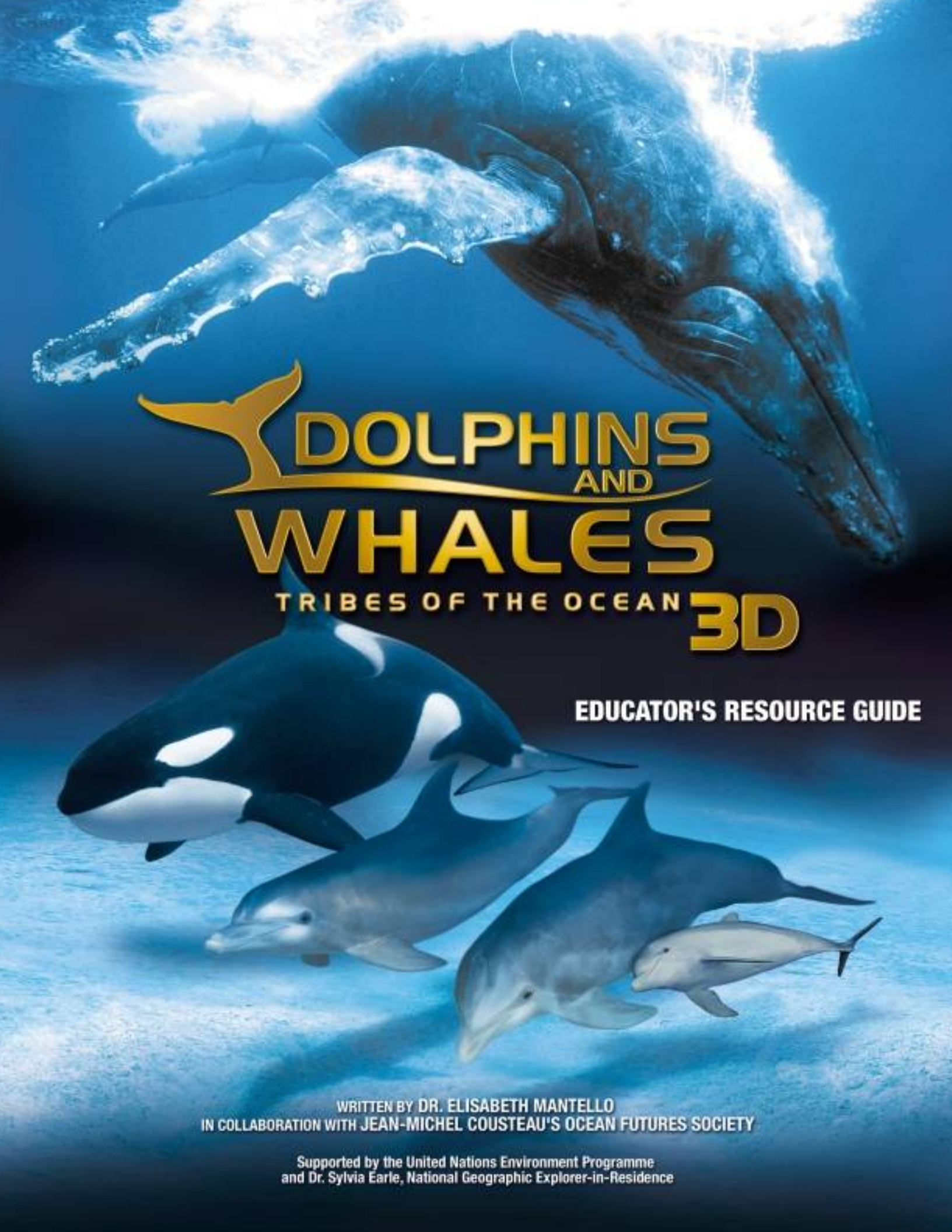

# DOLPHINS AND WHALES

## TRIBES OF THE OCEAN 3D

## EDUCATOR'S RESOURCE GUIDE

WRITTEN BY DR. ELISABETH MANTELLO
IN COLLABORATION WITH JEAN-MICHEL COUSTEAU'S OCEAN FUTURES SOCIETY

Supported by the United Nations Environment Programme
and Dr. Sylvia Earle, National Geographic Explorer-in-Residence

# A WORD FROM JEAN-MICHEL COUSTEAU

*Film Ambassador*

Marine mammals have always fascinated me. From the enormity of the great whales to the intelligence of dolphins, marine mammals are a mystery to many of us.

I have had the good fortune to dive with many species of dolphins and whales around the world and have come to appreciate the fact that they are our counterparts in the sea. From the excited chatter of spotted dolphins in the Caribbean to the eerie songs of the humpbacks in Hawaii to the mega pods of killer whales off Southern California, marine mammals showcase many complex behaviors that rival our own: communication, recognition of the individual, social structures, hunting skills, and play.

But today, many marine mammal populations are in decline, some for unknown reasons. As the only species that can protect all living things, we have a moral obligation to better understand our counterparts in the sea because, deep down inside, we know that if we cannot protect them, we cannot protect ourselves.

Thanks to the tireless, hard work of marine mammal scientists around the world, we now have a better understanding of the complexities of many of these populations, their movement patterns, their social structures, and their need for a productive and clean marine ecosystem.

There are success stories to be told of the incredible comeback of some of the protected baleen whale populations, like the Eastern Pacific gray whales, which have been removed from the Endangered Species List now that their population is thought to have recovered to their pre-hunting numbers of over 20,000.

But we also need to remember, despite over 20 years of protection, many of the baleen whale populations still remain at less than 25 percent of their original numbers, including humpback whales and fin whales, both featured in this film, because of habitat degradation, depleted fish stocks, entanglement, ship collision, heavily contaminated coastal marine habitats, and increased noise pollution.

This wonderful Educator's Resource Guide will take you and your students on a journey into the world of dolphins and whales with the help of the twelve marine mammal species featured in the film DOLPHINS AND WHALES 3D. You will learn all about their lifestyle and physical characteristics, and their vulnerability to an ever-changing environment.

There are reasons to be hopeful, though, for the future of marine mammals.

Thanks to the spectacular DOLPHINS AND WHALES 3D: Tribes of the Ocean and its outstanding educational materials, we have the resources to better inform ourselves and help contribute to the well-being of their future. Please join me in spreading the important message that we all need to act responsibly and live a more sustainable life-style to ensure the preservation of the world's ocean and its inhabitants, including the 80 plus species of marine mammals.

In the end, the most crucial partners whales and dolphins have are **YOU and ME.**

**FOR ADDITIONAL RESOURCES, VISIT ONLINE**
**DOLPHINSandWHALES3D.com/education**

DOLPHINS AND WHALES
TRIBES OF THE OCEAN 3D

"Less than 1% of human beings have had the incredible opportunity to visit the underwater world. With this beautiful adventure projected on to IMAX® 3D screens, viewers can virtually touch some of the most incredible mammals in the world. It is amazing how much we share with these beautiful creatures - play, family, education, community, struggles. Unfortunately, because we often are so unaware of these underwater tribes and our negative impact upon them through slaughterings and uncontrolled human activities, they are facing the greatest challenge of all: to survive the destruction of their habitat and depletion of food resources."

**DARYL HANNAH**
*Narrator*

"Although each encounter with these wild creatures was truly magical and highly emotional, DOLPHINS & WHALES 3D marks one of the most challenging and epic productions we have ever taken on as filmmakers. We had to set up two crews to work in parallel and they often faced daunting sea conditions while filming. But locating the pods at a time when their populations are dwindling was undisputedly the greatest obstacle to overcome. The result, however, is simply spectacular. We have exceptional footage of cetaceans shown as they really are in their daily lives: interacting socially, communicating through their highly complex system of sound, playing, feeding, breeding, migrating and perpetually fighting for their survival."

**JEAN-JACQUES MANTELLO**
*Director*

**This Educator's Guide was written by Dr. Elisabeth Mantello in collaboration with marine biologists from Jean-Michel Cousteau's Ocean Futures Society.**

**Special thanks to :**
**Jean-Michel Cousteau, Dr. Richard Murphy, Holly Lohuis, Aron Bosworth, Dr. Sylvia Earle, Laurence Billiet-Prades, Alexandra Body.**

**Illustrations by Joëlle Baron for 3D Entertainment Ltd.**

# TO EDUCATORS

The 3D Entertainment film "**Dolphins and Whales 3D**" takes you on a unique dive to encounter members of the last ocean tribes. With your students you will come so close to these animals, you'll become part of the tribe. You'll swim with great and small cetaceans – the right whale, humpback whale, sperm whale, pilot whale, beluga, orca, bottlenose dolphin, spotted dolphin, common dolphin and Risso's dolphin - as if you, too, were in the depth of the oceans.

The **Educator's Guide** has been designed to enhance your students' experience and enjoyment of the film. They will learn how to identify these marine mammals, and discover what is happening to them. We hope to raise their curiosity about these wonderful animals, and motivate them to play a role in reducing the threats to cetaceans, marine mammals, their environment and the planet we all share.

# HOW TO USE THE EDUCATOR'S GUIDE

**The Educator's Guide** is divided in three distinct Units:
*Unit I - "The Cast of the Film"* contains a separate Identification File for each marine mammal appearing in the film, each one outlining its main characteristics and conservation status. It is intended to serve as a quick reference guide for educators. Unit II and III provide several activities each with a "Student activity sheet" to photocopy and corresponding Answers, and Resources for the educators. These activities require the active participation of your students: they'll think of hypotheses, find and analyze information, present and discuss their findings, compare causes with consequences, and draw conclusions.

The goal of *Unit II "Discovering marine mammals"* is to make students familiar with the marine mammals they encounter in the film. The activities are geared to make them discover many of the biological features of these mammals, as well as their extraordinary social behavior.

*Unit III "Marine mammals in danger"* leads students to investigate how critical the situation faced by these marine mammals is today. The activities focus on the risks these marine mammals are facing today in their natural habitat, i.e. the many human-induced causes of their endangerment, and the degree of this endangerment. Using the official threatened species categories, students will be able to realize how endangered each species featured in the film is.

Following their investigation, students should have a better understanding of what makes these marine mammals particularly vulnerable to human activities and be able to think of viable solutions to protect and save them.

**The Educator's Guide** provides activities that are easily adapted for use with students of elementary age through high school. The topics can be worked into many areas of your curriculum, such as:

- *Science*: marine mammal biology (shape, form, function); ecological relationships (the habitat and biology of the animals, pollution and its effect on each animal's biology). Scientific inquiry process.
- *Education for sustainable development*: Environmental issues, understanding the reasons behind these marine mammals' endangered status (human causes), actions.
- *Citizenship*: Understanding the consequences of irresponsible behavior (littering, bycatch, overfishing, captivity industry); becoming a responsible citizen (taking actions such as adopt-a-whale, writing letters to authorities, not going to dolphinariums.)
- *Language Arts*: Reading, creative writing, presenting ideas, debating; learning new vocabulary.
- *Arts*: Creative drawings based on new information; creating posters to heighten awareness of how marine mammals are endangered and what the public can do to help (Put posters up around school and the community).
- *Mathematics*: Comparing sizes, using a scale to compare animal sizes.
- *ICT*: Internet-based research on many topics, followed by writing, presenting and debating.



