Coastal Research & Education Society of Long Island, Inc.

WHALE WATCH TRAINING WORKSHOP
MANUAL

Division of Natural Sciences & Mathematics, Kramer Science Center
Dowling College, Oakdale NY 11769-1999
631-244-3352 http://www.cresli.org

Welcome

On the behalf of all involved in the Viking - CRESLI - WCNE Great South Channel trips for the Summer of 2006, I'd like to welcome you to this training session.

My colleagues and I at CRESLI are professional scientists and educators who have been investigating the distribution, abundance, population and behavioral ecology, and diversity of marine mammals and sea turtles in NY's waters (and elsewhere, such as the Caribbean and the Pacific) since the late 1970's. Our extensive experience and our fervent commitment to research, education, and conservation drive what you will be experiencing today and throughout the summer.

CRESLI's Purpose

> To stimulate public interest in and to encourage conversation of coastal ecosystems through education programs for schools and public and private organizations.
>
> To foster a lifelong appreciation of and sense of stewardship towards coastal ecosystems through our programs, outreach activities and membership.
>
> To support marine mammal and sea turtle stranding programs which respond to stranded sea mammals and turtles with the goal of rehabilitating these animals for release back to the wild.
>
> To provide research and educational opportunities to students wishing to pursue an education or a career in coastal studies.
>
> To be a regional, national and international resource on marine species and their environment for researchers, educators and policy makers.

You will be instrumental in helping further CRESLI's mission "to promote and foster understanding and stewardship of coastal ecosystems through research and education." You will also play critical roles in gathering and recording much needed data concerning the status of cetacean (whales, dolphins, porpoises) and sea turtle populations.

Let me thank you in advance for the time and effort you will spend on the very important and rewarding work you will be undertaking.

Arthur H. Kopelman, Ph. D.
President, CRESLI

CRESLI'S Cetacean Research Program

Scientists from the Coastal Research & Education Society of Long Island have been studying cetaceans (whales, dolphins and porpoises) for over two decades. Samuel Sadove and Dr. Arthur H. Kopelman, have been investigating fin and humpback whale behavior and conducting population and distribution surveys for all cetacean in New York's waters, the Caribbean, and the Great South Channel. They bring their acquired experience and knowledge to CRESLI's research and educational projects. A number of students from Dowling and other colleges, as well as volunteers from all walks of life assist with data collection and analysis.

Studying whales at sea is very difficult and expensive. Weather and sea conditions are not always favorable, and vessel and air time are extremely costly. CRESLI has developed a diverse, innovative support network to continue these valuable studies. These include: whale watch cruises, which offer a platform for research, in addition to educating the public; and local fishermen, commercial and recreational boaters who provide sighting reports and information to researchers. These individuals and organizations make this important work possible.

CRESLI's cetacean research program includes several comprehensive projects:

Cetacean population and distribution: Using shipboard and aerial platforms, the species, number of individuals, and their locations are recorded, along with meteorological and other data. Over time this serves to give researchers a picture of general population and distribution trends, and how cetaceans utilize their habitat.

Sighting Network: Local commercial and recreational fishermen and boaters are asked about sightings of cetaceans. This information supplements data collected by CRESLI researchers.

Photo identification of individual fin whales: CRESLI researchers developed a method of identifying individual animals by photographing each whale's chevron pattern, dorsal fin, and any other distinguishing features. These photographs, along with observed behavioral data, are used to study individual animals and determine population numbers and distribution.

Photo-identification of humpback whales (with specialists from the Whale Center of New England)

Fin whale biology and behavior: Intensive studies of fin whale feeding behavior and prey species, movement patterns, and behavior.

A brief taxonomic list of cetaceans in NY waters

Long Island's waters have been found to be inhabited by at least 20 different cetacean species, making this an important region not only for human use, but also for these often endangered species. By monitoring populations and better understanding their biology and behavior, we can better protect these animals and their environment.

Suborder Mysticeti. The baleen whales
- Family Balaenidae. Right Whales
  - *Eubalaena glacialis* (Northern right whale)
- Family Balaenopteridae. Rorquals
  - *Megaptera novaeangliae* (humpback whale)
  - *Balaenoptera acutorostrata* (minke whale)
  - *Balaenoptera borealis* (sei whale)
  - *Balaenoptera musculus* (blue whale)
  - *Balaenoptera physalus* (fin whale)

Suborder Odontoceti. The toothed whales
- Family Physeteridae. Sperm whale
  - *Physeter macrocephalus* (sperm whale)

    Family Kogiidae. Pygmy sperm whales
  - *Kogia breviceps* (pygmy sperm whale)
- Family Ziphiidae. Beaked whales
  - *Ziphius cavirostris* (goose-beaked whale, Cuvier's beaked whale)
- Family Monodontidae. Beluga and narwhal
  - *Delphinapterus leucas* (beluga whale)
- Family Delphinidae. Dolphins
  - *Tursiops truncatus* (bottlenose dolphin)
  - *Stenella attenuata* (pantropical spotted dolphin)
  - *Stenella coeruleoalba* (striped dolphin)
  - *Delphinus delphis* (common dolphin)
  - *Lagenorhynchus albirostris* (white beaked dolphin)
  - *Lagenorhynchus acutus* (Atlantic white sided dolphin)
  - *Grampus griseus* (Risso's dolphin)
  - *Orcinus orca* (killer whale)
  - *Globicephala melaena* (long finned pilot whale)
- Family Phocoenidae. Porpoises
  - *Phocoena phocoena* (harbor porpoise)

A brief introduction to cetaceans

Whales , dolphins, and porpoises belong to an order of mammals known as the Cetacea (derived from the Latin term *cetos* or *cetus*, meaning large sea creature). Cetaceans and the Sirenians (dugongs and manatees) are the only two orders of mammals that are adapted to a fully aquatic existence.

Cetaceans evolved from land mammal ancestors about 53-54 million years ago (MYA) (Reynolds, Odell and Rommel 1999) and are represented by three sub-orders:

1. the earliest to have evolved, the **Archeocetes** (the ancient whales), are found in the fossil record during the early to middle Eocene (52-42 MYA) (Berta and Sumich 1999);
2. the **Odontocetes** (toothed whales), an extant group that diverged from the archeocetes about 25-35 MYA (Berta and Sumich 1999), that includes sperm whales, dolphins, porpoises, beaked whales, narwhals and belugas, and others, ;
3. the **Mysticetes** (baleen whales), an extant group that also is believed to have diverged from the during the late Eocene, about 25-35 MYA (Berta and Sumich 1999).

The cetaceans share common ancestry with today's Ungulates (hoofed mammals), particularly with the Artiodactyls (even toed ungulates) such as deer, antelopes, camels, pigs, hippopotami, and giraffes. Early analysis of fossil evidence led to the belief that cetaceans had evolved from mesonychians, an extinct group of archaic ungulates (hoofed mammals) that had wolf-like or hyena-like proportions and were adapted for rapid movement on land and had large heads with powerful jaws (Berta and Sumich 1999; Reynolds, Odell and Rommel 1999, Rice 1998). On the other hand, recent molecular studies have been interpreted to show that the closest extant relatives of whales are hippopotamids (Nikaido, Rooney and Okada 1999).

Recent and compelling evidence based upon analysis of several early cetacean skeletons (*Ichthyolestes pinfoldi* and *Pakicetus attocki*), support the hypothesis that cetaceans share common ancestry with Artiodactyls, not mesonychians (Thewissen, et al. 2001). Thewissen et al. (2001) state that cetaceans "are not the sister group to (any) mesonychians, nor to hippopotamids." Their analysis "stops short of identifying any particular artiodactyl family as the cetacean sister group..." The recent work of Gingerich et al. (2001) also indicates that "Cetacea evolved from early Artiodactyla rather than Mesonychia ."

