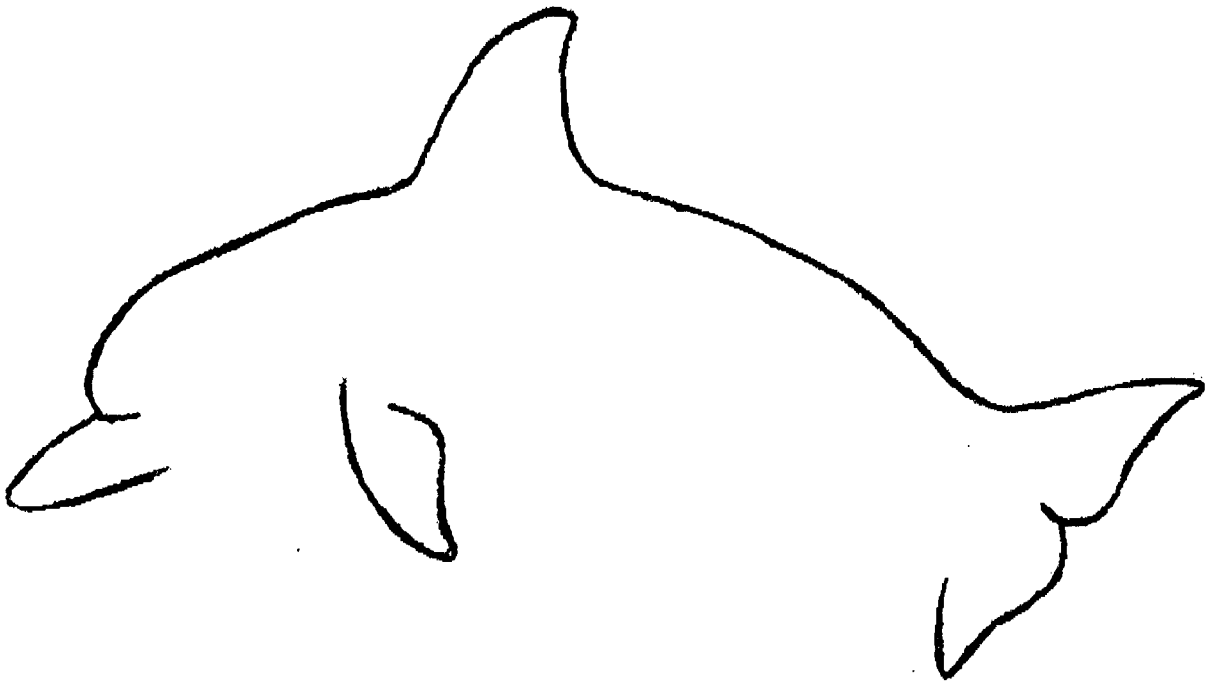
Whales and Dolphins of the Gulf of Mexico

A Teacher's Companion



Whales and Dolphins of the Gulf of Mexico

A Teacher's Companion

This companion to the Minerals Management Service's "Whales and Dolphins of the Gulf of Mexico" poster is for teachers who want to introduce their students to some of the Gulf's most fascinating inhabitants–cetaceans (suh-TAY-shuns).

Many people are surprised to learn that there are 79 species of whales and dolphins occurring worldwide; 28 can be found right here in the Gulf of Mexico. Many of you are familiar with the bottlenose dolphin, since it can be found nearshore, but you'll probably be amazed to know that killer whales, sperm whales, and some baleen whale species also call the Gulf home. The Gulf of Mexico supports a large number of human activities (fishing, recreational activities, oil/gas activities, etc.) that have the potential to affect these animals.

All marine mammals in U.S. waters are protected by the Marine Mammal Protection Act. Seven species of marine mammals found in the Gulf are also listed as endangered by the Endangered Species Act. The Minerals Management Service (MMS) supports comprehensive studies on the distribution, abundance, and behavior of the offshore whales and dolphins in the Gulf of Mexico. The MMS also funds studies looking at the possible effects of human activities on marine mammals. This information, combined with data that continue to be collected, will ensure that MMS has the information needed to prevent and regulate the potential impacts to marine mammals in the Gulf.

This packet provides you with information on whales and dolphins that occur in the Gulf, including basic biology and governmental protection of these animals. The MMS's role in our understanding of the Gulf's whales and dolphins is also featured. Suggested activities for the classroom are included.

You can also access this *Teacher's Companion*
through the WWW at:
http://www.mms.gov

Select: ⇨ Managing Offshore Resources
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(*New Orleans colloquialism for *a little something extra*)

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DOLPHINS AND WHALES ARE MAMMALS

- All mammals breathe air with lungs (from the blowhole on the top of their head).
- All mammals have hair (as a fetus, on the beak; some whales have small whiskers as adults).
- All mammals give birth to live young (pregnancy is long; bottlenose dolphins have a 12-month gestation).
- All mammals nurse their young with milk (from mammary glands tucked away in slits in the genital area; dolphin milk has a higher fat content than cow or human milk).
- All mammals are warm-blooded (they are able to regulate their own body temperature and are not dependent on their environment to keep them warm).

WHAT IS A MARINE MAMMAL?

- "Marine mammal" is used to refer to members of five different diverse mammal groups. The only thing any of these mammal groups have in common is that they get all (or most) of their food from marine (or sometimes fresh-) water.

Cetaceans (whales, dolphins, and porpoises)
Pinnipeds (sea lions, the walrus, and seals)
Sirenians (manatees and dugong)
Marine and sea otters
Polar bear

WHAT IS A CETACEAN?

- Dolphins, porpoises, and whales are a group ("order") of mammals called cetaceans (suh-TAY-shuns).
- The word "cetacean" comes from the Greek word *ketos* and the Latin word *cetus*, which mean "whale."

BALEEN AND TOOTHED WHALES: HOW ARE THEY DIFFERENT?

- Baleen whales (*mysticetes*) differ from the toothed whales (*odontocetes*) in anatomy, life history, and social organization.

- Baleen whales do not have teeth. They have baleen (plates of fibrous keratin) to filter their food from big mouthfuls of water; toothed whales use their teeth to catch and manipulate their prey.

- Baleen whales have two external blowholes; toothed whales have only one.

- Almost all baleen whales are much larger than the toothed whales.

- Toothed whales are generally faster swimmers than baleen whales.

- Baleen whales tend to grow and mature more rapidly than toothed whales.

- Toothed whales echolocate (page 26); baleen whales do not.

- Toothed whales communicate with high-frequency sound (clicks, whistles, squeaks, squawks). High-frequency sounds travel only a short distance (toothed whales tend to travel in groups, so any communicative sounds do not need to cover many miles). Baleen whales produce low-frequency sound. Low-frequency sounds travel long distances–many, many miles (baleen whales are more solitary and spread out, so any communicative sounds need to travel farther). Sound travels 4.5 times faster in water than in air.

- Most baleen whales are long-distance migrators. Baleen whales undertake some of the longest migrations in the animal kingdom.

- Many toothed whales are known to produce individually distinctive signals. Bottlenose dolphins produce signature whistles (whistles that are unique to an individual animal). This ability is beneficial because toothed whales travel in groups and need to identify themselves to other group members.

- Groups of toothed whales are more highly organized than baleen whales, possessing a social hierarchy. Toothed whale group members often surface close together. Baleen whales are often found spread out over a distance.

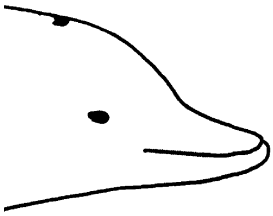
- Young toothed whales stay with their mothers longer than young baleen whales do. This extended period of dependence appears to be related to the importance of social learning. For example, human children stay with their parents for long periods of time and have much to learn. A bottlenose dolphin calf has many things to learn about feeding, avoiding predators, and social behavior from its mother and other group members.

- Reproduction and feeding in baleen whales are strongly seasonal. For example, a humpback whale off the Atlantic Coast of the United States would feed near the Arctic during the summer and then migrate to the Caribbean for mating and calving in the winter. A northern right whale feeds in waters off Nova Scotia and then migrates to waters off Georgia and Florida to calve. These species do this annually. Few toothed whales have long yearly migrations between separate feeding and breeding grounds.

DOLPHIN OR PORPOISE?

- The terms “dolphin” and “porpoise” are often used interchangeably. Scientists recognize them as two separate families of toothed whales.

- Dolphins usually have distinct beaks (sometimes it’s not easy to see the beak, because it is small); porpoises do not.



dolphin

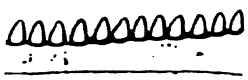
porpoise

- Most dolphins usually have falcate (tall, curved) dorsal fins; porpoises usually have triangular fins.

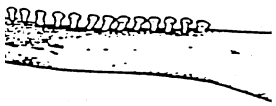
dolphin

porpoise

- Dolphins have cone-shaped teeth; porpoises have flattened, spade-shaped teeth. This feature is the best characteristic used to distinguish between dolphins and porpoises.



dolphin



porpoise

- In the Gulf of Mexico, we only have **dolphins**, and no porpoises.

- Fishermen often refer to dolphins as “porpoises” because of the colorful, oceanic dolphinfish (known as mahi-mahi or dorado) that fishermen often call “dolphin.” When you go out to eat and see dolphin on the menu, you don’t have to worry that you’re eating the mammal; dolphins are protected by U.S. law.

- Cetaceans have a tail (“flukes”) that moves up and down in the water column when the animal is swimming; fish have a tail that moves in a back-and-forth motion to propel the animal.

HOW MANY TYPES OF MARINE MAMMALS ARE THERE?

Total marine mammal species–approximately 121 living species worldwide

Cetaceans - approximately 79 species

- Baleen whales - 11 species
  - right whales - 4
  - rorquals - 6
  - gray whale - 1
- Toothed whales - 68 species
  - sperm whale, pygmy and dwarf sperm whales - 3
  - beluga and narwhal - 2
  - beaked whales - 19 (known or currently described)
  - oceanic dolphins - 33
  - porpoises - 6
  - river dolphins and franciscana - 5

Seals, sea lions, fur seals, walrus - 34 species

- sea lions and fur seals - 14
- true seals - 19
- walrus - 1

Manatees and dugongs - 5 species (4 living, 1 recently extinct)

- dugongs - 1 (and the now extinct Steller's sea cow)
- manatees - 3

Otters - 2 species

- sea otter
- marine otter

Bears - 1 species

- polar bear

MARINE MAMMALS OF THE GULF OF MEXICO

There are 28 cetacean, 1 introduced pinniped, and 1 sirenian species that are known to occur in the Gulf of Mexico. There is one pinniped species that is now extinct. All marine mammals in U.S. waters are protected by the Marine Mammal Protection Act. Seven species of marine mammals found in the Gulf are also listed as endangered by the Endangered Species Act.

