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**Elements for the Development of a
Marine Mammal Action Plan for the Wider Caribbean:
A Review of Marine Mammal Distribution**

**ELEMENTS FOR THE DEVELOPMENT OF A
MARINE MAMMAL ACTION PLAN FOR THE WIDER CARIBBEAN:
A REVIEW OF MARINE MAMMAL DISTRIBUTION**

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TABLE OF CONTENTS

pg. 4. Executive Summary

- 6. Introduction
- 7. Objectives of MMAP for the Wider Caribbean Region (WCR)
- 8. Marine Mammal Diversity and Distribution: A Review
- 9. Future Recommendations

- 10. General Distribution and Ecology of Marine Mammals in the WCR

ORDER CETACEA

- 13. Suborder Mysticeti or Baleen Whales
 - 13. Humpback whale, *Megaptera novaeangliae*
 - 15. Bryde's whale, *Balaenoptera edeni*
 - 17. Fin whale, *Balaenoptera physalus*
 - 17. Common minke whale, *Balaenoptera acutorostrata*
 - 17. Sei whale, *Balaenoptera borealis*
 - 18. Blue whale, *Balaenoptera musculus*
 - 18. Northern right whale, *Eubalaena glacialis*

- 18. Suborder Odontoceti or Toothed Whales
 - 19. Family Physeteridae
 - 19. Sperm Whale, *Physeter macrocephalus*
 - 22. Family Kogiidae, Pygmy and Dwarf Sperm Whales
 - 22. Pygmy sperm whale, *Kogia breviceps*
 - 22. Dwarf sperm whale, *Kogia sima*
 - 24. Family Ziphiidae, Beaked Whales
 - 24. Cuvier's beaked whale, *Ziphius cavirostris*
 - 24. Gervais' beaked whale, *Mesoplodon europaeus*
 - 26. Blainville's beaked whale, *Mesoplodon densirostris*
 - 27. True's beaked whale, *Mesoplodon mirus*
 - 27. Sowerby's beaked whale, *Mesoplodon bidens*
 - 27. Family Delphinidae, Oceanic Dolphins
 - 27. Killer whale, *Orcinus orca*
 - 28. Pygmy killer whale, *Feresa attenuata*
 - 29. False killer whale, *Pseudorca crassidens*
 - 29. Short-finned pilot whale, *Globicephala macrorhynchus*
 - 31. Melon-headed whale, *Peponocephala electra*

- 32. Fraser's dolphin, *Lagenodelphis hosei*
- 32. Pantropical spotted dolphin, *Stenella attenuata*
- 32. Atlantic spotted dolphin, *Stenella frontalis*
- 35. Spinner dolphin, *Stenella longirostris*
- 35. Clymene dolphin, *Stenella clymene*
- 36. Common dolphins, *Delphinus* spp.
- 37. Common bottlenose dolphin, *Tursiops truncatus*
- 39. Striped dolphin, *Stenella coeruleoalba*
- 39. Risso's dolphin, *Grampus griseus*
- 40. Rough-toothed dolphin, *Steno bredanensis*
- 41. Tucuxi, *Sotalia fluviatilis*

ORDER SIRENIA

- 42. Family Trichechidae
 - 42. West Indian manatee, *Trichechus manatus*

ORDER CARNIVORA

- 43. Suborder Pinnipedia
 - 43. West Indian monk seal, *Monachus tropicalis*
 - 43. California sea lion, *Zalophus californianus*

45. Acknowledgements

46. Literature Cited

70. Appendix I: Map and Occurrence Tables

Tables 1–6: Occurrence of Marine Mammals by Sub-Regions

Figure 1: Map of Wider Caribbean with Sub-Regions

75. Appendix II: Cetacean Species Descriptions and Conservation Status

84. Appendix III: Species List of Marine Mammals of the Wider Caribbean

EXECUTIVE SUMMARY

At the Inter-governmental Meeting of the Parties to the Cartagena Convention in Kingston, Jamaica (February 2000), the Parties adopted the Scientific Committees' recommendation for the timely development of a Marine Mammal Action Plan (MMAP) for the Wider Caribbean Region (WCR). The objectives of the MMAP are to ascertain the current status of marine mammals in the WCR, to identify where data are scarce, to make recommendations for future research, and to determine how best to apply and manage legislative and protective measures for maximum conservation benefit in the future. The MMAP aims to provide a framework for activities that require national and regional cooperation, on the basis of respect for the sovereign rights of the participating governments.

“The Distribution of Marine Mammals of the Wider Caribbean” describes the diversity and distribution of marine mammals in the WCR. This paper serves as a companion document to “Marine Mammals of the Wider Caribbean Region: A Review of Their Conservation Status” (UNEP (WATER)/CAR WG.22/ INF.7: Ward and Moscrop 1999). This literature review is intended to provide additional background information for the development of a MMAP, and to contribute to the development and expansion of conservation measures at both national and international levels throughout the region. Recommendations for cooperative research and management strategies are proposed as well as coordination of public awareness and conservation education efforts.

Information for this document was gathered from historical records, scientific literature, and sighting and stranding reports from various organizations including research groups and whale watch operations. The paucity of available information about marine mammals in the region, particularly cetaceans, indicates that future research would be beneficial.

MARINE MAMMAL SPECIES

Marine mammals are an integral part of the marine and coastal fauna of tropical and sub-tropical waters of the Caribbean Sea and the Gulf of Mexico. For many species, these waters serve as primary habitat for a range of critical activities including feeding, mating and calving. The term marine mammal is purely descriptive and is not a taxonomic designation, encompassing mammals from three orders (Cetacea, Sirenia, and Carnivora) (Jefferson *et al.* 1993). Thirty-four species of marine mammals have been documented from the region (31 cetacean, 2 pinnipeds, and 1 sirenian). The cetacean species include seven species of baleen whales (mysticetes) and 24 species of toothed whales (odontocetes). Of the two pinnipeds, the West Indian monk seal (*Monachus tropicalis*) is now generally considered extinct, with the last reported sighting in 1952 (Schmidly 1981; LeBoeuf *et al.* 1986), and the California sea lion (*Zalophus californianus*) was released from captive situations into the wild in the 1950s, with the last verified sighting in 1972

(Würsig *et al.* 2000). Two extralimital records of hooded seals (*Cystophora cristata*) (Mignucci-Giannoni and Odell 2000) have been reported off Puerto Rico (Mignucci-Giannoni and Odell 2000). The West Indian manatee (*Trichechus manatus*) is the only sirenian species in the region. Of all marine mammal species, seven are classified as endangered or vulnerable by the IUCN (Jefferson *et al.* 1993; Ward and Moscrop 1999). See Table 1-6 for species distribution by sub-regions.

FUTURE RECOMMENDATIONS

Recognising the paucity of information on cetaceans of the region, it is critical that Parties to the Convention develop common tools for standardising the collection and dissemination of information about cetaceans as well as organising training courses and education programmes to raise public awareness. The design and execution of conservation education programmes which improve public knowledge of the role of marine mammals in the environment and their conservation needs and act as a communication channel between the RCU and governments is integral to the development and participation in the MMAP for the WCR.

Recommendations and priorities for action include attention to: promoting studies on species occurrence, abundance and status; habitat status; anthropogenic and environmental threats; local attitudes and interactions with cetaceans; the socioeconomic benefits of whale watching ecotourism; and, existing research programmes and future needs.

Coordinated research and management efforts can contribute to ensuring a favourable conservation status for cetaceans by protecting them and their habitats from induced and cumulative effects resulting directly or indirectly from activities under national jurisdiction. Information obtained should be compiled and evaluated on a regional basis and distributed through an exchange network.

Regional success in managing and protecting marine mammals is ultimately rooted in the success of individual Caribbean states to build internal capacities and to commit to the regional concept by establishing conservation priorities, standards and strategies for cetacean conservation. The marine mammal fauna of the region is diverse and has significant ecological, economic, aesthetic and amenity value to the countries of the Wider Caribbean. It is vital that these populations and their habitat are offered sustainable protection.

INTRODUCTION

The Global Plan of Action for the Conservation, Management and Utilisation of Marine Mammals (MMAP) was developed (between 1978 and 1983) as a joint effort by the United Nations Environment Programme (UNEP), the Food and Agriculture Organisation of the United Nations (FAO) and other governmental and nongovernmental agencies concerned with marine mammal issues. The primary objective of an MMAP is to generate a consensus among the world's nations on which to base a worldwide policy for the conservation of marine mammals. An MMAP consists of five target areas: policy formation, regulatory and protective measures, increase in scientific knowledge, improvement of law and its application, and enhancement of public understanding.

Marine mammals are an integral part of the marine and coastal fauna of tropical and subtropical waters of the Caribbean Sea and the Gulf of Mexico. For many species, these waters serve as primary habitat for a range of critical activities including feeding, mating, and calving. The term *marine mammal* is purely descriptive and is not a taxonomic designation, encompassing mammals from three orders (Cetacea, Sirenia, and Carnivora) (Jefferson *et al.* 1993). Thirty-four species of marine mammals have been documented from the region (31 cetacean, 2 pinniped, and 1 sirenian). The cetacean species include 7 species of baleen whales (mysticetes) and 24 species of toothed whales (odontocetes). Of the 2 pinnipeds, the West Indian monk seal (*Monachus tropicalis*) is now generally considered extinct, with the last reported sighting in 1952 (Schmidly 1981; LeBoeuf *et al.* 1986); and the California sea lion (*Zalophus californianus*) was released from captive situations into the wild in the 1950s, with the last verified sighting in 1972 (Würsig *et al.* 2000). Two extralimital records of hooded seals (*Cystophora cristata*) have been reported off Puerto Rico (Mignucci-Giannoni and Odell 2000). The West Indian manatee (*Trichechus manatus*) is the only sirenian species in the region. Of all marine mammal species, 7 are classified as endangered or vulnerable by the IUCN (Jefferson *et al.* 1993; Ward and Moscrop 1999).

During the past two decades, awareness of marine mammals and their habitats has grown in the Wider Caribbean, as illustrated by the government's adoption of the Specially Protected Areas and Wildlife (SPA) Protocol to the Cartagena Convention and its Annexes listing all marine mammals as protected in Annex II. The document, 'Statement Justifying the Protection of Marine Mammals in the Caribbean' (UNEP (OCA) CRA/CAR WG.4/INF.8) by Mignucci-Giannoni and Ward, 1990, was adopted at the meeting of the Ad Hoc Group of Experts for the Development of the Annexes of the SPA Protocol of the Cartagena Convention in Martinique, 1990, and lists 33 species of marine mammals for inclusion in the SPA annexes.

The purpose of this document, 'is to present an overview of the known distribution and occurrence of marine mammal species of the Wider Caribbean Region (WCR) and to

provide the necessary elements for the development of a regional action plan for the conservation of marine mammals . Information for this document was gathered from historical records, scientific literature, and sighting and stranding reports from various organisations including research groups and whale watch operations. The paucity of available information about marine mammals in the region, particularly cetaceans (whales and dolphins), indicates that future research would be beneficial. This literature review is intended to encourage further investigation of the marine mammal fauna of the WCR and to assist the development and expansion of conservation measures at both national and international levels throughout the region.

OBJECTIVES OF A MMAP FOR THE WIDER CARIBBEAN REGION

In August 1999, the P document ‘Marine mammals of the Wider Caribbean Region: A review of their conservation status’ (UNEP (WATER)/CAR WG.22/ INF.7) by Ward and Moscrop ,1999 was presented in Havana, Cuba, to the Fourth Meeting of the Interim Scientific and Technical Advisory Committee (ISTAC) for the Specially Protected Areas and Wildlife (SPAW) Protocol. This document proposed that an MMAP be developed for the region, and it provided background information on species present, their significance to the region, and their conservation status and threats. At the Ninth Intergovernmental Meeting and Sixth Meeting of the Parties to the Cartagena Convention in Kingston, Jamaica (February 2000), the Parties adopted the Scientific Committee’s recommendation for the timely development of an MMAP for the WCR.

The objectives of the proposed MMAP are to ascertain the current status of marine mammals in the WCR, to identify where data are scarce, and to make recommendations for further research and education programmes, and how to apply and manage legislative and protective measures for maximum conservation benefit in the future. The MMAP aims to provide a framework for activities that require national and regional cooperation, on the basis of respect for the sovereign rights of the participating governments. To achieve these objectives, the proposed MMAP would:

- 1) (a) summarise existing knowledge of general biology such as distribution, population dynamics, habitat status, and ecology; and (b) assess threats to species, for example, from deliberate and incidental catches in fisheries, from degradation and disturbance of their habitats, and from pollution or reduction of food sources;
- 2) review existing conservation and research programmes and legislation at a regional and national level;
- 3) identify significant gaps in scientific knowledge, develop cooperation for research and monitoring of these species, and highlight the scale of environmental threats that must be mitigated to ensure more effective conservation measures;
- 4) encourage the development of local conservation and education initiatives and integrate traditional ecological knowledge, attitudes, and interaction with marine mammals to assist with these programmes;

- 5) develop recommendations and priorities for action at the national and regional levels with a view to strengthening regional cooperation; and
- 6) promote legislative measures at the national and international levels with special emphasis on agreements under the auspices of the Convention on the Conservation of Migratory Species of Wild (Bonn Convention), the Convention on International Trade in Endangered Species (CITES), and the Convention on Biological Diversity (CBD).

Parties that support an MMAP shall, in cooperation with relevant national and international organisations, assist in providing the maximum extent of their economic, technical, and scientific capacities and expertise to appropriating information or developing guidelines for a marine mammal conservation plan.

MARINE MAMMAL DIVERSITY AND DISTRIBUTION: A REVIEW

This present document serves as a preliminary review for describing marine mammal species diversity and concurrent distribution of marine mammals in the WCR. Although the Cartagena Convention has recently introduced a Manatee Action Plan for the Caribbean (UNEP 1995), the West Indian Manatee would be included in the general scope of the proposed Marine Mammal Action Plan for the WCR.

The review demonstrates the fascinating diversity of marine mammals, with special consideration to cetaceans, which exist either seasonally or year-round within the WCR. This information was compiled as an overview of the historical records, scientific literature, and sighting and stranding reports. Opportunistic sightings have been compiled from research cruises, whale watch vessels, yacht people, fishermen, and local cetacean research networks.

The information presented in this document is by no means exhaustive of all materials available. For a comprehensive review of marine mammals of the WCR, additional inputs from the collective knowledge of Fisheries Departments, whale watch operations, and research and environmental organisations are necessary. This effort is of particular importance in countries not fully represented in this document.

In gathering data for this review, it has become obvious that for many countries and regions there is minimal or no information available. The account shows that the region has not benefited from dedicated or consistent marine mammal research efforts. Some of the research results presented are data gathered 30 or more years ago, and it is clear that information is incomplete and patchy.

FUTURE RECOMMENDATIONS

Recognising the paucity of information on cetaceans of the region, it is critical that Parties to the Convention develop common tools for standardising the collection and dissemination of information about cetaceans as well as organising training courses and education programmes to raise public awareness. Recommendations and priorities for action include;

- 1) attention to promoting studies on species occurrence, abundance, and status;
- 2) monitoring habitat status and directed catches and by-catches;
- 3) attending to the legal status of these endangered species;
- 4) studying local attitudes and interactions with cetaceans;
- 5) promoting existing research programmes and identifying needs for additional research;
- 6) identifying the negative and positive socioeconomic benefits of ecotourism including whale watching, swim-with-dolphin programmes, and marine mammals in captivity; and
- 7) the design and execution of conservation education programmes that improve public knowledge of the role of marine mammals in the environment and their conservation needs. These should act as a communication channel between the UNEP- Regional Coordinating Unit (RCU) for the Caribbean Environment Programme and governments, which is integral to the development and participation in the MMAP for the WCR.

Specific scientific research and monitoring measures, using non-destructive and non-invasive procedures, to enhance conservation may include cooperating to:

- 1) assess the population status and annual/seasonal movement of species, especially in poorly studied areas;
- 2) develop systematic research programmes on dead, stranded, or sick individuals to determine interactions with human activities;
- 3) identify and assess present and potential threats to various species, in particular fishing practices and techniques, underwater disturbance (e.g., from military activities, etc.) and pollution, which have a significant negative effect on cetaceans;
- 4) facilitate the development of surveys (including passive acoustic techniques) to monitor cetacean populations and understand the ecology of marine mammal populations of the region;
- 5) determine migration routes and breeding and feeding areas in order to define where human activities may need to be limited (seasonally); and
- 6) define vulnerable species and critical habitats of various cetacean species.

Coordinated research and management efforts can contribute to ensuring a favourable conservation status for cetaceans by protecting them and their habitats from induced and cumulative effects resulting directly or indirectly from activities under national jurisdiction. Information obtained should be compiled and evaluated on a regional basis and distributed through an exchange network. These efforts may include:

- 1) conducting coordinated research investigations for collecting data on observations, incidental catches, strandings, epizootics, and other related phenomena;
- 2) preparing a compendium of national authorities, research and rescue centres, nongovernmental organisations, and scientists concerned with cetaceans;
- 3) forming a regional network of marine protected areas, including calving, breeding, and feeding grounds for cetaceans, that could benefit the conservation of cetaceans;
- 4) creating an efficient network to disseminate and exchange information such as sub-regional data banks or conservation bulletins for storing cetacean information;
- 5) developing widespread education campaigns to increase general awareness and promoting the development of local expertise (through student and researcher exchange programmes);
- 6) outlining lists of current and potential whale watch operations; and
- 7) adopting national and regional strategies to form links with international research organisations.

Regional success in managing and protecting marine mammals is ultimately rooted in the success of individual Wider Caribbean states to build their internal capacities and to commit to the regional concept by establishing conservation priorities, standards, and strategies for cetacean conservation. The marine mammal fauna of the region is diverse and has significant ecological, aesthetic, economic, and amenity value to the countries of the WCR. It is vital that these populations and their habitat are offered sustainable protection.

GENERAL DISTRIBUTION AND ECOLOGY OF MARINE MAMMALS

The WCR encompasses a vast marine area (4.31 million km² — the Caribbean Sea alone covers an area of about 2.64 million km²), bordered by 36 nations including island nations, dependent territories, and continental countries (Figure 1). The waters are characterised by high biological productivity along the coast, supported by a complex interaction of three major ecosystems: coral reefs, mangrove forests, and sea grass beds. In contrast, productivity is low in the deep-ocean regions.