Cetaceans are characterized by a variety of adaptations to their fully aquatic existence. These adaptations range from obvious morphological ones to subtler physiological ones. The obvious morphological adaptations include:

- large size to reduce the surface area to volume ratio (SA/V) to aid in thermoregulation;
- hydrodynamically stream-lined bodies with reduced protuberances to reduce drag;
- no hind limbs
- powerful tail flukes for propulsion;
- forelimbs modified as flippers use for steering and stability;
- dorsal fin (not in all species) used for stability and thermoregulation;
- nares (nostrils or blowholes) located on the top of the head, allowing swimming and breathing without taking on water.

The physiological adaptations are numerous including those involved in **thermoregulation**, **buoyancy control**, **diving**, **water balance**, **sensory reception**, **reproduction**, and **communication**, to name a few.

Odontocetes and **Mysticetes**

We recognize 11 species of mysticetes (baleen whales) and, depending upon who you're listening to, anywhere from 67 species to 76 species of odontocetes (toothed whales) (Klinowska 1991; Berta and Sumich 1999; Reynolds, Odell and Rommel 1999).

Odontocetes have teeth which they use to grasp prey, or in the case of the killer whale (*Orcinus orca*) to tear at flesh, but not for chewing. Typically, odontocetes swallow their prey whole. The teeth vary in size and shape from the large conical teeth of the largest odontocete, the sperm whale (*Physeter macrocephalus*), to small spade-like teeth of the harbor porpoise (*Phocoena phocoena*), to the lack of erupted teeth in the females of some beaked whale species.

Mysticetes are filter feeders and they don't have teeth as adults. Instead, baleen whales have overlapping plates of keratinized (keratin is a fibrous protein found in skin, hair, nails, hoofs, and feathers) tissue called baleen hanging down from their upper jaws. Each baleen plate is shaped somewhat like an elongated triangle, with the short end embedded in the upper jaw at right angles to the long axis of the jaw; one edge of the triangle is smooth and faces outward, while the inner edge is fringed with bristle-like or hair-like keratinized tubules. These collectively form a filtering mat of fibers. In one way or another ("gulping" or "skimming") baleen whales take in mouthfuls of food and water, force the water out through the baleen plates and trap food organisms. The amount of food, types of food, and volume of water varies with species, individual, and conditions. It is interesting to note that the size, shape, and texture of the bristles vary with species and their typical prey. For instance, the baleen bristles of fin whales (*Balaenoptera physalus*), which have a broad potential food base of relatively larger organisms (including small schooling fish such as sand eels, herring, tinker mackerel; squid; and crustaceans such as copepods and euphausiids), are very coarse. However, the baleen bristles of northern right whales (*Eubalaena glacialis*) which feed almost exclusively on calanoid copepods are much finer.

Mysticetes and odontocetes differ in an array of other features as well. The shape of the mysticete skull is symmetrical, while that of the odontocete is asymmetrical. Odontocetes have single blowholes, while mysticetes have double blowholes. Most odontocetes are highly social (gregarious) animals, living in relatively stable social groups, while mysticetes are solitary animals, found in groups only under certain conditions (mothers and calves; courtship and mating; when there is an abundance of food). Odontocetes and mysticetes differ in size related sexual dimorphism (differences in size between males and females). In mysticetes, females are larger than males of the same age. In odontocetes, typically, males are larger than females of the same age, although there are some taxa in which males and females are the same size (Kogiidae), and some in which females are larger than males (harbor porpoise, river dolphins, and beaked whales) (Reynolds, Odell and Rommel 1999).

References cited:

Berta, A. and J. L. Summich. 1999. Marine mammals: evolutionary biology. Academic Press, San Diego, CA.

Gingerich, Philip D., Haq, Munir ul, Zalmout, Iyad S., Khan, Intizar Hussain, Malkani, M. Sadiq. 2001. Origin of Whales from Early Artiodactyls: Hands and Feet of Eocene Protocetidae from Pakistan. Science 293: 2239-2242.

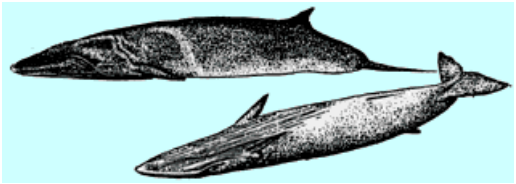
Klinowska, M. 1991. Dolphins, porpoises and whales of the World. The IUCN Red Data Book. IUCN, Gland, Switzerland and Cambridge, U.K.

Nikaido, M., A. P. Rooney and N. Okada. 1999. Phylogenetic relationships among cetartiodactyles based on insertions of short and long interspersed elements: Hippopotamuses are the closest extant relatives of whales. Proceedings of the National Academy of Sciences, USA 96: 10261-10266.

Reynolds, J. E. III, D. K. Odell, and S. A. Rommel. 1999. Marine mammals of the world. Pages 1-14 in J. E. Reynolds III and S. A. Rommel (eds). Biology of marine mammals. Smithsonian Institution Press, Washington, D.C.

Rice, D. W. 1998. Marine mammals of the world: systematics and distribution. Special Publication Number 4, The Society for Marine Mammalogy. Lawrence, KS.

Thewissen, J. G. M., E. M. Williams, L. J. Roe and S. T. Hussain. 2001. Skeletons of terrestrial cetaceans and the relationship of whales to artiodactyls. Nature 413: 277-281



AMERICAN CETACEAN SOCIETY FACT SHEET
FIN WHALE*(Balaenoptera physalus)*

The fin whale is one of the rorquals, a family that includes the humpback whale, blue whale, Bryde's whale, sei whale, and minke whale. The fin, or finback whale is second only to the blue whale in size and weight. Among the fastest of the great whales, it is capable of bursts of speed of up to 23 mph (37 km/hr) leading to its description as the "greyhound of the sea." Its most unusual characteristic is the asymmetrical coloring of the lower jaw, which is white or creamy yellow on the right side and mottled black on the left side. Fin whales are found in all oceans of the world, though they seem to prefer temperate, arctic, and antarctic waters to tropical seas.

PHYSICAL DESCRIPTION: The fin whale is long, sleek, and streamlined, with a V-shaped head which is flat on top. A single ridge extends from the blowhole to the tip of the rostrum (upper jaw). There is a series of 56-100 pleats or grooves on the underside of its body extending from under the lower jaw to the navel.

COLOR: The fin whale is light gray to brownish-black on its back and sides. Two lighter "colored" chevrons begin midline behind the blowholes and slant down the sides towards the fluke (tail) on a diagonal upward to the dorsal fin, sometimes recurving forward on the back. It is never posterior to the dorsal fin. The underside of its body, flippers, and fluke are white. The lower jaw is gray or black on the left side and creamy white on the right side. This asymmetrical coloration extends to the baleen plates as well, and is reversed on the tongue.

FINS AND FLUKE: The fin whale has a prominent, falcate (curved) dorsal fin located far back on its body. Its flippers are small and tapered, and its fluke is wide, pointed at the tip, and notched in the center.

LENGTH AND WEIGHT: Adult males measure up to 78 feet (24 m) in the northern hemisphere, and 88 feet (26.8 m) in the southern hemisphere. Females are slightly larger than males. Weight for both sexes is between 50-70 tons (45,360-63,500 kg).