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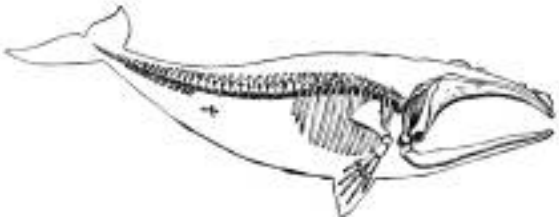
# UNIT 1 - THE CAST OF THE FILM

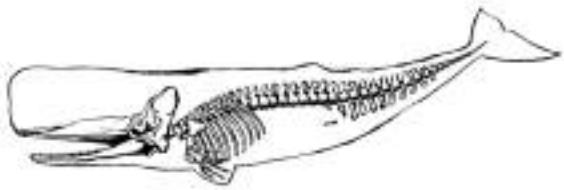
Despite their appearance, dolphins, whales and manatees are not fish; they are mammals, but mammals that live in water. They are marine mammals. Like all mammals, including ourselves, they are warm-blooded, breathe using lungs, give birth to live young that they feed with milk, and have some hair. Cetaceans usually are born with hair but shed it when very young. Cetaceans build complex social relationships.

Whales and dolphins do not belong to the same scientific order as the manatees. Whales and dolphins belong to the order Cetacea. Manatees belong to the order *Sirenia*.

## CETACEAN

There are around 86 kinds of cetaceans classified into 2 main suborders.





### BALEEN WHALES (MYSTICETES)

Cetaceans with baleen plates with which they filter-feed, and two blowholes.

This is a suborder of around 13 species including rorquals. "*Rorquals*" are baleen whales that have throat grooves that expand when they feed.

They are the largest animals on earth with females usually larger than males. Some dinosaurs might have been as long but they never weighed that much.

**DID YOU KNOW?**

The term "*great whales*" refers to the baleen whales **and** the largest toothed whale, i.e. the sperm whale.

### TOOTHED WHALES (ODONTOCETES)

Cetaceans with teeth and one blowhole.

Suborder of around 70 species, including *dolphins*.
*Dolphins* belong to the largest and most diverse family of toothed whales, with around 30 species.
The orca is the largest of the dolphins.
The oceanic dolphins include six large dolphin species that have the word "whale" in their name. One of them, the *pilot whale* appears in the film.

The male is larger than the female.

## SIRENIAN

Today, there are three species of manatee and one species of dugong left in the world.

The three mermaids that Christopher Columbus mentioned in his diary in January 1493 are believed to have been manatees; Columbus was quite disappointed, finding them not "as beautiful as the painted ones."

Manatees are the only marine mammals, along with the dugong, that are herbivores (plant eaters). They are also called "*sea cows*".
All sirenians have the following in common: molars, no collar bones, sparse hair on the body, a leathery looking skin type and color and the ability to grasp. One species of manatee - *the Stellar Sea Cow* - was first discovered in 1741 and was hunted to extinction by 1768. Sirenians and elephants share a common ancestor.

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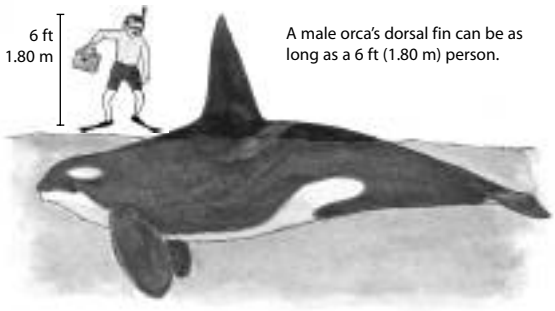
# The size of the film's marine mammals

The Size Chart on page 5 shows all the marine mammals appearing in the film from the smallest to the largest (based on maximum sizes). The size of a great whale is almost inconceivable. Since there are no humans or human-related objects in the film, we have included – among others - divers (6 ft/1.80 m with their diving fins) and a 40-ft yellow school bus with teacher and students in our chart.

The largest animal known to have ever lived on Earth is the blue whale. No land animals have reached such proportions, not even the dinosaurs. The blue whale can be up to 110 feet (33 m) and weigh as much as 150 tons or 25 adult male African elephants, Earth's largest land mammal today! Next to a blue whale, an elephant seems quite "small", standing up to 10 feet (3 m) at the shoulder and weighing "only" 6 tons (5,400 kg).
The blue whale's tongue weighs as much as an elephant and its heart as much as a small car!

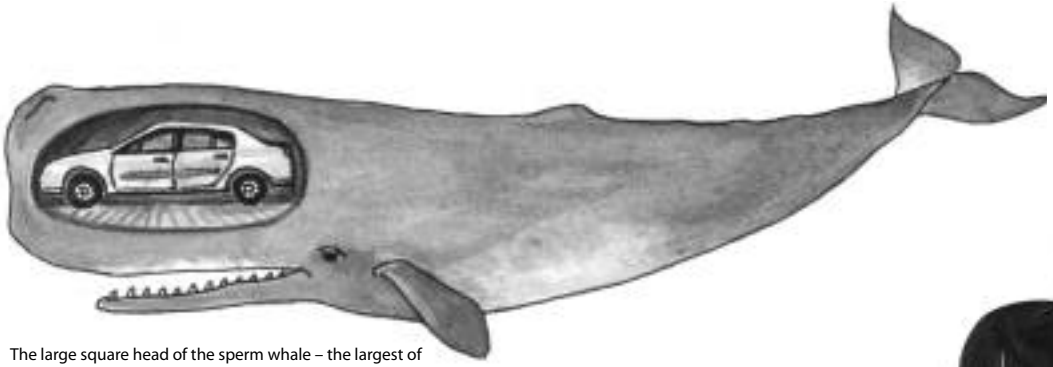



A male orca's dorsal fin can be as long as a 6 ft (1.80 m) person.

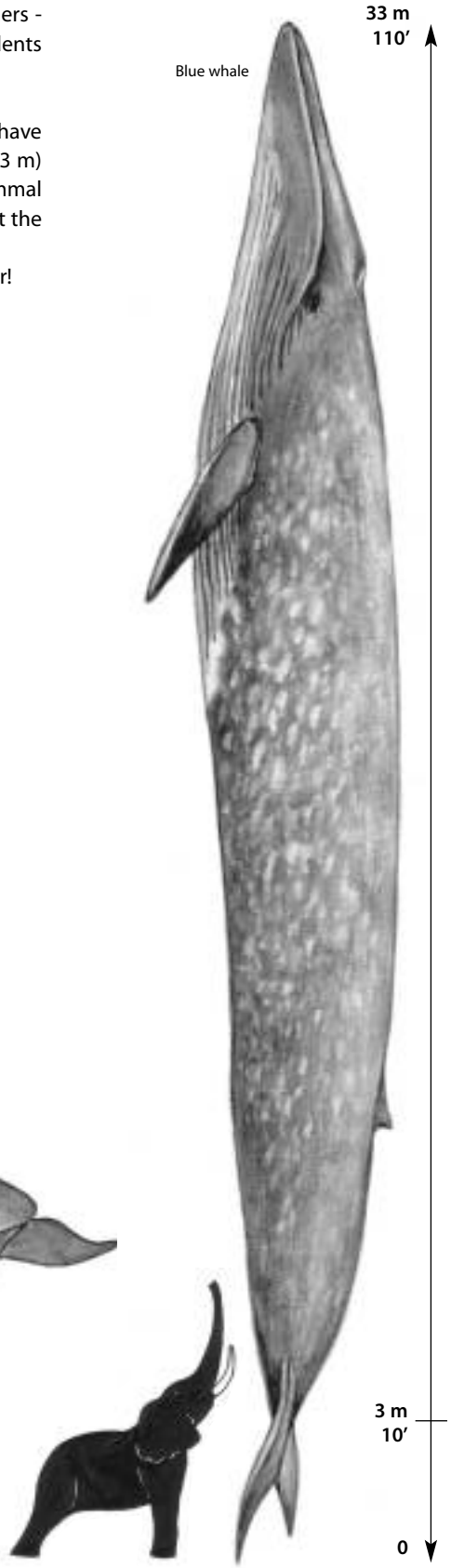
Orcas are enormous. An adult male can grow up to 30 ft (9 m) long and weigh a colossal 6 to 7 tons. That's as heavy as 9 cars or 133 people!

A sperm whale tooth: 9" (23 cm) long and weighs up to 4 lbs (1.8 kg).

To grasp the size of a fin whale, compare it to the size of an average IMAX® giant screen (52 ft high by 72 ft wide or 16 by 22 m).



The large square head of the sperm whale – the largest of the toothed whales - accounts for up to 1/3 of its body length and contains a cavity large enough for a car to fit inside! Weighing 17 lbs (7.7 kg), its brain is the largest of any living mammal.



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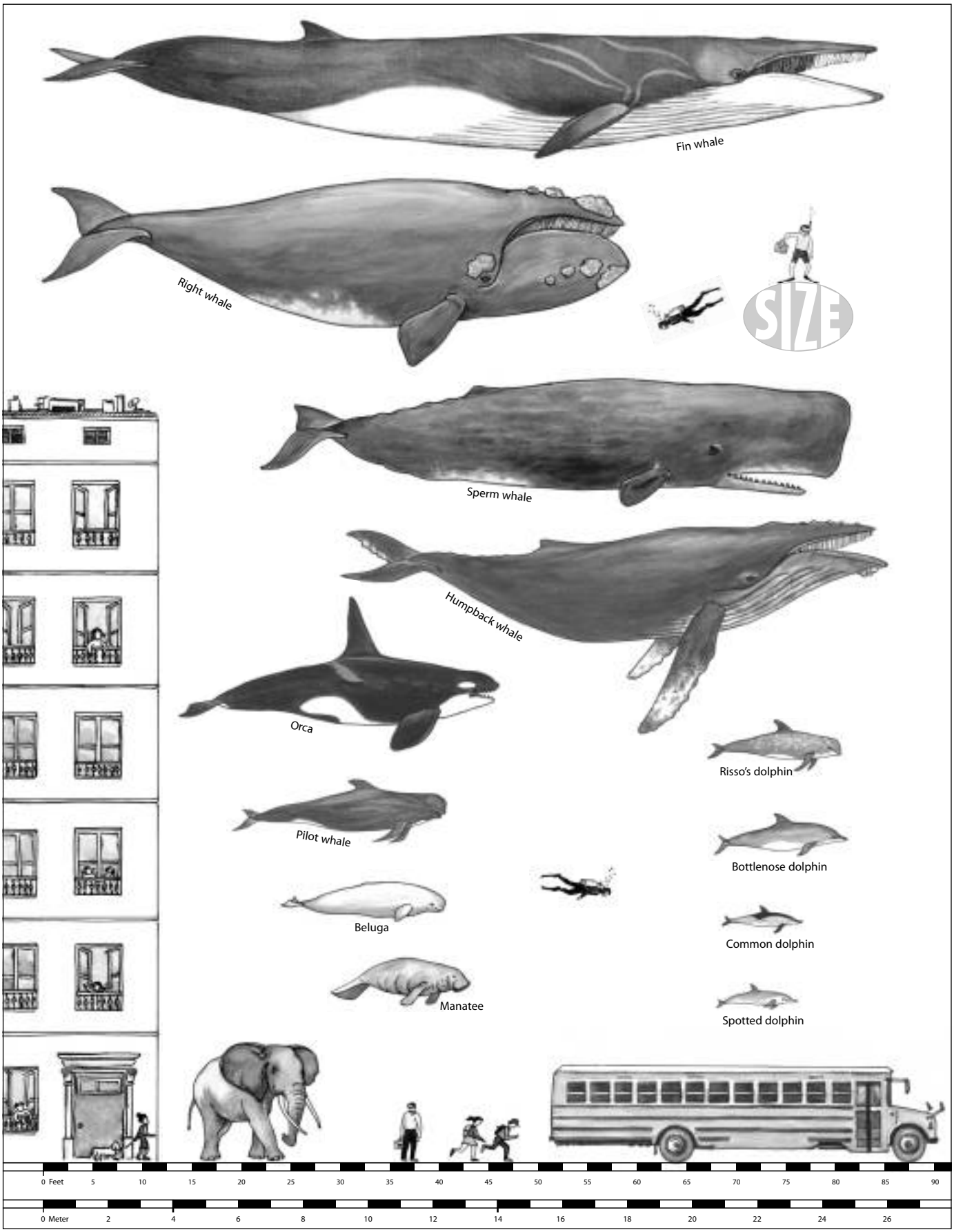