Major ocean currents sweep the region from east to west by the Caribbean Current, with coastal countercurrents and several large gyres. The hydrography of the Caribbean is dominated by flows of the North Equatorial current and, to a lesser degree (near Trinidad and Tobago), the South Equatorial Current, which filters westwards through the Lesser Antilles. This flow, the Caribbean Current, eventually bends northwards towards the Yucatan Channel. Within the Caribbean basin there is a mix of waters from the north and south Atlantic, the predominant water movement being directed through the Caribbean Sea to the Gulf of Mexico. Caribbean waters are relatively oligotrophic. Oceanic waters near the equator tend to be permanently stratified. The warm surface waters of the Caribbean (25–30 °C) rarely mix with the nutrient-rich, cold waters below. The thermocline is generally at a depth of around 50 metres.

The bathymetry of the Caribbean Sea, with deep-water basins, estuaries, oceanic islands, steep drop-offs, and varied bottom topography as well as shallow offshore sand banks and coral reefs, provides a diverse range of conditions and habitats that suit a variety of cetacean species, including species that prefer deep oceanic conditions and are usually found far offshore. The distribution of species may be determined by the abundance and availability of food, or it may depend on suitable conditions required for reproduction, which may vary according to factors such as water temperature, salinity, tidal flow and currents, areas of upwellings, prey movements or concentrations, and seafloor topography. Additional factors may influence distribution patterns including demographics such as reproductive status, age, sex, and population size; species adaptations including physiological and behavioural factors; and, human effects, including pollutants and habitat disturbance.

The cetacean fauna of the WCR includes 10 ‘cosmopolitan’ species that occur in most major oceans, and for the most part are eurythermic with a broad range of temperature tolerances. These are the common minke (*Balaenoptera acutorostrata*), sperm (*Physeter macrocephalus*), pygmy sperm (*Kogia breviceps*), dwarf sperm (*Kogia sima*), Cuvier’s beaked ((*Ziphius cavirostris*), Blainville’s beaked (*Mesoplodon densirostris*), and killer whales (*Orcinus orca*); and Risso’s (*Grampus griseus*), striped (*Stenella coeruleoalba*) and common bottlenose dolphins (*Tursiops truncatus*). Six species of whales—North Atlantic right, (*Eubalaena glacialis*), True’s beaked (*Mesoplodon mirus*), Sowerby’s beaked (*Mesoplodon bidens*) and Gervais’ beaked whales (*Mesoplodon europaeus*)—and the Atlantic spotted (*Stenella frontalis*) and Clymene dolphins (*Stenella clymene*) have a distribution confined to the Atlantic Ocean. Of these, 3 species (North Atlantic right whale, True’s beaked whale, and Sowerby’s beaked whale) are reported only from extralimital records in the region. Eleven cetacean species have distributions peculiar to tropical or warm temperature waters and may be considered warm, stenothermal species, capable of living within a limited range of temperatures. These include the Bryde’s (*Balaenoptera edeni*), short-finned pilot (*Globicephala macrorhynchus*), false killer (*Pseudorca crassidens*), pygmy killer (*Feresa attenuata*), and melon-headed whales (*Peponocephala electra*); and the rough-toothed (*Steno bredanensis*), pantropical spotted (*Stenella attenuata*), spinner (*Stenella longirostris*), Fraser’s (*Lagenodelphis hosei*), and tucuxi (*Sotalia fluviatilis*) dolphins. Four species {the blue (*Balaenoptera musculus*), fin (*Balaenoptera physalus*), sei (*Balaenoptera borealis*), and humpback (*Megaptera novaeangliae*) whales have disjunct bipolar distributions and are regarded as cold-stenothermal species based on their feeding grounds. Several migratory species occur in the region, including five species of rorquals (blue, fin, sei, humpback, and common minke whales), the North Atlantic right whale, and the sperm whale.

Many species are known to occur either seasonally or year-round in the waters of the region (by virtue of stranding records, scientific surveys, historical and opportunistic sightings, and incidental fisheries operations). However, there is a paucity of data concerning the life history, zoogeography, and behaviour of many of the species that are present in this region. In many parts of the Caribbean, such as near volcanic islands that have narrow submarine shelves, the coastline drops steeply to depths of more than

200 metres within a few kilometres of the shore. In these areas, whales and oceanic dolphins may be seen quite close to land. Various studies report cetacean 'hot spots' in high-relief areas (Jefferson and Lynn 1994; Evans 1971; Hui 1979, 1985; Selzer and Payne 1988; Davis *et al.* 1998), indicating that sightings of certain species correlate with bottom depth. Humpback whales have specific habitat requirements for breeding and rearing young, favouring warm shallow waters located over sandbanks or close to islands (Whitehead and Moore 1982); other species, particularly those that prefer deepwater cephalopod prey (squid), have been observed feeding along deepwater drop-offs. Fraser's dolphins (*Lagenodelphis hosei*), beaked whales (Ziphiidae), pilot whales, and sperm whales are all known to feed in deep water. Although much is now known about the seasonal movement of North Atlantic humpback whales to the Caribbean, the distribution, abundance, and behaviour of other species such as the sperm whale, beaked whales, and the smaller odontocetes have been poorly documented.

Prior to the mid-1970s, there were no systematic efforts to document cetacean records in the Gulf of Mexico (Würsig *et al.* 2000). The GulfCet I study (1991–1994) consisted of shipboard and aerial surveys to determine the seasonal and geographic distribution of cetaceans along the continental slope in the north-central and western Gulf (Davis and Fargion 1996). This study found that cetaceans in the northern Gulf were concentrated along the continental slope (Davis *et al.* 1998), and in or near confluence zones (hydrographic features with greater productivity). Additionally, the study showed that several poorly known species are moderately common (beaked whales, pygmy and dwarf sperm whales, melon-headed whale, and Fraser's and Clymene dolphins). The GulfCet II study (surveys conducted 1996–1997) continued to explore patterns of distribution and abundance of Gulf cetaceans and identified possible associations between cetacean high-use habitats and the ocean environment (Davis *et al.* 2000). Several studies collected information based on sightings in the northern Gulf of Mexico (Fritts *et al.* 1983; Mullin *et al.* 1994a). A focal study of sperm whales in the northern Gulf is currently being conducted.

However, no such large-scale multi-species survey efforts have been conducted in the southern Gulf or Caribbean Sea (Jefferson and Lynn 1994; Würsig *et al.* 2000). In the winter of 1995, a research cruise was conducted by the National Marine Fisheries Service (NMFS/USA) to characterise the cetacean species in the northern Caribbean US region (Roden and Mullin 2000). Of the 17 cetacean species reported for the northeastern Caribbean (e.g., near Puerto Rico and the Virgin Islands) (Mignucci-Giannoni 1998), 8 were sighted during the winter 1995 survey.

Survey work that has focussed on the acoustic surveying and tagging of sperm whales off Dominica and the surrounding islands in the Eastern Caribbean was initiated in 1981 by Watkins and colleagues at the Woods Hole Oceanographic Institute (Watkins and Moore 1982; Watkins *et al.* 1985; Watkins *et al.* 1993). Subsequent studies of the distribution, residency, and movements of sperm whales were conducted during the 1990s by the International Fund for Animal Welfare (Carlson *et al.* 1995; IFAW 1996; Gordon

et al. 1998; Boisseau *et al.* 2000). Additionally, a humpback whale and cetacean survey was conducted in coastal, shelf, and deep waters of the southeastern Caribbean islands in February 2000 (Swartz *et al.* 2000).

From the limited studies presented in this document, it is clear that the Caribbean possesses a diverse cetacean fauna, and future surveys will provide pioneering and useful information on the occurrence and natural history of cetaceans in the region. The literature record indicates the need for increased local and synoptic studies to determine species' occurrence, distribution, natural history and habitat use, and population and conservation status. Tables 1 through 6 show the distribution of marine mammal species by sub-regions from available data, with a marked lack from Sub-Region VI. A brief description of each species, which describes their distribution status and physical appearance, is included in Appendix II.

ORDER CETACEA, SUBORDER MYSTICETI or BALEEN WHALES

The mysticetes or baleen whales comprise the majority of large whale species. As a group, the baleen whales are characterised by the series of baleen plates that are used to filter small organisms from the sea water. The baleen is embedded in the roof of the whale's upper jaw in place of teeth. The number of plates, their size and flexibility, and the density in which they normally occur is related to the food preference of each species.

Within the WCR, seven mysticete species are recorded from the region, representing two families; the Balaenopteridae (five rorqual species), with six species characterised by the presence of numerous ventral pleats, and the Balaenidae (represented by one species), mentioned only in historical records (Würsig *et al.* 2000) (see Table 1 in Appendix I).

The HUMPBACK WHALE

In the North Atlantic, the **humpback whale** (*Megaptera novaeangliae*) ranges from tropical waters in the Caribbean to Arctic waters. During the winter, the majority of the population congregates to mate and calve in a number of locations among the reefs and islands of the West Indies. This species leaves the breeding areas in spring to migrate to several high-latitude feeding areas during spring and summer months (Smith *et al.* 1999). The western North Atlantic population appears to be comprised of relatively discrete feeding stocks. These include the Gulf of Maine, the Gulf of St. Lawrence, Newfoundland-Labrador, Greenland, Iceland, and Norway. Fidelity to feeding areas (Katona *et al.* 1980; Katona 1986; Clapham and Mayo 1987) and migratory destinations from the western North Atlantic (Katona and Beard 1990, 1991) have been well documented.

The principal breeding areas documented occur on offshore banks and off insular coasts of the Atlantic margins of the West Indies (Winn *et al.* 1975; Whitehead 1982; Whitehead and Moore 1982). Humpback whales have been recorded from nearly all the

islands in the West Indies, however. Overing and Letsome (1993) report an unusual sighting of a single humpback whale off the BVI in August 1992. Humpback whales in the Caribbean are strongly associated with banks and other shallow waters. Winn *et al.* (1975) noted that 99% of their sightings were on banks in water depth less than 183 metres, although Roden and Mullin (2000) noted 10 to 12 sightings in the northeastern Caribbean in water depth averaging 2877 metres.

The largest winter concentrations occur in the waters of the Dominican Republic, on Silver Bank, Navidad Bank, and in Samana Bay (Balcomb and Nichols 1982; Whitehead and Moore 1982; Mattila [and Clapham *et al.* 1989a; 1989b, 1994](#); Smith *et al.* 1999). Lower densities are found on Virgin Bank, Mouchoir Bank, and in the Mona Passage, Puerto Rico (Erdman *et al.* 1973; Winn *et al.* 1975; Levenson and Leaply 1978; Mattila and Clapham 1989b; Smith *et al.* 1999). Farther south along the Antillian arc through the Windward Islands, humpback whales appear to occur sparsely today, despite the historical significance of this region as a whaling ground (Mitchell and Reeves 1983; Ward 1995).

In the Gulf of Mexico, humpback whales are uncommon, although sightings have been made near Alabama, Texas (Galveston), and the west coast of Florida (Würsig *et al.* 2000). In December 1932, a humpback whale stranded in Havana, Cuba, and in March 1983, one stranded alive in Seahorse Key, Florida (Würsig *et al.* 2000). There have been occasional reports of humpback whales in the northern Gulf of Florida: a confirmed sighting of a humpback whale in 1980 in the coastal waters off Pensacola (Weller *et al.* 1996); two questionable records of humpback whale sightings from 1952 and 1957 off the coast of Alabama (Weller *et al.* 1996); a stranding east of Destin, Florida, in mid-April 1998 (Mullin, *pers. comm.* 2001); and a confirmed sighting of six humpback whales in May 1998 in the DeSoto Canyon (Ortega, *pers. comm.* 2001). A resident population of humpbacks does not occur in the Gulf of Mexico, and it is likely that observations during spring and winter represent accidental occurrences from the Caribbean of inexperienced yearlings on their first return migration (Weller *et al.* 1996).

Smaller concentrations of humpbacks have been reported throughout the Lesser Antilles including Barbados and Martinique (Swartz *et al.* 2000), Dominica (Carlson *et al.* 1995; IFAW 1996; Evans 1997; Boisseau *et al.*, 2000), Bequia, St. Vincent (Mayo 1984; ECCN 2000), Grenada (IFAW 1996; Boisseau *et al.* 2000; Swartz *et al.* 2000), Guadeloupe (Rinildi 1999, *pers. comm.*; Boisseau *et al.* 2000; Swartz *et al.* 2000), St. Lucia (Rambally 2000; Swartz *et al.* 2000), Trinidad and Tobago (Swartz *et al.* 2000), and the Gulf of Paria in the extreme southeast (Caldwell *et al.* 1971b; Smith *et al.* 1999). The presence of humpback whales in Venezuelan waters is reported in Boher and Garcia (1990) and Bolaños and Boher (1996). Naveira and Díaz (1996) note the first stranding of a humpback whale in the northeastern region of Venezuela in October 1994, and report nine humpbacks sighted between 1990 and 1994. Floresz-Gonzales and [Capella-AlzuetaTorres](#) (1994) report sightings of humpback whales in the Colombian Caribbean.

The humpback whales of the Lesser Antilles have not been studied as extensively as those further north; records of humpback whales from the southeastern Caribbean are primarily from historical whaling records from the Yankee pelagic fishery between 1830 and 1890 (Mitchell and Reeves 1983) and the fishery in Bequia (Brown 1945; Fenger 1958; Mitchell 1965; ECCN 2000). Charts in Townsend (1935) show catches of humpback whales distributed throughout the Eastern Caribbean chain during the winter, but few in the current centre of concentration near the Dominican Republic. Use of the area by humpback whales appears to be considerably lower today than historically (Mitchell and Reeves 1983).

There is little information on the summer feeding grounds used by the humpback whales that winter in the Eastern Caribbean. An understanding as to the apparent lack of recovery in the southern habitat areas is limited by the paucity of information on the relationships between individuals wintering in the Eastern Caribbean waters to those in other feeding and breeding areas. From photo-identification studies, Mattila and Clapham (1989b) noted a resighting of an individually identified humpback whale between Anguilla Bank and Greenland; the same individual was resighted again on Silver Bank. However, the Anguilla Bank lies at the northern edge of the Eastern Caribbean. Stevick *et al.* (1999) reported three resightings of humpback whales from the Eastern Caribbean. Two individuals were resighted in northern feeding grounds; one between Newfoundland and Saba Bank and the other between Greenland and Grenada, demonstrating movement between this breeding and calving area and two primary feeding grounds in the North Atlantic. Another individual was sighted in both Puerto Rico and Dominica, demonstrating an exchange between the Eastern Caribbean and other breeding and calving areas in the West Indies.

BRYDE'S WHALE

The **Bryde's whale** (*Balaenoptera edeni*), is similar in size and appearance to the sei whale and records of the species' distribution have been confused due to misidentification with sei whales. Bryde's whales are known to occur mainly in tropical or subtropical waters between 40 ° N and 40 ° S, preferring waters of 20 ° C or more, often near shore areas with high productivity, although they do not have a continuous distribution throughout these latitudes.

In the Atlantic, the species is found from the Gulf of Mexico and the Caribbean Sea southwards to Cabo Frio, Brazil (Vidal 1997; Mullin *et al.* 1994a). In the Gulf of Mexico, 12 verified stranding reports and 12 confirmed live sightings are available (Würsig *et al.* 2000). Most Bryde's whales were sighted in relatively shallow water near the 100-metre (328-ft) isobath. There are sightings in this area seen from every season except autumn in the DeSoto Canyon region and off western Florida. It is likely that the Gulf represents at least a portion of the range of a dispersed, resident population of Bryde's whale (Jefferson and Schiro 1997). With few exceptions, sightings in the Gulf have been along a narrow corridor near the 100-metre isobath (Davis and Fargion 1996; Davis *et al.* 2000). The

stranding reports are from all seasons and indicate that Bryde's whales are present in the Gulf of Mexico throughout the year. They are the most common baleen whale sighted in the Gulf of Mexico (Würsig *et al.* 2000).

Sightings have also been recorded in the Greater Antilles off the Dominican Republic (Bonnely de Calventi 1986); Erdman (1970) reported sightings off Puerto Rico and the Virgin Islands; a live stranding record exists on St. Croix in 1991 (Mignucci-Giannoni 1996); and Bryde's whales have been reported in Cuba, Grenada, Curaçao, Venezuela (Mignucci-Giannoni 1989), and Colombia (Flores-Gonzales and [Capella-Alzuetatorres](#) 1994). In the Lesser Antilles, Bryde's whales have been observed in Dominica (Carlson *et al.* 1995; Evans 1997). In St. Vincent and the Grenadines a Bryde's whale was resident for several days in the Tobago Cays in February 1983, and an individual was taken in the whale fishery in Barrouallie in 2000 (ECCN 2000). Ferguson (1929) reported on Bryde's whales taken during an intensive period of modern Norwegian whaling in the Grenadines between 1924 and 1926.

Bryde's whales have been radio-tagged off Venezuela (Watkins *et al.* 1979), and observations of Bryde's whales off Venezuela have revealed that the whales are most abundant from late spring to December, supporting the theory that they may be migratory. Sightings off Venezuela are also reported by Bolaños and Boher (1998) and Notarbartolo di Sciara (1979), and several groups of mothers and calves were sighted off Los Roques, Venezuela, in March 1989 (ECCN 2000). Strandings of Bryde's whales are reported on Curaçao (Soot-Ryen 1961), the Colombian Caribbean (Muñoz-Hincapié *et al.* 1998b), and Venezuela, where five stranded between June 1994 and July 1995 in the three islands off the Nueva Esparta State (Díaz *et al.* 1995). Jiménez *et al.* (1997) document, in a technical report, on the only known stranding of (a live) Bryde's whale in the Gulf of Venezuela, near the mouth of the Maracaico Lake, in March 1997.

OTHER BALEEN WHALES

In the North Atlantic, the **fin whale** (*Balaenoptera physalus*) may winter in the Gulf of Mexico and Caribbean, and occasionally may be sighted where deep water approaches the coast (Gambell 1985; Jefferson *et al.* 1993; Rice 1998). Sightings in the Gulf have typically been made in deeper waters, more commonly in the north-central area (Mullin *et al.* 1994a). Fin whales have been reported stranded in the Gulf on five occasions; there have been three confirmed sightings. Sighting and stranding records have been made throughout the year, and this is the second most frequently reported baleen whale from the Gulf of Mexico (Würsig *et al.* 2000). Adequate data do not exist for reliable population estimates, however, and it is likely that fin whales are extralimital to this area (Jefferson and Schiro 1997). Mignucci-Giannoni (1989) reported three sightings of fin whales that congregated in small groups of up to five animals in the Puerto Rico

region. Evans (1997) reported fin whales off Dominica; Lira *et al.* (1995) reported strandings of two fin whales off Venezuela; and Muñoz-Hincapié *et al.* (1998b) noted fin whale strandings in the Colombian Caribbean.