FEEDING: Fin whales feed mainly on small schooling fish, squid, and shrimp-like creatures called krill or euphausiids. They have been observed circling schools of fish at high speed, rolling the fish into compact balls then turning on their right side to engulf the fish. Their color pattern, including their asymmetrical jaw color, may somehow aid in the capture of such prey. They can consume up to 2 tons (1,814 kg) of food a day. As a baleen whale, it has a series of 262-473 fringed overlapping plates hanging from each side of the upper jaw, where teeth might otherwise be located. These plates consist of a fingernail-like material called keratin that frays out into fine hairs on the ends inside the mouth near the tongue. The baleen on the left side of the mouth has alternating bands of creamy-yellow and blue-gray color. On the right side, the forward 1/3 section of the plates is all creamy-yellow. The plates can measure up to 30 inches (76 cm) in length and 12 inches (30 cm) in width. During feeding, large volumes of water and food can be taken into the mouth because the pleated grooves in the throat expand. As the mouth closes water is expelled through the baleen plates, which trap the food on the inside near the tongue to be swallowed.

MATING AND BREEDING: Adult males reach sexual maturity at about 6-10 years of age. As in some other whales, sexual maturity is reached before physical maturity. Gestation is 12 months, and calves are born at 3 year intervals. Length at birth is 14-20 feet (5.5 -6.5 m) and weight is 2 tons (1,814 kg). Calves nurse for 6 months and are weaned when they are 30-40 feet (10-12 m) in length.

DISTRIBUTION AND MIGRATION: Fin whales are found in all oceans of the world, except in tropical areas. They may migrate to subtropical waters and the Gulf Stream for mating and calving during the winter months and to the more productive colder areas for feeding during the summer months; although recent evidence suggests that during winter fin whales may be dispersed in deep ocean waters, as well as the near shore waters of Long Island as opposed to migrating between wintering and summering regions. The waters of Long Island are a significant feeding area for fin whales of the Northwestern Atlantic.

NATURAL HISTORY: Fin whales are found most often alone, but groups of 3-7 individuals are common, and association of larger numbers or concentrations may occur in some areas at times. The fin whale's blow is tall and shaped like an inverted cone, and the dive sequence is 5-8 blows approximately 13 seconds apart before a long dive. It does not raise its fluke as it begins the long dive, which can be as deep as 755 feet (230 m).

STATUS: Their speed, plus the fact that they prefer the vastness of the open sea, gave them almost complete protection from the early whalers. With modern whaling methods, however, finback whales became easy victims. As blue whales became depleted, the whaling industry turned to the smaller, still abundant fin whales as a replacement. As many as 30,000 fin whales were slaughtered each year from 1935 to 1965. The International Whaling Commission (IWC) placed them under full protection in 1966 beginning with the North Pacific population. The present populations are estimated to be about 40,000 in the northern hemisphere and there may be as many as 15,000-20,000 in the southern hemisphere, a small percentage of the original population levels.

Selected Literature

Balcomb, K. and S. Minasian. 1984. *The World's Whales*. Smithsonian Books. W. W. Norton, NY

Ellis, R. 1980. *The Book of Whales*. Alfred A. Knopf, New York.

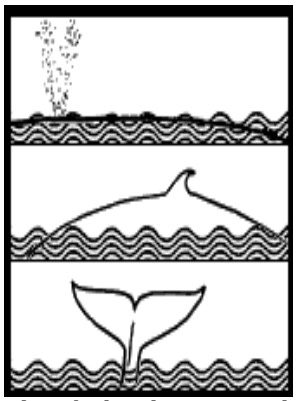
Kopelman, A. H. and S. Sadove. 1995. Ventilatory rate differences between surface-feeding and non-surface feeding fin whales (*Balaenoptera physalus*) in the waters off eastern Long Island, New York, USA, 1981-87. Marine Mammal Science 11(2):200-208.

Leatherwood, S.L. and R.R. Reeves. 1983. *The Sierra Club Handbook of Whales and Dolphins*. Sierra Club Books, San Francisco.

Miller, T. 1975. *The World of the California Gray Whale*. Baja Trail Publications, Inc., Santa Ana, California.

Acknowledgments

We greatly appreciate the knowledge and assistance of Steve Frohoff, who contributed to the revision of this fact sheet.

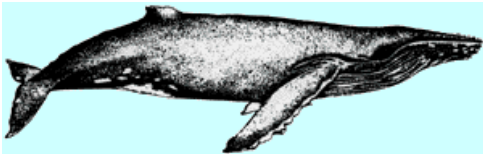


Fin whale Blow, Dorsal Fin and Fluke diagram

American Cetacean Society, P.O. Box 1391, San Pedro, CA 90733-1391
Phone 310-548-6279, Fax 310-548-6950, E-mail acs@pobox.com

Fact sheet revised August 1996. Web page updated April 12, 1997.
Modified and edited by A. H. Kopelman April 1999.

AMERICAN CETACEAN SOCIETY FACT SHEET



HUMPBACK WHALE

(Megaptera novaeangliae)

The humpback whale is one of the rorquals, a family that includes the blue whale, fin whale, Bryde's whale, sei whale, and minke whale. Rorquals have two characteristics in common: dorsal fins on their backs, and ventral pleats running from the tip of the lower jaw back to the belly area. The shape and color pattern on the humpback whale's dorsal fin and fluke (tail) are as individual in each animal as are fingerprints in humans. The discovery of this interesting fact changed the course of cetacean research forever, and the new form of research known as "photo-identification," in which individuals are identified, catalogued, and monitored, has led to valuable information about such things as humpback whale population sizes, migration, sexual maturity, and behavior patterns.

PHYSICAL DESCRIPTION

The head of a humpback whale is broad and rounded when viewed from above, but slim in profile. The body is not as streamlined as other rorquals, but is quite round, narrowing to a slender peduncle (tail stock). The top of the head and lower jaw have rounded, bump-like knobs, each containing at least one stiff hair. The purpose of these hairs is not known, though they may provide the whale with a sense of "touch." There are between 20-35 ventral grooves which extend slightly beyond the navel.

COLOR

The body is black on the dorsal (upper) side, and mottled black and white on the ventral (under) side. This color pattern extends to the fluke. When the humpback whale "sounds" (goes into a long or deep dive) it usually throws its fluke upward, exposing the black and white patterned underside. This pattern is distinctive to each whale. The flippers range from all white to all black.

FINS AND FLUKE

About 2/3 back on the body is an irregularly shaped dorsal (top) fin. Its flippers are very long, between 1/4 and 1/3 the length of its body, and have large knobs on the leading edge. The fluke (tail), which can be 18 feet (5.5 m) wide, is serrated and pointed at the tips.

LENGTH AND WEIGHT

Adult males measure 40-48 feet (12.2-14.6 m), adult females measure 45-50 feet (13.7-15.2 m). They weigh 25 to 40 tons (22,680-36,287 kg).

FEEDING

Humpback whales feed on krill, small shrimp-like crustaceans, and various kinds of small fish. Each whale eats up to 1 and ½ tons (1,361 kg) of food a day. As a baleen whale, it has a series of 270-400 fringed overlapping plates hanging from each side of the upper jaw, where teeth might otherwise be located. These plates consist of a fingernail-like material called keratin that frays out into fine hairs on the ends inside the mouth near the tongue. The plates are black and measure about 30 inches (76 cm) in length. During feeding, large volumes of water and food can be taken into the mouth because the pleated grooves in the throat expand. As the mouth closes water is

expelled through the baleen plates, which trap the food on the inside near the tongue to be swallowed.