Common Name	Scientific Name	Status
Baleen Whales		
Northern right whale	*Eubalaena glacialis*	Endangered
Blue whale	*Balaenoptera musculus*	Endangered
Fin whale	*Balaenoptera physalus*	Endangered
Sei whale	*Balaenoptera borealis*	Endangered
Bryde's whale	*Balaenoptera edeni*	
Minke whale	*Balaenoptera acutorostrata*	
Humpback whale	*Megaptera novaeangliae*	Endangered
Toothed Whales		
Sperm whale	*Physeter macrocephalus*	Endangered
Pygmy sperm whale	*Kogia breviceps*	
Dwarf sperm whale	*Kogia simus*	
Sowerby's beaked whale	*Mesoplodon bidens*	
Blainville's beaked whale	*Mesoplodon densirostris*	
Gervais' beaked whale	*Mesoplodon europaeus*	
Cuvier's beaked whale	*Ziphius cavirostris*	
Killer whale	*Orcinus orca*	
False killer whale	*Pseudorca crassidens*	
Pygmy killer whale	*Feresa attenuata*	
Short-finned pilot whale	*Globicephala macrorhynchus*	
Risso's dolphin	*Grampus griseus*	
Melon-headed whale	*Peponocephala electra*	
Atlantic bottlenose dolphin	*Tursiops truncatus*	
Rough-toothed dolphin	*Steno bredanensis*	
Striped dolphin	*Stenella coeruleoalba*	
Pantropical spotted dolphin	*Stenella attenuata*	
Clymene dolphin	*Stenella clymene*	
Atlantic spotted dolphin	*Stenella frontalis*	
Spinner dolphin	*Stenella longirostris*	
Fraser's dolphin	*Lagenodelphis hosei*	
Pinnipeds		
California sea lion	Zalophus californianus	Introduced
Caribbean monk seal	*Monachus tropicalis*	Extinct
Sirenian		
West Indian manatee	*Trichechus manatus*	Endangered

WHALES AND DOLPHINS IN THE GULF OF MEXICO

Northern right whale
Eubalaena glacialis

The northern right whale is a black, robust animal that often has some white on the belly. Right whales have huge heads with strongly bowed lower jaws and strongly arched upper jaws; also present are callosities (raised, roughened patches of skin scattered over the head). Right whales have cyamid (amphipod crustaceans) or "whale lice" that are found on the callosities and feed on the dead, sloughing whale skin. There is no dorsal fin. As with other baleen whales, the females are larger than the males, with adults reaching 17 m (56 ft) in length. Right whales are found between Nova Scotia, Canada, and Florida. During spring through late fall, right whales are found off Canada and the northeast United States in feeding areas. Winter distribution for the majority of the population is unknown, but coastal waters between Georgia and Florida are the only known calving area for these whales. Existing records of this species in the Gulf represent extralimital (outside of the normal distribution range) strays from the wintering grounds.

Blue whale
Balaenoptera musculus

The blue whale is the largest animal (23-27 m, or 75-89 ft) ever to have lived. Females are larger than males. The blue whale has a slender shape, with a broad, U-shaped head that has a single prominent head ridge. The blue whale is bluish-gray; individuals can be identified by the white-gray mottling pattern on the side of the body. The blue whale has a small dorsal fin that is set far back on the body. Blue whales are typically seen alone or in pairs. They feed by lunging through the water through clouds of krill. There are only two reliable records (strandings on the Texas coast) of blue whales in the Gulf of Mexico, and they are not thought to be regular inhabitants of the Gulf.

Fin whale
Balaenoptera physalus

The fin whale is second in size to the blue whale and is at least 24 m (79 ft) long in the Northern Hemisphere. The fin whale has a more pointed head than the blue whale and the dorsal fin is taller, more curved, and is located farther forward on the back. The fin whale is very dark in color, with a lighter colored belly. The most distinctive feature of this species is the asymmetrical head color–the left lower jaw is mostly dark, while the right jaw is mostly white. There are also V-shaped, light-gray markings on the back behind the head. Fin whales are one of the fastest of the great whales, possibly swimming at speeds of 37 km/h (23 mph=20 knots).

Sei whale
Balaenoptera borealis

Sei (pronounced "say") whales can be confused with fin and Bryde's whales, all of which have prominent, curved dorsal fins. This species has only a single prominent ridge on the moderately V-shaped head, which has a slightly downturned tip. Sei whales can reach 18 m (59 ft) in length. They skim-feed copepods. This species probably has only

an accidental occurrence in the Gulf (though it is interesting to note that three of the four reliable records were from strandings on the eastern Louisiana coast).

Bryde's whale
Balaenoptera edeni

The Bryde's (pronounced "BREW-days") whale is the second smallest (measuring 14 m, or 46 ft) of the balaenopterid whales or "rorquals." Bryde's whales feed mainly on schooling fish by lunging at their prey. The Gulf of Mexico probably has a resident population of these whales. Bryde's whales are usually found in warmer waters, either alone or in small groups.

Minke whale
Balaenoptera acutorostrata

The minke (pronounced "mean-KEY") whale is the smallest of the rorquals (10 m, or 33 ft). It is distinguished by an extremely pointed rostrum with a prominent head ridge, as well as white bands on the flippers. Minke whales feed mainly on krill and small schooling fishes. All records of minke whales in the Gulf are from strandings. Any minke whales found in the Gulf are probably strays from breeding grounds in the western North Atlantic.

Humpback whale
Megaptera novaeangliae

Humpback whales have rounded heads that have knobs on them, and extremely long, scalloped flippers that are all or partially white. Humpbacks reach lengths of up to 16 m (52 ft). They spend winter in warm waters to calve, and then move to colder waters to feed during the summer. The few reports of humpback whales in the Gulf are considered to be whales that have lost their way on return northerly migrations (from the Caribbean) in the western North Atlantic.

Sperm whale
Physeter macrocephalus

The sperm whale is the largest of the world's toothed whales, measuring up to 18 m (59 ft). Sperm whales live in deep waters and are the most abundant large whale in the Gulf of Mexico. Sperm whales can dive for two hours to depths of 3,200 m (10,500 ft) or more to feed on squid.

Pygmy and dwarf sperm whales
Kogia breviceps and *Kogia simus*

The pygmy and dwarf sperm whales are odd-looking with shark-like heads with small underslung mouths and a dark mark that looks much like a gill. Pygmy and dwarf sperm whales measure about 2.7 m (8.9 ft). Little is known about these species. Based on examinations of stomach contents of stranded individuals, it appears that these animals feed mainly on squid. Pygmy and dwarf sperm whales are found in deep waters of the Gulf.

Four species of beaked whales are known to occur in the Gulf of Mexico. Beaked whales are deep-diving animals, feeding mainly on fish, squid, and deepwater benthic (bottom) invertebrates. Beaked whales as a group range in size from 4 to 13 m (13-43 ft). Life history data on these open ocean species are limited. Beaked whales are usually found alone or in pairs, and are often covered with circular marks and scratches.

Sowerby's beaked whale
Mesoplodon bidens

This species is distinguished by a long beak and a bulge on the forehead. The tusks of adult males are in the middle of the lower jaw. They are charcoal gray; adults also have light spots on the body. Sowerby's beaked whales can reach lengths of 5.5 m (18 ft). This species is known from the colder waters of the North Atlantic. The one record from the Gulf probably is an extralimital occurrence.

Blainville's beaked whale
Mesoplodon densirostris

Blainville's beaked whales can reach about 4.7 m (15 ft) and up to 1,030 kg (2,270 lb). The teeth of adult males are found in a single, high arch in the middle of each lower jaw and can be seen outside the closed mouth. Blainville's beaked whales feed on squid. There are only three confirmed stranding records for this species in the Gulf.

Gervais' beaked whale
Mesoplodon europaeus

Gervais' beaked whales can reach 5.2 m (17 ft) and at least 1,200 kg (2,640 lb). The two small teeth of males are found near the tip of the snout and are visible outside the closed mouth. Like other beaked whales, they feed on squid. This is probably the most common mesoplodont in the Gulf.

Cuvier's beaked whale
Ziphius cavirostris

Cuvier's beaked whale measures about 7 m (23 ft). This species has a single pair of teeth (found in the tip of the lower jaw), which point forward. Like all beaked whales, this is a deepwater species that feeds mostly on squid, but also will take fish. Dives of up to 40 minutes have been recorded.

Killer whale
Orcinus orca

Killer whales are quite distinctive with their coloration pattern and, in males, the tall dorsal fin. The killer whale is the largest member of the dolphin family, with lengths up to 9.8 m (32 ft). Killer whales are known to feed on a wide variety of fish, squid, sea turtles, sea birds, and marine mammals. Killer whales, unlike other dolphin species, live

their lives in family groups called pods. Killer whales are found in all oceans. In the Gulf of Mexico, killer whales have been found southwest of the Mississippi River delta.

False killer whale
Pseudorca crassidens

This is a slender species that measures to about 6 m (20 ft). The false killer whale has a long, blunt head that tapers slightly toward the tip (there is no beak). This species' most distinctive feature is a characteristic hump on the leading edge of the flipper. The false killer whale feeds mainly on squid and large fish, as well as some small cetaceans. The majority of sightings in the Gulf are in pelagic waters, with several over the continental shelf.

Pygmy killer whale
Feresa attenuata

Pygmy killer whales are sometimes confused with melon-headed and false killer whales. The best distinguishing characteristic is that pygmy killer whales have rounded tips to their flippers. Adults reach lengths up to 2.6 m (8.5 ft) and a maximum weight of 225 kg (495 lb). The pygmy killer whale is found in tropical and subtropical oceanic waters around the world. Pygmy killer whales feed mainly on fish and squid, and have been reported to occasionally attack other dolphins in some parts of the world. Little is known of the biology of the pygmy killer whales.