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## Marine mammals appearing in the film:

BALEEN WHALES

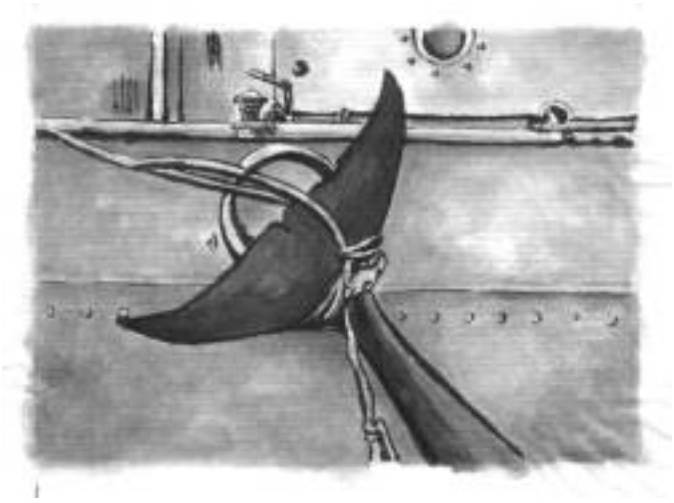
**Fin whale (rorqual family)**
**Southern right whale**
**Humpback whale (rorqual family)**

TOOTHED WHALES

**Sperm whale**
**Orca (dolphin family)**
**Short-finned pilot whale (dolphin family)**
**Beluga**
**Risso's dolphin**
**Bottlenose dolphin**
**Common dolphin**
**Spotted dolphin (Atlantic)**

SIRENIAN

**West Indian manatee**



Cetaceans, better known as dolphins and whales, have been roaming the oceans for millions of years.

Yet, in only one century we have slaughtered many of them close to extinction.

Despite efforts to protect them, human activity has forced these weakened populations to face the greatest danger of all: the destruction of their habitat and food resources.

## All these marine mammals are in danger!



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# FIN WHALE

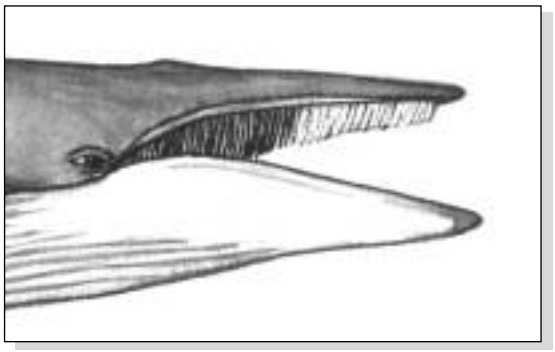
*Balaenoptera physalus*

**Classification**: Cetacean, Baleen whale, Rorqual (50-100 ventral grooves)
**Length**: 59 to 72 ft/18-22 m. Female larger, up to 85 ft/26 m.
**Weight**: Up to 88 tons
**Filter-Feeding**: Krill, crustaceans, schooling fish. 2 tons of food a day. Up to 473 baleen plates (up to 27.50 "/70 cm long.)
**Sexual maturity**: 8-12 years (female).
**Gestation**: 12 months. **Lactation**: 6-8 months. **Interval between births**: 3-4 years
**Life span**: 90 years.
**Habitat**: World-wide oceans. Lives in open sea. **Migration** to tropical waters to mate and calve, to polar waters to feed.
**Filmed** in the Azores.
**Social Life**: Solitary or small groups of 3 to 7, larger aggregations sometimes. Fin whales' powerful sounds – inaudible to humans - can be heard by other fin whales from more than 500 miles (850km) away.
**Special details**:
- The fastest of all great whales, with bursts of speed up to 23 mph, or 37 km/h.
- Asymetrical coloring. Lower jaw is dark on the left side and white on the right.
- The fin whale bends on the right side to catch food…

**IUCN Conservation Status: Endangered**
Very high risk of extinction in the near future.

**Population**: Precise estimates not available: Around 40,000 estimated in the northern hemisphere; maybe up to 20,000 in the southern hemisphere which had the biggest population. Estimated decline of at least 50% worldwide over the prior 75 years (1996). The fin whale never recovered from modern commercial whaling that severely reduced its population worldwide. Given full international protection in 1966, and despite the 1986 moratorium, ***fin whales are still hunted***.

**Specific threats**: Ship-strikes are a major cause of fin whale mortality. Like other large whales, they are threatened by environmental changes including noise and chemical pollution.



Asymmetrical coloring.



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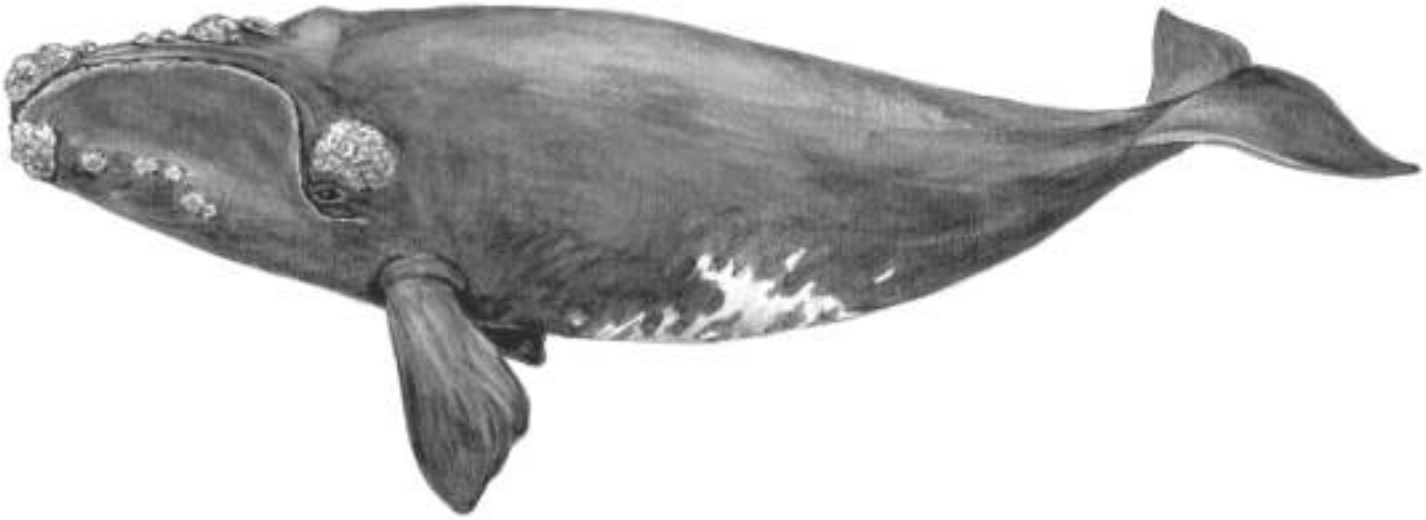
# SOUTHERN RIGHT WHALE

*Eubalaena australis*



**Classification**: Cetacean, Baleen whale.
**Length**: 36-60 ft/11-18.50 m. Female larger.
**Weight**: up to 110 tons.
**Filter-Feeding**: Krill and zooplankton. Up to 250 baleen plates (8.62 ft/2.80 m long). ***NO*** ventral grooves.
**Sexual maturity**: 5 to 15 years.
**Gestation**: 12-14 months.
**Lactation**: 12 months.
**Interval between births**: 3 to 4 years.
**Life span**: 40-50 years.
**Habitat**: Southern hemisphere circumpolar waters. Seasonal migrations from warmer winter coastal breeding grounds to the cold Antarctic summer feeding areas.
**Filmed** in Argentina.
**Social Life**: Usually solitary, they aggregate for mating and hunting. Several males breed the same female.

**Special details**:
- Head and lower jaw covered with white patches, called callosities, that are infested by whale lice.
- Typical mouth that looks like an upside-down U.

Callosities are like an identity card: unique to each right whale!

**IUCN Conservation Status:**
**Lower Risk/Conservation Dependent**
Nationally endangered under the Australian EPBC Act 1999.

The Southern right whale's recovery success depends on conservation actions. Old time whalers considered it ***the "right" whale to hunt*** because of its rich stores of blubber (half of its body weight); its numerous long baleen plates; its docile temperament and living close to shore thus making it easy to catch; it floats when dead, thus is easy to process. Consequently all three right whale species (Southern, North Pacific and North Atlantic) were on the verge of extinction at the turn of the 20th century. They were the first to get international protection in 1935, but there were kills long after that.

**Population**: Southern right whales show some signs of recovery with an estimated stable population of around 9,000, but North Atlantic right whales, with only 300 individuals remaining (2001 estimates), and their North Pacific cousins, with less than 100, are both facing extinction.

**Specific Threats**: Slow moving (up to 9 mph/15 km per hour) right whales are often victims of boat collision. Entanglement with fishing gear. Environmental pollution and climate changes.



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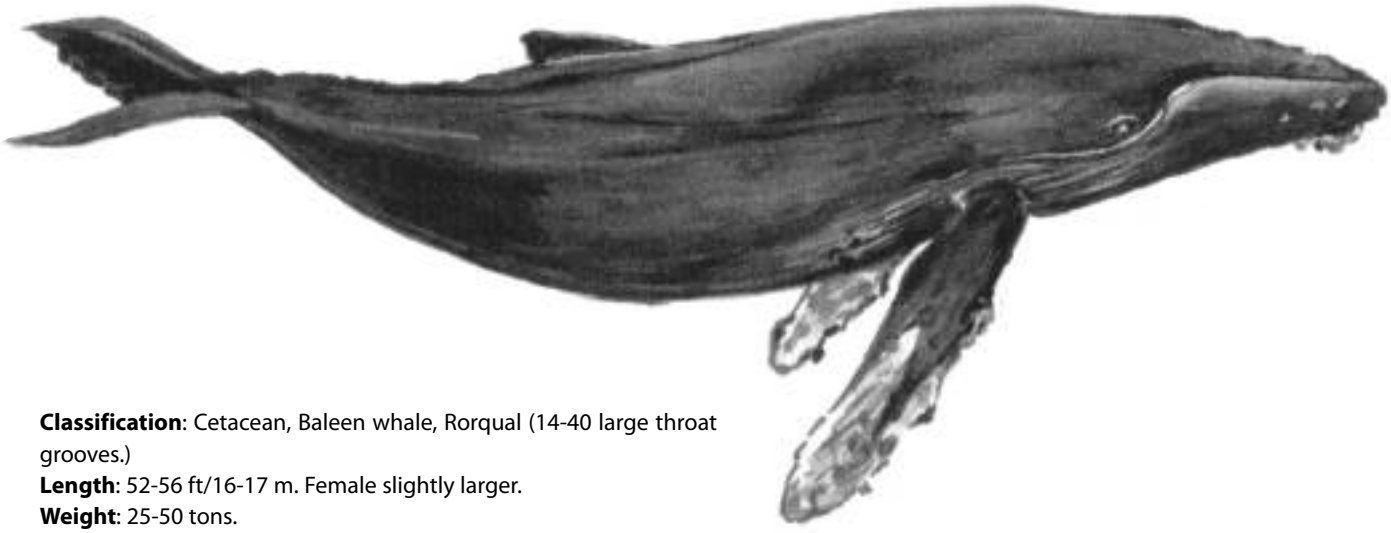
# HUMPBACK WHALE

*Megaptera novaeangliae*



**Classification**: Cetacean, Baleen whale, Rorqual (14-40 large throat grooves.)
**Length**: 52-56 ft/16-17 m. Female slightly larger.
**Weight**: 25-50 tons.
**Filter-feeding**: Krill, small schooling fish, crustaceans. 270-400 baleen plates per side (30"/76 cm long).
**Sexual maturity**: 6-10 years.
**Gestation**: 12 months. **Lactation**: 12 months.
**Interval between births**: 2-4 years.
**Life span**: 40-50 years.
**Habitat**: North Atlantic, North Pacific, Southern oceans. Some of the longest migrations from feeding grounds in Polar Regions to equatorial breeding grounds.
**Filmed** in French Polynesia and Tonga.
**Social Life**: Family group of 3 or 4, aggregating temporarily in larger numbers to feed and breed. Strong mother-calf bond.
Cooperative hunting when "bubble-netting", a most extraordinary feeding technique in which they blow a circle of bubbles around a school of fish. The fish are trapped in this bubble "net" and ascending whales, with their mouths wide open, scoop up the fish.