There are occasional observations of **common minke whales** (*Balaenoptera acutorostrata*) in the Caribbean (Rice 1998). Ten confirmed strandings in the Gulf of Mexico have been recorded off western Florida, Louisiana, and Texas involving mostly immature whales (Jefferson and Schiro 1997). No minke whales have been observed alive in the Gulf with the exception of a minke calf off the southeastern coast of the Gulf of Mexico (Delgado-Estrella *et al.* 1998). Because strandings in the Gulf occur during winter and spring months, there is speculation that these animals may represent a northwards migration from the open ocean or Caribbean Sea (Würsig *et al.* 2000) or strays from low latitude breeding grounds elsewhere in the western Atlantic (Mitchell 1991).

Observations of minke whales on Anguilla Bank include 10 sightings reported by Winn and Perkins (1976) and Taruski and Winn (1976), and a mother-calf pair on Anguilla Bank and in the Anegada Passage (Mattila and Clapham 1989b). Additional records are reported near Grand Turk and Caicos Islands, Puerto Rico (Winn and Perkins 1976: In: Mignucci-Giannoni 1989; Roden and Mullin 2000), the Dominican Republic (Bonnely de Calventi 1991, *pers. comm.*), and the leeward coast of Dominica in January 1996 (McLanaghan 1996, *pers. comm.*) and August 1996 (Camberon 1998, *pers. comm.*). Records summarised by Mitchell (1991) suggest a winter distribution of minke whales in the North Atlantic and in mid-ocean, south and east of Bermuda. As with many other species, a possibility of a deep ocean component to distribution exists but is unconfirmed (Waring *et al.* 1999).

Like other baleen whales, **sei whales** (*Balaenoptera borealis*) are highly migratory, but are generally uncommon in most tropical regions. In the western North Atlantic, sei whales are found mainly in offshore waters from the Gulf of Mexico and Caribbean Sea northwards to Nova Scotia and Newfoundland (Würsig *et al.* 2000). Five reliable stranding records are available from the Gulf of Mexico; three of the five records are from strandings in eastern Louisiana (Würsig *et al.* 2000), and one is from the Florida panhandle (Jefferson and Schiro 1997). The strandings have occurred in the winter and spring, and it is during these seasons that sei whales are most likely to be seen in the Gulf (Jefferson and Schiro 1997).

Mignucci-Giannoni (1989) reported two sightings of sei whales in waters off Puerto Rico. A group of approximately six sei whales were sighted off the northwest coast of Dominica in January 1996 (Moscrop 1998, *pers. comm.*), and Toyos-Gonzales *et al.* (2000) report a stranding off the Dominican Republic. The difficulty of distinguishing sei and Bryde's whales at sea has hampered efforts to determine sei whale distribution and population estimates in tropical waters.

Reports of **blue whales** (*Balaenoptera musculus*) are rare. Only two reliable reports are available from the Gulf of Mexico, and both are of stranded animals on the Texas coast

(Lowery 1974). There appears to be little justification for considering the blue whale to be a regular inhabitant of the Gulf of Mexico (Jefferson and Schiro 1997). Harmer (1923) reports on a cervical vertebra of a blue whale found at St. Cristobol, Panama, in 1922. Evans (1997) cites blue whales as rare visitors to Dominican waters. Blue whales are probably only of accidental occurrence in the WCR.

Only two records of the **North Atlantic right whale** (*Eubalaena glacialis*) are known from the Gulf of Mexico. These are observations off Sarasota, Florida (Moore and Clark 1963; Schmidly 1981) and a stranded right whale on the Texas coast (Schmidly *et al.* 1972). The Gulf records, from winter and spring, are probably extralimital strays from the portion of the western North Atlantic population that winters off the United States' southeast coast from Georgia to northeastern Florida (Jefferson and Schiro 1997).

SUBORDER ODONTOCETI or TOOTHED WHALES

The toothed whales or odontocetes include porpoises, dolphins, and all whales with teeth. They feed mostly on squid, fish, and occasionally other marine mammals. Toothed whales are generally smaller than the baleen whales; they range in size from the large sperm whales (body length: 15 m) to the small oceanic dolphins (body length: 150–250 cm). Although fishermen from this area characterise many toothed whales as 'porpoises', there are no 'true' porpoises in Caribbean waters. Porpoises have spade-shaped teeth; dolphins have cone-shaped teeth. The vast majority of marine mammals in the WCR are representatives of this suborder, Odontoceti. There are nine families and 68 species of odontocetes worldwide, of which four families and 24 species have been recorded from the region (see Tables 2–4).

FAMILY PHYSETERIDAE, SPERM WHALE

The family comprises a single species, the sperm whale (*Physeter macrocephalus*). It is the largest of the toothed whales and the most sexually dimorphic of all cetacean species. The most striking morphological feature is the huge spermaceti organ in the head, filled with up to 1900 litres of waxy oil. Sperm whales are distributed from the tropics to the pack-ice edges in both hemispheres (Jefferson *et al.* 1993). They tend to inhabit oceanic waters but come close to shore where there are seamounts, submarine canyons, or steeply shelving waters near the coast (Jefferson *et al.* 1993). The range of sperm whales includes the deeper basins of the Caribbean Sea and Gulf of Mexico.

Knowledge of the social organisation of sperm whales is incomplete, although it is known to be highly developed from studies conducted in various oceans over the past few decades (Best 1979; Gordon 1987; Whitehead and Arnborn 1987; Whitehead and Waters 1990; Christal and Whitehead 1998). Social groups are composed of matrilineally related females, which are confined to tropical and temperate waters from about 40 ° S to 40 °

N (Gordon 1987). Adult males move into high-latitude temperate and polar waters during summer and lead solitary lives. Mature males return to the mixed breeding groups in winter (Best 1979). It is possible that optimal feeding conditions in the higher latitudes are the reason for sexual segregation.

In the Caribbean, sperm whales may be found singly or in groups. Surveys of sperm whales conducted by Watkins and Moore in the early 1980s show a small isolated population in the southeast Caribbean numbering approximately 200 individuals, including large and small adults and calves of varying sizes (Watkins and Moore 1982). Watkins and Moore reported that these whales were found consistently in deep water west of the string of islands from Guadeloupe to the southern Grenadines. The whales concentrated locally in nearshore areas. Relatively stable, mixed breeding groups meandered along depth contours of 500 to 2500 metres, often in waters around 1000 metres. Dive profiles have shown that sperm whales in this region may dive to depths of more than 2000 metres (Watkins *et al.* 1993).

Preliminary results from photo-identification studies of sperm whales in the southeastern Caribbean (in Dominica and Grenada) revealed high proportions (55%) of re-sighted individuals, within and between years (Gordon *et al.* 1998). This return rate suggests that some individuals may be resident temporarily. Three of nine identified mature males were sighted in both 1995 and 1996 (Carlson *et al.* 1995; Gordon *et al.* 1998). Boisseau *et al.* (2000) reported within-year matches of sperm whales in both Guadeloupe and Dominica during the spring of 2000. Within-year matches between Guadeloupe and Dominica indicate that some individuals or groups travel between island states. Furthermore, there were several between-year sightings, the longest of which spanned 16 years of the same individual off Dominica.

In the Gulf of Mexico, the sperm whale is the most abundant large cetacean; it has been sighted on most surveys conducted in deeper waters (Fritts *et al.* 1983; Mullin *et al.* 1994a; Davis and Fargion 1996). Sperm whales occur throughout the oceanic (>200 m deep) northern Gulf of Mexico but concentrations have been found along the continental slope (200–2000 m), particularly near the Mississippi Delta (Jefferson and Schiro 1997). Sperm whales are found in waters with the steepest sea surface temperature gradient; sperm whales may forage along the thermal fronts associated with eddies (Davis *et al.* 1998). Strandings have occurred in Texas, Louisiana, Florida, and north of Veracruz, Mexico (Würsig *et al.* 2000). Ortega-Argueta *et al.* (1998) noted nine strandings of sperm whales in the Yucatan Peninsula. Sperm whales have been sighted or stranded in every month of the year in the Gulf, suggesting that at least some sperm whales are resident in the region (Würsig *et al.* 2000). It is likely that there is a resident population of sperm whales in the Gulf (Jefferson and Schiro 1997) consisting of females, calves, and immature whales (Davis and Fargion 1996; Weller *et al.* in press). Sperm whales in the Gulf are currently considered to be a separate stock from those in the Atlantic and the Caribbean (Waring *et al.* 1997).

It is unclear from the literature whether sperm whales are present in the northeastern Caribbean year-round, although they appear to be more common during the autumn and winter (Erdman *et al.* 1973; Mignucci-Giannoni 1998). Taruski and Winn (1976) reported acoustic and visual sightings of sperm whales off Caicos Bank, Mona Passage (PR), Anagada Passage (BVI), and the US Virgin Islands during winter months. Pérez-Padilla *et al.* (1995) reported a stranding of a sperm whale calf in May 1994 off Cabo Rojo, Puerto Rico. The umbilicus scar indicated that it had been recently separated from its mother. Cardona-Maldonado and Mignucci-Giannoni (2000) examined sperm whale strandings from Puerto Rico, the Virgin Islands, Venezuela, Barbados, Dominican Republic, Barbuda, Antigua, and Mexico. The strandings included females of all age classes and prematurely born calves, but consisted primarily of juvenile or subadult males. The strandings occurred throughout the year.

In the southeast Caribbean (Sub-Regions IV and V) during November and March, sperm whales were consistently found throughout most areas surveyed (Watkins *et al.* 1985). A St. Vincent fisherman stated that sperm whales are most commonly sighted in this region from October to late spring, although some appear to be present year-round (Caldwell *et al.* 1971a). In Dominican waters, sperm whales are usually sighted between November and April (Perryman 1998, *pers. comm.*; Evans 1997), although there was a reported sighting of three sperm whales in August 1988 (Armour 1999, *pers. comm.*). In the waters off St. Lucia, sperm whales are sighted between November and June (Hackshaw 2000, *pers. comm.*). The Eastern Caribbean Cetacean Network (ECCN) reported three stranding events from Antigua: in August 1984 and 1985, and December 1986 (ECCN 2000). Palacios *et al.* (1995) recorded the first sighting of a sperm whale in the Colombian Caribbean Sea. Linares and Bolaños (1995) reported strandings, and Bolaños and Boher (1996) reported sightings of sperm whales in waters off Venezuela (see Table 2).

FAMILY KOGIIDAE, PYGMY AND DWARF SPERM WHALES

The family Kogidae includes two species of the genus *Kogia*. The **pygmy sperm whale** (*Kogia breviceps*) and **dwarf sperm whale** (*Kogia sima*) appear to have a worldwide distribution in temperate to tropical waters (Caldwell and Caldwell 1989). These whales resemble the ‘giant’ sperm whale in having a spermaceti organ and functional teeth confined to the lower jaw. For these reasons, previous authors typically combined the pygmy and dwarf sperm whales into a single family with the giant sperm whale. In both species of *Kogia*, however, the blowhole is situated on top of the head instead of at the end of the snout, and *Kogia* have a distinct, curved dorsal fin; *Physeter macrocephalus* has no true dorsal fin. In 1966, the genus *Kogia* was separated into the two currently recognised species (*K. breviceps* and *K. sima*) (Handley 1966). One result of the nomenclatural confusion surrounding the genus *Kogia* is a critical lack of reliable information on the life history of these whales. Since they are difficult to distinguish from one another at sea, sightings of either species are often categorized as *Kogia* spp.

Sightings of *Kogia* spp. in the Gulf of Mexico and the WCR occur primarily in deeper waters (over and near the continental shelf edge and beyond) (Würsig *et al.* 2000). The majority of occurrence information, however, comes primarily from strandings (especially females with calves), which may give an inaccurate record of distribution, and individuals occasionally taken in small fisheries (Jefferson *et al.* 1993). These species are rarely observed at sea: live sightings may be scarce due to inconspicuous, elusive behaviour rather than rarity, although the incidence of strandings indicate that they are at least seasonally common. Thirteen strandings (inclusive of both species) are recorded from Puerto Rico and the Virgin Islands, and additional records exist for Colombia, Cuba, Dominican Republic, Mexico, Netherland Antilles and St. Vincent (Cardona-Maldonado and Mignucci-Giannoni 1999), and Grenada (Boisseau *et al.* 2000). The paucity of information along the coast of Central America between Belize and Panama and other Caribbean locations probably reflects a lack of survey effort rather than a gap in distribution. There is no information regarding population estimates in the Caribbean for either species.

Pygmy sperm whales are most likely a common element in the Gulf of Mexico fauna, but their habits—such as their offshore distribution, small group size, and cryptic behaviour—prevent them from being readily observed. Rarely seen at sea by casual observers, these whales most commonly occur in groups of three to six individuals. Pygmy sperm whales are most often reported over and near the continental slope (Würsig *et al.* 2000).

In the Gulf of Mexico region, many strandings appear to be related to the birth process; females with newborn calves and postpartum females strand often (Würsig *et al.* 2000). During 1984 to 1990, the Southeastern United States Stranding Network documented 22 pygmy sperm whale strandings along the Gulf of Mexico coastline, but no confirmed sightings (Jefferson *et al.* 1992). Fifteen of these were from Florida, six from Texas, and one from Mississippi (Würsig *et al.* 2000). Additionally, there are several

records of the pygmy sperm whale from the Gulf of Mexico and Yucatan areas summarised in Caldwell *et al.* (1960), Ortega-Argueta *et al.* (1998), Ortega-Argueta and Morales-Vela (1998), De la Parra (1998), Delgado-Estralla *et al.* (1998), and Würsig *et al.* (2000). Reports include strandings from Veracruz, Mexico (Delgado-Estralla *et al.* 1998), two strandings on the Yucatan Peninsula (Ortega-Argueta *et al.* 1998), one stranding in Cuba (Aguayo 1954: In Caldwell *et al.* 1973); nine strandings for Puerto Rico and the Virgin Islands between 1976 and 1988 (Caldwell and Caldwell 1989; Cardona-Maldonado and Mignucci-Giannoni 1999); and recent and historic strandings off Colombia from 1950 to 1994 (Vidal 1990; Muñoz-Hincapié *et al.* 1998a; Muñoz-Hincapié *et al.* 1998b). Pygmy sperm whales have been sighted off Dominica (Evans 1997; Boisseau *et al.* 2000) and Grenada (Boisseau *et al.* 2000).

The **dwarf sperm whale** is a slightly smaller version of the pygmy sperm whale. In stranded specimens, examination of the lower jaw distinguishes the two species: the dwarf sperm whale has 8 to 11 teeth in each side of the lower jaw, whereas the pygmy sperm whale has 12 to 16 teeth. Dwarf sperm whales inhabit deep water in offshore areas, and their range appears to overlap that of *K. breviceps*. Seasonal movements, although they may occur, have not been documented, and no population estimates exist in the region. In the western North Atlantic, they are known from Virginia to the Lesser Antilles and the Gulf of Mexico (Würsig *et al.* 2000).

From 1984 to 1990, the Southeastern United States Stranding Network documented 14 strandings of dwarf sperm whales (*K. sima*) from the Gulf of Mexico (Jefferson *et al.* 1992). Seven of these records were from Florida, two from Texas, and one from Louisiana. Both pygmy and dwarf sperm whales strand more often in the eastern Gulf; the dwarf sperm whale occurs about half as frequently as *K. breviceps*, with strandings throughout the year (Würsig *et al.* 2000).

Caldwell *et al.* (1973) reported on the collection of two skulls of *K. sima* from the fishery off the leeward coast of St. Vincent and noted that Vincentian fishermen usually encounter the 'rat porpoise' in small groups. Stomach contents (including cephalopods, fish, and crustaceans) indicate that *K. breviceps* is mainly pelagic in distribution and feeds primarily seawards of the continental shelf. *Kogia sima* is likely to be found near shore (Gricks 1994), although both are found in deep water. This distribution pattern is reflected by artisanal fisheries' catches in St. Lucia and St. Vincent, where *K. sima* appear with more frequency, indicating that *K. sima* lives closer to shore and inhabits areas over the continental shelf (Ross 1979). Evans (1997) reports that dwarf sperm whales are sighted occasionally near the leeward coast of Dominica.

Other stranding records for *K. sima* include two individuals, one stranded in Aruba in 1984, and one calf (probably *K. sima*) stranded on Isle of Klein, Curaçao, in December 1989 (Debrot and Barros 1992); the Dominican Republic (Bonnely de Calventi 1986; Toyos-Gonzales *et al.* 2000); Colombia (Vidal 1990; Debrot and Barros 1992; Muñoz-Hincapié *et al.* 1998a); Quintana Roo, Mexico (Smithsonian Institute 1998).

Additionally, two animals were sighted off Cancun (Sanchez-Okrucki 1997), and one individual off the Yucatan (Membrillo and Antochiw-Alonzo 1998) (see Table 2).

FAMILY ZIPHIIDAE, BEAKED WHALES

The vernacular name is derived from the long, narrow beak that forms a continuous smooth profile with the head in all forms known from the WCR. In most ziphiids (beaked whales), the teeth show strong sexual dimorphism, with males having one pair of usually large teeth in the lower jaw; in females, these teeth are absent. The cetacean fauna of the WCR includes two genera and five species. Many species have been seen only as stranded animals. With analysis of newly acquired genetic samples and newly discovered skull fragments, it is probable that several new species will be described in the future (see Table 3).

Cuvier's beaked whale (*Ziphius cavirostris*) stranding records indicate that the species occurs in deep basins along most coasts and in areas where the continental shelf is narrow and coastal waters are deep around many oceanic islands (Klinowska 1991). Heyning (1989: In Klinowska 1991) lists known food species as mostly mesopelagic or deepwater benthic organisms, indicating that Cuvier's beaked whale is an offshore, deep-diving species and the most cosmopolitan of the beaked whales. Although there is little information on abundance of the species, there are a surprising number of strandings reported from the Gulf of Mexico (Würsig *et al.* 2000) and the West Indies (Erdman *et al.* 1973).

In the Gulf of Mexico, 18 strandings of Cuvier's beaked whale have been reported by the Southeastern United States Stranding Network or are known from the historic record of Gulf cetacean sightings. Most strandings have been from the eastern area of the Gulf, primarily Florida. Strandings have occurred in all seasons, with a slight peak in spring. Vidal (1991: In Debrot and Barros 1994) and ECOSUR (1988) report Cuvier's beaked whale strandings in the Gulf of Mexico. During the 1992 through 1997 GulfCet surveys, Cuvier's beaked whales were observed from the ship in the deepest part of the northwestern Gulf study area, in depths of approximately 2000 metres (6560 ft). Seasonal movements remain unsubstantiated, but nevertheless data suggest that the Cuvier's beaked whale is one of the most common ziphiid species in the Gulf of Mexico (Jefferson and Schiro 1997).