Short-finned pilot whale
Globicephala macrorhynchus

Pilot whales have large, bulbous heads and a low, curved dorsal fin that has a very wide base. The flippers are long and sickle-shaped. Males are much larger than females and have a more squarish head. Pilot whales can reach up to 6.1 m (20 ft) in length and weigh nearly 3,600 kg (7,900 lb). Pilot whales are deep-offshore animals that are primarily squid-feeders. From historical records (mostly strandings), one would think that this species would be one of the most common offshore cetaceans in the Gulf; however, pilot whales have only occasionally been sighted during recent surveys. One notable Gulf sighting was an apparent aggressive attempt on a group of sperm whale mothers with calves.

Risso's dolphin
Grampus griseus

Risso's dolphins are robust dolphins with a blunt head; a tall, curved dorsal fin; and a dark gray to white body that, in adults, is covered with white scratches and blotches. The scratches are thought to be in part due to the sharp beaks of the squids upon which they feed. This species has recorded lengths of up to 3.8 m (12.5 ft). Risso's dolphins in the Gulf are frequently sighted along the continental shelf edge.

Melon-headed whale
Peponocephala electra

The melon-headed whale was not even known to the Gulf of Mexico until 1990 and 1991, when there were strandings in Texas and Louisiana. Recent surveys have found that this species is actually fairly common in the Gulf. Melon-headed whales have a triangularly-shaped head, a dark "mask" on their face, and white lips; they also have a dark cape on their back. This species can reach up to 2.8 m (9 ft) in length. Melon-headed whales feed on squid and small fish, and are found in large (>100 individuals) herds, often swimming with other species.

Atlantic bottlenose dolphin
Tursiops truncatus

The bottlenose dolphin is probably the most familiar species due to its coastal distribution and widespread use in films and captivity. In some areas, bottlenose dolphins can reach up to 3.8 m (12.5 ft) in length. They eat a wide assortment of fishes, squid, and shrimp, and use a variety of feeding behaviors, including feeding behind shrimp boats and chasing fish onto mudbanks. Bottlenose dolphins live in open societies, with the strongest bonds being between a mother and her calf. Bottlenose dolphins in the Gulf of Mexico occur mostly on the continental shelf. (For more information on this species, see "The Bottlenose Dolphin" on page 15).

Rough-toothed dolphin
Steno bredanensis

The rough-toothed dolphin is an odd-looking dolphin with large flippers, a cone-shaped head, white lips and lower jaw, and a narrow cape. The rough-toothed dolphin got its name from the subtle wrinkles on its teeth. This dolphin measures up to 2.8 m (9 ft) and feeds on squid and fish in the offshore, deep waters of the Gulf. Rough-toothed dolphins often swim with their chin and head above the water surface in a unique way that is called "skimming."

Striped dolphin
Stenella coeruleoalba

The striped dolphin is striking with its black stripes, which extend from the eye to the flipper and eye to the anus. Striped dolphins measure up to 2.6 m (8.5 ft) in length. Sometimes called "streakers," these dolphins are commonly found in herds of a few hundred. Striped dolphins feed on squid and lantern fish and, in the Gulf of Mexico, prefer the deeper waters of the continental slope.

Pantropical spotted dolphin
Stenella attenuata

These slender dolphins are born gray, spotting as they age; their lips tend to be a bright white. This species feeds on fish and squid. This spotted dolphin can reach lengths of 2.6 m (8.5 ft). Pantropical spotted dolphins are the most abundant dolphin or whale in the Gulf of Mexico and are found commonly along the continental slope in the north-central and western Gulf of Mexico.

Clymene dolphin
Stenella clymene

Formerly classified with spinner dolphins, clymene dolphins are more robust in size and shape than the spinner dolphin with which they are often confused. The clymene dolphin is distinguished by a cape that dips in two places (above the eye and below the dorsal fin) and a dark stripe on the top of the beak, which in most cases has a black "moustache." The clymene dolphin reaches a length of at least 2.0 m (6.6 ft) and weighs at least 85 kg (187 lb). The clymene dolphin is found in tropical and subtropical waters of the Atlantic Ocean, primarily in deep waters, where it feeds on small fish and squid. Very little is known about the natural history of the species. The clymene dolphin has been recognized as a valid species since 1981.

Atlantic spotted dolphin
Stenella frontalis

Atlantic spotted dolphins are born gray and become more spotted as they age. This spotting aids in determination of the age and in the individual identification of the dolphin. This dolphin measures 2.3 m (7.5 ft). Atlantic spotted dolphins feed on squid and fish and commonly occur over the continental shelf in the Gulf of Mexico.

Spinner dolphin
Stenella longirostris

This dolphin is very slender with a very long, narrow beak that has dark lips and beak tip. Spinners have dark eye-to-flipper stripes, a dark gray cape, light gray sides, and a white belly. This species can get as large as 2.4 m (8 ft) and 77 kg (170 lb). The spinner dolphin is named for its habit of spinning up to seven times on its long axis when it jumps out of the water. Spinners feed mainly at night on midwater fish and squid. Spinners in the Gulf are found traveling in large groups in deep continental slope waters (950-1,100 m or 3,100-3,600 ft).

Fraser's dolphin
Lagenodelphis hosei

Fraser's dolphins are stocky-looking, have a very short beak, and very small flippers and flukes. The Fraser's dolphin's most distinctive feature is a wide, prominent black band running from the face to the anus. There is also a flipper stripe starting at the middle of the lower jaw. Fraser's dolphins probably get at least as large as 2.8 m (9 ft), with weights over 210 kg (460 lb). Little is known about this species. Fraser's dolphins are often sighted mixed with other species, such as melon-headed whales, Risso's dolphins, and spinner dolphins. When these dolphins surface, they are very splashy. Fraser's dolphins eat midwater fishes, squid, and crustaceans. Ship-based surveys in the Gulf led to sightings of two large herds (>100 individuals) of Fraser's dolphins (previously known to the Gulf from only a mass stranding in the Florida Keys), as well as information previously uncollected on sounds produced by these animals.

THE BOTTLENOSE DOLPHIN

Distribution

The Atlantic bottlenose dolphin (*Tursiops truncatus*) is one of the best-known cetaceans because of its widespread use in marine parks and research facilities. The bottlenose dolphin is found worldwide in temperate and tropical waters, and is absent only from polar regions. It is frequently seen in harbors, bays, lagoons, estuaries, and river mouths. There appear to be two ecotypes, a coastal form and an offshore form. Genetic studies are now providing more information about the relationships within and between the ecotypes.

Different areas along Texas and other coastlines often have markedly varying population levels, as if there are individuals that may be migratory. Under research are the population(s) composed of "residents" that stay in an area year-round, and "transients," which travel up and down the coastline. It seems that the residency of some bottlenose dolphins is seasonal, with some individuals returning each year at about the same time. This phenomenon is probably related to fish movements that are, in turn, a response to fluctuating water temperature.

Description

Bottlenose dolphins are usually charcoal gray with a slightly lighter belly that is sometimes lightly spotted. During warm weather, the belly is often a flushed pink color thought to be a response to the warm water. The rostrum, or "beak," is short and stubby or "truncated." The dorsal fin has a curved point that is falcate. Recognizable markings or characteristics, such as dorsal fin scars or notchings, can be used to identify different individuals. Repeated sightings of these individuals provide information about home-range limits and group composition. Bottlenose dolphins are typically 2.4-2.8 m (8-9 ft) in length, weigh about 13.6 kg (30 lb) at birth, and reach 181.4-226.8 kg (400-500 lb) at maturity, with males being slightly larger than females.

Natural History

Males reach sexual maturity at 10-12 years of age, females at 5-12 years. The average lifespan is estimated to be about 25 years, although some live to their late 40's. The age of a dolphin may be determined by the presence of growth layers in its teeth, much as the age of a tree may be determined from its rings. Females bear a single calf every two or three years and gestation is about 12 months. Calves are nursed for a year or more, yet stay with their mothers for up to five years. During this extended period of dependence, calves spend their time learning practical skills such as how to find and capture food, how to recognize other dolphins, and who fits where in the dolphin social hierarchy.

Coastal bottlenose dolphins are found in smaller groups than offshore ones. Ecological pressures, like predation and food availability, are probably the driving factors for group sizes. Dolphins live in a "fusion-fission" society, with animals not remaining with one particular group for long periods of time, although long-term bonds do seem to exist for some individuals. However, there may be some degree of segregation based on age and sex, at least in some areas. Adult males rarely associate with subadult males, the latter usually remaining in bachelor groups or with one or two adult females. Females with calves associate with each other and occasionally with other age and sex classes.

Almost without exception, bottlenose dolphins appear opportunistic in their feeding habits, taking a wide variety of fish and invertebrates. They can be seen feeding alone and cooperatively with one another, herding fish onto mud banks and, in some parts of the world, working with humans to catch fish.

Bottlenose dolphins are quite adaptable and have learned to capitalize on human disturbance of the environment for new food sources such as feeding behind shrimp boats or expanding their natural range to feed in newly created ship channels. However, these dolphins, as well as other marine animals, face a variety of threats worldwide. The inshore habitat is vulnerable to human encroachment, disturbance, and pollution. For this reason, bottlenose dolphins may be used as "bioindicators" of the health of the marine environment. Because of their ecological position in the food web, at the top (like humans), their slow reproductive rate, and the gaps in our knowledge about them, continued research is needed to safeguard them and the environment in which we both live.

SOME FACTS ABOUT THE GULF OF MEXICO

- The Gulf of Mexico is almost completely enclosed, being nearly surrounded by the United States, Mexico, and Cuba. There only two gaps in this land-locked area: the Straits of Florida (between Florida and Cuba) and the Yucatan Channel (between Mexico and Cuba).

- The maximum depth of the Gulf is about 3,500 m (11,500 ft); this is shallow compared with the World Ocean, which has an average depth of 3,800 m (12,500 ft).