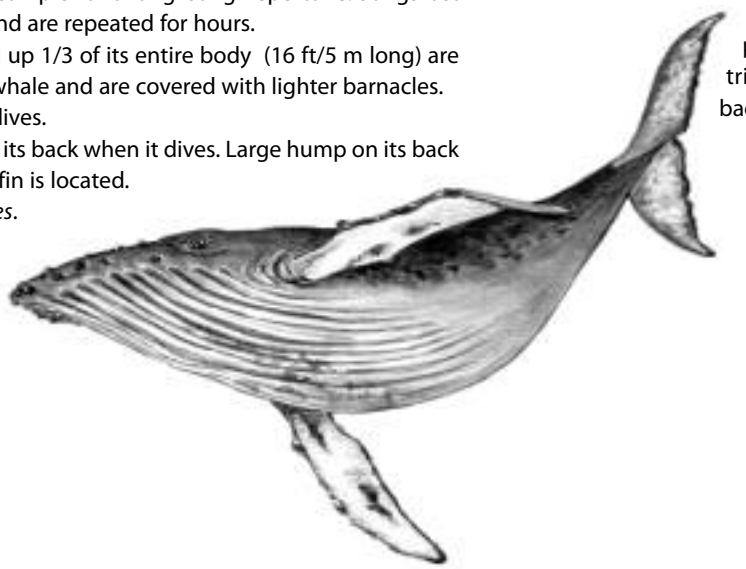
**Special details**:
- *Remarkable vocalizations* presumably used by males to attract females. Incredibly complex and long "song" repertoire. Songs last up to 30 minutes, and are repeated for hours.
- *Pectoral fins* making up 1/3 of its entire body (16 ft/5 m long) are the longest of any whale and are covered with lighter barnacles.
- Up to 45 min long dives.
- Makes a hump with its back when it dives. Large hump on its back where a tiny dorsal fin is located.
- *Very acrobatic species*.

**IUCN Conservation Status: Vulnerable**
Threatened species in danger of extinction.

The species was nearly hunted to extinction in the past but it has recovered somewhat today. Although they were granted a worldwide protection status in 1966, they continued to be the victims of illegal hunting on a massive scale in the southern oceans by the former Soviet Union until the 1970's.

**Population**:
Around 11,600 humpbacks left in the Western North Atlantic.
Approx. 10,000-17,000 in the Southern hemisphere and 6,000-8,000 in the Northern Pacific.

**Specific threats**: Collision with ships, pollution of their coastal habitat, water and noise pollution, by-catch, entanglement in fishing nets and gear, prey depletion (starvation). Some countries think of resuming whaling humpbacks...



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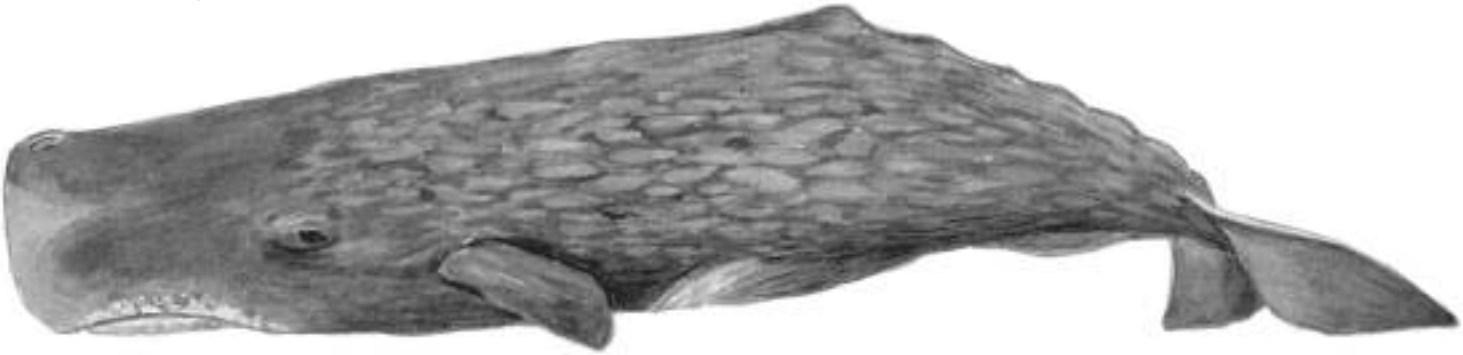
# SPERM WHALE

*Physeter macrocephalus*



**Classification**: Cetacean, Toothed whale
**Length**: Up to 59 ft/18 m. Female smaller.
**Weight**: Up to 62 tons.
**Feeding**: Giant squid, seals, rays, sharks, fish; Feeds on or near the ocean bottom.
**Sexual maturity**: 7-13 for females.
**Gestation**: 14-15 months. **Lactation**: 1.5 to 3 years.
**Interval between births**: 3-4 years.
**Life span**: 50-80 years.
**Filmed** in the Azores.
**Habitat**: Worldwide. Females, calves, and juveniles remain in tropical and temperate waters. Males only make large-scale migrations to higher latitudes.
**Social life**: Very social species.
Very strong mother-calf bond. Matriarchal "nursery" pods of around 12 individuals (mothers, off-springs, juveniles) staying in temperate waters. Very strong bonds in nurseries. Communal babysitting when mother is absent. Young males also baby-sit. Helping the injured.
Juvenile herds, bachelor herds. Medium-sized males form groups of 12 staying in temperate waters. Large males mostly solitary; the only ones reaching the polar waters.

**Special details**:
- *Huge box-like head* counting for up to a 1/3 of its body length; the head contains a waxy substance called "**spermaceti**" that was used in ointments and cosmetics, to make fine candles, for leather working, as a lubricant.
- Unique blowhole always on the left side.
- Particularly wrinkly skin, covered with scars from fights with giant squid.
- *Diving record*: Deepest and longest dives: Over 7200 ft (2200 m) for 1h 30 and more.
- The largest toothed whale; Only has teeth in its lower jaw!

**IUCN Conservation Status: Vulnerable**
Threatened species in danger of extinction.

This species has been recovering due to the ban on whaling but is still currently listed as vulnerable. Between 1964 and 1974 one quarter of a million sperm whales were killed.

**Population**: Down to 400,000 to 1 million from the 2 million estimated in the early 1940's.

**Specific threats**: whaling, by-catch, entanglement in fishing nets, chemical pollution.

## SAD FACT

Sperm whales used to be heavily hunted for their superior-quality oil, "spermaceti", blubber, and "ambergris". Ambergris, a waxy substance formed in the sperm whale's intestines, was used in perfume. Found in only 1-5 % of sperm whales, it was rare and very expensive.

## DID YOU KNOW?

"Moby Dick", the hero of Herman Melville's novel, is a white sperm whale.



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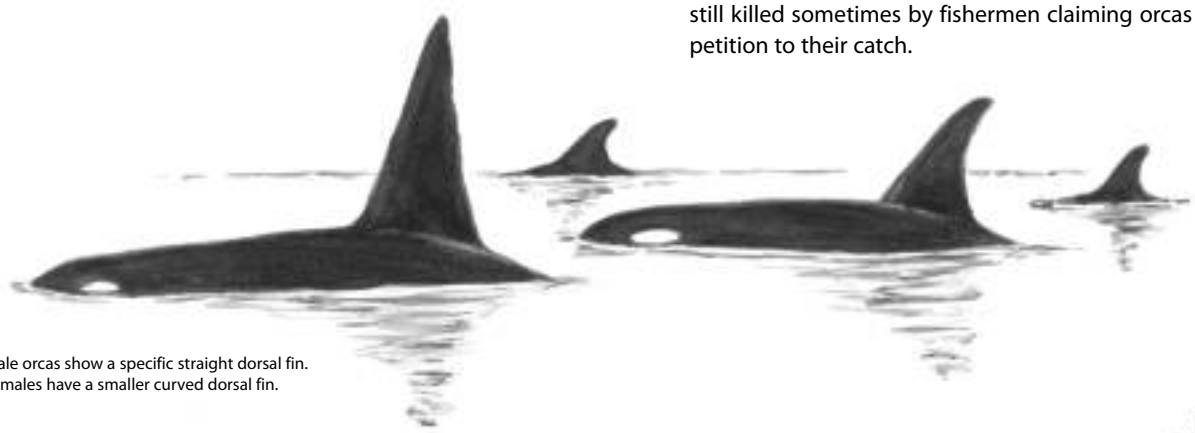
# ORCA

*Orcinus orca*

**Classification**: Cetacean, Toothed whale
The largest member of the dolphin family. 3 types of orcas – resident, transient, offshore – that feed hunt, echolocate and vocalize differently.
**Length**: 18-32 ft/5.50-9.70 m. Male much larger than female.
**Weight**: 3.3-10 tons.
**Feeding**: Depends on the type of orca: fish, shark, squid, seabirds, turtles, sea lions, seals, dolphins and whales including bigger species. The only marine mammals that eat warm-blooded animals. Resident orcas do not eat marine mammals.
**Sexual maturity**: 6-13 years.
**Gestation**: 12-16 months. **Lactation**: 15 months.
**Interval between births**: 8 years.
**Life span**: 30-60 years. Can be much longer for females.
**Filmed** in New Zealand.
**Habitat**: Worldwide oceans, coastal and offshore waters; likes polar waters.
**Social Life:** Sophisticated social behavior. Some populations remain their entire life in the pod that their mother belongs to. These pods are made of 3 to 25 individuals of same kinship. Males mate with females from other families and return to their original pod.
Life-long bond between mother and calf. Only death or live capture separates an orca from its family. Collaboration between individuals.

**Special details**:
- Extremely sensitive, intelligent species: They have the second largest brain on the planet.
- Very impressive communication skills: Each group has its own communication patterns (dialects). Resident orcas are the most vocal and the most studied by scientists. Transients hunt silently and do not use echolocation as their prey are marine mammals with good hearing.
- A remarkable predator able to adapt its hunting strategy to the prey available, it is also called "Killer whale" or the "wolf of the sea".
- One of the fastest marine animals with a top speed of 30 mph (50 km/h).
- Used in captivity as display animals in shows, attraction parks, and dolphinariums.

**IUCN Conservation Status:**
**Lower Risk/Conservation Dependent**
**Population**: Worldwide population unknown. Not highly abundant.
**Specific threats:** Has no predator and has never been targeted on a large scale by whalers in the past. Hunted for its meat and oil until the 1980's. Pollution, habitat degradation, ship collision, noise pollution, prey depletion (starvation), captivity industry, entanglement in fishing nets, culling, i.e. still killed sometimes by fishermen claiming orcas are competition to their catch.



Male orcas show a specific straight dorsal fin.
Females have a smaller curved dorsal fin.