Two Cuvier's beaked whales have been reported stranded on Curaçao, one in February and one in December 1991 (Debrot and Barros 1994), and four on Bonaire in April 1974 (van Bree and Kristensen 1974). Muñoz-Hincapié *et al.* (1998b) report on

strandings of Cuvier's beaked whales from the Colombian Caribbean, Toyos-Gonzales *et al.* (2000) from the Dominican Republic and Rosario-Delestre, and Mignucci-Giannoni (1998) report on eighteen stranding and mortality events in Puerto Rico and the Virgin Islands. Delgado-Estrella *et al.* (1998) report on a stranding off Campeche, Mexico.

Cuvier's beaked whale has also been reported off Puerto Rico, Barbados, St. Martin, and Curaçao (van Bree 1975). Four reports have been reported from the northeastern Caribbean (Hispaniola to Antigua): a 3.28-metre (18-ft) female stranded on the south coast of Puerto Rico in February 1961 (Erdman 1962), another stranding in September 1964, five in December 1965, and one stranding of a male in March 1966 (Erdman *et al.* 1973). Two females beached on Barbados, one in May 1968 and one in April 1969 (Caldwell *et al.* 1971a). Balcomb and Claridge (2000) report on the strandings of seven Cuvier's beaked whales in March 2000 in the Bahamas. Gricks (1994) considers that Cuvier's beaked whale is more likely to be encountered than any other beaked whale in the Caribbean, though it is still seldom recorded.

Observations of Cuvier's beaked whales have been reported by Aguayo (1954), who noted two specimens from Caibarien and Matanzas on the northern coast of Cuba, and by Varona (1964), who reported on the skull of a specimen from the southern coast of the Isle of Pines. Additionally, *Z. cavirostris* has been reported off the Dominican Republic (Bonnely de Calventi 1986) and Venezuela (Linares and Bolaños 1995; Bolaños and Boher 1996). Five unidentified beaked whales were sighted during a survey in June/July of the Gulf of Mexico and Caribbean, all in deep water (Jefferson and Lynn 1994). IFAW and ECCN reported observations of Cuvier's beaked whales off the leeward coast of Dominica in January 1995 (Carlson *et al.* 1995) and in January and November 1997 (ECCN 2000). Records for the species stretch from St. Vincent to the Bahamas. Cuvier's beaked whales have been caught in small numbers by fishermen from St. Lucia and St. Vincent for human consumption (Caldwell *et al.* 1971b; Caldwell and Caldwell 1975). Despite being among the more abundant and frequently stranding of the mysterious beaked whales, life history information of Cuvier's beaked whales is extremely sparse and population estimates do not exist.

Gervais' beaked whale (*Mesoplodon europaeus*) may also be taken in Caribbean small cetacean fisheries (Jefferson *et al.* 1993). Records of the species are known from Florida, the Bahamas, Jamaica, Barbados, St. Vincent, Puerto Rico and the Virgin Islands, Cuba, Dominica, Trinidad, Curaçao, Bonaire (Mignucci-Giannoni 1989), the Dominican Republic (Toyos-Gonzales *et al.* 2000), and the Gulf of Mexico in the Yucatan region (Vidal 1991; In Debrot and Barros 1994; Solis-Ramirez 1995).

Additionally, 16 stranding records are available from the Gulf of Mexico, making it the most frequently stranded beaked whale in those waters (Jefferson and Schiro 1997). Four strandings are recorded from middle to southern Florida, two from the northeastern Gulf, five from Texas, four from the northwestern shore of Cuba, and one from southern Mexico. This may be the most widely distributed ziphiid (beaked whale) in the Gulf (Würsig *et al.* 2000). Mignucci-Giannoni *et al.* (1999a) recorded two strandings in Puerto Rico and the Virgin Islands. In February 1953, two females were taken at Bull Bay, east of Kingston (Rankin 1953), and in the early part of 1963, a Gervais' beaked whale washed ashore in Montego Bay, Jamaica (Caldwell 1964). There are several stranding records of this species in the winter on the north coast of Jamaica (Moore 1966). In January 1953,

a Gervais' beaked whale stranded in Trinidad (ECCN 2000), and in March 1990 a stranding was reported from Curaçao, the first published for this southernmost region. Although there are only six previous records for which strandings are dated, they suggest greater abundance of this species in winter (Debrot and Barros 1992). Balcomb and Claridge (2000) report on a stranding of an adult male off Allans, Pensacola Cay, Abaco Island, Grand Bahama. Bolaños and Villarroel (1999) report on the first stranding of whale of the genus *Mesoplodon* (a cow-calf pair) in Playa Blanca, Puerto Cabello, central coast of Venezuela on 19 August 1998 (Bolaños 1999). Subsequently, González-Fernández identified them as *Mesoplogon europaeus* (Campo 2001, *pers. comm.*).

Blainville's beaked whale (*Mesoplodon densirostris*) has been reported from several regions in the Caribbean and Gulf of Mexico. Only four verified stranding records are available from the Gulf of Mexico (Jefferson and Schiro 1997; Würsig *et al.* 2000). Additional records are from the Bahamas, Puerto Rico, and the Cayman Islands (Klinowska 1991; Mignucci-Giannoni *et al.* 1999a). In March 2000, three stranded in the Bahamas (Balcomb and Claridge 2000); in 1979, an individual stranded in the Cayman Islands; and one in Puerto Rico (Mignucci-Giannoni 1989). Macleod and Claridge (1998) examined habitat use by *M. densirostris* in the northeastern Bahamas between May and September 1998. Distribution was not random. *M. densirostris* spent the majority of time in water depths of 200 to 1000 metres and close to two specific areas, a gully-like feature at the southern end of the study area and a complex topographic feature in the northern end of the study area. Foraging probably only occurred in the gully-like features. The authors note that although the species is reported throughout tropical and subtropical waters, local distribution may be limited to small areas of suitable habitat, particularly for foraging. This may indicate that *M. densirostris* is more vulnerable to anthropogenic impacts than it would be if widely distributed. The species is believed to live further offshore than any of the other *Mesoplodon* spp. (Moore 1966; Mead 1989; In Klinowska 1991). Twenty sightings of *M. densirostris* between March 1991 and July 1995 off the northeast Bahamas are reported in Claridge and Balcomb (1995). Distinctive individuals were successfully photographed during 13 encounters, and a catalogue of 35 individuals exists. MacLeod and Claridge (1998) report on scarring in a population of *M. densirostris* off the coast of Abaco Island, Bahamas. The distribution of intraspecific scarring between age and sex classes is similar to that of sperm whales and the authors suggest that *M. densirostris* may have a similar breeding system.

True's beaked whale (*Mesoplodon mirus*) distribution reportedly overlaps with several other *Mesoplodon* species. However, the species has never been positively identified at sea, so nothing is known about its behaviour. The species is known from limited strandings and seems to resemble closely Cuvier's beaked whale. Strandings have been reported from Nova Scotia to Florida in the North Atlantic and the Bahamas (Jefferson *et al.* 1993).

The only record of **Sowerby's beaked whale**, *Mesoplodon bidens*, from the Gulf of Mexico is a single stranding (alive) from Gulf County, Florida. This stranding probably represents an extralimital occurrence, the lowest reported latitude occurrence for this species that normally occurs much farther north in the North Atlantic (Jefferson and Schiro 1997). It is doubtful that Sowerby's beaked whale occurs with any regularity in the WCR (Würsig *et al.* 2000).

FAMILY DELPHINIDAE, OCEANIC DOLPHINS

This is the most diverse family of cetaceans, with a total of 17 genera and 33 species. The Delphinidae include all the classic dolphins; smaller cetaceans with beak-like snouts and slender, streamlined bodies; and the bulbous headed, larger stout-bodied whales often termed 'blackfish', such as the killer, pilot, and melon-headed whales. In the WCR there are 12 genera and 17 species (see Table 4).

The **killer whale** (*Orcinus orca*) is the largest member of the dolphin family Delphinidae. It is sighted irregularly in the Caribbean, with anecdotal sightings throughout the West Indies chain. In the Caribbean, sightings of killer whales have been reported from the Bahamas, Cayman Islands, Cuba, Dominican Republic, St. Lucia, St. Vincent and the Grenadines, Puerto Rico and the Virgin Islands, and Trinidad and Tobago (Mignucci-Giannoni 1989; Carlson 1998, *pers. comm.*). In the Bahamas, records include a killer whale stranded on Great Abaco Island in June 1960. This stranding was unusual because killer whales rarely beach themselves and sightings off the southeast United States are rare (Backus 1961). Moore (1953) listed several sightings of this species off Miami. Erdman (1970) included several sighting records from near the Virgin Islands; in one case, a large group of killer whales were reported attacking a large whale off Culebra Island, Puerto Rico. Killer whales were sighted in Puerto Rico and the Virgin Islands most frequently during the winter and early spring months, whereas in the Lesser Antilles killer whales were most often captured during the summer months (Winn *et al.* 1979).

Killer whales have been sighted north of the Dominican Republic (Cabo Samana) (Mattila *et al.* 1994). Anecdotal observations have been reported on several occasions in waters off Antigua (ECCN 2000), Martinique and Venezuela (Bolaños and Boher 1996; ECCN 2000), Dominica (Evans 1997; Armour 1999, *pers. comm.*), and St. Vincent and the Grenadines (ECCN 2000). A group comprising two adults and a juvenile was observed several miles off St. Georges, Grenada in March 1996 (IFAW 1996). Caldwell *et al.* (1971b) reported takes of orcas in the St. Vincent fisheries: in May 1968, two females and a juvenile male, from a pod of six animals, were harpooned. All three animals had the remains of leatherback turtles in their stomachs (the first record of turtle as a prey item for this species) (Caldwell and Caldwell 1969). In July 1968, three were taken from a pod of eight (one was a 6-metre male with heavily worn teeth). Three more (two females and a subadult) were harpooned from a pod of six in May of 1968 (Caldwell *et al.* 1971b). Fishermen's accounts show that four more were taken in June 1969. Caldwell and

Caldwell (1975) report that the whalers of St. Vincent frequently encounter killer whales, locally dubbed 'black and white fish', in the months of May, June, and July (from 1967–1974 records). Whalers interviewed in St. Lucia stated that they rarely observe killer whales (Reeves 1988), although one whaler said he had killed three over the 25 years he had been whaling. Recent reports from the Lesser Antilles indicate that killer whales are still taken by the St. Vincent fishermen in Barrouallie (three were taken in July 1995) (ECCN 2000). In Trinidad, a killer whale was landed by fishermen at Chaguaramas in 1987 (Spencer 2001, *pers. comm.*).

Most killer whale sightings in the northern Gulf have been in offshore waters greater than 200 metres deep, although there are other sightings from over the continental shelf (Davis and Fargion 1996). Killer whales are found almost exclusively in the broad area of the north-central Gulf (Mullin and Hansen 1999). Stranding records from the Gulf of Mexico include one possible stranding from the northern coast of Cuba, one unverified report from south Texas, and three records from the Gulf coast of Florida (Jefferson and Schiro 1997). Sightings in the Gulf of Mexico are more frequent in recent years. Although only nine reliable records were noted before 1990, another 14 have been added since then, primarily in the northwestern Gulf from GulfCet surveys (O'Sullivan and Mullin 1997). The paucity of records of sightings and strandings in the Gulf indicate that killer whales are relatively rare in this area (Jefferson *et al.* 1992).

The distribution of the **pygmy killer whale** (*Feresa attenuata*) is poorly known from sparse but widely distributed records. The species mainly occurs in deep tropical and subtropical waters, rarely close to shore except near oceanic islands. Pygmy killer whales may form large pods of several hundred, but pods of 50 or less are more common (Leatherwood and Reeves 1983). Reports of large herds may be the result of confusing pygmy killer whales with melon-headed whales (*Peponocephala electra*).

This species has been recorded in the Gulf of Mexico in both eastern and western regions and probably occurs year-round (Jefferson *et al.* 1992). Additional records are from Dominica (Evans 1997), Venezuela (Romero *et al.* 1997; Villarroel *et al.* 1998; Bolaños 2001, *pers. comm.*), and St. Vincent (Caldwell and Caldwell 1971; Ross and Leatherwood 1994). Boisseau *et al.* (2000) report on four encounters with pygmy killer whales off Guadeloupe; sightings ranged from one individual to a pod of 12 animals.

Villarroel *et al.* (1998) report the first confirmed stranding of the species in the Venezuelan Caribbean. One male stranded live on the Veracruz coast of Mexico (Delgado-Estrella *et al.* 1998). Rodrigues-López and Mignucci-Giannoni (1999) reported a live stranding of a male off Puerto Rico in 1997. The animal died the next day; its stomach content included squid beaks and fish otoliths. Mignucci-Giannoni *et al.* (1999c) reported a mass stranding of five pygmy killer whales in the British Virgin Islands (BVI) in September 1995. Toyos-Gonzales *et al.* (1998) reported a live stranding of five *F. attenuata* off Trellis Bay, Beef Island, Tortolla, BVI.

Caldwell *et al.* (1971b) reported the capture of a pygmy killer whale in 1969 in the St. Vincent fishery in the Lesser Antilles. Catch records from whalers in St. Vincent show that the pygmy killer whale is present year-round. No migrations are known.

The distribution of the **false killer whale** (*Pseudorca crassidens*) is poorly known, and current evidence suggests that it is probably not very abundant (Klinowska 1991). It seems to prefer warm, temperate offshore waters around oceanic islands, although no fixed migration is known. In the Atlantic, *P. crassidens* are reported from Maryland southwards along the coasts of the Gulf of Mexico, the southeastern Caribbean Sea to Venezuela. There are no worldwide population estimates (Klinowska 1991). The historical record of live animal sightings include 11 sightings throughout the northern Gulf in water generally 200 metres to more than 2000 metres (656–6560 ft) deep. During GulfCet 1992 to 1997 surveys, another five were sighted. There are 15 stranding reports from the Gulf of Mexico including Cuba, the Florida Keys, Louisiana, Texas, and southern Mexico. The stranding of a single male in November 1965 and a single male in December 1969 off Florida was noted, as was a mass stranding of false killer whales on the southeastern coast of Florida in January 1970 (Caldwell *et al.* 1970). Sightings and strandings can occur at any time of the year in the Gulf (Jefferson *et al.* 1992).

The species has been reported in Colombia (Palacios *et al.* 1995), Cuba, the Virgin Islands, Tobago, Dominica and Grenada (IFAW 1996; Evans 1997; Mignucci-Giannoni 1998; Perryman 2000, *pers. comm.*), Venezuela (Bolaños and Boher 1996), and by whalers in St. Vincent and the Grenadines (Caldwell *et al.* 1971b; Caldwell and Caldwell 1972; Mignucci-Giannoni 1989). All records off Venezuela have been exclusively from coastal waters (Leatherwood and Reeves 1983). Castellanos and Casinos (1982) report a single stranding in 1978 in San Juan de los Cayos, off the central coast of Venezuela. The bones of a false killer whale were found in Aves Island off Venezuela in 1883, as well as in south Florida in 1918 (Miller 1920). A live stranding occurred in Antigua (Gricks 1994). Several individuals were taken by fishermen off Castries, St. Lucia, in spring 1998 (Ingram 1998, *pers. comm.*). Due to the paucity of data there are no abundance estimates for the region.

Short-finned pilot whales (*Globicephala macrorhynchus*) exhibit a more tropical distribution than their close relative, the long-finned pilot whale (*Globicephala melas*). They are observed in the western North Atlantic from Virginia southwards to northern South America, the Caribbean, and the Gulf of Mexico (Leatherwood *et al.* 1976). They have a wide distribution in the Caribbean (van Bree 1975; Watkins and Moore 1982; Mattila and Clapham 1989b). Both pilot whale species are known to prefer deep waters, such as those found at the edges of the continental shelves and submarine canyons, but have been sighted in a wide range of water depths greater than 500 metres (Roden and Mullin 2000). Short-finned pilot whales, also called ‘blackfish’, live in tight social units and are commonly found in groups of 15 to several hundred adults (Jefferson *et al.* 1993). Although originally thought to be a summer visitor to the West Indies (Caldwell and Erdman 1963), Taruski and Winn (1976) observed pilot whales throughout the winter.

Based on historical records (mostly strandings), the short-finned pilot whale would be considered one of the most common offshore cetaceans in the Gulf (Jefferson and Schiro 1997). However, the short-finned pilot whale has only occasionally been sighted during recent surveys in the northern Gulf. Elevated historical abundance estimates may be due to misidentifications with other ‘blackfish’ species (e.g., false killer, killer, pygmy killer, and melon-headed whales). Short-finned pilot whales have been reported from the Gulf of Mexico during all months of the year and are probably the most common species of ‘blackfish’ in these waters (Jefferson *et al.* 1992). No pattern of season migration is evident, however. Mass strandings occur in all months except December and January. As of 1990, 15 mass strandings of more than five animals per stranding were recorded in the Gulf. Of this total, 40 percent were during July and August. All the mass strandings occurred in Florida with the exception of one in Louisiana (Würsig *et al.* 2000).

Short-finned pilot whales have also been reported in the waters of Mexico; ECOSUR (El Colegio de la Frontera 1998) reported six strandings of pilot whales in the Gulf including Isla Mujeres, Cozumel, and the Yucatan, from 1984 through 1991. Additional reports are from Cuba (Cuni 1918; Aguayo 1954), Colombia (Muñoz-Hincapié *et al.* 1998b), Dominica (Carlson *et al.* 1995; IFAW 1996; Evans 1997; Boisseau *et al.* 2000), Dominican Republic (Toyos-Gonzales *et al.* 2000), Martinique, Haiti, (Mignucci-Giannoni 1989), Grenada (Boisseau *et al.* 2000), Puerto Rico and the Virgin Islands (Mignucci-Giannoni 1998), St. Lucia (Mignucci-Giannoni 1989; Rambally 2000), St. Vincent and the Grenadines (Brown 1945, 1947; Fenger 1958; Caldwell and Erdman 1963), and Venezuela (Casinos and Bou 1980; Bolaños and Boher 1996). A pod of pilot whales stranded at La Filette, on the northern coast of Trinidad (Spencer 2001, *pers. comm.*), and 26 pilot whales stranded on Manzanilla Beach, Trinidad, on October 1999 (ECCN 2000). According to Erdman *et al.* (1973), short-finned pilot whales are more often seen in the summer and in greater number in the northern Caribbean. Fishing captains from San Juan, Puerto Rico, report seeing pilot whales only in the summer (Caldwell and Erdman 1963), whereas Taruski and Winn (1976) document sightings of pilot whales in this area in January, February, and March.