- The Gulf is ringed by a shallow continental shelf that is quite broad in some areas, such as off the west coast of Florida, off Louisiana and Texas, and off the Mexican states of Campeche and Yucatan. In other locations, the shelf is quite narrow: off Alabama and Mississippi; and off the Mexican states of Tamaulipas, Veracruz, and Tabasco. At the mouth of the Mississippi River, the shelf is almost nonexistent.

- At the edge of the shelf, the "shelf-slope break," the water gets deeper at a faster rate. This is the beginning of the continental slope.

- The Gulf has many other interesting features such as large knolls, salt domes, canyons, steep escarpments, ridge systems, rocky outcrops, natural hydrocarbon seeps, and an abyssal plain.

- The main oceanic current feature is the Loop Current, which comes northward into the Gulf from the Caribbean and exits southward and eastward to join the Florida Current and the Gulf Stream on the eastern seaboard. The Loop Current occasionally "pinches off" clockwise eddies that migrate westward toward Texas and Mexico, carrying with them parcels of warm water, plankton, and upwelling nutrients.

- Investigations suggest that some of the bottom circulation and temperature features will affect the distribution of cetacean species.

- Temperatures of Gulf waters range from over 27°C (>80°F) at the surface to as low as 4°C (39°F).

- The Mississippi River affects water clarity, nutrients, salinity, and coastal temperature, and introduces some pollution runoff from about two-thirds of the United States' industries, parking lots, farms, and yards.

GULF OF MEXICO CETACEAN RESEARCH

- The Gulf's cetaceans have been less studied compared to cetaceans off the Atlantic and Pacific coasts of the United States.

- Whaling logs, dating from as early as the 1840's, indicate that the Gulf of Mexico once supported limited whaling on sperm whales.

- Through MMS-funded studies, we've learned that sperm whales are more common in the Gulf than originally thought, whereas the pilot whales, which were originally thought to be common (due to historic records), are in fact not. Several poorly known species, such as beaked whales, pygmy, and dwarf sperm whales, and the Clymene dolphin, have turned out to be moderately common. Fraser's dolphins and melon-headed whales (both previously unknown to the Gulf before strandings in the early 1990's) have actually been seen in large schools. The MMS's studies program "GulfCet," conducted by Texas A&M University at Galveston and the National Marine Fisheries Service, has shed some light on the distribution and abundance of the more common cetaceans and provided limited information on how they interact with their environment in the western and central Gulf.

- There is some evidence that sperm whales may be found in conjunction with the edge of cold water areas, where upwelling events may enhance productivity and prey abundance.

- The bottlenose dolphin and the Atlantic spotted dolphin are the two species that can be found nearshore on the continental shelf. All other species in the Gulf are found mainly offshore in deeper waters.

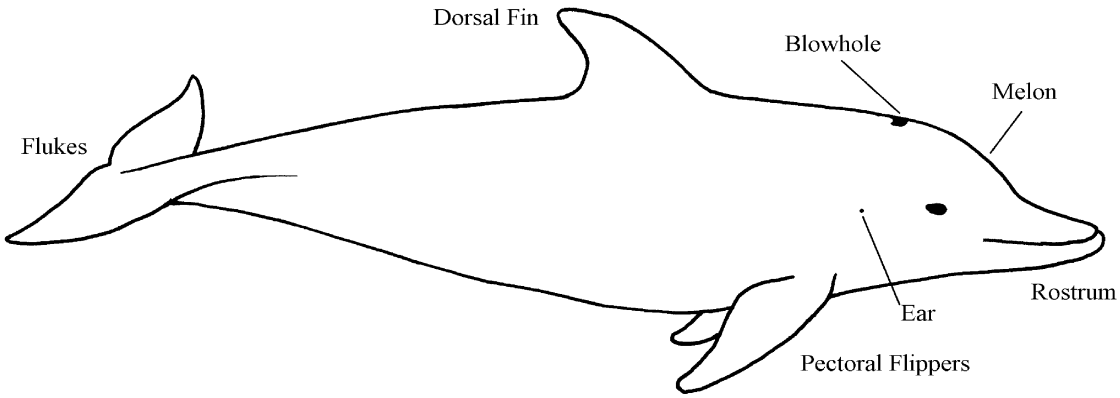
- Many cetaceans have been sighted off the Mississippi River delta.

- Baleen whales are occasionally reported in the Gulf but, for the most part, these are probably animals that have strayed during migrations to breeding or feeding grounds. For example, a young humpback whale was sighted off the Texas coast a few years ago, the first sighting of a humpback whale for the western Gulf. The reason that it is believed that the Gulf doesn't have many baleen whales is that the oceanographic situation isn't what is required to provide the amount of prey productivity to keep them here.

- Cetacean researchers use quite sophisticated technologies. Dolphins and whales are spotted at sea using 25x binoculars ("big-eyes") mounted to the research ship. By towing hydrophones (underwater microphones), it is often possible to determine the species and sometimes the number of animals that are producing clicks and whistles–animals undetected by the human eye, but not the ear. The hydrophone is a powerful tool when one considers that a sperm whale can stay submerged for periods upwards of two hours. Dolphins and whales can also be spotted and counted from planes flying overhead, and any interesting behaviors can be recorded.

- Some fascinating observations on cetacean behavior made in the Gulf include an attack by killer whales on some pantropical spotted dolphins and an apparent aggression by pilot whales on a sperm whale group that included calves. (The sperm whales went into a defensive position by encircling the calves.)

- In addition to distribution and abundance work, MMS funds research that focuses on characterizing the habitats of cetaceans by using sophisticated imaging, large net trawls, and hydrographic data. Overall, these measurements and observations will shed light on the distribution, abundance, life history, behavior, and biology of the diverse cetacean populations in the Gulf. This program, "GulfCet II," is exploring the entire northern Gulf of Mexico, but emphasizes eastern Gulf waters in anticipation of possible oil/gas development off Florida.



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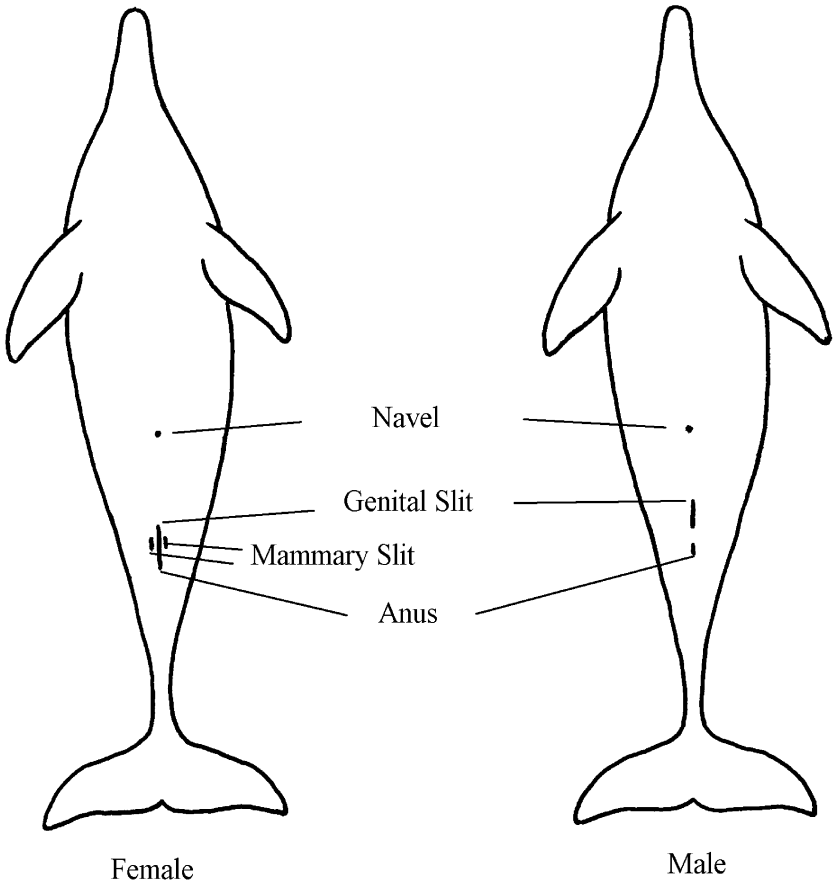


CETACEAN EVOLUTION

- The cetaceans' closest land relatives are ungulates (cows and pigs).
- The ancestors of modern cetaceans entered the oceans approximately 50 million years ago.
- Cetaceans evolved from mesonychids (small- to medium-sized, clawed, herbivorous mammals) that gave rise to modern ungulates. This relationship between whales and modern ungulates is confirmed by various soft anatomical features such as a three-part stomach, a similar ovarian structure, and a fibro-elastic penis.
- Much of whale evolution occurred in the Tethys Sea (the ancestral Mediterranean). The Tethys Sea extended from the Caribbean to Indonesia and provided a warm, fairly stable environment for marine organisms. During the Eocene Epoch (approximately 54 million years ago), the Tethys Sea began to shrink; remnants are today's Mediterranean, Black, Caspian, and Aral Seas.
- The earliest primitive cetaceans are classified in the extinct suborder *Archaeoceti.* These cetaceans demonstrated a transition from earlier land forms to truly marine animals.
- Baleen and toothed whales share a common archaeocete ancestor (evidence based on chromosomal information, protein analysis, and the fossil record). Echolocating toothed whales evolved 35 million years ago. The earliest baleen whales still had well-developed teeth.
- The first whales were ungainly and had short tails, long hind legs, and long necks.

INTERESTING BIOLOGICAL FACTS ABOUT CETACEANS

- Cetaceans have the most highly modified skeleton of any mammal (with the possible exception of bats). A cetacean has a skeleton that is highly adapted for living in an aquatic environment.
- There was evolutionary telescoping of the skull (the nasal opening and bones are pushed back to the top of the head). At the same evolutionary time, mouth bones elongated.
- There is isolation of the ear bones by ligaments, unlike the bony connection in terrestrial mammals. This isolation helps the animal to locate sounds made underwater.
- The flipper (pectoral fin) displays hyperphalangy (an increased number of digits in the flipper, which helped develop the broad, paddle-like flipper that is used for steering).
- The flipper has bones similar to other forelimbs in mammals. The "arm bones" are, however, shortened and flattened, and the elbow is at the body surface.
- The pelvis is rudimentary (represented by two small, internal, remnant bones).
- No bones are in the dorsal fin or tail.
- The vertebrae have "spines" (processes) for muscle attachment. This feature allows dolphins/whales to have much more muscle, which is important for propulsion through the water.