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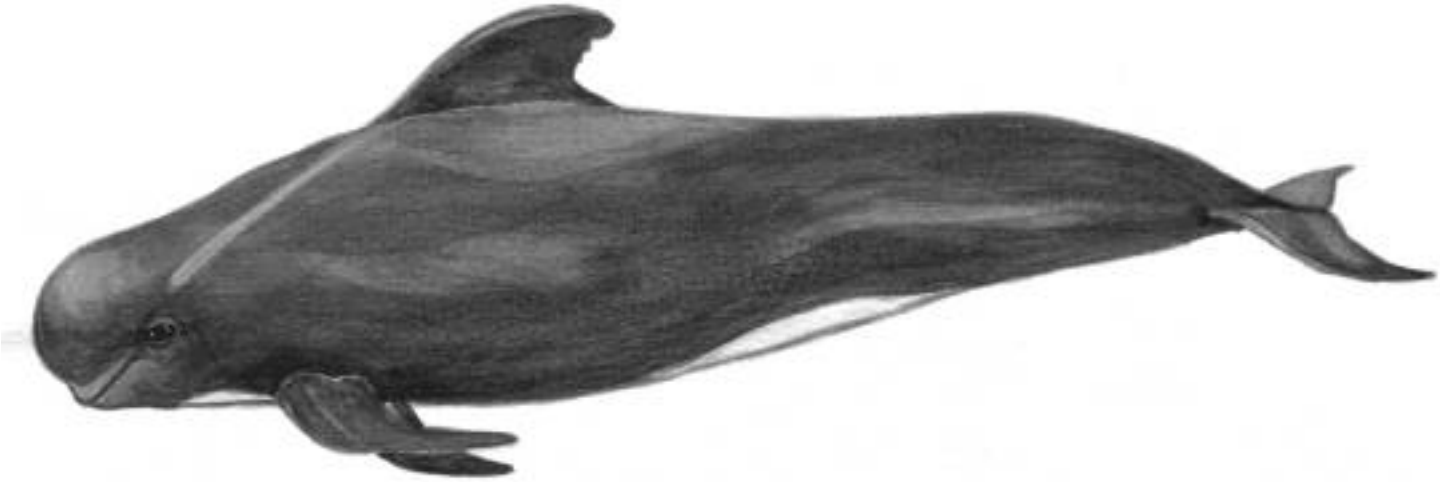
# SHORT-FINNED PILOT WHALE

*Globicephala macrorhynchus*



**Classification**: Cetacean, Toothed whale
Large member of the dolphin family.
**Length**: 13-21 ft/4 to 6.50 m.
**Weight**: 2 to 3.8 tons.
**Feeding**: Squid, fish, and octopuses.
**Sexual maturity**: 7 to 12 years (females).
**Gestation**: 15 months. **Lactation**: 20-27 months.
**Interval between births**: 3 years.
**Life span**: Up to 60 years (female), 45 years (male).
**Filmed** in the Azores.
**Habitat**: Temperate and subpolar Atlantic, Indian and Pacific deep off-shore waters.
**Social life**: Very strong social bonds. Female-based stable subgroups. Strong mother-calf bond. Pods include all ages and both sexes. Younger adults baby-sit. Feed and travel together in very well organized pods from 10 to 60 individuals headed by a *male leader* that they follow no matter what. Victims of *mass stranding* because if one gets stranded, they all follow. This was used by whalers to kill entire herds. Groups in the thousands can be found.

**Special details**:
- Slow swimmer but great diver - up to 1.640 ft/500 m and 15 min long.
- Does "well" in captivity. As intelligent as other dolphins, it is easily trained.

**IUCN Conservation Status:**
**Lower Risk/Conservation Dependent**

**Population**: At lower risk but conservation dependent, there are approx. 185,000 left. Together with the 500,000 long-finned pilot whales, the total pilot whale population is around 780,000 (IWC 1989 estimates). More than 1,000 long-finned pilot whales are killed each year by Faeroe Islanders, and a few hundred short-finned pilot whales are taken annually by Japanese whalers. A few hundred in the Caribbean and the Philippines used for bait and human consumption.

**Specific threats**: This species is globally threatened by human activities, including whaling, by-catch, entanglement in fishing gear, chemical and noise pollution, captivity industry and human disturbance (tourism, recreation, transport). Natural predators are orcas and sharks.

## DID YOU KNOW?

The Pilot whale gets its name from the fact that they lead, i.e. "pilot", other dolphins, birds and fishermen to the squid they feed on, as well as the species the squid feeds on, such as herring, mackerel, and capelin. What feeds them also kills them…



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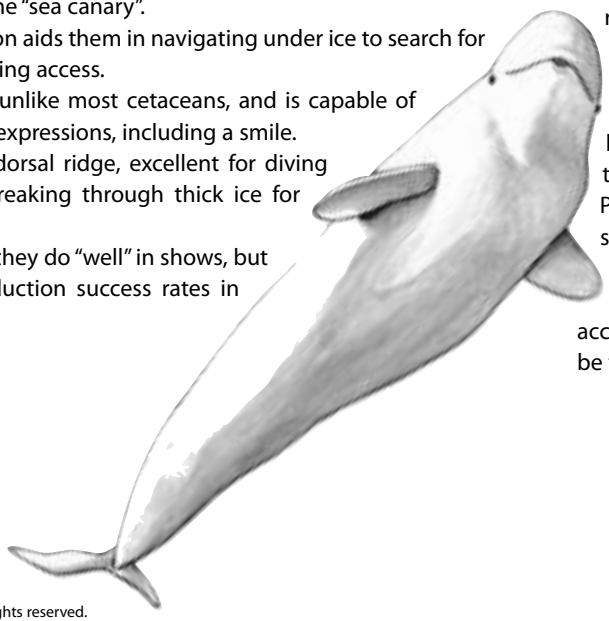
# BELUGA WHALE

*Delphinapterus leucas*

**Classification**: Cetacean, Toothed whale
**Length**: 10-16 ft /3 to 4.90 m. Male larger.
**Weight**: 0.8 to 1.7 tons.
**Feeding**: Fish, krill, crustaceans, and squid.
**Sexual maturity**: 4-7 years.
**Gestation**: 14 months. **Lactation**: 20-24 months.
**Interval between births**: 2-3 years.
**Life span**: 25-30 years (according to recent aging determination methods 50-60 years.)
**Habitat**: Arctic and sub-Arctic waters. Shallow estuaries and coastal waters during the summer months. In the late spring, belugas migrate to warmer fresh bay and estuary waters (as warm as 50-60° F/10-15° C) to rear their young calves. Winter months in deep open waters within the solid ice pack that do not freeze (water temperatures are as low as 32° F/0° C).
**Filmed** in Hudson Bay, Churchill, Manitoba, Canada.
**Social life**: Extremely social; Live in pods or social groups of 2 to 25 individuals, and form aggregations of thousands. Hunt and migrate together. Plays with objects. Curious, easily approached.

**Special details**:

- As white as its ice and snow environment, it is born grey and turns white by 6 years of age. The name Beluga stems from the Russian "bieluga", from "biely" for white.
- Very "chatty", makes all sort of noises that can also be heard above the surface. Nicknamed the "sea canary".
- Advanced echolocation aids them in navigating under ice to search for holes in ice for breathing access.
- It can move its neck unlike most cetaceans, and is capable of making many "facial" expressions, including a smile.
- No dorsal fin, but a dorsal ridge, excellent for diving under the ice and breaking through thick ice for breathing access.
- Captured for display, they do "well" in shows, but have had low reproduction success rates in captivity.



**IUCN Conservation Status: Vulnerable**
Threatened species in danger of extinction.

**Population**: Vulnerable species overall, particularly in light of a rapidly changing Arctic environment due to climate change and associated potential impacts.
Certain populations are at greater risk than others and those most threatened are at risk of extinction. Other beluga populations are quite robust and appear to be healthy.
Estimated worldwide population of approximately 150,000.

**Specific threats**: Climate change-associated impacts, including receding ice pack, changes in prey distribution, increased predation, increased competition and increased human activity (e.g. oil and gas development and shipping). Seriously reduced in the past by commercial hunting. Continue to be hunted by native people throughout the Arctic as a critical subsistence resource, even though their meat is contaminated and toxic. Toxic chemicals like PCBs bioaccumulate through the food chain, causing marine mammals, including belugas, to be toxic to eat. In Canada, brominated flame retardants are now showing up in their blubber. Exposed to many contaminants such as PCBs, DDT, and heavy metals such as mercury, they suffer congenital deformities, and die from immune system dysfunctions, ulcers, and cancer. In the St Lawrence River, their PCB levels is so high that, according to Canadian authorities, their bodies should be treated as toxic waste upon death.

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# RISSO'S DOLPHIN

*Grampus griseus*

**Classification**: Cetacean, Toothed whale
**Length**: 8.5 to 13 ft/2.60 to 4 m. Males slightly larger.
**Weight**: 660 to 1100 lbs/300 to 500 kg
**Feeding**: Squid, fish.
**Sexual maturation**: 3-4 years.
**Gestation**: 13-14 months. **Lactation**: Unknown.
**Interval between births**: Unknown.
**Life span**: at least 20 years.
**Filmed** in the Azores.
**Habitat**: Widely distributed; tropical and temperate deep waters; Atlantic, Pacific and Indian oceans.
**Social life**: Highly social. Stable pods for long periods of time. Average herds of 30 individuals (up to 100). Huge groups of around 4,000 individuals have been reported. Rough social interactions and aggressive behavior between adults.

**Special details**: One of the largest of the dolphin family.

- During its life, its body gets covered with scars and scratches (from the squid beaks, mating "rituals" and fights with other adults happening every day) that give this species a battered appearance!
- Beakless with a stocky head. Resembles the pilot whale because of its big "melon" (forehead). Great diver.
- Only have teeth at the front of the lower jaw and none in the upper jaw.

**IUCN Conservation Status: Data Deficient**
Not enough data, but at risk.

**Population**: Population number unknown, but the species is probably abundant. 13,000 to 30,000 estimated in certain Californian areas, possibly as many as 300,000 globally.

**Specific threats**: Direct catch, by-catch, accidental entanglement in fishing gear and nets, pollution from coastal development, hunting. Killed for human consumption (Taiwan, Japan, Indonesia, some Caribbean and Pacific islands) and they are part of Japanese drive fisheries. Victims of environmental changes.

## DID YOU KNOW?

Fishermen in the Azores have nicknamed this dolphin, which is grey at birth, "moleiro" (miller), as it tends to turn entirely pale grey when growing older.