MATING AND BREEDING

Humpback whales reach sexual maturity at 6-8 years of age or when males reach the length of 36 feet (11.6 m) and females are 40 feet (12 m). Each female typically bears a calf every 2-3 years and the gestation period is 12 months. A humpback whale calf is between 10-15 feet (3-4.5 m) long at birth, and weighs up to 1 ton (907 kg). It nurses frequently on the mother's rich milk, which has a 45% to 60% fat content. The calf is weaned to solid food when it is about a year old.

DISTRIBUTION AND MIGRATION

Found in all the world's oceans, most populations of humpback whales follow a regular migration route, summering in temperate and polar waters for feeding, and wintering in tropical waters for mating and calving.

NATURAL HISTORY

At least 3 different species of barnacles are commonly found on both the flippers and the body of the humpback whale. It is also home for a species of whale lice, *Cyamus boopis*.

Humpback whales are active, acrobatic whales. They can throw themselves completely out of the water (breaching), and swim on their backs with both flippers in the air. They also engage in "tail lobbing" (raising their huge fluke out of the water and then slapping it on the surface) and "flipper slapping" (using their flippers to slap the water). It is possible that these behaviors are important in communication between humpbacks.

Perhaps the most interesting behavior of humpback whales is their "singing." Scientists have discovered that humpback whales sing long, complex "songs." Whales in the North American Atlantic population sing the same song, and all the whales in the North American Pacific population sing the same song but the songs of each of these populations and of those in other areas of the world are uniquely different. A typical song lasts from 10-20 minutes, is repeated continuously for hours at a time, and changes gradually from year to year. It appears that all the singing whales are males and that the songs may be a part of mating behavior.

STATUS

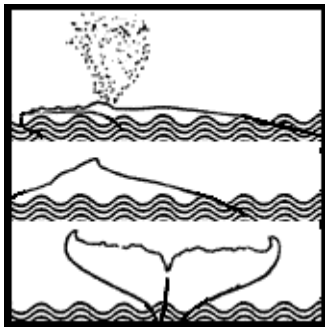
Because their feeding, mating, and calving grounds are close to shore and because they are slow swimmers, the humpback whales were an easy target for early whalers. Between 1905 and 1965, 28,000 humpback whales were killed. The International Whaling Commission (IWC) gave them worldwide protection status in 1966. It is believed they number about 15,000-20,000 at present, or about 15-20% of the original population.

Selected Literature

Balcomb, K. and S. Minasian. 1984. *The World's Whales.* Smithsonian Books. W. W. Norton, New York.

Leatherwood, S.L. and R.R. Reeves. 1983. *The Sierra Club Handbook of Whales and Dolphins.* Sierra Club Books, San Francisco.

Winn, L.K. and H.E. Winn. 1985. *Wings in the Sea; the Humpback Whale.* University Press of New England, Hanover, NH.



Humpback blow, dorsal, and flukes

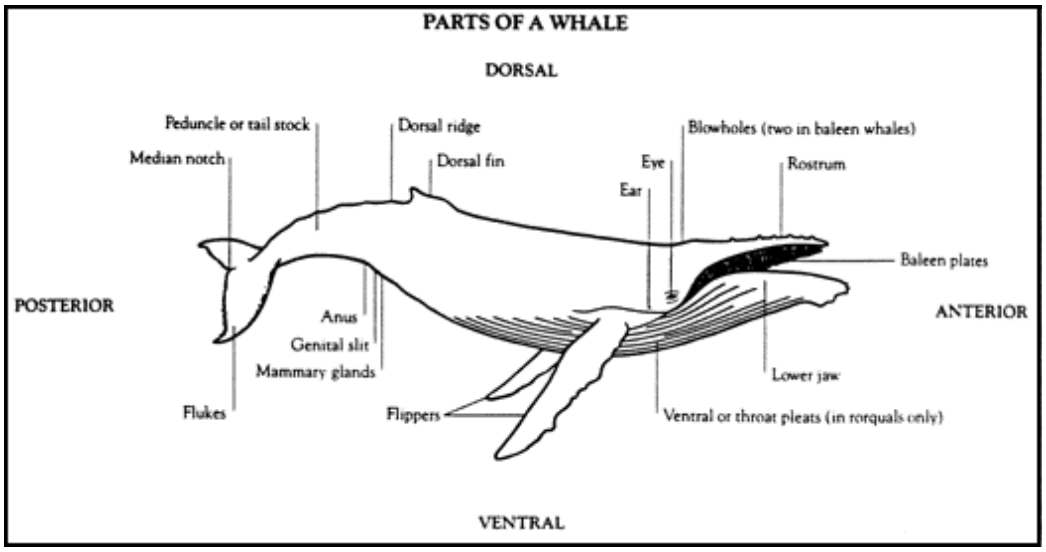
Acknowledgments

We greatly appreciate the knowledge and assistance of John Calambokidis of Cascadia Research and Mason Weinrich of Cetacean Research Unit, who contributed to the revision of this fact sheet.

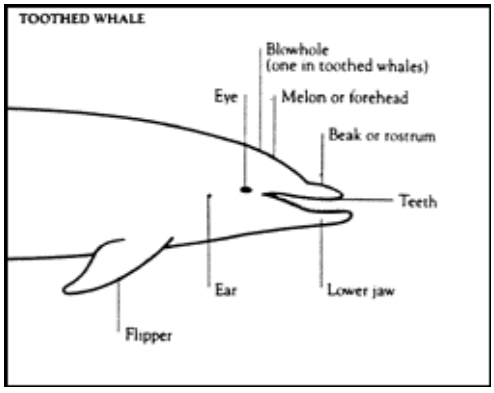
American Cetacean Society, P.O. Box 1391, San Pedro, CA 90733-1391, Phone 310-548-6279

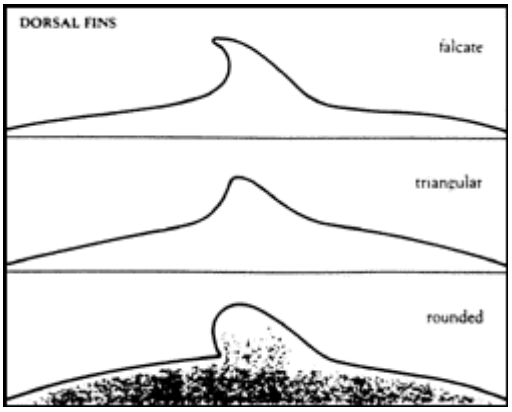
Fact sheet revised August 1996. Web page updated April 12, 1997.

AMERICAN CETACEAN SOCIETY FACT SHEET
PARTS OF A WHALE



The humpback whale above represents a typical baleen whale. In the diagram below, a bottlenose dolphin represents toothed whales.





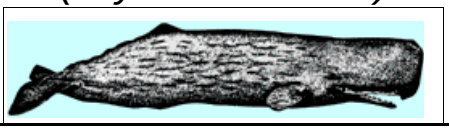
Fact sheet revised August 1996. Web page updated February 27, 1997.

American Cetacean Society, P.O. Box 1391, San Pedro, CA 90733-1391, Phone 310-548-6279

AMERICAN CETACEAN SOCIETY FACT SHEET

SPERM WHALE

(Physeter catodon)



The sperm whale is the largest *odontocete*, or toothed whale. It has been portrayed frequently in art and literature as a symbol of the great whales, and is best known as the leviathan *Moby Dick* in Melville's novel by that name. Unique in appearance, the sperm whale seems to have social characteristics that, to date, also appear to be unique among whales. Sperm whales are among the deepest diving cetaceans, and are found in all oceans of the world. Females and their young travel in family units, whereas the much larger males rove between breeding and feeding grounds, as well as among groups of females when breeding.