Short-finned pilot whales are thought to be fairly common in the Caribbean, although Klinowska (1991) noted that despite such reports their status and abundance is not known, and directed takes are common (but unquantified) throughout the Lesser Antilles (Caldwell *et al.* 1971b). Caldwell *et al.* (1971b) report catches of pilot whales from St. Vincent in all months of the year (from 1962 to 1970) and note that fishermen report that they are there year-round. In the Windward Islands, pilot whales have various vernacular names including ‘bott’ in Dominica, ‘meshouin’ in St. Lucia, and ‘blackfish’ in St. Lucia and St. Vincent and the Grenadines. Due to the varied terminology for pilot whales as well as other delphinid species (usually referred to as ‘porpoise’), observers have difficulty in estimating the full extent of the catch in island fisheries (Reeves 1988; Klinowska 1991).

The **melon-headed whale** (*Peponocephala electra*) is characteristically found in deep tropical and subtropical waters (Perryman *et al.* 1994). They may associate with

Fraser's dolphins and sometimes with spinner and spotted dolphins. Melon-headed whales are often confused with pygmy killer whales as they are similar in appearance. They are reported to feed on squid and small fishes (Caldwell *et al.* 1976).

Barron and Jefferson (1993) reported strandings of male melon-headed whales in the Gulf of Mexico during 1990 and 1991. The 1990 specimen represented the first documented occurrence of the species in the Gulf and clarified the worldwide distribution of this species in tropical and warm temperate waters. During the 1991 through 1997 GulfCet II study, one group of 400 whales was sighted in the northwestern Gulf. Ten sightings of melon-headed whales in the Gulf of Mexico were recorded during 1992 and 1993 from shipboard and aerial surveys (Mullin *et al.* 1994c). Jefferson *et al.* (1992) notes two records of strandings in the Gulf, one in Texas and the other in Louisiana, both in summer. The abundance for the oceanic Gulf is estimated to be 1734 individuals (Davis *et al.* 2000).

The species is occasionally taken in the Lesser Antilles in the St. Lucian and Vincentian small cetacean fisheries, where they are called the 'mango-head whale'. Four animals were taken off St. Vincent in 1976 (Caldwell *et al.* 1976). Four sightings were reported by Watkins *et al.* (1997) in an area west of Dominica during three cruises in October 1991 (14 whales), May 1994 (12 whales), and April 1995 (10 and 12 whales). Debrot *et al.* (1998) report a stranding (1982) and a sighting (1997) in Bonaire in the Leeward Netherland Antilles. Surveys in the Caribbean during 1988, 1990, and 1994 by Palacios *et al.* (1995, 1996), during 1991 by Jefferson and Lynn (1994), and during 1995 (Mullin, *pers. comm*) did not yield any sighting of the melon-headed whale. A large group of melon-headed whales and Fraser's dolphins was encountered off Carriacou (IFAW 1996), and a group of seven to nine off St. Vincent in 1996 (Daize 2000, *pers. comm.*). Mignucci-Giannoni (1998) reports the first record of a melon-headed whale stranded off Puerto Rico. A 210-centimetre juvenile stranded at la Playa Los Veleros in Cayo Icaos in August 1998.

Fraser's dolphins (*Lagenodelphis hosei*) are a little known tropical species with few records from the Atlantic Ocean (Leatherwood *et al.* 1993). Rarely seen inshore except around oceanic islands, this tropical pelagic species was first described in 1956 from the remains of a beach-washed specimen. Like false killer and pygmy killer whales, they appear to favour warm oceanic waters and rarely stray into the relatively shallow depths over the continental shelf. Analysis of prey suggests that Fraser's dolphin is a deep diver, hunting at depths of at least 250 to 500 metres (820–1640 ft) (Watkins *et al.* 1994). They are often seen in mixed schools with pelagic cetaceans such as melon-headed and false killer whales and pantropical spotted or striped dolphins. Little is known about their reproductive biology or seasonal movements.

Records exist for the species from the south of Florida (Caldwell and Caldwell 1983), the Puerto Rican Bank (Mignucci-Giannoni *et al.* 1999b), the Lesser Antilles including Dominica and St. Vincent and the Grenadines (Caldwell *et al.* and Caldwell

1976; [Caldwell and Caldwell](#), 1983; ECCN 2000), and the Gulf of Mexico (Würsig *et al.* 2000). This species was previously known to the Gulf only from a mass stranding in the Florida keys in 1981 (Hersh and Odell 1986). From 1992 through 1997 there were five sightings in offshore waters of the northern Gulf of Mexico (all associated with GulfCet surveys); four of the five sightings were associated with melon-headed whales (Würsig *et al.* 2000). Until 1992, when the first of these sightings occurred, the mass stranding in 1981 was the only record for the Gulf. The sightings in the northwestern part of the Gulf were in waters around 1000 metres deep (Davis and Fargion 1996). Carlson *et al.* (1995) report sightings of Fraser's dolphins off the leeward coast of Dominica during January, February, and March of 1995, and IFAW (1996) reports sightings offshore of Carriacou in 1996. Boisseau *et al.* (2000) reports two encounters off Dominica: one pair and a group of approximately 50 individuals.

Previously only 17 records were known from the entire Atlantic Ocean (Mignucci-Giannoni *et al.* 1999b). The Caribbean records include three specimens harpooned and taken by a cetacean fishery at St. Vincent between 1972 and 1973 (Caldwell *et al.* 1976) and two strandings records in Puerto Rico: one on the southwest coast in 1994 (Mignucci-Giannoni *et al.* 1999b), and a calf in 1997 in Ponce, on the south coast (Mignucci-Giannoni *et al.* 1999b). In the Gulf of Mexico, there was a mass stranding in 1981 in the Florida Keys (Hersh and Odell 1986).

Pantropical spotted dolphins (*Stenella attenuata*) are sighted less frequently in the Caribbean than **Atlantic spotted dolphins** (*Stenella frontalis*). The taxonomy of *Stenella* spp. has long been confused: two apparent species of spotted dolphins exist, one endemic to the Atlantic and the other pantropical. They may be distinguished by different colour patterns and non-overlapping vertebral counts (Perrin *et al.* 1987). Although several names have been used to describe spotted dolphins, Perrin *et al.* (1987) proposed that *Stenella frontalis* (G. Cuv., 1829) be used for the Atlantic endemic species (previously known as *S. plagiodon* in the historical literature) and *Stenella attenuata* (Gray 1846) for the pantropical species. Records of spotted dolphins (Erdman 1970) are difficult to interpret prior to the taxonomic work of Perrin *et al.* (1987), due to the confusion over the descriptions of 'spotted' dolphin species.

Pantropical spotted dolphins are distributed throughout the tropical and subtropical waters in the world. In the western North Atlantic, this species is found from North Carolina to the Antilles, West Indies, and down to the equator. The pantropical spotted dolphin is the common small cetacean in deep Gulf waters (Mullin *et al.* 1994b; Davis and Fargion 1996; Davis *et al.* 2000; Mullin and Hoggard 2000). It is probable that they were often mistaken in the past for Atlantic spotted dolphins. At least 21 stranding records exist from the coasts of Texas, Alabama, Mississippi, Florida, the Florida Keys, and northwestern Cuba. Numerous sightings have been made of groups in waters deeper than 100 metres (Würsig *et al.* 2000). They occur in the Gulf in all seasons.

Pantropical spotted dolphins have been reported off the Dominican Republic (Roden and Mullin 2000), Dominica (Evans 1997), St. Vincent and the Grenadines

(Caldwell *et al.* 1971b; ECCN 2000), St. Lucia (Taruski and Winn 1976), Tobago (Carlson *et al.* 2000), Venezuela (Bolaños and Boher 1996), and Colombia (Palacios *et al.* 1996). In general, *S. attenuata* is seen in deep water. Watkins *et al.* (1985) report two encounters (135 animals) with *S. attenuata* during cruises in November and March in the southeast Caribbean. Caldwell and Caldwell (1975) reported that spotted dolphins are hunted off St. Vincent, and Reeves (1988) indicated that *Stenella* spp. are commonly killed by fishermen of St. Lucia. Pantropical spotted dolphins are found mainly where surface water temperature is higher than 23 ° C (Carwardine 1995).

Atlantic spotted dolphins are distributed only in tropical to warm temperate waters of the Atlantic Ocean, including the Caribbean Sea and Gulf of Mexico southwards to Brazil. Along with the bottlenose dolphin, *S. frontalis* is a common offshore dolphin in the Gulf of Mexico, occurring extensively off the Mexican Campeche Bank north and west of the Yucatan Peninsula, typically inhabiting shallow waters on the continental shelf within the 250-metre isobath but rarely beyond the 2000-metre contour (Mullin *et al.* 1994a; Davis *et al.* 1998; Davis *et al.* 2000). Records indicate that these dolphins may move inshore during the late spring and summer months corresponding to prey availability (Würsig *et al.* 2000). In the northern Gulf of Mexico, the heavier coastal form occurs on the continental shelf and the extreme upper continental slope (<500 m) (Hansen *et al.* 1996; Mills and Rademacher 1996). The Gulf form is typically larger, more robust and often has more spotting than the ‘oceanic island’ form described by Perrin *et al.* (1994).

Atlantic spotted dolphins in the Caribbean constitute one of the six geographical populations endemic to the Atlantic Ocean (Perrin *et al.* 1987). Mignucci-Giannoni (1998) reported only the Atlantic spotted dolphin around Puerto Rico and the Virgin Islands. He found that 85 percent of sightings were in water less than 183 metres deep and that the species was rarely seen offshore. Jefferson and Lynn (1994) reported two sightings of Atlantic spotted dolphins at 40 metres and 5425 metres but noted that the latter sighting was in the vicinity of shallow water.

Interestingly, this abundant continental shelf species has few documented strandings. Strandings have been recorded from the Gulf of Mexico coast, Yucatan Peninsula (Sanchez-Okrucki 1997), the Caribbean coast of South America (Gutierrez-Carbonelli: In Ortega-Argueta and Morales-Vela 1998), and throughout the insular Caribbean islands (Perrin *et al.* 1987; Díaz *et al.* 1995; Bonnelly de Calventi 1986; Rodríguez-López *et al.* 1995; Muñoz-Hincapié *et al.* 1998b; Carlson 2000; ECCN 2000). Herzing (1997) studied age classes by degree of spotting and colour phases as well as reproductive parameters of females of free-ranging *S. frontalis* inhabiting the Great Bahama Banks. Brunnick and Herzing (1999) studied association patterns related to age and gender of this population. Calves showed close association to their mothers during the first few years of life. Association values between female calves and their mothers dropped significantly during the first 3 to 4 years, with the greatest decline when the calves became juveniles. Male calves had a more consistent relationship with their mothers during the first few years. This declined significantly when they became juveniles. Juvenile males

began to form associations with males of the same age, many developing into long-term associations. Mothers had the strongest relationships with their calves and with other females in similar reproductive state. In adults, male–female associations became fluid while male–male associations continued to be age-related.

S. frontalis have also been observed interacting with bottlenose dolphins north of Grand Bahama Island in the Bahamas (Herzing and Johnson 1997) and in the Gulf of Mexico. Ten sightings of *S. attenuata* were logged, making it the most commonly sighted small cetacean during the cruise. *S. frontalis* and/or *S. attenuata* were also observed feeding at night on flying fish in the Gulf of Mexico (Richard and Barbeau 1994).

Bolaños and Boher (1996) report sightings off Venezuela and Bolaños *et al.* (1998) report repeated sightings of one individual over a 3-year period (1997–1999). Bolaños *et al.* (1998) report resightings of one young individual (*Stenella frontalis*) between 1996 and 1997. This same individual was resighted in 1998 and again in June 2000 (Bolaños 2001, *pers. comm.*). Bolaños and Campo (1998) report on interaction between *S. frontalis* and *T. truncatus* off the central coast of Venezuela, where *S. frontalis* is the most commonly observed species in both sighting frequency and absolute numbers. Pods of 3 to 300 *S. frontalis* were observed (Bolaños and Campo 1998). Bolaños and Boher (1998) report a mass stranding of more than 100 animals on the Island of La Tortuga in northeastern Venezuela in January 1998.

Delgado-Estrella (1997) reports on interactions with shrimp fisheries of *S. frontalis* in Campeche Sound, Mexico. The dolphins are probably attracted to trawling activities because such activities makes it easier to exploit a concentrated food source; they remained behind the shrimp boats and ate the discarded by-catch (Fertl and Leatherwood 1997). *S. frontalis* was observed year-round during sighting surveys southeast of the Gulf of Morrosquillo, from Crispate Bay to the mouth of the river Sinu, in the Colombian Caribbean. A population of approximately 144 individuals was recorded (Avila 1995).

Spinner dolphins (*Stenella longirostris*) may be seen both inshore and in deep water travelling commonly in herds of 200, although sightings of more than 1000 individuals have been observed. They occur worldwide in tropical and warm temperate waters close to tropical islands and atolls with adjacent deep water. In these areas, they typically rest and socialize in the shallows during the day and feed in deep water at night. In the eastern tropical Pacific, they occur far offshore, distant from land. In the western North Atlantic, Atlantic spinner dolphins have been documented from Florida, the Caribbean, the Gulf of Mexico, and throughout the West Indian chain southwards to Venezuela (Würsig *et al.* 2000).

During GulfCet surveys in the Gulf of Mexico, spinner dolphins were sighted in every season except autumn with group sizes ranging from 9 to 750 animals, found in waters much deeper than 100 metres (328 ft) (Würsig *et al.* 2000). This species has mass stranded twice in the Gulf of Mexico; approximately 36 spinner dolphins stranded in Florida in 1961; and about 50 stranded near Sarasota, Florida, in 1976. Frazier (1998)

reports a stranding of *S. longirostris* in the Gulf of Mexico (Yucatan) in February 1991. The paucity of sightings on deepwater surveys suggests that spinner dolphins are not as common in the Gulf as other species of the genus *Stenella*, particularly pantropical spotted dolphins (Jefferson *et al.* 1992).

Jefferson and Lynn (1994) recorded one sighting north of Curaçao, and Erdman *et al.* (1973) reported two sightings in the waters off Puerto Rico (20 seen west of San Juan and 20 seen near Sponge Bank, west of Mayaguez in Puerto Rico). Taruski and Winn (1976) document repeated sightings in Mona Passage (Puerto Rico), one at St. Vincent and one on the Virgin Banks; the animals were in large groups (200 or more) and were seen over banks and in deep water. Groups of spinner dolphins (total of 400) were encountered on several occasions during a research cruise in the southeast Caribbean in November 1983 (Watkins *et al.* 1985). Evans (1997) reports that the species is fairly common year-round in the nearshore waters off Dominica's west coast. Caldwell *et al.* (1971b) reported that the spinner dolphin, dubbed 'skipjack porpoise' in St. Vincent and 'schoolboy porpoise' in St. Lucia, is seen less frequently off St. Vincent than the spotted dolphin. The spinner dolphin is hunted in both locales (Caldwell *et al.* 1971b; Caldwell and Caldwell 1975).

The **Clymene dolphin** (*Stenella clymene*) was considered to be one of the variations of the spinner dolphin until it was fully described as a distinct species in 1981 (Perrin *et al.* 1981). It has been observed at sea only in deep water (250–5000 m/820–16,400 ft or deeper). There is considerable overlap in the range of *S. clymene* and *S. longirostris* in the Atlantic, and they are difficult to distinguish at sea. In the past, *S. clymene* was regarded as a rare cetacean, but this is certainly the result of taxonomic confusion with *S. longirostris* and the striped dolphin (*S. coeruleoalba*) (Jefferson and Schiro 1997). Although more robust than the spinner, *S. clymene* is characterised by a shorter snout. Distribution is unknown but observations are mostly in tropical and subtropical waters.

The Clymene dolphin has been sighted as far north as New Jersey to Florida, the Caribbean, the Gulf of Mexico, and down to Venezuela and as far south as Brazil. During the GulfCet surveys, these dolphins were sighted well past the 100-metre (328-ft) contour. They were more widely distributed in the western oceanic Gulf during the spring and the northeastern Gulf slope waters during the summer and winter (Davis *et al.* 2000). Twenty-nine groups were sighted in the Gulf of Mexico during ship line transect surveys from 1990 through 1993 (Mullin *et al.* 1994b). Estimated group size ranged from 100 to 200 animals, with calves observed in 45 percent of the groups.

Watkins *et al.* (1985) observed one group of *S. clymene* in November 1983 during a cruise from St. Lucia to the Grenadines and in March 1984 during a cruise from Guadeloupe to Martinique to Guadeloupe. Rambally (2000) reports sightings of *S. clymene* in St. Lucian waters and Carlson *et al.* (1995) off Dominica in January and March 1995. In the northern Gulf of Mexico, 11 Clymene dolphins stranded between 1981 and 1992

(Jefferson *et al.* 1995). One stranding is reported in the Yucatan, Gulf of Mexico in 1991 (De la Parra Venega 1998).

Common dolphins (*Delphinus* spp.) are commonly encountered offshore or seawards of the 100-fathom contour over the continental shelf. Animals are sighted in areas with high sea floor relief, and where surface temp is 10 to 28 ° C (50 to 82 ° F), and are less common in waters less than 180 metres (Leatherwood and Reeves 1983; Carwardine 1995). There are thought to be two species—the short-beaked (*D. delphis*) and the long-beaked (*D. capensis*) (Rice 1998). *Delphinus delphis*, also commonly called the ‘saddleback dolphin’, is an offshore species found over the continental slope and in proximity to ocean ridges (Winn *et al.* 1979). Their distribution has been associated with productive areas of convergence and divergence, and with areas of intrusion of warm water into cooler regions (Mignucci-Giannoni 1998).

Although both sighting and stranding records exist for the Gulf of Mexico, all museum skulls previously noted as *Delphinus* have been reidentified as another *Stenella* species. Similar descriptions of *Delphinus* at sea may well be misidentifications, mainly of *S. clymene*, before that dolphin was ‘rediscovered’ in 1981. No alleged sightings have been made in the 1980s or 1990s in the northern Gulf. Common dolphins are represented in the Gulf of Mexico by only 15 reports, which have not been confirmed. One of those is a stranding in Texas; the others are sightings, many of which may have been misidentifications (Jefferson *et al.* 1992). Extensive shipboard and aerial surveys of the northern Gulf since 1991 have found no common dolphins (Hansen *et al.* 1996; Blaylock and Hoggard 1994; Jefferson 1996; Mullin and Hoggard 2000). Observers from the Instituto Nacional de la Pesca from Mexico documented at least two winter 1995 sightings of common dolphins in the southern Gulf; however, this has not been confirmed (Würsig *et al.* 2000).