- The cervical (neck) vertebrae are relatively fused and usually compressed, a development that protects the spinal cord during fast swimming and grabbing at fish, as well as providing rigidity for streamlining.

- The toothed whale skull is asymmetrical, that is, the nasal opening is offset to the left, a structural feature that relates to sound production.

- Baleen whales have strong upper jaws to hold heavy baleen plates.

- Dolphins and whales are voluntary breathers. (They have to be conscious to breathe, so that they can regulate it.) This feature is beneficial for deep and/or long dives.

- Since dolphins are voluntary breathers, it is thought that dolphins sleep with half the brain at a time. Dolphins in the wild probably just "catnap."

- Dolphins make a variety of sounds, such as whistles (used for communication), clicks (mainly used in echolocation), squeaks, and squawks.

- There is much space devoted to the thoracic cavity (lungs), little to the abdominal cavity.

- Dolphin respiration is more efficient than humans'. Dolphins exchange 80% or more volume of air with each breath, humans only about 17%. Dolphins take an average 2-3 breaths per minute.

- Baby dolphins have papillae (small projections) at the edge of their tongue. Papillae are thought to help with suckling (to get a good quick attachment to the nipple for nursing).

- Dolphins have a "chambered" stomach. The forestomach does mechanical breakdown of food; dolphins don't chew their food. The teeth are only used to grasp food.

- A naso-pharyngeal sphincter is located at the nasal sac, allowing dolphins to swim with their mouths open and not get water into the lungs.

- Dolphins have lobulated kidneys (reniculi). Each reniculus is anatomically a kidney. This feature conserves water, since a dolphin lives in a saltwater environment. Bottlenose dolphins have 300 reniculi to a kidney.

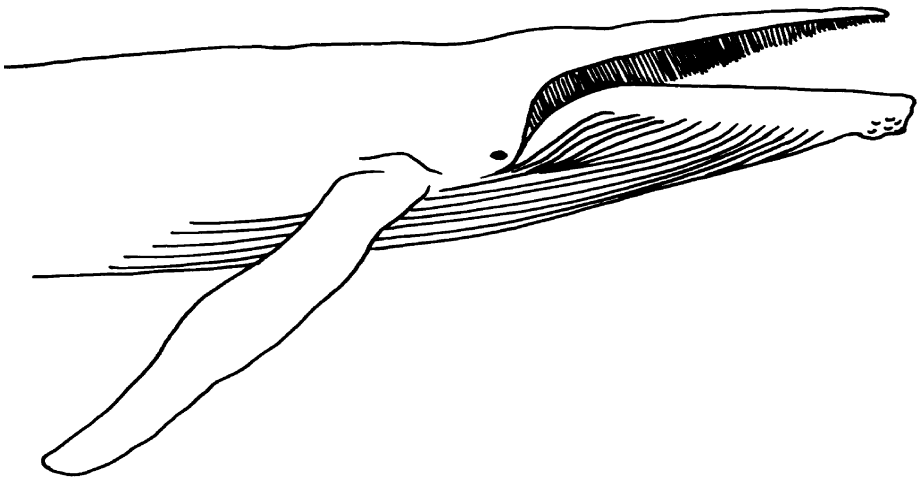
- The dolphin's cervix is actually like several cervixes, which act like "security gateways" to prevent seawater from getting into the body and to prevent sperm from getting out.

- The dolphin's body is insulated by "blubber," a thick fat layer. The blubber also acts as an energy store. This ability to store food is especially important to baleen whales that migrate, since they fast during migration and feed only on the feeding grounds.

- A dolphin has only one set of teeth for its entire life. These teeth all look the same (unlike ours).

- You can tell the age of a dolphin by pulling a tooth, cross-sectioning and staining it, and then counting the growth layers, just like counting rings in a tree.

- Baleen whales use baleen to catch their food by straining mouthfuls of water that contain plankton and small fishes (food is trapped on the fringed inner side). Plates of baleen, arranged like teeth in a comb, grow down from the upper jaw, extending down each side of the mouth (see picture below). Baleen is made of keratin, the same material that makes up hair and fingernails. Baleen whales normally feed by swimming with their mouths open (skimming) or by lunging and gulping water and fish.



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- Calves may be born tail- or headfirst. Marine parks have observed that each occurs about 50% of the time.

- Dolphins swim by moving their tails up and down in the water column. A bottlenose dolphin will swim about 3 mph, but can probably swim as fast as 20 mph if it needs to chase something (or is being chased).

- Depending on where a dolphin lives (how deep the water), a bottlenose dolphin usually dives from 3 to 46 m (10-150 ft). The deepest dive made by a Navy-trained bottlenose dolphin was 547 m (1,795 ft). Dives are often less than 2 minutes, though one could last as long as 10 minutes.

- A sperm whale may dive deeper than 2,000 m (6,562 ft) for periods of one hour or more.

- All marine mammals, including dolphins, have a slower heart rate while diving.

- The lungs of a dolphin are made to collapse under pressure. The ribs of a dolphin are not fused to the backbone as in a human, so it is easy for the whole rib cage to collapse. The lungs are then able to collapse so that no gas exchange can take place; hence, excess nitrogen cannot enter the bloodstream, and the bends cannot occur.

- During a dive, the circulatory system is adapted to supply oxygen only to the tissues that need oxygen the most–the heart and brain. When a dolphin dives, the heart slows way down and blood flow is restricted to the heart and brain. The muscles and other organs receive only a little blood.

- Dolphins have more hemoglobin (molecules on blood cells that capture oxygen) and more myoglobin (in the muscle, captures oxygen) than humans or any other animals. More myoglobin means that muscles can get plenty of oxygen during periods of reduced blood flow.

- A dolphin's body is more resistant to lactic acid than a human's. This means that a dolphin's muscles can work very hard for long periods of time, and there is no cramping up of muscles, as with humans.

- Dolphins do not have sweat glands. They thermoregulate through their flukes, flippers, and dorsal fin via a countercurrent heat exchange system. (Heat loss in water is about 27 times greater than in air.) The arteries in these locations are surrounded by veins. Some heat from the blood traveling through the arteries is transferred to the venous blood rather than the environment. If the animal needs to dump heat from its body, circulation increases to veins near the surface of the skin in those same locations and decreases to veins returning blood to the core of the body, getting rid of excess heat to the water.

- A dolphin's body temperature is about 98.4°F (36.9°C).

LIFE THROUGH THE SENSES OF A CETACEAN

Sight

- Pupils are large so that the animal can see in very low light (at depth), and the pupils can be closed to a slit to still be able to see in bright light.
- Can dolphins see color? Some studies indicate that dolphins are probably able to discriminate between colors.
- The shape of the eye lens can be altered greatly so that the dolphin can see well both in air and in water.

Touch

- Whale skin is highly sensitive, with lots of nerve endings. The skin is very soft and damages fairly easily, though it heals amazingly quickly.
- Nerve endings around the blowhole are sensitive to water pressure changes, which cause muscles to close the blowhole during diving and to open it at the water's surface.
- Dolphins spend much time touching one another by stroking with flippers or rubbing bodies– actions that can be likened to people shaking hands, rubbing backs, or giving hugs.

Taste

- Some cetacean species appear to be able to distinguish tastes. There are taste buds on the tongue of a bottlenose dolphin. It has been suggested that dolphins might be able to tell if a female is ready for mating by tasting urine in the water. It is known that bottlenose dolphins, although they do eat a wide variety of food, have preferences for some food over others. For example, fish with a higher fat content seem to be preferred (just as people like fatty food since it tastes good). This makes good sense to be attracted to such fatty fish since they carry a high-energy content.

Smell

- Whales and dolphins are not able to smell things. Looking at the cetacean brain, you would see that the olfactory bulb, important to processing information about smells, is very reduced.

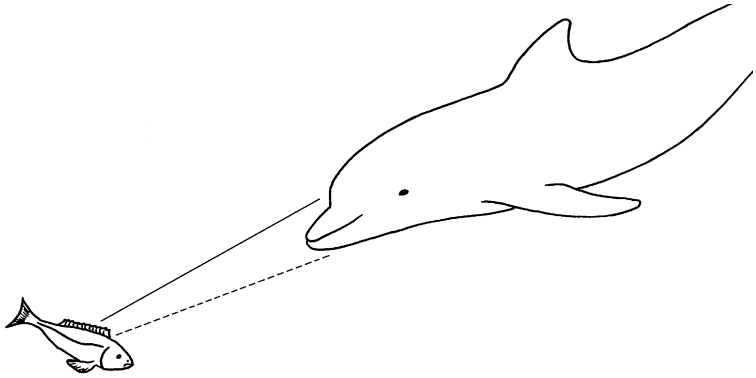
Hearing

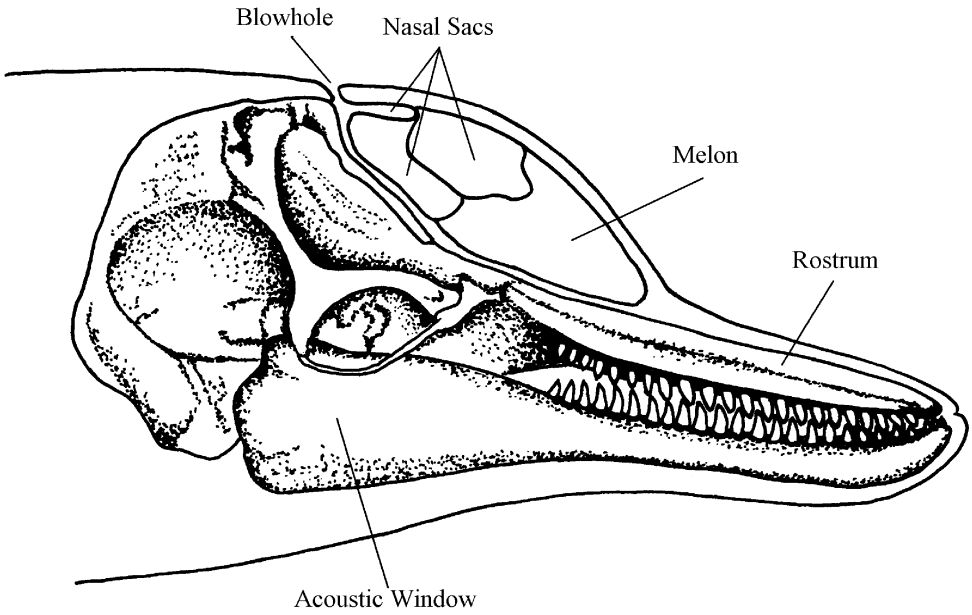
- Sound travels about 4.5 times faster in water than in air (because of water's density).
- Cetaceans do have ears: a small hole just behind the eye. The ear canal is blocked with debris and wax. Whales and dolphins have the same ear bones that humans do. The bones are, however, fused and are protected against diving pressure by a spongy cavity surrounding them.
- Cetaceans have a keen sense of hearing.