PHYSICAL DESCRIPTION: The head of the sperm whale is blunt and squared off, and has a small, underslung jaw. The head is also large, and makes up 1/3 the total body length and more than 1/3 of its mass. A single blowhole is located forward on the left side of the head, and the blow, which is bushy, is projected forward rather than straight up as it is with other whales. Its body has a wrinkled, shriveled appearance, particularly behind the head.

COLOR: The sperm whale is usually a dark, brownish gray with light streaks, spots and scratches. The skin around its mouth, particularly near the corners, is white. The ventral (underside) of the body is a lighter gray and may have white patches.

FINS AND FLUKE: The sperm whale has a squat triangular dorsal fin, followed by knuckles along the spine. Its flippers are small and slightly tapered, while its fluke is broad, measuring as much as 16 feet (5 m) from tip to tip.

LENGTH AND WEIGHT: Adult males reach lengths of 49-59 feet (15-18 m) and weigh up to 35-45 tons (31,750-40,800 kg). Adult females are much smaller, growing to about 36 feet (11 m) and a maximum weight of 13-14 tons (12,000-12,700 kg).

FEEDING: Its main source of food is medium-sized deep water squid, but it also feeds on species of fish, skate, octopus, and smaller squid. A sperm whale consumes about one ton (907 kg) of food each day. The lower jaw contains 18-25 large teeth on each side of the jaw, 3-8 inches in length. The upper jaw may have tiny teeth but they rarely erupt. The upper jaw contains a series of sockets into which the lower teeth fit.

MATING AND BREEDING: Males reach sexual maturity at approximately 33-39 feet (10-12 m), and 10 years or more of age but do not seem to take an actual part in breeding until their late 20's. Females reach sexual maturity at 27-29 feet (8-9 m), and 7-13 years of age. Gestation is 14-16 months. Newborn calves weigh approximately 1 ton (907 kg), and are 11-16 feet (3.4-4.9 m) long. Calves nurse up to two years or longer. Contrary to earlier belief, sperm whales do not seem to have harems. Instead, large males only attend female groups a few hours at a time. These female groups (family groups) consist typically of 10-20 animals. Within these groups there appears to be communal care for the young.

DISTRIBUTION AND MIGRATION: Sperm whales are found in all oceans of the world. The males, alone or in groups, are found in higher latitudes during summers. In winter they migrate toward lower latitudes, and only the physically mature males appear to enter the breeding grounds close to the equator. Females, calves, and juveniles remain in the warmer tropical waters of the Pacific, Atlantic, and Indian Oceans year round.

NATURAL HISTORY: The sperm whale is the deepest diver of the great whales and can descend to depths of over 3,300 feet (1000 m) and stay submerged for over an hour. Average dives are 20-50 minutes long to a depth of 980-1,970 feet (300-600 m). At such great depths there is little or no

solar light. However, organisms at these depths may produce biochemical light (bioluminescence). Sperm whales use their highly developed echolocation ability to locate food and to navigate, making nearly constant clicking sounds that pulse through the water. Sperm whales communicate using "morse-code" like patterns of clicks called codas. There is also a theory that sperm whales may stun their prey with a burst of sound.

The sperm whale's head houses a large reservoir containing spermaceti, a clear liquid oil that hardens to a waxlike consistency when cold, and has long been prized by whalers. Ambergris, a strange substance found in large lumps in the lower intestine of sperm whales, is formed around squid beaks that remain in the stomach. It was used in the making of perfume, and continues to be valuable in spite of its widespread replacement by synthetics.

STATUS: Sperm whales are still fairly numerous, but selective killing of the larger breeding-age males over many years upset the male-to-female ratio, and the birth rate has seriously declined in some populations. The average size of sperm whales killed noticeably decreased during the last 40 years of hunting.

At one time there were an estimated two million sperm whales throughout the world. In 1964, a peak year for sperm whale harvest, 29,255 were killed. Present population estimates are the subject of controversy among the world's experts on whale populations, but there may be a minimum of 500,000.

Selected Literature

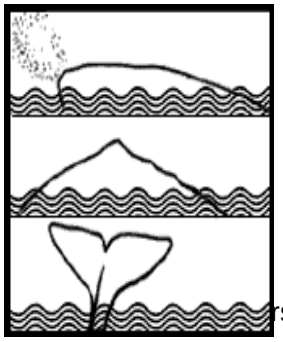
Balcomb, K. and S. Minasian. 1984. *The World's Whales*. Smithsonian Books. W. W. Norton, New York.

Ellis, R. 1980. *The Book of Whales*. Alfred A. Knopf, New York.

Leatherwood, S.L. and R.R. Reeves. 1983. *The Sierra Club Handbook of Whales and Dolphins*. Sierra Club Books, San Francisco.

Maptia, A. 1990. *Whales and Dolphins*. Salamander Books, London.

_____. 1988. *Whales, Dolphins, and Porpoises: an Encyclopedic Survey by International Experts*. New York: Facts on File Publications, New York.



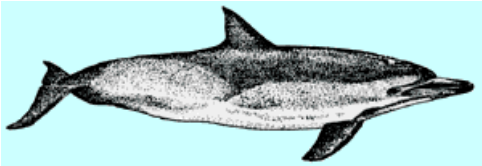
rsal, and fluke

Acknowledgments

We greatly appreciate the knowledge and assistance of Hal Whitehead of Dalhousie University and Tom Arnbom of Stockholm University, who contributed to the revision of this fact sheet.

American Cetacean Society, P.O. Box 1391, San Pedro, CA 90733-1391, Phone 310-548-6279

AMERICAN CETACEAN SOCIETY FACT SHEET
COMMON DOLPHIN
(*Delphinus delphis* and *Delphinus capensis*)



The common dolphin throughout history has often been recorded in art and literature. It was recently proposed that two forms of this species, the short- and long-beaked common dolphin, represent two distinct species.

PHYSICAL DESCRIPTION Common dolphins are colorful, with a complex hourglass color pattern on the side; the long-beaked common dolphin being more muted in color. The back is dark gray-to-black from the top of the head to the tail dipping to a V on the sides below the dorsal fin. The flanks are light gray behind the dorsal fin and yellowish-tan forward of the dorsal fin, forming an hourglass pattern. Its belly is white. There are large dark circles around the eyes connected by a dark line that runs across the head behind the beak and a black stripe runs from the jaw to the flippers. When looking at the profile of the two common dolphin species, the short-beaked common dolphin has a more rounded melon that meets the beak at a sharp angle, as compared to the long-beaked common dolphin that has a flatter melon that meets the beak at a more gradual angle.

COLOR Color patterns on the common dolphin are the most elaborate of any cetacean. The back is dark gray-to-black from the top of the head to the tail dipping to a V on the sides below the dorsal fin. The flanks are light gray behind the dorsal fin and yellowish-tan forward of the dorsal fin, forming an hourglass pattern. Its belly is white. There are large dark circles around the eyes connected by a dark line that runs across the head behind the beak and a black stripe runs from the jaw to the flippers.

FINS AND FLUKES The dorsal fin is triangular-to-falcate (curved). It is pointed and located near the middle of the back and is black-to-light gray in color with a black border. The flippers are long and thin and slightly curved or pointed depending on geographical location. Flukes are thin and pointed at the tips with a slight notch in the center.