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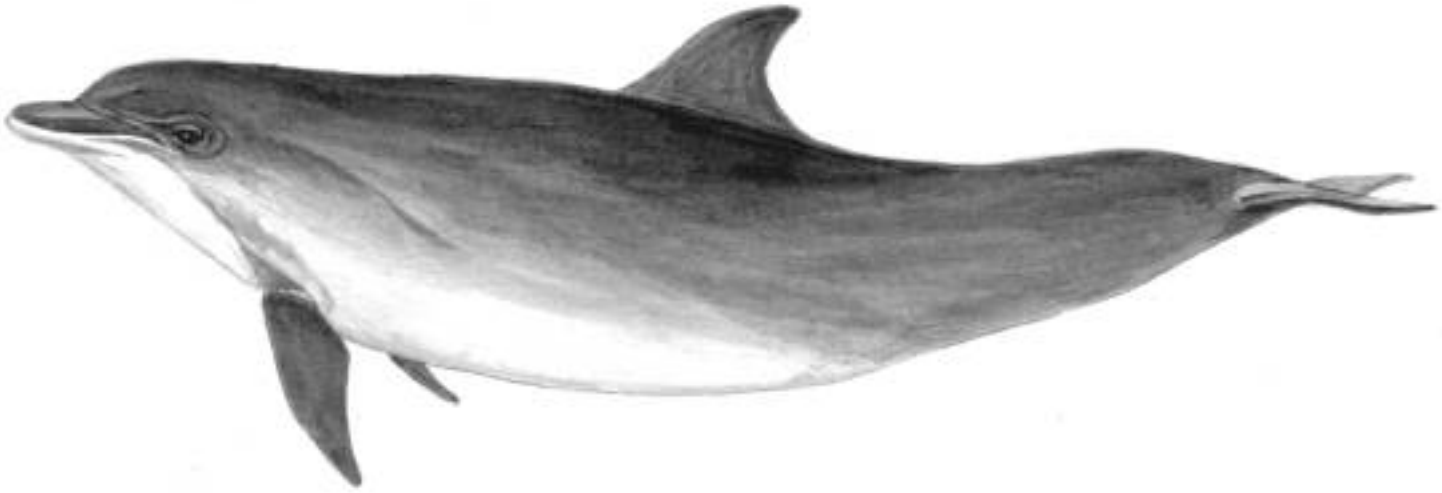
# BOTTLENOSE DOLPHIN

*Tursiops truncatus*



**Classification**: Cetacean, Toothed whale
**Length**: 6 up to 13 ft/1.90 up to 4 m. Great size variation among populations.
**Weight**: 330-1435 lb/150-650 kg.
**Feeding**: Fish, krill, crustaceans, and squid.
**Sexual maturity**: Varies.
**Gestation**: 12 months. **Lactation**: 12-18 months.
**Interval between births**: 2 to 3 years.
**Life span**: 40 years.
**Filmed** in The Bahamas.
**Habitat**: Tropical and temperate coastal and offshore waters. Live in different areas during different stages of life circle (breeding, giving birth, etc.)
**Social Life**: Live in small pods of 12 individuals but congregate in huge loose groups of several hundred individuals. Strong mother-calf bond. Females and calves in small groups. "Aunts" help mothers at birth and baby-sit. Transmission of knowledge to young females by mothers: Use of sponge to protect beak from sand when digging.

**Special details**: Dives up to 1,600-ft/500 m.

- Very intelligent species: Able to adapt its behavior and improvise according to situation.
- Collaboration with human fishermen to herd fish toward nets (Laguna, Brazil).
- Used in captivity.

**IUCN Conservation Status: Data Deficient**
Not known worldwide, but at risk.

**Population**: The species remains generally abundant in numbers, but is near depletion in some areas like in the North Atlantic coastal waters. There are two types of bottlenose: inshore and offshore.

**Specific threats**: By-catch, entanglement in fishing nets, drive fisheries. Victim of environmental changes, habitat loss, human disturbance including live capture, hunting, feeding and swimming with them, chemical pollution, boat collision. Coastal habitat has become hazardous to inshore species' health due to industrial pollution.

**DID YOU KNOW?**

The Bottlenose is the most popular of all dolphins thanks to TV series "Flipper" and its appearance in many aquariums and shows.



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# COMMON DOLPHIN

*Delphinus delphis*

**Classification**: Cetacean, Toothed whale
**Length**: 5.9-7.9 ft/1.80-2.40 m.
**Weight**: 150-300 lbs/70-135 kg. Males slightly larger.
**Feeding**: Fish (sardines), squid.
**Sexual maturity**: females 5-7 years.
**Gestation**: 10 months. **Lactation**: 14 months. **Interval between birth**: 2 years.
**Life span**: 40 years.
**Filmed** in the Azores
**Habitat**: Worldwide in temperate, tropical and sub-tropical waters. Mostly offshore.
**Social life**: Very social. Females assist with birthing and baby-sitting. Competition between males for females. Usually offshore species in pods of hundreds, even thousands of individuals (average 500).

**Special details**: The smallest dolphin in the film.
- Several color patterns.
- Extremely vocal.
- Great diver (840 ft/280 m); speed up to 30 mph.

**IUCN Conservation Status:**
**Lower Risk/Least Concern**

**Population**: Some of the regional populations in serious trouble (Black Sea, Mediterranean) but generally abundant worldwide – maybe the most widely distributed cetacean.

**Specific threats**: Hunted in Japan and Norway, in the Mediterranean and in the Black Sea for meat and oil. Used for food and bait for sharks. Thousands die entangled in fishing gear, purse seine and drift nets. Vulnerable to industrial fishermen catching tuna. Victim of environmental changes, habitat loss, human activities, chemical pollution, man-made noise pollution. Starvation due to overfishing resulting in lack of prey/food. Culling. Depletion of sardine stock.



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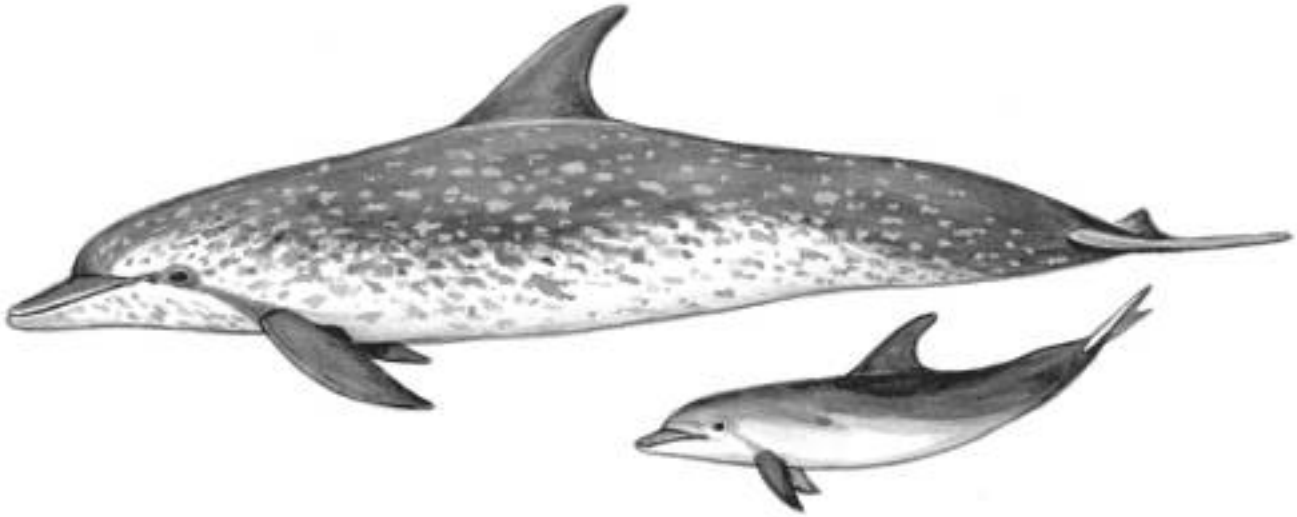
# SPOTTED DOLPHIN (ATLANTIC)

*Stenella frontalis*



**Classification**: Cetacean, Toothed whale
**Length**: 5.9-7.6 ft/1.80-2.30 m.
**Weight**: 220-310 lbs/100-140 kg.
**Feeding**: Fish, squid and starfish.
**Sexual maturity**: 10-12 years (female)
**Gestation**: 12 months. **Lactation**: 12-24 months. **Interval between births**: 2-5 years.
**Life span**: 45 years.
**Filmed** in the Bahamas
**Habitat**: Temperate and tropical waters of the Atlantic Ocean.
**Social life**: Highly social species. Small- to moderate pods of less than 50 individuals. Huge herds, fluid group structure.

**Special details**:
- Different offshore and inshore types.
- Does not do well in captivity.
- This species is born without spots! The older they grow, the more spots they get.

**IUCN Conservation Status: Data Deficient**
Not enough data, but at risk.

**Population**: Number unknown. Together with the Pantropical spotted dolphin, it is one of the most abundant species worldwide.

**Specific threats**: By-catch, direct catch in Caribbean fisheries. Victim of environmental changes.

## Did You Know?

**The Pantropical spotted dolphin** - ***Stenella attenuata*** - forms herds of hundreds and sometimes thousands of individuals. IUCN Status: LR/CD. They are caught in huge numbers by industrial fishermen's purse seine nets used for tuna fishing. Spotted dolphins are the species that has suffered the most from by-catch of tuna fisheries. Things have improved since 1972 but not everywhere. There are too many unregulated fisheries, and they are not recovering at the expected rate. The number caught in Japan each year is always very high.



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# WEST INDIAN MANATEE

*Trichechus manatus latirostris*

**Classification**: Sirenian, Manatee
**Length**: 10-13.6 ft/3-4.10 m. Female larger.
**Weight**: 1500 to 3000 lbs/680 to 1400 kg.
**Feeding**: Herbivore, thus its name: "sea cow".
**Gestation**: 11-14 months. **Lactation**: 2 years. **Interval between births**: 2 to 5 years.
**Life span**: 60 years.
**Habitat**: Shallow fresh, salty or brackish (72° F/22° C) water, 3-7 ft /1-2 m deep. Live in rivers, springs, coastal waters and love the warmth of discharge canals. Cannot survive temperatures below 68° F/20° C.
**Migration**: Move in summer into the ocean or the Gulf of Mexico and in winter go to a spring or a river to find the warm waters they need.
**Filmed** in Florida, USA.
**Social life**: Live in loosely organized groups, gathering and dispersing whenever they feel like it. Curious and playful. Very strong mother-calf bond. Mother and calves vocalize to identify each other. Vocalizations sound like mouse chirps and squeaks.
**Special details:**

- Large flat "marching molars" similar to an elephant's with which they chew and grind coarse sand-filled vegetation. When the molars in front wear down, those that have grown in the back of the jaw "march forward" to replace them.
- Prehensile snout with very long sensory "vibrissae".
- Sirenians have two long front flippers that they use to grab food and push it into their large flexible lips.
- Manatees have a paddle-shaped tail and are good swimmers, even though they usually move slowly. Dives up to 33 ft/10 m.
- Non-territorial and non-aggressive species: No predators besides humans and sometimes crocodiles or sharks. Their only defense is to flee.
- Despite their appearance, manatees are not that fat! Their layer of blubber is much thinner (0.2"/5mm) than that of a bottlenose dolphin (0.7"/18 mm).
- They have 3 to 4 nails on each flipper!

**IUCN Conservation Status: Vulnerable**
Threatened species in danger of extinction
**Population**: 3,200 left in Florida. 1,000 in other areas.

**Specific threats**: Collision with boats (25% of deaths), drowning in canal locks and floodgates, habitat loss due to increased human presence. Cold temperature stress. Fishing hooks, litter, and other man-made objects which they accidentally ingest. Victims of "red tides" caused by harmful algae full of toxins which affect sea animals' central nervous system.

**DID YOU KNOW?**

Sirenians, which includes dugongs and manatees, are descended from land animals. They have a common ancestor with the elephant.



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# UNIT 2 - ACTIVITIES TO DISCOVER MARINE MAMMALS

## A. STUDENT ACTIVITIES

The chapter "Discovering Marine Mammals" contains five activities, each with a "Student activity sheet" to photocopy and corresponding Answers, and Resources for the educators. Information on each species can be found in Unit I "The Cast of the Film."

The goal of these activities is to make students familiar with the marine mammals they encounter in the film. They can be used to prepare students prior to seeing the film.

**Activity 1** checks what students know about marine mammals. It should be done both before and after research and other activities.

**Activity 2** is a quick identification exercise for students to check if they can identify the marine mammals appearing in the film. It should be done before and after the film and/or research.

**Activity 3** familiarizes students with all the marine mammals. It is a two-step activity for students working in small groups. In step 1, they choose to study one specific animal and look for its characteristics. They create an "I.D." including a photo and a drawing with labels to present to the class. This presentation is Step 2. During the presentation, the other students fill out the "Identification sheet" provided on page 22.

**Activity 4** allows students to study the size of these animals by creating a size chart. Great whales are the biggest animals on earth. Their size is so impressive that it is difficult to conceive of. Since no humans or man-made objects appear in the film, this activity is designed to help students get an idea of how big the marine mammals really are.