The common dolphin (*Delphinus* spp.) has been reported from around the Caribbean (Roden and Mullin 2000). Erdman (1970) reports a group of 20 common dolphins off Antigua, and Erdman *et al.* (1973) reported on a group of 50 close to Mona Island (Pajaro Beach) Puerto Rico in 1971. A group of 100 common dolphins was sighted in the southeast Caribbean in November 1983 (Watkins *et al.* 1985). Mignucci-Giannoni (1998) reported 13 sightings from the northeastern Caribbean. Common dolphins are mentioned infrequently in records from the Lesser Antilles’ small cetacean fisheries. A notable location where coastal upwelling occurs in the Caribbean, northeast Venezuela, is also one of the few places where *D. capensis* (Gray) is taken in fisheries (Romero *et al.* 1997).

Common dolphins have been reported off Antigua, Cuba, the Dominican Republic, Puerto Rico, the Virgin Islands, St. Lucia, and St. Vincent and the Grenadines, with strandings reported from Jamaica (Mignucci-Giannoni 1989) and Venezuela (Mignucci-Giannoni 1989; Díaz *et al.* 1995). Three common dolphins stranded on the Isla Margarita, Venezuela, in 1954 (Bolaños *et al.* 1995). Opportunistic sightings have been reported of

D. capensis between Margarita Island and Puerto La Cruz, and two skulls were collected from the Gulf of Cariaco (Bolaños 2001, *pers. comm.*).

Common bottlenose dolphins (*Tursiops truncatus*) are the most common delphinid in the nearshore waters and outer edge of the continental shelf in the Gulf of Mexico, and are common in waters of the Caribbean and southwards to Venezuela and Brazil. They have been recorded from all regions within the WCR. There are known to be two distinct forms of bottlenose dolphin: an inshore type that inhabits shallow bays, inlets, estuaries, rivers, and lagoons; and an ‘oceanic’ type that remains in deeper, offshore waters on the continental shelf. In the Gulf of Mexico, the continental shelf form has been described as living sympatrically with the Atlantic spotted dolphin. Pelagic or open ocean bottlenose dolphins are often of different colour and size than their conspecific nearshore relatives, suggesting little or no interbreeding between offshore and onshore groups (Würsig *et al.* 2000).

The common bottlenose dolphin is found in riverine and estuarine areas, bays and channels, and shallow marine waters from the outer coasts of the mainland and barrier islands to the continental slope. During the GulfCet surveys, bottlenose dolphins were almost exclusively sighted at depths of less than 1000 metres (3280 ft), indicating that they do not occur in the deeper, central parts of the Gulf (Würsig *et al.* 2000). At present, bottlenose dolphins are year-round residents of the Gulf, although some populations may exhibit inshore-offshore or north-south shifts in abundance (Jefferson *et al.* 1992). On the eastern Gulf of Mexico continental shelf (within 30 km of the coast), *Tursiops* were reportedly sighted more frequently in water depths of less than 30 metres (Griffen and Griffen 2000).

Tursiops truncatus are considered to be the most common inshore cetacean species in parts of the Caribbean as noted by the following researchers: in Colombia (Palacios *et al.* 1995), near Grand Bahama Island (Rossbach and Herzing 1999), Puerto Rico and the Virgin Islands (Erdman 1970; Mignucci-Giannoni 1989), and the Lesser Antilles and Venezuela (Schmidley 1981). Erdman (1970) indicated that bottlenose dolphins are seen in greater numbers around Puerto Rico and the Virgin Islands in the summer, and that they occasionally come near to shore in very shallow channels amongst mangroves. Rodríguez-Ferrer *et al.* (2000) reported on the status of the bottlenose dolphin in Puerto Rico; the species is characterised as common throughout the year and ranked second in the number of strandings in the area. Eighty-six sightings, with a mean group size of between 7.2 and 8.3 animals, have been reported over 33 years.

Bottlenose dolphin distribution appears to be related to areas of low sea floor relief, near the shelf edge and offshore waters. Studies of bottlenose dolphins near Grand Bahama Island, Bahamas, indicate that near and offshore groups are distinguished by association patterns. Members of the offshore group were found in deeper water and over predominantly sandy bottoms, while the nearshore group was sighted in shallow water with predominantly grassy bottoms (Rossbach and Herzing 1999). Behavioural patterns of

bottlenose dolphins at Turneffe Atoll, Belize, were studied as a function of group size and environmental characteristics. The patterns of habitat use by the dolphins will be taken into account during the development of a management plan for the atoll (Sanders and Grigg 1988). Hinderstein and Markowitz (2000) report on the feeding strategy of bottlenose dolphins in the Drowned Cays, Belize. They conclude that there are several interacting factors that affect dolphin feeding location. Occurrence patterns of the bottlenose in the Drowned Cays area was studied from 1997 to 1998 (Kerr *et al.* 2000). Photographic data provide evidence for several distinct residence patterns.

No overlap in photographic catalogues was found between the dolphins in the Drowned Cays and Turneffe Atoll, only 16 kilometres away. Muñoz-Hincapié *et al.* (1998b) reported strandings from the Colombian Caribbean since 1950. Bottlenose dolphins were seen in small pods off St. Lucia (Reeves 1988; Rambally 2000), St. Vincent (Ryan *et al.* 2000), Dominica (Evans 1997; Perryman 2000, *pers. comm.*; Boisseau *et al.* 2000), Tobago (Carlson *et al.* 2000), and Venezuela (Bolaños and Boher 1996; Delgado-Estrella 1997). The species is hunted by whalers off St. Vincent (Caldwell *et al.* 1971b; Caldwell and Caldwell 1975; ECCN 2000). Bolaños and Campo (1998) report sightings of bottlenose dolphins off the central coast of Venezuela. Group size ranged from one to fifteen individuals and occasionally the bottlenose dolphins were observed in association with *S. frontalis*. They are reported in every month of the year.

Records of **striped dolphins** (*Stenella coeruleoalba*) in the Caribbean are not common (Debrot *et al.* 1998; Mignucci-Giannoni 1998). Striped dolphins are a deepwater species and come near to shore only where the oceanic drop-off is close to the coastline (deeper than 200 m/656 ft). They are reported from the Caribbean, the Gulf of Mexico, and Brazil (Würsig *et al.* 2000), although there are few accounts of striped dolphins in the literature from these areas. There have been five reported strandings of striped dolphin from the Gulf of Mexico; sightings are mostly from spring through autumn, but it is likely that the species occurs in the Gulf in the winter as well (Jefferson *et al.* 1992). Jefferson and Lynn (1994) observed striped dolphins on three occasions in groups ranging from 1 to 30 animals. One striped dolphin group (approximately 140 animals) was observed north of Puerto Rico during the winter of 1995 (Roden and Mullin 2000). Rambally (2000) reported sightings off the leeward coast of St. Lucia.

Risso's dolphin (*Grampus griseus*) is reported to inhabit deep oceanic and continental shelf waters from the tropics through the temperate regions (Jefferson *et al.* 1993). From literature accounts, Risso's dolphin seems to have been uncommon in the Gulf of Mexico in the past, but this apparent rarity is most likely due to its oceanic range, which is often outside normal shipping lanes. Risso's dolphins in the northern Gulf have been frequently sighted along the shelf edge, along the upper slope; in recent years, most commonly over or near the 200-metre water depth contour just south of the Mississippi River (Würsig *et al.* 2000). During GulfCet surveys, Risso's dolphins were sighted in all seasons with groups ranging from 1 to 78 individuals (Würsig *et al.* 2000). Baumgartner (1997) reports on the distribution of Risso's dolphins in the northern Gulf of Mexico. Sixty-seven and 25 groups were sighted from shipboard and aerial surveys, respectively.

There are 17 records of stranding sites for the Gulf of Mexico, with concentrations in Texas and Florida, and one off the northwestern shore of Cuba. Although not reported as part of the Gulf fauna until 1968, Risso's dolphins appear to be moderately common in at least some parts of the area and can be expected year-round (Jefferson *et al.* 1992).

Additionally, sightings are recorded north of St. Croix, the Virgin Islands, and offshore northwest of Whale Banks; both areas of high underwater relief (Mignucci-Giannoni 1998). Risso's dolphins have been observed off Venezuela (Linares and Bolaños 1995; Bolaños and Boher 1996), and Evans (1997) reports that these dolphins are fairly regularly offshore from Dominica and are sighted occasionally inshore. Caribbean records include Risso's dolphins taken in the St. Vincent fishery, representing the most southern report of *Grampus* in the eastern Atlantic (Caldwell *et al.* 1971b; Caldwell and Caldwell 1975). A single report exists for a stranded animal in Puerto Rico in 1991 (Mignucci-Giannoni 1999) and another from the Colombian Caribbean (Muñoz-Hincapié *et al.* 1998b). Data indicate that the animals use the steep sections of the continental shelf, offshore areas deeper than 200 metres. The lack of sightings and strandings supports the assumption that Risso's dolphins are not common in the WCR.

The **rough-toothed dolphin** (*Steno bredanensis*) has a similar general distribution as Risso's dolphin, inhabiting warm, tropical and temperate waters (Miyazaki and Perrin 1994). Although reported to have a wide pelagic range, it does not appear to be particularly numerous in any specific area. It is generally an offshore species of dolphin (Jefferson *et al.* 1993; Würsig *et al.* 2000). Records of strandings or sightings within the WCR are from the Gulf of Mexico, the West Indies, and the northeastern coast of South America. There are no reliable population estimates and seasonal migratory ranges are not known.

In the Gulf of Mexico, sightings of rough-toothed dolphin occur primarily in the deeper waters (850–1000 m) off the continental shelf (Mullin *et al.* 2000; Davis *et al.* 1998). Most of the sightings have been west of the Mississippi River (Mullin and Hansen 1999). The species have reportedly stranded in 10 different areas of the northern Gulf, from south Texas to the Florida Keys (Würsig *et al.* 2000). Rough-toothed dolphins have been reported mass stranded on three occasions in the Gulf of Mexico with between 15 and 30 animals involved each time (Würsig *et al.* 2000). Stranding and sighting records in the Gulf are from all seasons. Group sizes of sighted animals averaged about 10 animals, with a range of 2 to 48 individuals (Würsig *et al.* 2000). Wells *et al.* (1999) reported on the ranging patterns of rehabilitated rough-toothed dolphins from a mass stranding of 62 near Cape San Blas, Florida. Two males were tagged with satellite-linked transmitters and released off Sarasota, Florida. One transmitter was tracked for 112 days. Water depth averaged 195 metres with an average sea surface temperature of 25 °C. The two dolphins were sighted together and with other dolphins. In addition, two females (one tagged) were released from Destin, Florida. Tracking over a 22-day period placed the tagged female near, but not with, the males. Data suggest a regular occurrence of rough-toothed dolphins in the northeastern Gulf of Mexico (Rhinehart *et al.* 1999). Jefferson and Lynn (1994) sighted one group west of Cuba that approached the survey ship to bow-ride. This

sighting may be the first observation of the species in the southern Gulf of Mexico.

Sanchez-Rios

et al. (1998) reported a pod of 27 rough-toothed dolphins stranded in the Yucatan, Gulf of Mexico in 1995.

There are reports of rough-toothed dolphins occasionally being taken in the small cetacean fisheries in the Windward Islands (Caldwell *et al.* 1971b; Caldwell and Caldwell 1975 [St. Vincent]; Klinowska 1991 [West Indies]). A skull of a rough-toothed dolphin, the first from the Caribbean, was obtained from the St. Vincent fishery in the spring of 1969 (Caldwell *et al.* 1971b). Mattila and Clapham (1989b) observed five groups of rough-toothed dolphins off Virgin Gorda, BVI (Virgin Bank) and six stranding records from Puerto Rico; four of the five groups were observed travelling with humpback whales. In 1986, ECCN (2000) observed a group of about 15 rough-toothed dolphins, locally called 'pink bellies', travelling off St. Vincent, remaining submerged for almost 10 minutes, and Boisseau *et al.* (2000) report on a sighting of a similar sized group of rough-toothed dolphins off Guadeloupe. Evans (1997) listed the species as occasionally seen offshore of Dominica in schools of 15 to 30 individuals. Bolaños and Boher (1996) reported that rough-toothed dolphins have been sighted off Venezuela; Naveira (Bolaños 2001, *pers. comm.*) records the only known stranding of this species in Venezuela. Rodríguez (1988) documents the species in Colombian Caribbean waters.

Tucuxi (*Sotalia fluviatilis*) move freely between fresh, brackish, and marine environments. Until recently, five different species were described, but these are now considered to be colour and age variants of just one, *Sotalia fluviatilis* (Carwardine 1995). Marine *Sotalia* have been reported from the Atlantic coast of Central and South America from Panama (Bossenecker 1978: In Borobia and Barros 1989) to southern Brazil (Simões-Lopes 1987: In Borobia and Barros 1989). The southern limit of the range of *S. fluviatilis* is associated with the confluence zone of the Brazil and Falkland currents, suggesting that low sea-surface temperature is a limiting factor (Borobia *et al.* 1991).

Groups of 2 to 25 are seen in bays and nearshore coastal waters along the Caribbean coast between Nicaragua and Columbia (Leatherwood and Reeves 1983; Carr and Bonde 1993; Avila-Olarte and Amaya 1998). A large part of their range overlaps with the river dolphins, the boto (*Luia geoffrensis*), and in the southern part of their range it may be impossible to distinguish a tucuxi from a juvenile franciscana (*Poutoporva blainvillei*). Because much of its habitat is extremely turbid, individuals are difficult to observe. Ojeda and Vidal (1995) report on a group of the tucuxi along the Amazon River bordering Colombia, Peru, and Brazil. Group size ranged from one to twenty individuals and most (86%) were observed in less than 15 metres of water. At least 25 individuals have been identified based on notches and scars. Strandings on the Caribbean coast have been reported by van Bree (1979) and Casinos *et al.* (1981: In Borobia and Barros 1989), in Trinidad and Tobago (Leatherwood and Reeves 1983), and in Suriname (van Utrecht 1981: In Borobia and Barros 1989). This species is reported seasonally from the southwestern Gulf of Morrosquillo along the Caribbean coast of Colombia (Rodríguez 1988; Avila-

Olarte and Amaya 1998), and Garcia (2000) reports on the feeding strategies of tucuxi in Cispatá Bay, Colombia.

One hundred and thirty-six tucuxi were reported during manatee/dolphin surveys along the northeast coast of Nicaragua during 1992 (Carr and Bonde 2000). The animals were located near shore and in the coastal lagoons of the Miskito Reserve. Group size ranged from one to twenty-four individuals. The sightings of tucuxi in Nicaragua document the species occurrence more than 800 kilometres north of their closest known range in Panama. Edwards and Schnell (2001) conducted research in the Cayos Reserve, Nicaragua, from 1996 to assess the status of the tucuxi. One hundred and eighty-three groups were observed, with highest individual density in the coastal area from Haulover to Wauhta Lagoon. The average pod size was 3.1 and varied between years. Data indicate that resource distribution is an important factor influencing tucuxi distribution and in coastal areas the dolphins were within 100 metres of shore. In 1998, it was estimated that 48 to 55 tucuxi inhabit the area and that the numbers were declining. A small population of tucuxi was studied off the Caribbean coast of Costa Rica from 1977 to 1999. The tucuxi were observed with bottlenose dolphins in more than 50 percent of sightings. Based on behavioural observations of the mixed groups, the authors conclude that groups of male bottlenose dolphins herded female tucuxi in an attempt to mate. Several researchers (Bolaños and Boher 1996; Parra and Bolaños 1998; Tosta and Bolaños 1999) list the tucuxi as one of seventeen species occurring in Venezuelan waters.

ORDER SIRENIA

There is only one species of sirenian in the WCR, the West Indian manatee (*Trichechus manatus*), which is now listed as a rare and endangered species. They are coastal animals and therefore inevitably come into contact with humans over much of their range. In previous centuries, West Indian manatee populations have been reduced by hunting; today they are threatened by habitat destruction and being struck and killed by boats.

FAMILY TRICHECHIDAE, WEST INDIAN MANATEE

The family includes three species, two of which occur in the western Atlantic: the West Indian manatee (*Trichechus manatus*) and the Amazonian manatee (*T. inunguis*). Two subspecies have been proposed for the West Indian form: the Florida manatee (*T. m. latirostris*), restricted to the Florida peninsula, and the Antillean or West Indian manatee (*T. m. manatus*). Currently, the range of the **West Indian manatee** (*Trichechus manatus*) extends (discontinuously) from the southeastern United States through Central America and various Caribbean islands to northeastern Brazil (Domning and Heyek 1986; Reynolds and Odell 1991). The West Indian manatee occupies the coastal waters and some connecting rivers around the Gulf of Mexico and the Caribbean Sea to eastern Brazil,

the Orinoco basin, and the Greater and Lesser Antilles, where the species inhabits shallow coastal waters—estuaries, bays, lagoons, and rivers. Typically it utilises grazing pastures in both shallow freshwater and adjacent saltwater ecosystems, although there may be a preference for the former.

Although distributed more widely in the Caribbean, the West Indian manatee (*T. m. manatus*) is found mainly south of Nauka, Veracruz, in the southwestern Gulf. The distribution of both subspecies were formerly much wider and probably overlapped, at least seasonally, in the northern Gulf (Würsig *et al.* 2000). There are several records of manatees in Texas, the most recent stranding in 1986 (Jefferson *et al.* 1992). The distribution of manatee strandings in Puerto Rico resembles the distribution of live sightings based on aerial surveys (Mignucci-Giannoni 1996). The north, northeast, and south coasts have the highest stranding numbers. Limited populations of the West Indian manatee are found in all sub-regions of the WCR with the exception of Region IV, the Eastern Caribbean (UNEP 1995). Present distribution is fragmented because of local extinction or habitat unsuitability (Lefebvre *et al.* 1982; InWard and Moscrop 1999). An overview of the West Indian manatee is presented in UNEP's Regional Management Plan for the West Indian Manatee (UNEP 1995) (see Table 5).

ORDER CARNIVORA

SUBORDER PINNIPEDIA, West Indian monk seal and the California sea lion

Two species of pinnipeds are found in the WCR from two families: the introduced California sea lion (*Zalophus californianus*) from the Otariidae family, and the extinct West Indian monk seal (*Monachus tropicalis*) from the family Phocidae (see Table 6).