LENGTH AND WEIGHT Common dolphins can reach lengths of 7.5 - 8.5 feet (2.3-2.6 m) and weigh as much as 297 lb (135 kg). The short-beaked common dolphin is relatively heavier, and has a larger dorsal fin and flippers than the long-beaked common dolphin.

FEEDING The common dolphin feeds on squid and small schooling fish. In some parts of the world, common dolphins feed at night on the deep scattering layer, which moves towards the water's surface during that time. Common dolphins have been seen working together to herd fish into tight balls. Like many other dolphin species, the common dolphin will sometimes take advantage of human fishing activities (such as trawling), feeding on fish escaping from the nets or discarded by the fishermen.

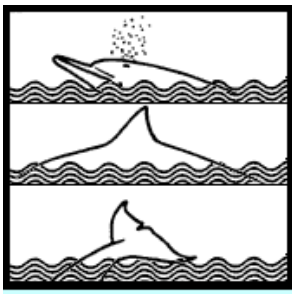
MATING AND BREEDING Sexual maturity is reached at 3 to 4 years of age or when they reach 6 to 7 feet in length (1.8 to 2.1 m). Calves are 30 to 34 inches at birth (76 to 86 cm); gestation period is 10 to 11 months.

DISTRIBUTION AND MIGRATION The common dolphin is found in all tropical and warm-temperate waters. The long-beaked common dolphin is found more in coastal waters; the short-beaked common dolphin is found in offshore waters and is the species that occurs frequently in the eastern

tropical Pacific. Both long-beaked and short-beaked common dolphins occur in the Southern California Bight.

NATURAL HISTORY Common dolphins are usually found in large herds of hundreds or even thousands. They are extremely active, fast moving, and engage in spectacular aerial behavior. They are noted for riding bow and stern waves of boats, often changing course to bow ride the pressure waves of fast-moving vessels and even large whales. Common dolphins can be frequently seen in association with other marine mammal species.

STATUS In the past 20 years, hundreds of thousands of common dolphins have been taken incidentally, along with spinner and pantropical spotted dolphins, in purse seine nets used during tuna fishing operations in the eastern tropical Pacific. Common dolphins also may be caught accidentally in other fishing gear, such as mid-water trawls. Turkish and Russian fishermen used to catch large numbers of common dolphins in the Black Sea for meat (to be used for fish meal) and oil. The fishery stopped after the common dolphin numbers became severely depleted (and still is); there are several reports suggesting that the Turkish fishery may have resumed. Many common dolphins are taken in a Japanese small cetacean fishery and directly caught in the Mediterranean. Some common dolphins may be taken in Peru for human consumption.



Blow, Dorsal Fin and Fluke Diagram

Selected Literature

Evans, W.E. 1994. *Common dolphin, white-bellied porpoise Delphinus delphis Linnaeus*, 1758. Pages 191-224 in *Handbook of Marine Mammals*, vol. 5: The first book of dolphins (S.H. Ridgway and R. Harrison, eds.). San Diego: Academic Press.

Heyning, J.E. and W.F. Perrin. 1994. *Evidence for two species of common dolphins (Genus Delphinus) from the eastern North Pacific*. Contributions in *Science*, Natural History Museum of Los Angeles County, No. 442.

Jefferson, T.A., S. Leatherwood, and M.A. Webber. 1993. *Marine Mammals of the World*. FAO Species Identification Guide. Rome: FAO.

Klinowska, M. 1991. Dolphins, Porpoises and Whales of the World: The IUCN Red Data Book. Gland, Switzerland: IUCN (World Conservation Union).

Leatherwood, S. and R. Reeves. 1983. Whales and Dolphins. San Francisco: Sierra Club Books.

Acknowledgments

We greatly appreciate the knowledge and assistance of Dagmar Fertl, Biologist, Minerals Management Service, U.S. Department of Interior.

American Cetacean Society, P.O. Box 1391, San Pedro, CA 90733-1391, Phone 310-548-6279

Some Important Terminology

The following terms and expressions are among those that will be used during the training session and the whale watches. Many of these terms may seem foreign at first, but with use and exposure, will become a part of your lexicon.

Terms pertaining to vessels:

Please note that some definitions have been taken from *Online Nautical Dictionaries* (http://www.refer.fr/termisti/nauterm/dicten.htm)

Abaft - Toward the rear (stern) of the boat. Behind.

Abeam - At right angles to the keel of the boat, but not on the boat.

Aft - Toward the stern of the boat.

Bow (fore) - The forward part of the vessel.

Dead Ahead - Directly ahead.

Dead Astern - Directly aft.

Leeward - The direction away from the wind. Opposite of windward.

Pilot house - The enclosed space on the navigating bridge from which a ship is controlled when under way. This area contains the main navigation and communication equipment, as well as the instrumentation that provide data for us. This is our base of operations. The pilot house and adjacent area are not open to the general public.

Port - When facing forward, the port side is the left side. A good way to remember is that the terms "port" and "left" both contain 4 letters and end in "t".

Starboard -When facing forward, the starboard side is the right side of the vessel.

Stern (aft) - The rear part of the vessel.

Terms pertaining to our research projects:

Apnea period - interval between breaths.

Anterior - toward the front an animal.

Baleen - filtering material in the mouths of mysticetes. These triangular hairy fringed plates of keratinized tissue are found in closely packed rows hanging from each side of the roof of the mouth.

Benthic - pertaining to the ocean bottom.

Blow - Also called the spout, cetacean's exhalation; often looks like a puff of steam or smoke when air is forced out of the blowhole(s). The visibility, angle, and height of a blow will vary between individuals and species depending upon a variety of conditions.

Blow hole(s)- nostril(s), or external nare(s) of cetaceans found on top of the head.

Breaching - leaping out of the water.

Caudal peduncle - Tapered rear part of the body from just posterior to the dorsal fin to just anterior to the flukes. Also called "tail stock."

Cetacean - any member of the order Cetacea, a group of fully aquatic mammals, that include the whales, dolphins, and porpoises.

Cruise Track - a log of the vessel's position, heading, and other parameters concerning oceanographic conditions, taken at regular intervals.

Dorsal - refers to the top, or back, of an animal (opposite of ventral).

Dorsal fin - a large fin located along the mid-line of the dorsal surface of most cetaceans.

Echolocation - a means by which animals can detect an object and its properties by means of reflected sound.

Fluke - in cetaceans, a horizontal flattened tail fin.

General Data - data regarding position, heading, and other parameters concerning cetaceans, taken only at the direction of the naturalist.

Littoral zone - intertidal zone ; the area between low and high tides.

Melon - in toothed whales, the bulbous forehead, containing oils, nasal sacs and passages, and muscles.
Pectoral fins (or flippers) - paired forelimbs used for stability and steering.
Pelagic - pertaining to the open ocean.
Photo identification - a procedure by which individual animals can be identified via the analysis of appropriate photographs of distinguishing characteristics. Photo identification studies can be used to follow individuals, and to make accurate assessments of population density via mark-recapture analyses.
Photo data - data regarding position, heading, roll #, photo #, and other parameters concerning cetaceans, taken only at the direction of the naturalist.
Plankton - aquatic organisms that cannot swim against a current.
Porpoising - leaping out of the water and moving forward rapidly.
Phytoplankton - photosynthetic plankton (i.e. autotrophic plankton).
Posterior - toward the rear of an animal.
Sounding dive - see "terminal dive"
Terminal dive - or "down dive", or "sounding dive"; a deep dive that occurs typically after a series of shallow submergences and surfacings.
Ventral - of, near, on, or towards the belly (opposite of dorsal).
Ventral pleats - in rorquals, furrows extending backward from the chin. Also called throat grooves, these pleats allow the expansion of the mouth during feeding, and then contract to assist in forcing water out through the baleen plates.
Zooplankton - plankton that feed on other organisms (i.e., heterotrophic plankton).