**Activity 5** is an identification exercise where students need to use their new knowledge to complete the pictures of these marine mammals.



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# ACTIVITY 1

## What do you know about marine mammals?

**Indicate if you agree or disagree with each of the statements below. Then after having done research, indicate whether or not you agree now with each statement. Rewrite any false statements using complete sentences to make them true statements. *Warning! Even if some statements are partially true, they still count as false.***

*Before research*
☐ Agree ☐ Disagree

1. Whales, dolphins and manatees all have teeth.

*After research*
☐ Agree ☐ Disagree

*Before research*
☐ Agree ☐ Disagree

2. Whales, dolphins and manatees use "nostrils" to breathe air like land mammals, including humans, do.

*After research*
☐ Agree ☐ Disagree

*Before research*
☐ Agree ☐ Disagree

3. Dolphins and whales are descended from land mammals that returned to the water. Their body adapted for living in the water.

*After research*
☐ Agree ☐ Disagree

*Before research*
☐ Agree ☐ Disagree

4. Manatees have very long tactile hair that protects them from the cold.

*After research*
☐ Agree ☐ Disagree

*Before research*
☐ Agree ☐ Disagree

5. The fin whale is a baleen whale. It dives very deeply to catch giant squid that live at the bottom of the ocean.

*After research*
☐ Agree ☐ Disagree

*Before research*
☐ Agree ☐ Disagree

6. Whales and dolphins are social species that live and travel in groups. These social groups are called "pods".

*After research*
☐ Agree ☐ Disagree

*Before research*
☐ Agree ☐ Disagree

7. Just after her calf is born, the whale mother pushes it up to the surface to get its first breath. She will remain with her calf many years teaching him/her how to survive in the ocean.

*After research*
☐ Agree ☐ Disagree

*Before research*
☐ Agree ☐ Disagree

8. Manatees, like dolphins and whales, live all over the world.

*After research*
☐ Agree ☐ Disagree



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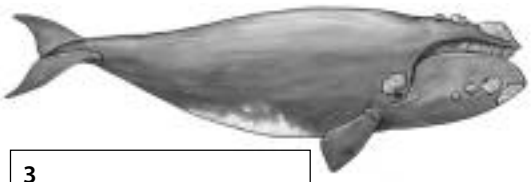
**Check your knowledge by matching the names with the pictures. Take the quiz before and after you have done some research!**

Bottlenose dolphin
Risso's dolphin
Spotted dolphin
Humpback whale
Manatee
Sperm whale
Orca
Beluga
Fin whale
Short-finned pilot whale
Right whale
Common dolphin

1

2



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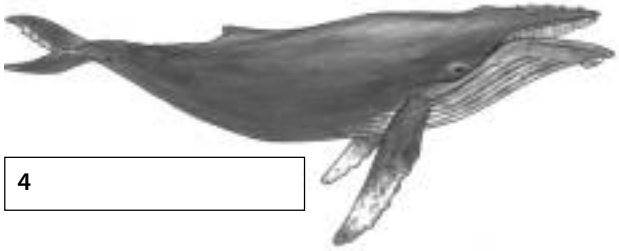

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12



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**Step 1. (Alone/Small group activity)** Choose one animal to study and look for its characteristics, such as size, weight, appearance, body parts and any other specific details. Create an I.D. including its characteristics, a photo and a drawing with labels. Get ready to present your animal to the class.

**Step 2.** Listen to each student group presenting their animals and fill out the sheet below. Try to gather as much information as possible.

| Write name of animal | Size Ft / M | 1 blowhole Teeth | 2 blowholes Baleen | Characteristics |
|---|---|---|---|---|
| Beluga | 16 / 4.90 | X | | 2 flippers, flukes, no dorsal fin<br>Big melon<br>Can move its neck<br>White smooth skin |
| | / | | | |
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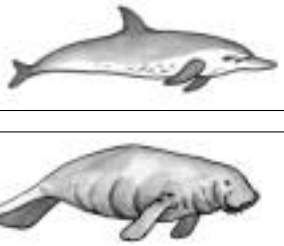
|  | / | | | |
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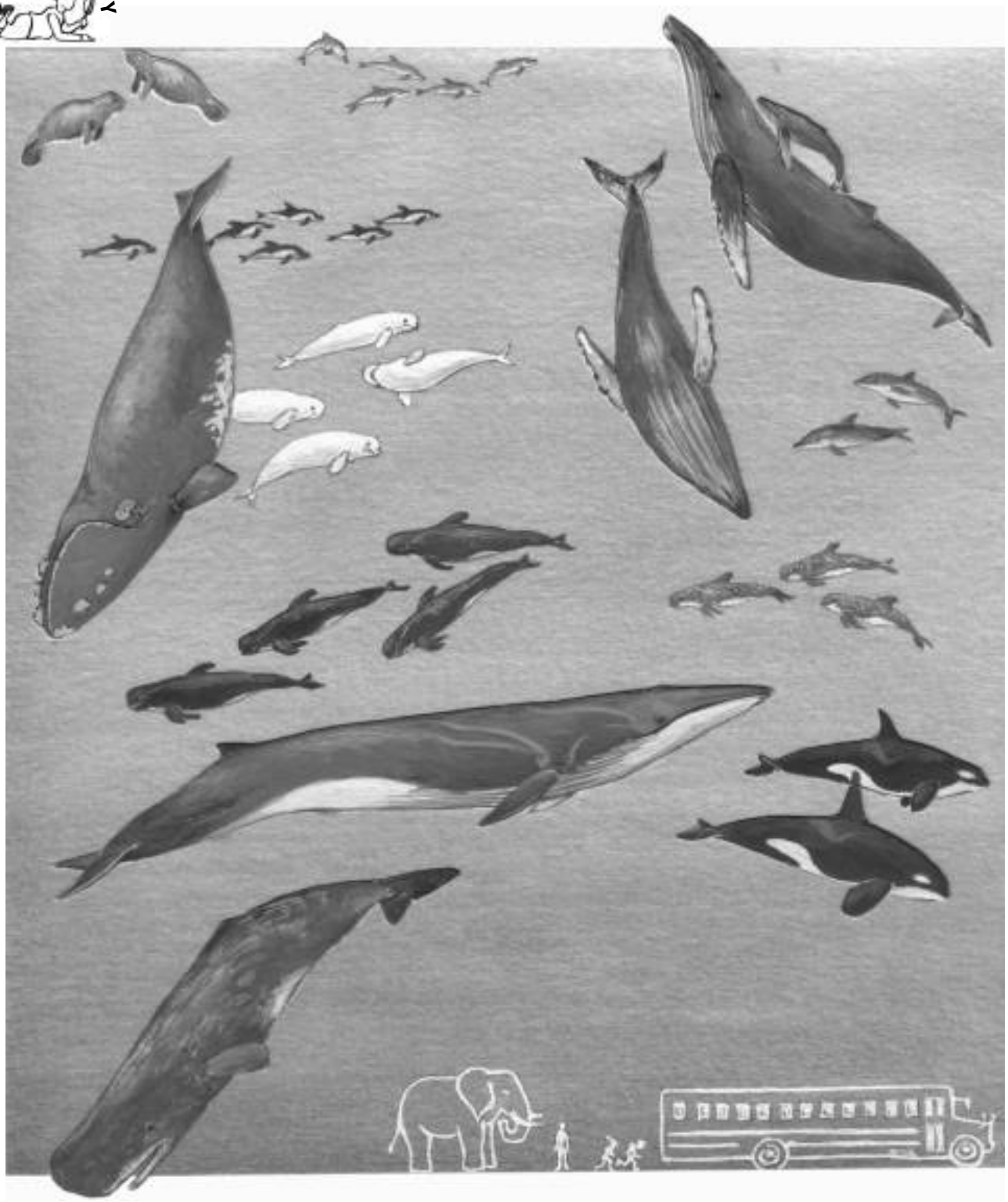
STUDENT ACTIVITY

Measure their size by using one of the rulers included below. Order them by size in a table starting with the smallest. Choose feet or meters and create a graph. Trace a line on your graph showing the size of each animal.



Meter 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35

Feet 0 10 20 30 40 50 60 70 80 90 100 110

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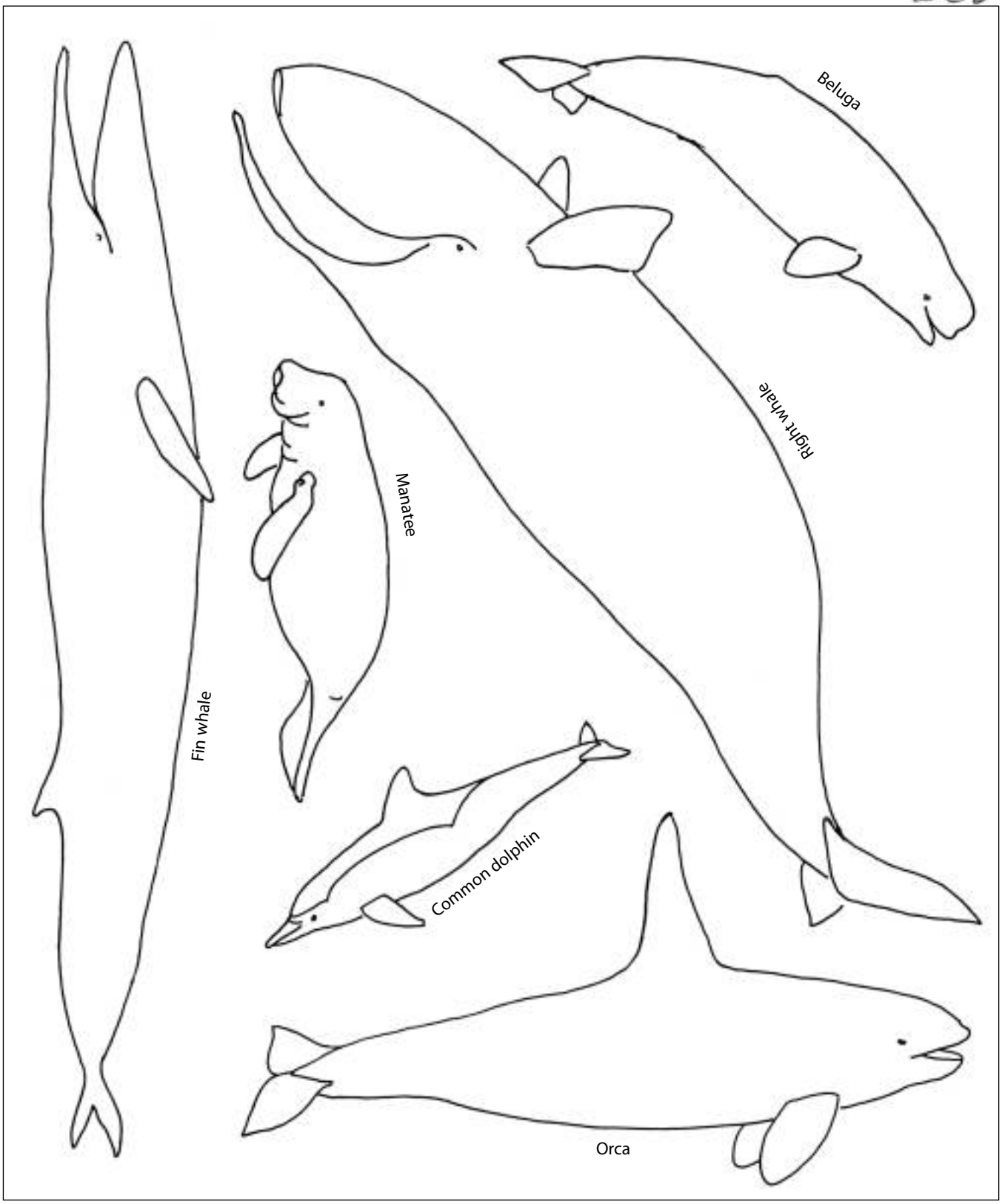
# ACTIVITY 5

**Finish the pictures**

Some of the physical characteristics such as teeth or baleen, whiskers, special coloring, knobs, callosities, and others are missing. Add them!