FAMILY PHOCIDAE, West Indian monk seal

The range of the extinct **West Indian monk seal** (*Monachus tropicalis*) is known to have extended in historical times from the Florida Keys and the Bahamas south to the coast of northern Central America and east, through the Greater Antilles, to Nevis (Wing 1992) and Dominica (Timm *et al.* 1997). The Alacranes Islands and Triangle Keys off the coast of Yucatan were apparently the monk seal's last remaining stronghold; residents of the area reported seals as late as 1948 (Würsig *et al.* 2000). Historical accounts from the early 17th century for the island of Klein Curaçao indicate the southern Caribbean as part of the species' normal range (Debrot 2000). The last authenticated record was an observation in 1952 of a small colony on Serenilla Bank, which is in the Caribbean Sea midway between Jamaica and Nicaragua (Rice 1973). Numerous expeditions since that time have come to the conclusion that the species is extinct.

To date, fewer than 45 confirmed records exist for the West Indian monk seal. An unconfirmed report of a single individual on an offshore island in northern Haiti in 1985 led to an investigation of this region sponsored by the US Marine Mammal

Commission (Woods and Hermanson 1987). Three previous surveys (Kenyon 1977; LeBoeuf *et al.* 1986; Nichols *et al.* 1990) produced no evidence of monk seals. Using a statistical analysis of the frequency of past sightings, Solow (1993) suggested that the probability of the West Indian monk seal surviving was very low. Hooded (*Cystophora cristata*), harbour (*Phoca vitulina*), and less frequently harp seals (*Pagophilus groenlandicus*) are known to stray occasionally as far south as the central east coast of Florida. Reports of ‘seals’ in the WCR are speculated to be feral California seal lions or extralimital records of hooded seals in the Caribbean Sea (Mignucci-Giannoni and Odell 2000).

FAMILY OTARIIDAE, California sea lion

The California sea lion (*Zalophus californianus*) has been observed on several occasions, and they are thought to be escapees from aquariums and animal shows at marine parks (Jefferson *et al.* 1992). Specific examples include two cases reported from Puerto Rico in 1955 and in 1967, and one case in 1993 of a male animal that escaped from Acuario Nacional in la Habana, Cuba (Mignucci-Giannoni and Odell 2000). There have been at least four sightings from Florida, Alabama, Mississippi, and Louisiana. One stranding is known (Jefferson *et al.* 1992). These sea lions are coastal in distribution but no verified sightings have been reported since 1972 (Würsig *et al.* 2000).

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Note: ** Indicates literature cited only in Table 1 not in text.

APPENDIX I: MAP AND OCCURRENCE TABLES

OCCURRENCE OF MARINE MAMMALS BY SUB-REGION IN THE WIDER CARIBBEAN

SUB-REGION	I	II	III	IV	V	VI
TABLE 1: Occurrence of Baleen whales by sub-region in the Caribbean						
Blue whale	*	*		*		
Fin whale	*		*	*	*	
Sei whale	*		*	*	*	
Bryde's whale	*	*	*	*	*	*
Humpback whale	*		*	*	*	*
Minke whale	*	*	*	*		*
North Atlantic right whale	*					
TABLE 2: Occurrence of Sperm whales by sub-region in the Caribbean						
Sperm whale	*	*	*	*	*	*
Pygmy sperm whale	*	*	*	*	*	
Dwarf sperm whale	*	*	*	*	*	
TABLE 3: Occurrence of Beaked whales by sub-region in the Caribbean						
Cuvier's beaked whale	*	*	*	*	*	
Gervais' beaked whale	*	*	*	*	*	
Blainville's beaked whale	*		*	*		
True's beaked whale	*		*			
Sowerby's beaked whale	*					

SUB-REGION	I	II	III	IV	V	VI
TABLE 4: Occurrence of Oceanic Dolphins by sub-region in the Caribbean						
Killer whale	*		*	*	*	*
Pygmy killer whale	*	*	*	*	*	
False killer whale	*	*	*	*	*	*
Pilot whale ¹	*	*	*	*	*	
Melon-headed whale	*		*	*		
Fraser's dolphin	*		*	*		
Pan-tropical spotted dolphin	*	*	*	*	*	
Atlantic spotted dolphin	*	*	*	*	*	
Spinner dolphin	*	*	*	*	*	
Clymene dolphin	*	*		*	*	
Common dolphin ²	*		*	*	*	*
Bottlenose dolphin	*	*	*	*	*	*
Striped dolphin	*	*	*	*	*	*
Risso's dolphin	*		*	*	*	
Rough-toothed dolphin	*	*	*	*	*	*
Tucuxi		*			*	*

SUB-REGION	I	II	III	IV	V	VI
TABLE 5. Occurrence of the Manatee by sub-region in the Caribbean						
West Indian manatee	*	*	*		*	*
TABLE 6. Occurrence of the Caribbean monk seal / sea lion by sub-region in the Caribbean						
Monk seal ³	extinct?	extinct?	extinct?	extinct?	extinct?	extinct?
California sea lion ⁴	*					

1. Due to misidentification of *Globicephala* spp (*G. melas* and *G. macrorhynchus*), both species are incorporated under ‘pilot whale’ in this table. Würsig *et al.* (2000) note that observations of *G. melas* in the Gulf of Mexico may represent extra-limital reports. Observations of pilot whales in other sub-regions are most likely *G. macrorhynchus* (the short-finned pilot whale).
2. Because of the recent addition of *Delphinus capensis* species listing and difficulty in differentiation between previous sighting records of *Delphinus delphis*, both *Delphinus* spp. are incorporated under “common dolphin” in this table.
3. Boyd and Stanfield (1998) report some indications that the monk seals still survive off Jamaica and Haiti.
4. Although not endemic to the Wider Caribbean, the California Sea Lion was introduced into the Gulf of Mexico during the 1950s and 1960s, with the last reported sighting in 1972 (Jefferson *et al.* 1992; Würsig *et al.* 2000).

Note: Refer to the text for distinctions between Sub-Regions I–VI (See Geographic Coverage, Figure 1). This table was compiled by the authors from various sources including literature cited in text of this document, sighting and stranding networks, fisheries managers, whale watch operators, and marine mammal biologists. Data are less comprehensive for Sub-Regions II, V, and VI due to translation of Spanish speaking documents and contact with researchers in these regions to date.

Figure 1: Sub-Regions within the Wider Caribbean and Related Countries



For the purposes of this document, geographic coverage is based on the definition used in the Convention for the Protection and Development of the Wider Caribbean Region

(WCR) as stated in Article 2 (UNEP 1983):

The 'Convention area' means the marine environment of the Gulf of Mexico, the Caribbean Sea and areas of the Atlantic Ocean adjacent thereto, south of 30 ° north latitude and within 200 nautical miles of the Atlantic coast of the States referred to in article 25 of the Convention.

The 'Convention area' includes twelve continental states, thirteen Island States, the Commonwealth of Puerto Rico, three overseas Departments of France, a Territory shared by Netherlands and France (St. Maarten), and eleven dependent Territories (Figure 1, map adapted from UNEP 1994).

SUB-REGIONS within the Wider Caribbean Region and Related Countries

- I. GM = GULF OF MEXICO**
(Cuba, Mexico, United States)
- II. WC = WESTERN CARIBBEAN**
(Belize, Costa Rica, Guatemala, Honduras, Mexico (Yucatan), Nicaragua, Panama)
- III. NCC = NORTHEASTERN AND CENTRAL CARIBBEAN**
(Bahamas, Cayman Islands, Cuba, Dominican Republic, Haiti, Jamaica, Puerto Rico, Turks and Caicos Islands)
- IV. EC = EASTERN CARIBBEAN**
Anguilla, Antigua and Barbuda, Barbados, the British Virgin Islands, Dominica, Grenada, Guadeloupe, Martinique, Montserrat, St. Maarten, St. Lucia, St. Kitts and Nevis, St. Vincent and the Grenadines, the US Virgin Islands)
- V. SC = SOUTHERN CARIBBEAN**
(Colombia, Netherlands Antilles, Trinidad and Tobago, Venezuela)
- VI. EA = EQUATORIAL ATLANTIC NORTHWEST**
(French Guyana, Guyana, Suriname)

APPENDIX II: SPECIES BRIEFS

MARINE MAMMAL Species Briefs*

Atlantic spotted dolphin (*Stenella frontalis*)

Large dolphin spotted similar to pantropical spotted dolphin. Spots begin to appear on animals after one year, and coverage increases with age. Moderately long, but chunky beak with distinct crease between melon and beak. Averages 2.1 to 2.3 metres (7–7.5 ft), 140 kilograms as adults, and approximately 1 metre (3 ft) at birth. Atlantic spotted dolphins typically travel in groups of 5 to 15 animals, sometimes forming temporary gatherings of several hundred. Very active at surface, often breaching. May be confused with bottlenose dolphin or pantropical spotted dolphin. *Distribution:* Atlantic only. In west North Atlantic, southern New England to Gulf of Mexico. IUCN status: Insufficiently known. Endemic to Atlantic.

Blainville's beaked whale (*Mesoplodon densirostris*)

Very distinctive toothed whale exhibiting a pair of massive horn-like teeth growing from bulges in its lower jaw. Adults are blue-grey above and white below; the dark areas tend to have round or oval white scars and scratches. Adults may reach 4.7 metres (15 ft), 1 ton and approximately 2.1 metres (7 ft) at birth. Blainville's beaked whales may travel in groups of 1 to 6 individuals, although singles or pairs are most common. Dives of over 45 minutes have been recorded. *Distribution:* Worldwide in tropical to warm-temperate waters, mostly off shore in deep waters. In Atlantic, strandings have been reported from Gulf of Mexico to Canada. IUCN Status: Insufficiently known. Cosmopolitan.

Blue whale (*Balaenoptera musculus*)

Largest whale (and largest animal ever known), reaching 23 to 27 metres (75–89 ft), 125 tons as an adult, and approximately 7 metres (23 ft), 7.5 tons at birth. Blue-grey in colour (often mottled on the back and sides) with small dorsal fin set far back. Slender and streamlined with a broad, U-shaped head when viewed from above. Along the centre of the rostrum is a single, prominent ridge and large 'splash guard' around the blowholes. Usually seen alone or in pairs, but scattered aggregations may appear on prime feeding grounds. *Distribution:* Worldwide. In west North Atlantic, most frequently seen off east Canada. Rare visitor in US Atlantic. May range south to Florida and Gulf of Mexico in winter. IUCN status: Endangered. Cosmopolitan. Extralimital.

Bottlenose dolphin (*Tursiops truncatus*)

Probably the most familiar of the small cetaceans. Large robust dolphin with short to moderate stocky beak with obvious crease between the beak and melon. Tall, falcate dorsal fin. May vary greatly in size, shape, and colour (several species may exist), with larger offshore form and smaller inshore morph. Features a grey colouring with a distinct

* Species listed alphabetically by common name.

beak and rounded forehead. Adults may reach 1.9 to 3.8 metres (6–12 ft), 140 to 650 kilograms. At birth, approximately 1 metre (3 ft), 25 kilograms. Usually travel in small groups, but as many as 500 individuals may occur offshore. Sometimes aerially active. *Distribution:* Worldwide, tropical to temperate waters. US Atlantic, offshore form: primarily north of Cape Hatteras, also south to Gulf of Mexico. Coastal form: primarily Gulf of Mexico, year-round south of Cape Hatteras, further north in summer. IUCN status: Insufficiently known. Cosmopolitan.

Bryde's whale (*Balaenoptera edeni*)

Similar in appearance to sei whales, but features three unique longitudinal ridges on its head. Tall, falcate dorsal fin. Grey body, sometimes mottled, with prominent, falcate fin. Adults may reach 13 to 15.5 metres (43–51 ft), up to 30 tons; at birth approximately 3.4 metres (11 ft), 1 ton. Migratory, offshore form and resident, inshore forms may exist. It is now accepted that there are at least two forms of the species, which may vary in size and migratory habits (Rice 1998). Although the taxonomy of this species has been the subject of much debate, it was decided at the Scientific Committee of the IWC in 2000 to 'retain one species of Bryde's whale, *Balaenoptera edeni*, pending resolution of the nomenclature uncertainty, recognising that more than one species is involved.' It is likely that the species will be split in the future. *Distribution:* Worldwide, primarily between 40 ° N and 40 ° S latitude. In US Atlantic, range from Gulf of Mexico to Chesapeake Bay). IUCN status: Insufficiently known. Tropical.

California sea lion (*Zalophys californianus*)

Possibly the most recognisable pinniped, California sea lions are featured in zoos, aquaria, and circuses. Males grow to 2.4 metres (8 ft) and 390 kilograms, females to 2.0 metres (6.6 ft) and 110 kilograms. Pups are dark brown to black at birth, moult into a lighter brown coat within the first month, and moult again when 5 to 6 months old. Adult males are generally dark brown, but some are blonde. Males begin to develop their pronounced forehead, sometimes called a 'sagittal crest', and a broader chest when they enter puberty. California sea lions breed on San Miguel, San Nicolas, Santa Barbara, and San Clemente islands in southern California. In Mexico, California sea lions haul out and breed on the Coronados, Guadalupe, San Martin, Cedros, and the San Benito islands off the Pacific coast of Baja California, and there are many smaller colonies on islands in the Gulf of California. They are an introduced species in the Caribbean (Reeves *et al.* 1992).

Clymene dolphin (*Stenella clymene*)

Similar in appearance to the spinner dolphin but smaller and more robust with a shorter, stockier beak. Recognisable by slightly falcate fin, pale grey stripe between blowhole and beak, and black-tipped 'lips'. Adults reach 1.8 to 2 metres (6–6.6 ft), 75 kilograms. At birth, approximately 0.8 metres (32 in). The Clymene dolphin typically travels in groups of 5 to 50 animals (reaching groups of 500 individuals). *Distribution:* Tropical and subtropical Atlantic only. In west North Atlantic, seen in winter, spring, and summer in deep waters off the north Gulf of Mexico; strandings north to New Jersey. IUCN Status: Insufficiently known. Endemic to Atlantic.

Common dolphin (*Delphinus delphis* and *Delphinus capensis*.)

Moderately slender dolphin with a medium to long beak and tall, slightly falcate dorsal fin. Strikingly marked, with distinctive criss-cross ‘hourglass’ pattern with dark cape and yellowish patch on both sides behind eye. Commonly confused with striped, spinner, spotted, and Atlantic white-sided dolphins. Adults typically reach 2.3 to 2.6 metres (7.5–8.5 ft), 135 kilograms; at birth approximately 0.8 metres (32 in). Common dolphins travel in large groups of 10 to 500 animals (up to 2000 in the eastern tropical Pacific). Often move at high speed, and may bowride. *Distribution:* Oceanic, widely distributed worldwide, in subtropical to temperate waters. In west North Atlantic, primarily north of Cape Hatteras, rare sightings south to Florida. Common January through May from Cape Hatteras to Georges Bank; summer through autumn on Georges Bank. IUCN Status: Insufficiently known. Cosmopolitan.

Cuvier’s beaked whale (*Ziphius cavirostris*)

Relatively robust medium-sized toothed whale, with short, poorly defined beak and mouthline that is upcurved at the rear. The most widespread and abundant of the beaked whales. Slightly concave top to head; this becomes increasingly obvious in older animals. Swirling colour pattern ranges from brown to white, depending on location, sex, or age. Circular scars common. Two small teeth at tip of jaw are visible with the mouth closed. Adult males to 7 metres (23 ft), exceeding 5 tons; adult females to 7.5 metres (24.6 ft), 2 to 3 tons. At birth approximately 2.7 metres (8.8 ft). *Distribution:* Offshore, worldwide except polar waters. Stranding throughout US Atlantic from Gulf of Mexico to Canada. Rare spring through summer sightings off northeast United States, year-round in Gulf of Mexico. IUCN Status: Insufficiently known. Cosmopolitan.

Dwarf sperm whale (*Kogia simus*)

Small toothed whale, reaching only 2.1 to 2.7 metres (7–9 ft) and 280 kilograms as an adult. At birth, approximately 1 metre (3 ft), 45 kilograms. Shark-like profile, with a more pointed snout than the pygmy sperm whale. Large dorsal fin set near middle of back. Bluish-grey or dark grey in colour, with white arc (‘false gill’) behind the eye. Typically found alone or with one other individual (up to groups of 10). *Distribution:* Worldwide in tropical to temperate oceanic waters, largely offshore. In the United States, sightings from Gulf of Mexico to Virginia. Strandings as far north as Nova Scotia. IUCN Status: Insufficiently known. Cosmopolitan.

False killer whale (*Pseudorca crassidens*)

One of the species known as ‘blackfish’ in the region. Long slender body, a rounded overhanging forehead and no beak. The dorsal fin is falcate and slender, often rounded at the tip. Playful whale that readily approaches boats. Uniformly dark in colour, with a unique ‘elbow’ on S-shaped flippers. Adult males reach up to 6 metres (18 ft), exceeding 2 tons. Adult females reach up to 4.8 metres (16 ft), estimated 1200 kilograms. At birth, approximately 1.8 metres (6 ft), 78 kilograms. False killer whales are typically found in groups of 10 to 50 animals, sometimes forming social groups of up to 300 animals. *Distribution:* Deep, offshore waters, worldwide in tropical and temperate

waters. In US Atlantic waters, rare summer sightings from Gulf of Mexico to Maryland. IUCN Status: Insufficiently known. Tropical.

Fraser's dolphin (*Lagenodelphis hosei*)

Distinctive dolphin, with a stocky body and extremely small appendages. Short triangular dorsal fin. Distinguished by a dark lateral stripe along a blue-grey or grey-brown upper side. Also features a dark line extending from beak to flippers and a short but well-defined beak. They are deep divers, and are often seen in mixed schools with other pelagic species. Adults may reach 1.9 to 2.7 metres (6–7.5 ft) and 275 kilograms. At birth, approximately 1 metre (3 ft). Fraser's dolphins travel in groups of 100 to 500 animals (up to 1000 animals in a group). *Distribution:* Deep waters, worldwide in temperate and tropical waters. In US Atlantic, known only from deep waters of Gulf of Mexico. IUCN Status: Insufficiently known. Tropical.