A Typical Whale Watch Trip

I. What you will need:

A. You should **be prepared for a variety of weather conditions**. Have several layers of warm clothing (particularly early in the season) available; have foul weather gear available.

B. **Shoes ... strong, sturdy, flat, non-skid, rubber-soled, no sandals**. It is a smart idea to bring an extra pair of socks with you also.

C. **A hat** ... During warm weather a hat is needed to protect you from the sun, rain, etc., under cold conditions as much as 80% of your body heat is lost through your head.

D. **Sun screen** ... that blocks UV_a and $_{Uvb}$. VERY IMPORTANT!

E. **Sun glasses** ... VERY IMPORTANT!

F. **Sea-sick medication** ... for those that need it, take the recommended dosage at the recommended time prior to departure. Understand that many over-the-counter medications will make you sleepy.

G. **CRESLI T-shirt** and appropriate apparel

H. **Food, liquid, and money** (if you choose, you can purchase all your food and drinks or you can bring your own, or a combination thereof).

I. **Sleeping bag**, **toiletries, medications and clothes** for 2-3 days.

J. **Common sense, courtesy and good spirits**... this is a cooperative effort. We all must work together, must meet at the proper times and places, and must look after and help each other.

II. At the dock

A. Volunteers are expected to be at the boat at least 70 minutes prior to its scheduled departure. We will have a meeting and then usually board passengers shortly thereafter. Departure is at 19:00. Please be at the ship no later than 18:20. Upon arrival at the vessel, you should check in and stow your gear in the pilot house . Check with the naturalist, educators, or mates regarding any immediate tasks that may require your assistance.

1. If this is your first time on a particular vessel, please familiarize yourself with the position of fire extinguishers, pfd's (personal flotation devices), and other safety equipment.

B. When directed to do so by the captain, naturalist, or mates, you should begin boarding passengers. For safety, it is imperative that the boarding procedures described below be adhered to carefully.

1. At least two people, and preferably 4, should be available to assist in boarding. One person will be taking tickets from passengers, another should be using a clicker-counter to count passengers as they step aboard. Two people must be available and situated such that each can extend an immediate a hand to each passenger coming aboard. Children and all passengers needing assistance must not be allowed to step across the gap between the dock and the vessel without a someone holding on to them.

C. Those volunteers not assisting with boarding should be available to answer questions, or direct the passengers to the appropriate individual for answers.

D. Before we leave the dock, the naturalist will give watch and data assignment.

III. Leaving the dock

A. All passengers must be seated, with hands and other appendages away from the railing. REMINDERS MAY BE NECESSARY. An announcement will be made over the public address system, but you may have to remind those passengers that are not complying with the safety rules.

B. Do not block the Captain's view as the vessel is being backed out of the slip or leaving the harbor.

IV. At sea

A. From the time we leave the dock, until we lose light or visibility or return to the dock, volunteers should keep eyes out for marine mammals, sea turtles, fish, birds, other marine life, and debris. At some time on Monday morning, while at the whale grounds, you will hear the naturalist state the phrase "eyes on station." This is the indication that it is formally time to scan your spotting area in earnest. Before then, keep looking anyway - things have a tendency to "pop -up" unexpectedly and if we're not looking, we miss them.

B. CREW ASSIGNMENTS

1. **For the single day trips:** You will be given a spotting station and a data assignment. Your spotting stations may be rotated at 2 hour intervals throughout the course of the day.

2. **For the Great South Channel Trips:** The crew will be organized into 2 watches (A and B) of 4-6 persons each. Watches are "on" for 3 hour intervals, starting at 06:00 and ending at sunset (around 19:00).

a. The watches will be scheduled as follows:

Monday		Tuesday	
06:00 - 09:00	A WATCH	06:00 - 09:00	B WATCH
09:00 - 12:00	B WATCH	09:00 - 12:00	A WATCH
12:00 - 15:00	A WATCH	12:00 - 15:00	B WATCH
15:00 - 18:00	B WATCH	15:00 - 18:00	A WATCH
18:00 - 21:00	A WATCH	18:00 - 21:00	B WATCH

C. While on station, your main objective is to scan intently for cetaceans. Your eyes and concentration are our best tools. Therefore it is important that you concentrate on the task at hand. I am sure that passengers may come to you and attempt to carry on a dialogue, that's fine, but remember that when you speak to them, you should still be looking out over your spotting area.

D. When you think you have spotted a whale, immediately inform the naturalist so that he (or she) can confirm the sighting and notify the passengers. **Volunteers are not to make any species identifications**, leave that to the naturalist.

E. When with whales, those with cetacean specific data assignments should be ready to undertake their tasks. The key to remember is that when the whale has sounded and you have recorded the appropriate data (quickly, accurately, and legibly), you must go back to your spotting stations and begin scanning again.

F. If you must leave your station for any reason, please let others on the research team know, so that your area can be covered in your absence.

G. Do not block the Captain's or the naturalist's view, especially when we are with whales. Remember that if you around the pilot house and can turn around and see the Captain, you are in the Captain's field of view.

H. Often when conditions are windy the windward door of the pilot house will be closed. Please do not open the windward door; go around to the leeward side and open that door.

I. The area above the pilot house is absolutely out-of bounds except for authorized staff and crew personnel.

J. Volunteers, when not on station, should rest, and if possible, should mingle with the passengers on the way out and back. Spending time with passengers can add significantly to their experience.

1. Answer their questions if you can, but remember that you don't have all the answers and be willing to state that.
2. If you get a question you can't answer regarding any of the biota or processes that we encounter, bring the question and/or the questioner to the naturalist.

V. Safety regulations for passengers and crew

A. Running is not allowed on the vessel.

B. Arms and legs must remain inside the rails at all times.

C. To avoid slipping, wear non-skid shoes.

D. When not seated, keep a firm hand on the rails, or other secure parts of the vessel.

E. Do not take out life preservers (pfd's) unless instructed to do so by the captain.

F. Do not stand on seats or deck boxes (i.e., keep one foot on the deck at all times).

G. Smoking is only permitted on the lower deck, along the aft railing. Cigarette butts are not to be thrown overboard.

H. IN THE EVENT OF AN EMERGENCY, AWAIT ALL FURTHER INSTRUCTIONS FROM THE CAPTAIN OF THE VESSEL.

VI. Garbage

A. Anything made of paper, plastic, metal, or wood is to be placed in one of the many garbage pails found about the vessel.

B. Recyclable cans and bottles are to be placed in appropriate containers.

C. Any material light enough to be picked up and carried by the wind must be secured and not left unattended. If you see any such material, grab it before it becomes air borne and goes overboard.

D. **NOTHING GOES OVERBOARD** EXCEPT THAT WHICH COMES FROM ONE'S GASTROINTESTINAL TRACT.

VII. Sea Sickness

A. If you are prone to sea sickness, take appropriate precautions.

B. If you are not feeling well:

1. If you are on the upper deck, move to a lower deck, (there is less motion).
2. Stay towards the rear third of the vessel (on the lower deck).
3. **STAY OUT ON DECK IN THE FRESH AIR!! DO NOT GO INTO THE CABIN!! DO NOT GO INTO THE BATHROOMS!!**
4. Eat bready and doughy foods; stay away from acidified liquids.
5. Keep looking out over the horizon.