- Toothed whales use echolocation to “see with sound” to locate food, to find their way around, and to give themselves much information about their surroundings. Some species may be able to use sound to stun prey. No one knows whether baleen whales have the ability to echolocate. Humans are able to see with sound by using ultrasound technology (for example, a fetus can be looked at with ultrasound).

Echolocation: How Does it Work?

- Sound is made by the animal in its blowhole, by air sacs rubbing together to produce sounds.
- The melon (which is a fat deposit) focuses this sound into a directional beam (the melon takes the sound and focuses it like a flashlight beam).
- The sound bounces off an object, causing an echo to be reflected back to the animal. The sound is received in an area of the lower jaw where the bone is very thin–the acoustic window. The lower jaw is filled with a fat deposit just like the melon.
- The sound is transmitted through the fat in the lower jaw to the middle ear and then to the brain to be processed.





STRANDINGS

- *Stranding* occurs when a whale or dolphin ends up ashore ill, weak, simply lost, but often dead.

- *Mass-stranding* refers to stranding of two or more animals at a time (other than a mother and her calf).

- *Die-off* refers to the death of hundreds of animals at one time. Mass die-offs are often a result of rapidly spreading viruses, such as morbillivirus (a virus in the same family as measles), which has been implicated in die-offs of bottlenose dolphins on the Atlantic and Gulf Coasts of the United States.

Why do dolphins/whales strand?

- In short, we don't know the answer. There have been many proposed explanations including that, when stressed, cetaceans might have a primitive instinct to seek safety on land; confusion of echolocation signals by shallow water; inner ear parasites preventing proper reception of echolocation signals; brain infections that disorient; and geomagnetic field anomalies.

Why are we interested in dead dolphins/whales that have washed up on the beach?

- Many types of data for each species are collected, including data from tissues, which provide scientists with information on things like reproduction, age, parasites, feeding preferences, growth rates, and types of human impacts on cetaceans (including entanglement in fishing gear and levels of pollutants).

- Some species of cetaceans are known only from stranded specimens. For example, the melon-headed whale for quite some time was not known to occur in the Gulf of Mexico until strandings in Louisiana and Texas occurred.

- These dead animals are a source of specimens to be housed in museum collections and/or to be used for educational purposes.

TO HELP A STRANDED DOLPHIN OR WHALE

- Any dolphins or whales found on the beach (dead or alive) are under U.S. Government protection (Marine Mammal Protection Act). They should not be harassed or removed from the general area.

- If you discover a live or dead animal, call your local stranding network or law enforcement agency. Give the location, size, and general condition of the animal.

STRANDING NETWORK NUMBERS TO KNOW

Texas: 1-800-9-MAMMAL
Louisiana: Louisiana Dept. of Wildlife and Fisheries 1-800-442-2511 (24 hrs., 7 days a week)
Louisiana Marine Mammal Stranding Network–Digital pager 1-504-934-5337
Mississippi: 1-800-799-6637
Alabama: 1-334-380-3072
Florida: Florida Marine Patrol 1-800-342-5367 or 1-800-dialfmp

FIRST AID FOR LIVE ANIMALS IS ENCOURAGED

1. Call the stranding network and do not panic. Keep your personal safety in mind. Do not turn your back to the waves or position yourself where you might be hurt.
2. Move the animal to shallow water. Carefully move the animal, as it is very easy to damage the flippers by putting too much strain on them. Never lift the animal by its fins or flukes. Keep your hands away from the animal's mouth.
3. Keep the blowhole above water.
4. Dig pits under the flippers. Sand pits under each flipper will help prevent damage from the animal's weight. Be sure to avoid getting sand into the blowhole or eyes.
5. Keep the animal cool and wet either by continuous bathing or by applying a damp cloth to exposed areas, EXCEPT the blowhole. A cetacean will overheat quickly when on land if not kept wet.
6. Keep the animal's skin from cracking. Skin or sunscreen products, especially those containing lanolin, may be used to protect the skin.
7. Keep pets and crowds at a distance. Marine mammals may have *infectious diseases* potentially transmissible to humans and must at all times be treated with caution. Whales may thrash without warning, inflicting serious *injuries* to bystanders.
8. Remain with the animal until help arrives.

DO NOT ATTEMPT TO RETURN THE ANIMAL TO SEA

In most cases, an illness or injury is the cause of the stranding, so the animal will very likely beach again.

SOME THREATS TO THE GULF'S CETACEANS

Marine Debris

- Dolphins and whales can ingest debris, as well as become entangled in it. Plastic bags are the most common debris in the digestive tract of cetaceans and manatees. Plastic bags can block digestion and cause ulcers, ultimately killing the animal.

Live Captures

- Many dolphins from the Mississippi Sound area were caught for aquariums and research facilities. Captures in the past concentrated on the females, which could mean lower recruitment (lower population level).

- Live captures in the Gulf have been halted due to a number of die-offs that have occurred.

Die-offs

- A number of die-offs have occurred in the Gulf: 1990, 1992, and 1994.

- In January 1990, the deaths of 26 bottlenose dolphins in Matagorda Bay were attributed to cold weather.

- No conclusive evidence for a single or multiple causal agent(s) was provided for the other 300+ animals on the Gulf Coast that were part of the 1990 die-off.

- A localized die-off of dolphins in East Matagorda Bay in 1992 was suggested to be due to agricultural runoff (trace amounts of Aldecarb were found in the water).

- In 1994, 67% of tested stranded bottlenose dolphins in East Texas/Louisiana were found to have morbillivirus. Morbillivirus is part of the family of viruses that includes measles and distemper. Morbillivirus is thought to be very contagious to other marine mammals.

Chemical Pollution

- Dolphins and whales are high up in the food chain, which means they can be affected by the bioaccumulation of contaminants.

- A variety of contaminants has been found in Gulf whales and dolphins (including heavy metals and organochlorides, such as PCB's and DDT).

- Dolphins and whales have large stores of fat, which acts as insulation and as an energy reserve. Many contaminants bind to fat and are stored there. When the animal's body needs to use the fat (for example, if the animal can't find food or is fasting, or if the animal is nursing), these chemicals can be released into the body and be harmful.

- There is growing evidence that high pollutant loads are associated with skeletal deformations, developmental effects, reproductive and immunological disorders, and hormonal alterations.

- It is possible that contaminants initially cause immunosuppression, rendering dolphins susceptible to various types of infection, and may cause die-off situations.

- Baleen whales probably have lower levels of pollutants in them since they feed lower on the food chain than do toothed whales.

Fisheries Interactions

- Commercial fisheries may accidentally entangle and drown or injure cetaceans during fishing operations or by lost and discarded fishing gear. Commercial fisheries may also compete with marine mammals for the same fishery resources.

- There is little information on cetacean/fishery interactions in the Gulf.

- Bottlenose dolphins are often seen feeding in association with shrimp fishery operations. Dolphins sometimes also get caught in these nets.

- Dolphins may be caught and killed occasionally in the menhaden purse seine fishery.

- Whales and dolphins might be interacting with the tuna/swordfish longline fishery in the offshore Gulf. No one knows if cetaceans are being accidentally caught, but there are reports of pilot whales and possibly Risso's dolphins taking fish off the longlines.

- Stranded dolphins have exhibited evidence of gillnet entanglement.

- Fisheries may indirectly compete with marine mammals by reducing the amount of food available to them.

- Shooting of bottlenose dolphins also occurs sometimes. It is thought that fishermen shoot at dolphins to scare them away from their gear.

Habitat Loss and Degradation

- Habitat alteration (coastal development, making boating channels, etc.) has the potential to disrupt the social behavior, food supply, and health of cetaceans that occur in the Gulf. Such activities may stress the animals and cause them to avoid traditional feeding and breeding areas.

Ecotourism

- Dolphin-watching trips occur in some locations of the Gulf Coast.

- Any interaction involving dolphins or whales is regulated by the Marine Mammal Protection Act (and monitored by the National Marine Fisheries Service).

- Feeding wild dolphins is likely to disrupt normal behavior, particularly feeding and migration patterns. This activity could make dolphins dependent upon nonnatural food sources and more vulnerable to being hit by boats, to malicious shooting, and to accidental or deliberate food poisoning.

Boat Traffic

- Boats can collide with whales and dolphins. These collisions can cause major wounds on cetaceans and/or be fatal.

- Many people think that since dolphins come to ships to bowride, they should also be able to avoid being hit by boats. This isn't the case. If dolphins are playing, looking for food, or distracted in any way they can be hit by a boat.

- Even if a boat doesn't hit a dolphin, just causing the dolphin to move away from the boat's path can stress the animal, may cause it to stop what it was originally doing, and leave the area. This is especially a concern for cetacean mothers with their calves, since they have to feed a lot.

Noise

- Noise comes from a wide variety of sources, including aircraft, boats of all sizes, working oil rig platforms, etc.

- Noise may elicit a startle and/or avoidance reaction from cetaceans. It may also affect the ability of an animal to communicate and to receive information about its environment. Sounds may frighten, annoy, or distract a whale or dolphin. Noise may also make a whale or dolphin stop whatever activity it was engaged in, and leave an area. This would be especially bad for females that have nursing calves with them, as well as animals already stressed by parasites and disease; it could diminish an individual's chance for survival.

- Sound may also affect the prey of dolphins and whales.

