonial times. Seals were so persistently slaughtered for their oil that they had already become rare by 1851 (Allen 1942). The subsequent extinction of these seals can be directly attributed to human disturbance, especially that of fishermen. The remotest habitat of Caribbean monk seals have now been invaded by fishermen, who are prone to kill seals as competitors. Because monk seals evolved in **island** environments where there were no natural "enemies on shore, they became genetically tame and were thus easy victims (**Kenyon** 1977).

Life History. - Virtually nothing was ever learned about their life history before they became extinct.. Apparently the young were **born** in the first part of December because several females **killed** in the Triangle Keys during **this** time had fetuses nearly ready for birth. The animals themselves were remarkably sluggish and inconspicuous, allowing persons to come among them without great **alarm**, so that numbers could **easily** be killed without difficulty (Allen 1942). No doubt this lack of suspicion and fear contributed to their undoing. Their diet probably included **fish** and **molluscs** (Hall and Kelson 1959).

Records of Occurrence. - Quad 21. Florida: Pensacola, 30°21' N, 87°31' W (S, 104). Quad 25. Texas: **Bolivar** Peninsula, E of Galveston (69); Galveston (65, 67, 69). Quad 32. ~~Texas~~ Brazes Santiago Pass (65, 67, 69); Brazes Santiago Pass (65, 67, 69). Quad 47. **Dry Tortugo** Islands, 24°10' N, 83°55' W (104); Fort Jefferson, Dry **Tortugos** (104). Quad 48. Florida: **Key West** (.5, 67, 104, 146); Cape Florida, 25°04' N, 80°09' W (5, 104). Quad 56. Alacranes Islands (5, 6, 104); Alacranes Islands (5, 69). Quad 59. Cuba: Habana (5).

Quad 60. 5 mi from Key West, 23 °33'N, 81°48'W (104) . Quad 61. Salt Bank Key (5). Quad 66. Triangle Keys (5, 104); Traingle Keys (5); West TRiangle Key, Gulf of Campeche (60); Triangle Keys (60); Cayos Areas, 100 mi N Carmen (60). Quad 70. Anina Islands (5).

SUMMARY AND RECOMMENDATIONS

Thirty-three species (29 cetaceans and 4 pinnipeds) of marine mammals are known from the study area. At least two cetaceans (Peponocephala electra and Lagenodelphis hosei) have been recorded so close to the boundaries of the region that they are likely to be eventually found in the area. Of the four pinnipeds, one (the West Indian seal, Monachus tropicalis) is now extinct and no longer occurs in the region, another (the California sea lion, Zalophus californianus) has been introduced and occurs only in the feral condition, and a third (the hooded seal, Cystophora cristata) is known only on the basis of stray individuals. The harbor seal (Phoca vitulina) is the only pinniped to regularly occur in the study area, and it is only known from the Atlantic Coast.

The cetacean fauna includes 12 cosmopolitan species which occur in most of the major oceans and which, for the most part, are eurythermic species with a broad range of temperature tolerances. These are: Balaenoptera musculus, Balaenoptera borealis, Balaenoptera physalus, Megaptera novaeangliae, Physeter catodon, Ziphius cavirostris, Pseudorca crassidens, Orcinus orca, Delphinus delphis, Tursiops truncatus, Grampus griseus, and Stenella coeruleoalba. Four species (Mesoplodon europaeus, Mesoplodon mirus, Stenella plagiodon, and Stenella clymene) have a distribution confined to the Atlantic Ocean. Nine cetaceans have distributions peculiar to tropical-warm temperate waters of both hemispheres and may be considered as warm-stenothermal forms. These include: Balaenoptera edeni, Kogia breviceps, Kogia simus, Mesoplodon densirostris, Feresa attenuata, Globicephala macrorhynchus, Steno bredanensis, Stenella frontalis, and Stenella longirostris. Three species (Eubalaena glacialis, Balaenoptera acutirostrata, and Globicephala melaena) have disjunct bipolar (antitropical) distributions and are regarded as cold-stenothermal forms. Another cold-stenothermal species, Phocoena phocoena, is peculiar to

northern waters and only barely enters the study area.

Several migratory species occur in the study area including Physeter catodon, several species of Balaenoptera, Megaptera novaenangliae, and Eubalaena glacialis. These species generally travel between a breeding zone in which they do not eat, and a feeding zone, of high productivity, in cooler waters.

Some of the larger whales that occur in the study area have been placed on the Endangered Species List of the U.S. Environmental Protection Agency. These include the sei whale (Balaenoptera borealis), fin whale (Balaenoptera physalus), blue whale (Balaenoptera musculus), the right whale (Balaenoptera glacialis), and the sperm whale (Physeter catodon). Only two of these, "the blue whale and the right whale, are considered endangered on a worldwide basis. None of these large whales have been hunted commercially in the study area during this century, and there are no plans for such hunting in the future.

None of the dolphins or other **odontocetes** in the study area are considered endangered anywhere on **the species level**, although the spinner dolphin (Stenella longirostris) has received considerable attention as a locally-endangered species in the eastern Pacific where large numbers were killed each year by accident in the tuna purse seine fisheries. If such a fishery is established in the eastern Gulf of Mexico, as has **been** suggested, then this species might become locally endangered there as well (Caldwell and Caldwell 1973).

The possible effects of oil and oil-industry activities on marine mammals are a subject of **great** concern in the study area. All marine mammals inhabit surface waters to breathe and some to feed, exposing them to spilled oil by contact, inhalation, or **ingestion**. Shoreline accumulation of oil could directly affect inshore-dwelling cetaceans and all pinnipeds. As top-level predators, these species are potential accumulators of oceanic contaminants. Noise and shock waves generated by seismic surveys, **drilling**, construction, and **support**

vessels potentially threaten marine mammals by displacing them from otherwise dependable feeding grounds, migratory routes, and fragile nursing rookeries. In spite of these concerns, there are **little** hard scientific data upon which to base decisions.

With the exception of the **bottlenose** dolphin (Tursiops truncatus), no data are available for estimating population sizes of cetaceans and pinnipeds in the study area. Huge data gaps exist, with the exception of stranding studies. The Smithsonian Institution supports a stranding network in the Cape Hatteras region and has a **sizeable** unpublished data base. Similarly, there is a Southeastern Regional Stranding Network which is sponsored by National Marine Fisheries Service (NMFS), but which operates largely on a volunteer-sporadic basis because of the lack of federal support,

The area in need of immediate support is field studies carried out by airplanes, ships, and platforms of opportunity, With the exception of bays, there is almost a complete lack of at-sea studies. Until these are done, critical areas and certain aspects of life histories, such as migrations, cannot be determined. Without this information, it is virtually impossible to assess the influence of man's activities in comparison to the influence of normal environmental fluctuations. In this regard, the **BLM-FWL** project, which involves an offshore systematically planned aerial sampling scheme at several places in the study area, offers much promise for providing adequate data to use in assessing stock-s of cetaceans and pinnipeds.

The **bottlenose** dolphin is in need of continued, intensive study since the bays, river mouths, and along shore areas are important habitats for this species. In particular, boat and **aerial** studies are needed to determine population estimates and ascertain movements. NMFS is currently sponsoring Tursiops studies in Florida and Texas waters.

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