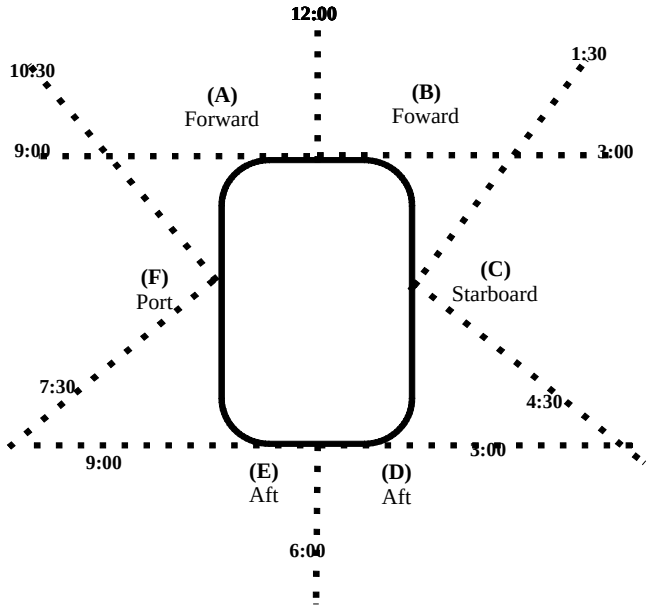
C. If the things listed above do not help:

1. Stay near a railing on the leeward side and let nature take its course.

SPOTTING STATIONS AND DATA ASSIGNMENTS

I. SPOTTING STATIONS

Each volunteer will be given a "spotting station," i.e., an area in which to scan for cetaceans and other things of interest. We arrange spotting stations so that the research crew has "eyes" 360° about the vessel. Spotters are usually situated as follows: 2 looking forward; 2 looking aft; one looking to port; and one looking to starboard. Each spotter will be scanning an area of 90° as follows (see diagram below, where the hands of a clock depict direction): Spotter A scans forward from (9:00 to 12:00); Spotter B scans from 12:00 to 3:00; Spotter C scans from 1:30 to 4:30; Spotter D scans from 3:00 to 6:00; Spotter E scans from 6:00 to 9:00; and Spotter F from 7:30 to 10:30. In this way all areas are covered and some areas have multiple coverage.



You should scan water's surface out toward the horizon, with most effort within the nearest 2 miles. You are looking for blows, which seem like puffs of smoke or steam arising from the surface and remaining in the air for a few seconds. In addition, you will be looking for anything that seems to pique your interest.

We place you on station early enough so that you can get reasonably used to the visual "background noise" level; you will then be able to distinguish "noise" from other objects and therefore develop a better searching image. If you see something that you suspect should be checked further, note its direction and approximate distance, and get the attention of the naturalist.

II. Data Assignments

Data are to be written legibly, and in pencil. The date, vessel and appropriate header information are to be filled out for each sheet. **The boxes on the upper right hand of each sheet are to be filled out by the naturalists only.**

Persons collecting and recording data must do so quickly, legible, and accurately, and must return to their spotting stations immediately upon recording data after sounding dives. You are needed at your stations because the whale has sounded and may come up anywhere - and we need "eyes all around."

You will be assigned a particular data task on a per watch basis. Every attempt will be made to try and rotate all volunteers through the full set of data tasks during the course of the voyage.

A. Daily Cruise Track

1. One person per watch will be assigned to collect and record the vessel's position, time, water depth, water temperature, vessel heading, and "remarks" (see Daily Cruise Track data sheets) at 15 minute intervals, beginning at the Montauk Harbor jetty and continuing until we return to the jetty. **Cruise Track Data must be recorded, regardless of what other activities are occurring.** Please remember to record debris, birds, and other marine life (as directed by the naturalist) in the "Remarks/Behavior" column. The question you might have is, which line to record the observations in? Let's assume you've taken a set of data for time 11:30; 5 minutes later the naturalist tells you to mark down a leatherback sea turtle - where would you put it? The answer should be clear, in the next time period's box (with the sighting time listed parenthetically). Later, at 11:45, fill out the rest of the line.

POSITION (latitude/longitude)	VESSEL HEADING (in degrees)	WATER TEMP. (^{o} F)	TIME (24 h clock)	DEPTH (in feet)	REMARKS/BEHAVIOR
N 41^o:50.25'/ W 71 ^{o}:30.28'	90 ^{o}	64.3 ^{o}	11:30	180	seas calm, 6 storm petrels
			11:45		leatherback (11:40)

2. As you can see from this hypothetical, **latitude and longitude (the vessel's position)** are to be recorded as follows: **N degrees : minutes/ W degrees : minutes**, where minutes are measured to the nearest hundredths. Please check with the naturalist if you are unsure of which instrument you are to use to get these readings.

3. Note that headings are given in degrees, and water temperature in degrees Fahrenheit. Also note that temperature is recorded to one decimal point (even if the temperature is on an integer, you must record the decimal point).

B. General Data

1. One person will be assigned to collect and record General Data including: boat's position (as close to the tail slick as possible), time, water depth, water temperature, animal's heading, the prey distribution profile, and remarks/behavior (see General Data sheets). These data are collected only upon direction of the naturalist. The naturalist will indicate what to put in the "prey distribution" and "remarks/behavior" columns." The General Data person will be the only data recorder in the pilot house (except for Cruise Track) after a sounding dive, and will provide the recorded data to the Breathing Data and Photo Data persons. Begin a new sheet for each new animal or group of animals (check with the naturalist).

C. Photo Data

1. One person will be assigned to work with the photographer (naturalist) to collect necessary data. It is important that the data collector remain with the photographer while photos are taken. The data card or film rolls are numbered and recorded along with each photo number.
2. 2 forms: Photo ID sheet and Photo Data sheet
   a. Photo ID Sheet to identify roll or disk; new date; new area (when asked by naturalist)
   b. Photo Data Sheet is used to record specific information about a photograph or a series of consecutive photographs taken at a surfacing; time record is key.

      (1) When possible, the distance between the animal and the boat will be accurately measured (via specially equipped binoculars) and recorded in the "notes" section of the data sheet. These data will enable researchers to determine the length of the whale which ultimately will enable researchers to determine the size structure of the population.
      (2) When an animal has sounded, the Photo Data person will get information regarding position, time, animal heading, and remarks from the General Data person.

D. Breathing data (a 2 person assignment)

1. One person will use a stopwatch to measure the time intervals between breaths (apnea period) while the other records the data. When an animal has sounded, the timer will continue to time the interval, while the recorder will get data regarding position, time of day, depth, and prey profile from the General Data person. Breathing data are recorded intermittently at the discretion of the naturalist. Each whale will require new data sheets.

After all is said and done, remember the following:

1. If you have any questions, please ask the naturalist.
2. New volunteers will be assigned to work with more seasoned ones, when possible.
3. If you are not sure about a data assignment, piece of equipment, or anything else, please don't hesitate to ask the naturalist for assistance.
4. Enjoy your interactions with our amazing cetaceans.

We are doing this to help gather information in order to protect and preserve our coastal ecosystems. That's what matters!

"When the last individual of a race of living things breathes no more, another heaven and another earth must pass before such a one can be again" William Beebe

APPENDIX

Directions to the Viking Dock:

L. I. E. (Rt 495) East to Exit 70, South on Rt. 111 to Rt. 27, approximately 1 hr. to Montauk; or Southern State Pkwy. to Sunrise Hwy. (Rt. 27) East to Montauk, then Edgemere Road to Viking Landing in Montauk Harbor.