- Just because a whale or dolphin lives in an area where there is much noise and appears to tolerate the sound, doesn't mean it isn't bothered by it. This situation is similar to people who live in the city, and don't like all the noise, and continue to live there, but may be stressed by the noise.

Oil

- Oil can affect marine mammals in different ways, depending on many factors (especially if the animals have fur). A cetacean surfacing to breathe could physically contact oil, or inhale oil vapors, or it could ingest it via contaminated food, and oil could foul baleen if a whale is feeding.

- A cetacean's skin is quite different from that of other mammals (for example, there are no hair follicles to trap oil to the skin). A cetacean's epidermis is nearly impenetrable to oil.

- The vapors that come from spilled oil could, if inhaled, lead to irritation of respiratory membranes, lung congestion, and pneumonia; subsequent absorption of contaminants in the vapors could make their way into the bloodstream and accumulate in such tissues as the brain and liver, causing nervous system and liver damage.

- Trained, captive dolphins were found to be able to detect thick dark oil, but not light oil sheen. The animals would avoid surfacing in or swimming beyond thick oil after a few brief times of touching it. Reactions of free-ranging (wild) dolphins vary; sometimes dolphins swim through oil, other times they avoid it.

- Spilled oil can lead to the reduction or contamination of prey. Feeding strategies of cetaceans could lead to ingestion of oil-contaminated food or incidental ingestion of floating or submerged oil or tar. Harmful chemical fractions could be swallowed or consumed through contaminated prey and by fouling of baleen.

- If an animal comes in direct contact with oil, the spill may physiologically stress an animal, making it more vulnerable to disease, parasites, environmental contaminants, and/or predation.

LAWS THAT PROTECT MARINE MAMMALS IN THE GULF OF MEXICO

- The Minerals Management Service (MMS) formally consults with the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) to ensure that activities under the management of MMS do not jeopardize the continued existence of a threatened or endangered species and/or result in adverse modification or destruction of its critical habitat.

Marine Mammal Protection Act of 1972

- The Marine Mammal Protection Act of 1972 (MMPA) was most recently reauthorized in 1994. In passing the MMPA in 1972, Congress found that

    - certain species and population stocks of marine mammals are, or may be, in danger of extinction or depletion as a result of man's activities;

    - such species and population stocks should not be permitted to diminish beyond the point at which they cease to be a significant functioning element in the ecosystem of which they are a part and, consistent with this major objective, they should not be permitted to diminish below their optimum sustainable population level;

    - measures should be taken immediately to replenish any species or population stock that has diminished below its optimum sustainable level;

    - there is inadequate knowledge of the ecology and population dynamics of marine mammals and of the factors that bear upon their ability to reproduce themselves successfully; and

    - marine mammals have proven themselves to be resources of great international significance, and aesthetic and recreational as well as economic value.

- The MMPA established a moratorium, with certain exceptions, on the taking of marine mammals in U.S. waters and by U.S. citizens on the high seas, and on the importing of marine mammals and marine mammal products into the United States.

Definitions

Take

- The term "take" is statutorily defined to mean "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture or kill any marine mammal."

Harassment

- Under the 1994 amendments, the Congress statutorily defined and divided the term "harassment" to mean any act of pursuit, torment, or annoyance that

    1. (Level A Harassment) has the potential to injure a marine mammal or marine mammal stock in the wild; or

    2. (Level B Harassment) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering.

- Under the Marine Mammal Protection Act, you are not allowed to pet, feed, or swim with wild marine mammals. You need to maintain a minimum distance of 50-100 yd from all animals, whether in the water or on shore, to prevent disturbance or harassment. Rules regarding stranded animals can be found on page 26.

- Under the MMPA, the Secretary of Commerce is responsible for the conservation and management of pinnipeds (other than walruses) and cetaceans. The Secretary of the Interior is responsible for walruses, sea and marine otters, polar bears, manatees, and dugongs. The Secretary of Commerce delegated MMPA authority to the NMFS. Part of the responsibility NMFS has under the MMPA involves monitoring populations of marine mammals to make sure that they stay at optimum levels.

Endangered Species Act of 1973

- The Endangered Species Act (ESA) establishes protection and conservation of threatened and endangered species and the ecosystem upon which they depend. The ESA is administered by the U.S. Fish and Wildlife Service and the National Marine Fisheries Service. Seven baleen whales, one toothed whale, and the West Indian manatee occurring in the Gulf are protected by the ESA.

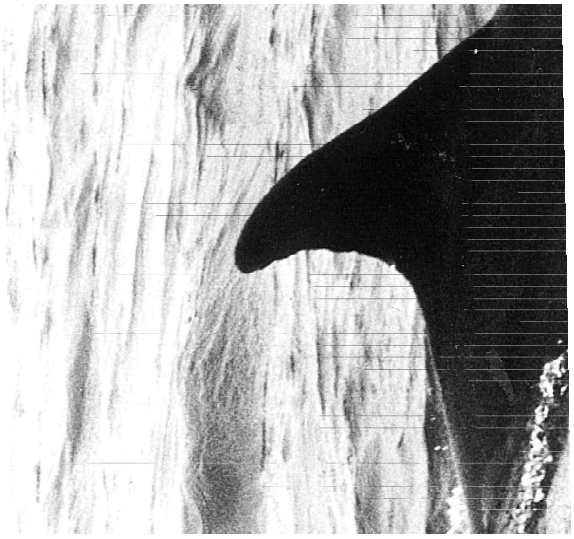
ACTIVITY–RECOGNIZING INDIVIDUAL BOTTLENOSE DOLPHINS

Scientists are able to recognize individual dolphins by photo-identification of natural marks. For bottlenose dolphins, the pattern of notches along the easily tattered rear edge of the dorsal fin permits identification of individuals–it is as unique to a dolphin as a thumbprint is for people. Unique coloration, scars, or distinctive shaping of the fin may provide additional information. Repeated sightings of dolphins with distinctive natural markings allow determination of home ranges and association patterns between individual animals.

The following two pages are a chance for you to play marine mammal scientist and try to match photos of individual dolphins. These are dolphins that were photographed in Galveston Bay.

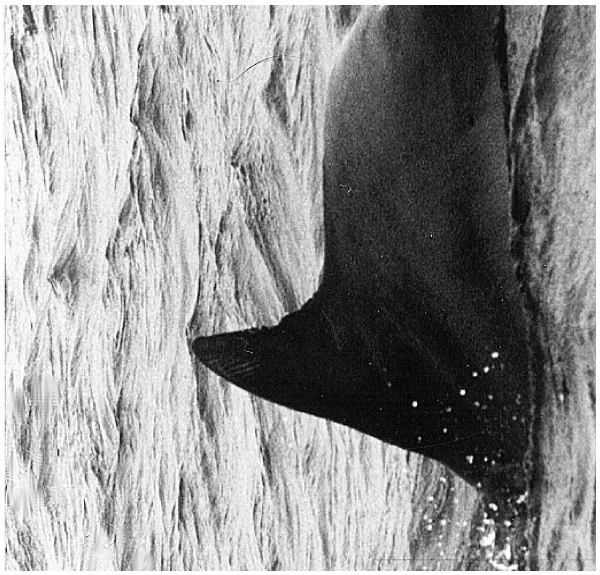
All dolphins on the first page are also represented on the second page. Match the letter to the number. The key is given below.

Key–A=2, B=4, C=3, D=1



B

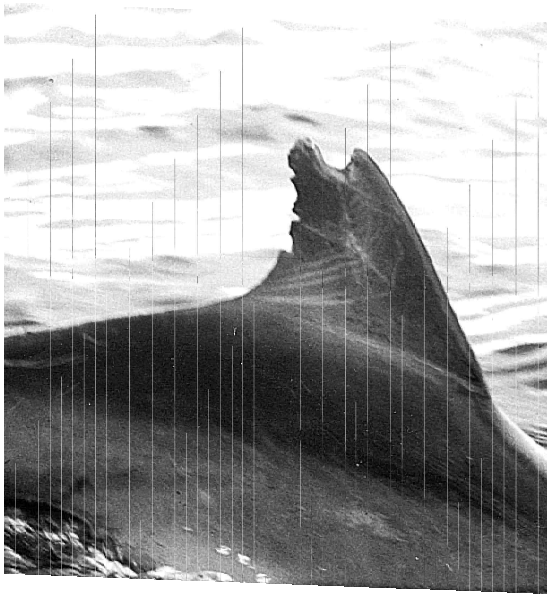
D



A

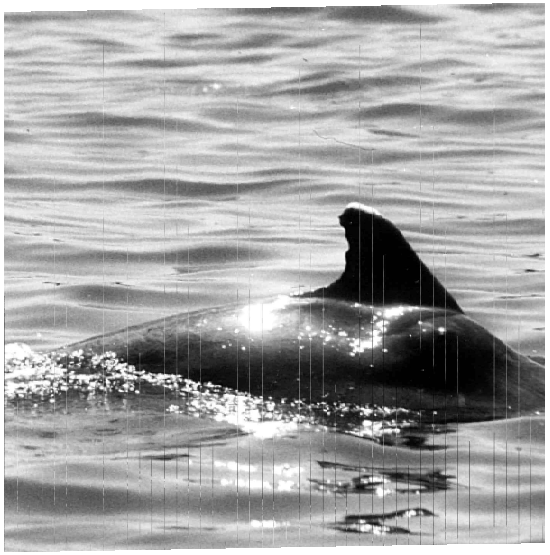
C

1



2

3



4

SUGGESTED ACTIVITIES

- Convert length and weight measurements to metric or U.S. units.

- Have students figure out their own weight/height and compare it to that of a bottlenose dolphin and then a sperm whale. How many students would it take to weigh as much as one dolphin or sperm whale?

- Calculate food intake and convert it to the number of hamburgers.

- Go out to the school parking lot and measure off the size of a blue whale so that the students can get an idea of the scale.

- Measure 10 ft on the parking lot and mark it with chalk. Then start another chalk line, explaining that one inch of the new line represents the old line. Use the new line to demonstrate the depth that a beaked or sperm whale dives.

- Have the students all hold their breath, using a stopwatch to record the time of the longest breath-hold. Now talk about the sperm whale and its ability to hold its breath for long periods of time while diving.