Fin whale (*Balaenoptera physalus*)

Very large, sleek, and streamlined baleen whale reaching 17 to 24 metres (56–79 ft), 70 tons. At birth, approximately 6.5 metres (21 ft), 2 tons. Features unique asymmetrical head pigmentation, with the lower 'lip' dark in colour on the left side but white on the right. May be confused with sei, blue, or Bryde's whales. Group size typically small (1 to 7 animals), but 100 or more may gather at feeding grounds. *Distribution:* Worldwide, oceanic. In US Atlantic, from Cape Hattaras north. Known major summer feeding ground in New England. Winter calving and breeding grounds are unknown for most of the population. IUCN Status: Vulnerable. Cosmopolitan.

Gervais' beaked whale (*Mesoplodon europaeus*)

Identifiable by a small, shark-like dorsal fin, a small head with a slightly bulging forehead, and pronounced, narrow beak. Teeth may be visible outside the closed mouth. Scarring may also be present on its dark grey or marine blue upper side. Gervais' beaked whales typically travel in groups of 2 to 5 animals. Adult males may reach 4.6 metres (15 ft), and adult females may reach 5.2 metres (17 ft). At birth, approximately 2.1 metres (7 ft). *Distribution:* Warm, temperate waters. Atlantic only. In US Atlantic, rare sightings from Gulf of Mexico. Strandings from Gulf of Mexico to New York; most commonly stranded *Mesoplodon* spp. in United States. IUCN Status: Insufficiently known. Endemic to Atlantic.

Humpback whale (*Megaptera novaeangliae*)

Acrobatic whale known for breaching, lobtailing, flipper-slapping and approaching boats. Robust body. Distinguishing features include unique long, white pectoral flippers and knobs (bumps) on top of head and lower jaw. Also have a low, stubby dorsal fin and tail flukes with knobby trailing edges (animals also typically fluke-up when diving). Distinctive markings in black and white on underside of fluke used to identify individual animals. Adults reach 11 to 16 metres (36–52 ft) and 40 tons (females slightly larger than males). At birth, approximately 5 metres (16 ft), 2 tons. Humpbacks may be found travelling in groups of 1 to 15 animals, with large groups at good feeding and breeding areas. *Distribution:* Worldwide, often coastal. In west North Atlantic, most winter in

Caribbean (where calves are born) and migrate to summer feeding grounds from Gulf of Maine to Iceland. Increased sightings off US mid-Atlantic and southeast states since mid-1980s. IUCN Status: Vulnerable. Cosmopolitan.

Killer whale (*Orcinus orca*)

The largest member of the dolphin family is easily distinguished by its jet-black coloration contrasting with white side and eye patches and a very tall, erect dorsal fin. Adult males reach up to 9.5 metres (31 ft), 8 tons. Adult females reach up to 7 metres (23 ft), 4 tons. At birth, approximately 2.4 metres (8 ft), 180 kilograms. Killer whales typically travel in stable pods of 3 to 25 animals, sometimes forming larger groups of up to 50 animals as pods come together. May form highly stable societies. *Distribution:* Worldwide, found from polar regions to the equator. In US Atlantic, rare sightings from the Gulf of Mexico, but more common north of New Jersey. IUCN Status: Insufficiently known. Cosmopolitan.

Melon-headed whale (*Peponocephala electra*)

This species is identifiable by its dark, torpedo-shaped body, a white, light grey, or pink outline to 'lips', and a dark 'mask' on its face. May be confused with pygmy killer whale. Adults reach 2.6 to 2.7 metres (8.5–9 ft), 182 kilograms. At birth, approximately 0.8 metres (32 in). Melon-headed whales typically travel in large groups of 100 to 500 animals (though as many as 2000 may be found together). Often associate with other species (e.g., Fraser's dolphin). *Distribution:* Worldwide in tropical and subtropical waters. In US Atlantic, sightings in Gulf of Mexico only; one stranding reported from Maryland. IUCN Status: Insufficiently known. Tropical.

Minke whale (*Balaenoptera acutorostrata*)

Smallest and most abundant rorqual whale, with adults reaching 9 to 10 metres (29–33 ft), and up to 14 tons. At birth, approximately 2.8 metres (9 ft), 450 kilograms. Identifiable by a sharply pointed snout that often breaks the surface at an angle during surfacing, a falcate fin, and white bands on flippers in northern hemisphere whales. Group size ranges from 1 to 3 animals, though up to 100 or more may be found in good feeding grounds. *Distribution:* Worldwide. In US Atlantic, range from Gulf of Mexico north. Likely winter offshore and in Caribbean. IUCN Status: Insufficiently known. Cosmopolitan.

North Atlantic Right Whale (*Eubalaena glacialis*)

North Atlantic Right Whales are identifiable by their dark body, lack of a dorsal fin, and bulges on their head called callosities that are often covered in light-coloured whale lice (cyamids). Adults reach 13 to 18 metres (43–59 ft), 60 tons. At birth, approximately 4.5 metres (15 ft). *Distribution:* In west North Atlantic, summer Gulf of Maine to Newfoundland with concentration areas near Massachusetts and Nova Scotia. Wintering area(s) of most of population unknown; known calving areas off of Georgia and Florida

(Carwardine, 1995; Wynne and Schwartz, 1999). IUCN Status: Endangered. North Atlantic.

Pantropical spotted dolphin (*Stenella attenuata*)

Slender, streamlined dolphins with a long thin beak and distinctive crease between the melon and beak. Unspotted at birth, spots begin appearing in juveniles; amount of spotting varies with age and location of individual. Also recognisable by white ‘lips’ and tip of beak. Adults reach 1.6 to 2.6 metres (5.3–8.5 ft), 120 kilograms. At birth, approximately 0.8 metres (32 in) long. Spotted dolphins typically travel in large groups of 50 to 1000 animals, although coastal forms are often found in groups of less than 100. Acrobatic. *Distribution:* Worldwide in tropics and some temperate waters, generally oceanic. In west North Atlantic, year-round in north Gulf of Mexico and offshore southeast United States in winter. IUCN Status: Insufficiently known. Tropical.

Pygmy killer whale (*Feresa attenuata*)

This species is identifiable by its dark, torpedo-shaped body, a white, light grey, or pink outline to ‘lips’, with some individuals exhibiting a white chin. May be confused with the melon-headed whale and false killer whale. Flipper of the whale is the best distinguishing feature: the tips are rounded in the pygmy killer whale. Adults reach 2.4 to 2.6 metres (8–9.5 ft), exceeding 160 kilograms. At birth, approximately 0.8 metres (32 in). Pygmy killer whales typically travel in groups of 15 to 25 animals (though as many as several hundred may be found together). Slow and lethargic compared to the similar-appearing melon-headed whale. *Distribution:* Worldwide in tropical and subtropical waters. In US Atlantic waters, rare sightings from Gulf of Mexico north to Cape Hatteras. IUCN Status: Insufficiently known. Tropical.

Pygmy sperm whale (*Kogia breviceps*)

Rarely seen, but may be distinguished by its dark, steel grey to blue-grey back; a small, slightly hooked, falcate dorsal fin (set well back behind the midpoint); a tiny, underslung, light-coloured jaw; a blunt head, and ‘false gill’. May be confused with the dwarf sperm whale. Adults reach 3 to 3.4 metres (10–12 ft), 400 kilograms. At birth, approximately 1.2 metres (4 ft), 55 kilograms. Pygmy sperm whales typically travel in groups of 3 to 10 animals. Often appear slow and sluggish at sea, with no visible blow. *Distribution:* Worldwide in deep, tropical to warm temperate oceanic waters, especially over and near the continental slope. In United States, sightings from Gulf of Mexico to

mid-Atlantic with strandings as far north as Nova Scotia. IUCN Status: Insufficiently known. Cosmopolitan.

Risso’s dolphin (*Grampus griseus*)

Robust, blunt-headed animals without a distinctive beak. Older animals highly recognisable by very tall dorsal fin and white scars covering a blue-grey to almost white body colour. Battered appearance may be a result of Risso’s dolphin teeth or confrontations with squid. Flippers are long and pointed. Adults have a distinctive vertical crease on the front of the melon. Young animals range from light grey to darkish brown and are

relatively unmarked. Adults reach 3 to 3.8 metres (10–12.5 ft), 600 kilograms. At birth, approximately 1.5 metres (5 ft). Risso's dolphins typically travel in groups of 3 to 50 animals, and may gather temporarily in groups of up to 150. May also be found travelling in mixed schools with several species of dolphin or pilot whales. *Distribution*: Worldwide in deep, oceanic and continental slope, tropical and temperate waters. In US Atlantic, north Gulf of Mexico to mid-Atlantic year-round. IUCN Status: Insufficiently known. Cosmopolitan.

Rough-toothed dolphin (*Steno bredanensis*)

Easily identifiable by conical head and lack of demarcation between the melon and snout. A relatively robust dolphin with a tall, falcate dorsal fin, large flippers, and pink or yellow spots on a dark grey or bluish-grey cape. Adults reach 2.4 to 2.8 metres (8–9 ft), 150 kilograms. At birth, approximately 0.9 metres (35 in). Rough-toothed dolphins typically travel in small groups of 10 to 20 animals, occasionally forming groups of several hundred animals. Often move at high speed with the head and chin above the surface in a distinctive skimming behaviour sometimes described as 'surfing'. *Distribution*: Worldwide in deep, oceanic, subtropical and tropical waters. In US Atlantic, known only from deep waters of north Gulf of Mexico, year-round. IUCN Status: Insufficiently known. Tropical.

Sei whale (*Balaenoptera borealis*)

The sei whale can easily be confused with the Bryde's whale, as they are similar in colour and size. Adults may reach 18 metres (59 ft), 30 tons, with females slightly larger than males. At birth, approximately 4.5 metres (15 ft), 900 kilograms. Sei whales typically travel in groups of 1 to 5 animals, though larger groups of up to 30 animals may be found in good feeding grounds. Fast swimmers, and often dive and surface in a very predictable series. Migrations are poorly known and are probably irregular. *Distribution*: Oceanic, worldwide, but more restricted to mid-latitude temperature zones than are other rorquals. In US Atlantic, seen primarily on Georges Bank in spring. May migrate to lower-latitude wintering areas from Gulf of Mexico south. IUCN Status: Vulnerable. Uncommon in the tropics.

Short-finned pilot whales (*Globicephala macrorhynchus*)

Large animals, jet black or dark grey in colour, with a low, prominent dorsal fin, bulbous head, and no beak. Easily confused with long-finned pilot whale, though short-finned pilot whales have shorter flippers and fewer teeth. Males distinguishable from females by their more bulbous and less upright dorsal fin. Adult males may reach 6 metres (20 ft), 2 tons. Adult females may reach 5.2 metres (17 ft), 1.2 tons. At birth, approximately 1.4 metres (5.5 ft), 60 kilograms. Pilot whales typically travel in groups of 10 to 50 animals, though several hundred animals may occasionally be found. Strong social bonds exist within the relatively stable, female-based groups. *Distribution*: Deep, offshore, worldwide in tropical and temperate waters. In west North Atlantic from Gulf of Mexico to Virginia. Overlaps range of long-finned pilot whale in mid-Atlantic. IUCN Status: Insufficiently known. Tropical.

Sperm whale (*Physeter macrocephalus*)

The largest toothed cetacean. Identifiable by its low, bushy blow extending forward and to the left. Features a huge, blunt head, a triangular or rounded hump on its dorsal side with ‘knuckles’ extending from hump to flukes. Narrow, underslung lower jaw. Wide, spatulate flippers, broad tail flukes with a deep median notch. Commonly flukes are raised out of the water when diving. Behind the head the body surface tends to be crinkled. Highly sexually dimorphic. Adult males may reach 18 metres (59 ft), 60 tons. Adult females may reach 12 metres (39 ft), 18 tons. At birth, approximately 4 metres (13 ft), 1 ton. Group size typically extends from 1 to 50 animals, though hundreds may travel together. Highly social on breeding/nursery grounds. *Distribution:* Deep, oceanic waters worldwide, between 60 ° N and 60 ° S latitude, although generally only large males venture polewards of 40 ° latitude. Present year-round in Gulf of Mexico and from North Carolina to Georges Bank. IUCN Status: Insufficiently known. Cosmopolitan.

Spinner dolphin (*Stenella longirostris*)

Very acrobatic dolphins, known for spectacular aerial displays. Named for habit of leaping from the water and spinning on its long axis. Features a slender, predominantly grey body with a dorsal fin that becomes more erect with age. Other distinctive features include black ‘lips’ and a long, thin, dark-tipped beak. Dorsal fin ranges from slightly falcate to erect and triangular. Adults reach 1.8 to 2.2 metres (6–7.2 ft), 95 kilograms. At birth, approximately 0.8 metres (32 in). Spinner dolphins typically travel in groups of 5 to 200 animals, sometimes found in larger, mixed groups of up to 1000 animals. *Distribution:* Worldwide in subtropical and tropical waters. In US Atlantic, have stranded from Gulf of Mexico to North Carolina. Sightings in north Gulf of Mexico in winter, spring, summer. IUCN Status: Insufficiently known. Tropical.

Striped dolphins (*Stenella coeruleoalba*)

Similar in body shape to other *Stenella* and *Delphinus* species with a falcate dorsal fin and moderately long beak. Stunning coloration with a bluish-grey or brownish upper side with a distinctive pale-grey stripe along its entire side. A pale grey ‘finger’ extends below a dark, prominent fin. Black beak extends into a stripe back to eye and along lower flank to anus. May be confused with Fraser’s dolphin or Atlantic spotted or bottlenose dolphins. Adults reach 2.2 to 2.6 metres (7–8.5 ft), 130 kilograms. At birth, approximately 1 metre (3 ft). Striped dolphins typically travel in groups of 10 to 500 animals, reaching aggregations of 3000 individuals. Fast swimmers, sometimes known as ‘streakers’. *Distribution:* Primarily a warm water species but worldwide in temperate to tropical oceans. Observed only close to shore where deep water approaches the coast. In US Atlantic, year-round from Cape Hatteras to Georges Bank; in Gulf of Mexico from autumn to spring. IUCN Status: Insufficiently known. Tropical.

True’s beaked whale (*Mesoplodon mirus*)

Distinguishable by a slightly bulging forehead, prominent beak, small teeth located at the tip of the lower jaw, and a scratched and scarred body. Adults may reach 5.3 metres (17.4 ft), 1.4 tons. At birth, approximately 2.1 metres (7 ft). *Distribution:* Known from

strandings in the United Kingdom and northwest Atlantic, from southeast Africa and southern Australia. In US Atlantic, rare sightings and strandings north of Florida, particularly in the mid-Atlantic. IUCN Status: Insufficiently known. Endemic to Atlantic.

Tucuxi (*Sotalia fluviatilis*)

A small dolphin with a chunky body shape, adults may be up to 2.1 metres (coastal) and 1.6 metres (riverine) in length, 32 to 36 kilograms. Size at birth is between 0.7 and 0.8 metres. Distinguishable by prominent beak, broad, triangular fin, and bluish-grey or brownish-grey upper side (animals may grow paler with age). Typically found in groups of 2 to 7, with larger groups of up to 30 animals occurring in marine waters. Generally shy and difficult to approach. *Distribution:* Found in both salt and fresh water and along the coast from Nicaragua to Brazil. IUCN Status: Insufficiently known. Tropical.

West Indian monk seal (*Monachus tropicalis*)

Similar to other monk seals, adults feature a brownish back with grey tinge, lighter on the sides, and pale yellow or yellowish white on the undersides and muzzle. Males grew to 2.1 to 2.4 metres (7–8 ft), with females being slightly smaller. At birth, these seals were probably about 1 metre (3 ft). This species is almost certainly extinct, with the last confirmed sighting in 1952. IUCN Status: Extinct. (Reeves *et al.* 1992).

Note: Sources of information for Cetacean Species Briefs: Minasian *et al.* 1984; Reeves *et al.* 1992; Jefferson *et al.* 1993; Carwardine 1995; Rice 1998; Wynne and Schwartz 1999; and Wursig *et al.* 2000.

APPENDIX III: SPECIES LIST OF MARINE MAMMALS OF THE WIDER CARIBBEAN

ORDER CETACEA

Suborder MYSTICETI

Family BALAENOPTERIDAE

Balaenoptera musculus
Balaenoptera physalus
Balaenoptera borealis
Balaenoptera edeni
Balaenoptera acutorostrata
Megaptera novaeangliae

The Rorquals

Blue whale
 Fin whale
 Sei whale
 Bryde's whale
 Minke whale
 Humpback whale

Family BALAENIDAE

Eubalaena glacialis

North Atlantic right whale

Suborder ODONTOCETI

Family PHYSETERIDAE

Physeter macrocephalus

The Sperm Whales

Sperm whale

Family KOGIIDAE

Kogia breviceps
Kogia sima

The Pygmy and Dwarf Sperm

Pygmy sperm whale
 Dwarf sperm whale

Family ZIPHIIDAE

Ziphius cavirostris
Mesoplodon densirostris
Mesoplodon europaeus
Mesoplodon bidens
Mesoplodon mirus

The Beaked Whales

Cuvier's beaked whale
 Blainville's beaked whale
 Gervais' beaked whale
 Sowerby's beaked whale
 True's beaked whale

Family DELPHINIDAE

Orcinus orca
Peponocephala electra
Feresa attenuata
Pseudorca crassidens
Globicephala macrorhynchus
Steno bredanensis
Lagenodelphis hosei
*Delphinus delphis*¹
*Delphinus capensis*¹
Tursiops truncatus
Stenella attenuata
Stenella frontalis
Stenella coeruleoalba

The Oceanic Dolphins

Killer whale
 Melon-headed whale
 Pygmy killer whale
 False killer whale
 Short-finned pilot whale
 Rough-toothed dolphin
 Fraser's dolphin
 Short-beaked common dolphin
 Long-beaked common dolphin
 Common bottlenose dolphin
 Pantropical spotted dolphin
 Atlantic spotted dolphin
 Striped dolphin

Stenella longirostris
Stenella clymene
Grampus griseus
Sotalia fluviatilis

Spinner dolphin
Clymene dolphin
Risso's dolphin
Tucuxi

Suborder SIRENIA

Family TRICHECHIDAE

Trichechus manatus

West Indian manatee

Order CARNIVORA

Suborder PINNIPEDIA

Family PHOCIDAE

*Monachus tropicalis*²
(extinct)

West Indian monk seal

Family OTARIIDAE

Zalophus californianus

California sea lion (introduced)

- ¹ Because of recent addition of *Delphinus capensis* species listing and difficulty in differentiating between previous sighting records of *Delphinus delphis*, both *Delphinus* spp. are listed to note the occurrence of separate species, but sightings and strandings are combined and do not differentiate between species.
- ² Boyd and Standfield (1998) report some indications that monk seals might still survive off Jamaica and Haiti.