- Ask what color dolphins are. Illustrate expected answers with photos of a bottlenose dolphin, but surprise them with dolphins from the genus *Stenella* (some dolphins with spots!) and genus *Inia* (. . . and pink ones!).

- Use red pipe cleaners, black beads, etc. to do an arts-&-crafts project where students build a krill. (Krill is a small shrimp that baleen whales eat.) Chances are, after working to build a krill, they will remember its name, and remember something baleen whales eat.

- For older kids, get a copy of a book with good illustrations in it (such as Darling et al.'s *National Geographic* book; see suggested reference list). Tell each student to pick a favorite dolphin and do a report on it. For the report, each has to draw a picture of the dolphin. Each student has to get up, tell the class the name of his or her dolphin, how big it grows, and how much it weighs.

- Have students create a scale model of a dolphin or whale. Label the body parts.

- Have students come up with a list of advantages/disadvantages for animals to live in groups.

- How is the reproductive rate of a sperm whale different from that of a fish? What does the whale's slow reproductive rate have to do with its endangered status? Why is it important to protect the adult whales?

- Find out the gestation period for other mammals, such as humans, dogs, and elephants. How old is an individual before it can produce young?

- Have students collect photos of different types of marine mammals from old magazines and newspapers and make a collage. Can they tell the differences between dolphins and porpoises, seals and sea lions, etc., by just looking at them?

- Have each student create his or her own cetacean T-shirt design. Select the winning design and display it for all to see. (During the holidays, tree or classroom decorations could be made.)

- Have students list other animals that might share a bottlenose dolphin's habitat. For example, in some areas, these animals could be manatees, river otters, fish, birds, insects, and turtles. Draw pictures of them sharing this habitat.

- Have students find or draw pictures of animals that cetaceans might eat.

- As a class, participate in a local cleanup campaign that would be beneficial to cetaceans (beach cleanups, for example, keep trash from getting into the water where dolphins or whales could eat it).

- Discuss the word "stranding" and how it relates to whales and dolphins. Have students research the current theories on why some whales strand themselves. What should you do if you see a stranded dolphin?

- Discuss the words "obituary" and "eulogy" with your students. Have the students write obituaries for a cetacean using different ways that cetaceans have died (boat propellers, fishing gear, disease, etc.).

- Have students research organizations that work to protect cetaceans. Are they private or governmental? What do they do?

MARINE MAMMAL WORD FIND

Words are listed backwards, forwards, up, down, diagonally, and some even overlap! There are 78 words hidden. Have fun!!

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E Z E N O B  L U B B E R B J D U M S E L T S I H W A T H Q   O
L R A S E A  B I R D S C E R U P I H T E E T E V A W X I D   P
A E M B V K C D D L P A S E A L G R S S F U N T T Y Z O O   E
H L N O R L Y R O A O P T A G O R T N E A B D S E L N T P   D
W L O W E H E H L R I T R N U N A S O N A R A U R T U E P   U
C E O H S H U A P O S I E U O M T A I E C I N O O L B C Z   N
E P P E B Y O M H T R V A T B D I A L M S G G C R H O H E   C
T O R A O D R V I C U I M D S K O J A G E H E A F A H O D   L
O R A D N R B O N E T T L N E L N R E H D T R E N R U L E   E
L P H O T O G R A P H Y I U H S I F S I E U E M A B M O E   A
O E T O H P G N I V I D N O S N G B O A F R D Z L O P C F   G
G M N D A H R B O A T P E S E R R D Y H L Z P O R R B A R   N
Y Y N G E O N O T E S Q D M A R S E K U L F W O W X A T E   I
E S C I E N C E T A C E A Y I L A U L L L H I Y R V C I T   D
N T C R W E D A P A S M V T A N U G A A O V E N U P K O L   A
O I R A X O Q W L R M I U U H G K G C L A U T E A T O N I   H
L C P E R U E L A A K V Q C N R U E E H L Y E D L O D I F   S
E E L L A S O L L E S R A I A L A K E E O N C L I C K S S   R
M T J R N S U S R P O E D S E L H B E T A L U G N U O C E   E
A E I A I C U T E R R N S B L P J L A S O C I A L U Q I J   T
A U E T O Y R C X B A L E E N E U L B C R E P P I L F S H   N
M C I N Z A I T E R A E N A A C O U S T I C S D D E I F G   U
O E I M T E C E T C N E E M A M M G N I L A H W A B E R C   O
S B Y S S T I S R M T I C O U S T E A U C A M E R A I R K   C
S T L O B E V O T S A R O S B O T T L E N O S E H G F L I   C
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WORD LIST

Acoustics	Calf	Endangered	Melon	Porpoise	Species
Aquarium	Captivity	Filter feed	Migration	Propeller	Star Trek IV
Baleen	Callosities	Fish	Minke	Right	Stenella
Behavior	Camera	Flipper	Mysticete	Rorqual	Stranding
Beluga	Cetacea	Flukes	Notes	Scars	Streamlined
Binoculars	Cetology	Gray	Observe	Science	Teeth
Blowhole	Clicks	Harbor	Ocean	Sea	Tuna
Blubber	Countershading	Harpoon	Odontocete	Seabirds	Tursiops
Blue	Cousteau	Herd	Orca	Seal	Ungulate
Boat	Diving	Humpback	Pectoral	Sea lion	Water
Bottlenose	Dolphin	Hydrophone	Peduncle	Social	Whale
Bowhead	Dorsal fin	Krill	Photography	Sonar	Whaling
Breach	Echolocation	Marine mammals	Pod	Sound	Whistles

HOW ARE MARINE MAMMALS CLASSIFIED?

Kingdom - Animalia

Phylum - Chordata

Subphylum - Vertebrata

Class - Mammalia

Order - Cetacea		Order - Sirenia	Order - Carnivora	
Suborder Mysticeti	Suborder Odontoceti		Suborder Pinnipedia	
Families	Families	Families	Families	Families
Balaenidae	Physeteridae	Dugongidae	Otariidae	Mustelidae
Neobalaenidae	Kogiidae	Trichechidae	Odobenidae	Ursidae
Balaenopteridae	Monodontidae		Phocidae	
Eschrichtiidae	Ziphiidae			
	Delphinidae			
	Phocoenidae			
	Platanistidae			
	Iniidae			
	Pontoporiidae			

KEY TERMINOLOGY AND PRONUNCIATION

The Name	What It Means	How You Pronounce It
Balaenidae	right and bowhead whales	bay-LYNN-uh-dee
Balaenopteridae	rorquals	bay-LYNN-op TEAR-uh-dee
Cetacea	whales, dolphins, porpoises	suh-TAY-shuh
Delphinidae	ocean dolphins	DEL-fin-uh-dee
Dugongidae	dugong	do-GONG-i-dee
Eschrichtiidae	gray whale	esh-RICHT-uh-dee
Iniidae	boto	in-KNEE-uh-dee
Kogiidae	pygmy and dwarf sperm whales	co-gee-UH-dee
Monodontidae	narwhal, white whale	mohn-oh-DONT-uh-dee
Mustelidae	(represented by sea otter and marine otter)	muh-STEL-uh-dee
Mysticeti	baleen whales	miss-TUH-see-tea
Neobalaenidae	pygmy right whale	KNEE-oh-bay-LYNN-uh-dee
Odobenidae	walrus	oh-duh-BEN-uh-dee
Odontoceti	toothed whales, dolphins, porpoises	oh-DONT-o-see-tea
Otariidae	eared seals	oh-tuh-RYE-uh-dee
Phocidae	true seals	foe-SUH-dee
Phocoenidae	true porpoises	foe-SEEN-uh-dee
Physeteridae	sperm whale	fi-suh-TEAR-uh-dee
Pinnipedia	walrus, fur seals, sea lions, true seals	pin-uh-PED-e-uh
Platanistidae	Ganges and Indus River dolphins	pla-TUH-nis-tuh-dee
Pontoporiidae	baiji and franciscana	PON-toe-pore-uh-dee
Sirenia	manatees, dugongs	sigh-RIN-ee-uh
Trichechidae	manatees	trick-uh-KAY-uh-dee
Ursidae	bears (represented by polar bear)	ur-SUH-dee
Ziphiidae	beaked whales	ZIFF-uh-dee

SUGGESTED FURTHER READING/REFERENCE

Caldwell, D.K. and M.C. Caldwell. 1972. The world of the bottlenosed dolphin. Lippincott, St. Augustine, Fla.

Darling, J.D., C. Nicklin, K.S. Norris, H. Whitehead, and B. Würsig. 1995. Whales, dolphins, and porpoises. National Geographic Society, New York.

Evans, P.G.H. 1987. The natural history of whales and dolphins. Facts on File, New York.

Harrison, R. and M.M. Bryden. 1988. Whales, dolphins, and porpoises. Facts on File, New York.

Leatherwood, S. and R.R. Reeves. 1983. The Sierra Club handbook of whales and dolphins. Sierra Club, San Francisco, Calif.

Reeves, R.R., B.S. Stewart, and S. Leatherwood. 1992. The Sierra Club handbook of seals and sirenians. Sierra Club, San Francisco, Calif.

Reynolds, J.E. and D.K. Odell. 1991. Manatees and dugongs. Facts on File, New York.

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Würsig, B., T. Jefferson, and D. Schmidly. In press. The marine mammals of the Gulf of Mexico. Texas A&M University Press, College Station.

SURFING THE WEB? LOOK HERE

WhaleNet
http://whale.wheelock.edu/

Texas Marine Mammal Stranding Network
http://www.tmmsn.org

Louisiana Marine Mammal Stranding Network
http://www.premier.net/~lmmsn/

Marine Mammal Resource Links (National Marine Fisheries link)
http://kingfish.ssp.nmfs.gov/tmcintyr/otherres.html

Protected Marine Species Resources: Listings by Species
http://www.rtis.com/nat/user/elsberry/marspec/ms_spec.html

Sea World's Teacher Guides to Marine Mammals
http://www.seaworld.org

American Cetacean Society (teaching kits can be obtained here as well)
http://www.acsonline.org/

Pursuing a Career in Marine Mammal Science
http://www.pegasus.cc.ucf.edu/~smm/strat.htm

Society for Marine Mammalogy
http://pegasus.cc.ucf.edu/~smm/