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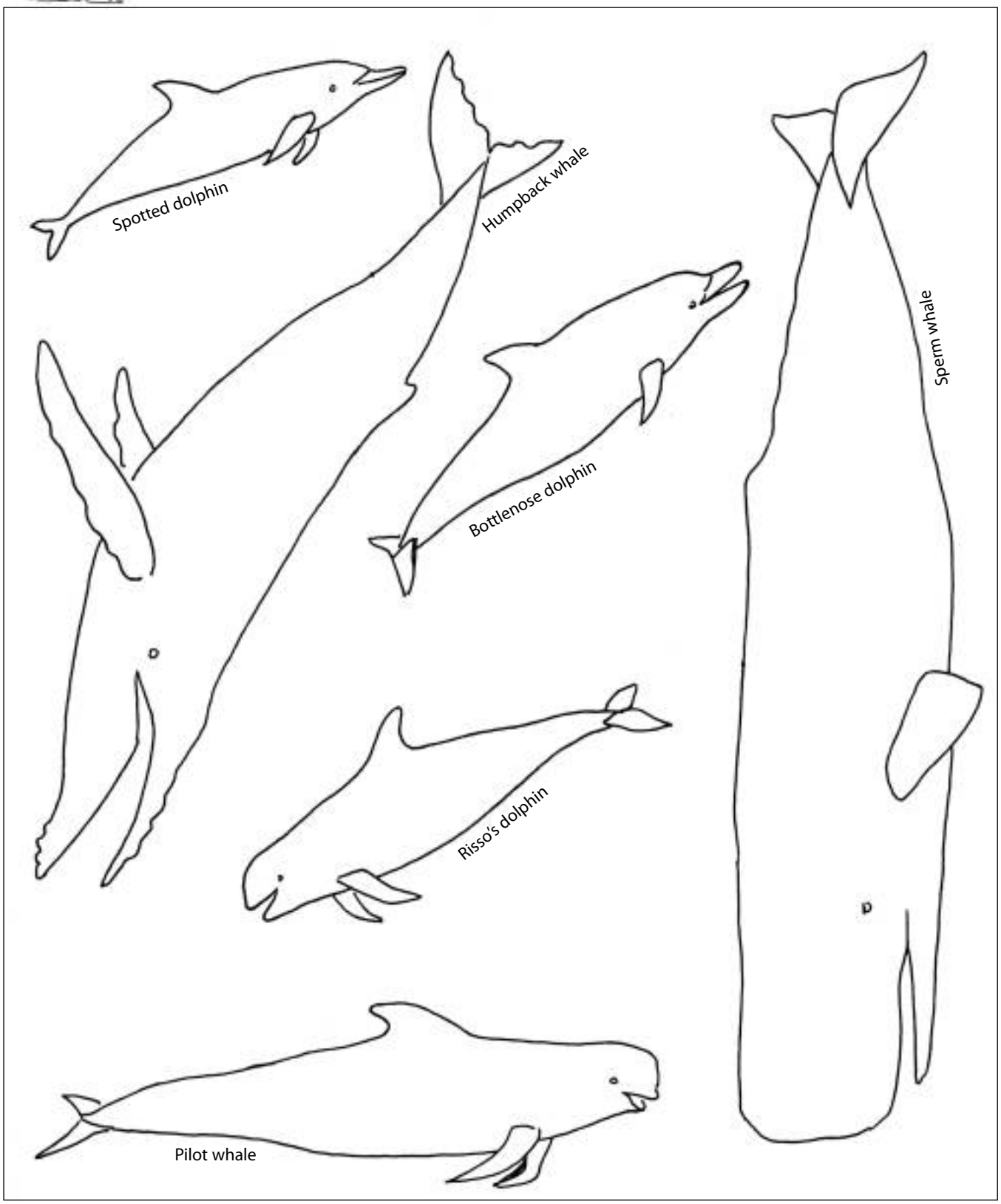
STUDENT ACTIVITY



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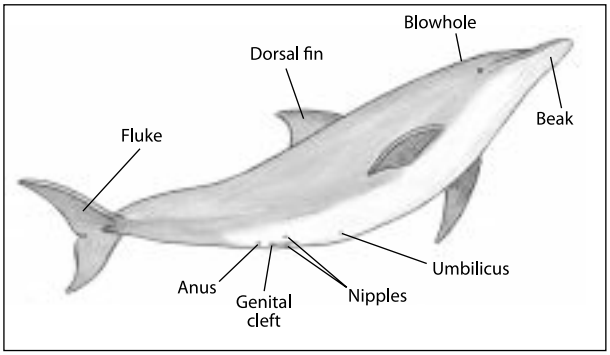
# B. RESOURCES FOR EDUCATORS

## 1. Body adaptation to living in the water

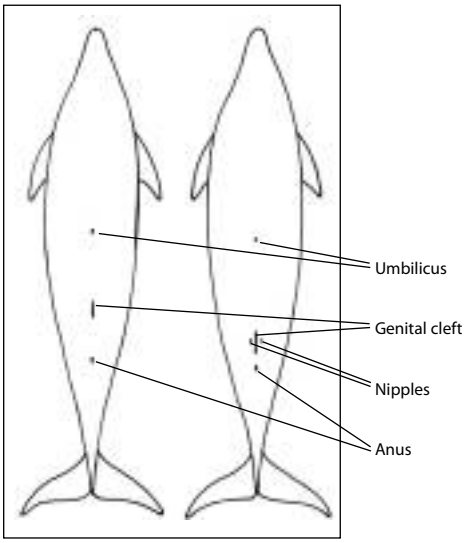


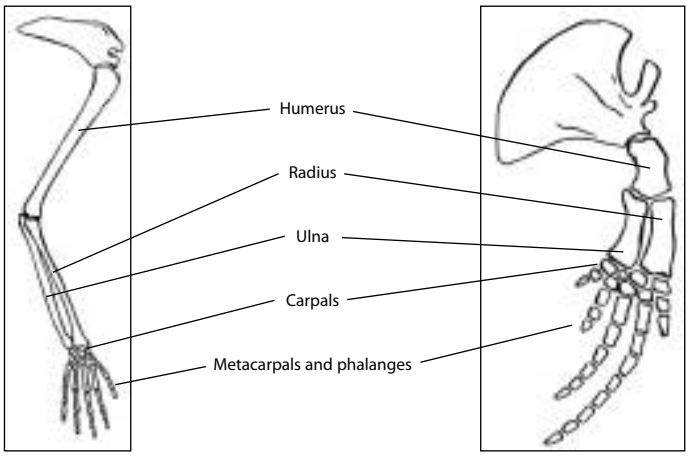

A body adapted to living in the water.

Cetaceans are descended from land mammals but millions of years ago their ancestors went back to the sea and their bodies adapted to living in the water. To offer less resistance to the water, and thus move easily and quickly under water, the bodies of the cetaceans streamlined, and their external features disappeared, for example the external ear flaps and the prominent part of nose. The nose openings migrated to the top of the head, becoming one or two "blowholes". Cetaceans use blowholes to breathe and to produce sounds. They do not use them to smell as land mammals do. Reproductive organs, such as nipples for the female and the penis for the male, recessed inside the body. The hind limbs were replaced by a horizontally flattened tail, called "fluke". Their forelimbs evolved into flippers that look like paddles and are "specialized" for swimming and steering. If you take an X-ray of a marine mammal's front flipper you will see many of the bones you might expect to see in a hand and an arm!

### Did you know?

Like fish, most whales and dolphins also have dorsal fins to direct and stabilize their movements. A few species have no dorsal fins, such as the beluga, which helps it move easily under ice, and the right whale. However, when swimming, the tail moves up-and-down working as a propeller, unlike a fish's tail that moves from side to side.



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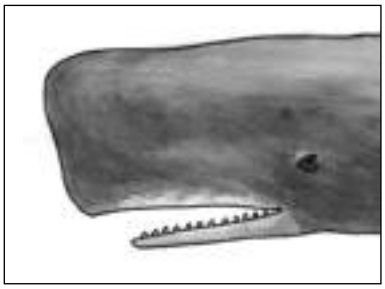
## 2. Teeth or baleen plates?

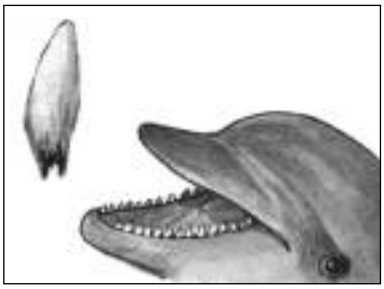
**Toothed whales** or Odontocetes such as the sperm whale, the orca, the pilot whale, the beluga and dolphins all have different diets but they all have teeth. The sperm whale - the largest toothed whale - has teeth in its lower jaw only. The Risso's dolphin only has teeth in the front of its lower jaw and none in the upper jaw. The odontocetes' teeth are made for grabbing and tearing the prey that they swallow whole or in big chunks. They do not chew. They mainly feed on fish, squid. Some orcas eat other marine mammals.

**Baleen whales** or Mysticetes such as the fin whale, the right whale and the humpback whale do not have teeth but have baleen plates that they use to filter out small organisms (krill, small schooling fish) from the water. Baleen whales have large, stringed plates that hang from the upper jaw. Baleen, also called "whalebone", is made of keratin, the same material as human fingernails and cow horns. Like fingernails, baleen constantly grows. Mysticetes mainly feed on plankton, krill and some eat small schooling fish. They gulp down tons of water containing hundreds of thousands of these small creatures.

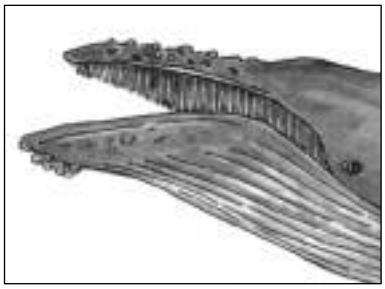
**Sirenians** - **manatees and dugongs** - do not have the same teeth as toothed whales. They are herbivores and have "marching molars" - similar to an elephant's molars - with which they chew and grind coarse sand-filled vegetation. Every time their molars wear down, others that have grown in the back of the jaw move forward to replace them.



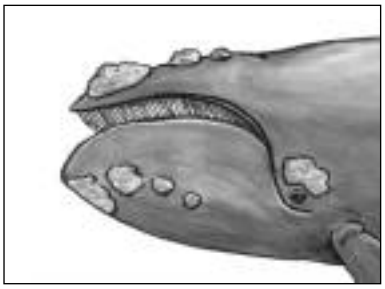
Sperm whale



Bottlenose dolphin



Humpback whale



Right whale

**DID YOU KNOW?**

The sirenian's closest land relative is the elephant. Same skin, same marching molars, a prehensile snout.

## 3. Rorqual and filter-feeding

*In the film students will see an amazing "filter-feeding" scene involving a fin whale. A huge school of little fish (Horse mackerel) snugly grouped into a "bait ball" is attacked by birds (Cory's Shearwater birds) and dolphins simultaneously. A fin whale then appears to settle the "dispute"! It takes an enormous mouthful of fish and water, catching the entire school all at once. Its throat grooves expand and balloon outward. By closing its mouth, the whale forces the water out, and its baleen plates filter the fish which it then swallows.*

The fin whale is a baleen whale that has many throat pleats that extend down to its belly: it is a rorqual. It filter-feeds on some of the smaller organisms in the ocean such as krill and schooling fish.

Ventral grooves expanding to engulf the catch. (Scene from the film)



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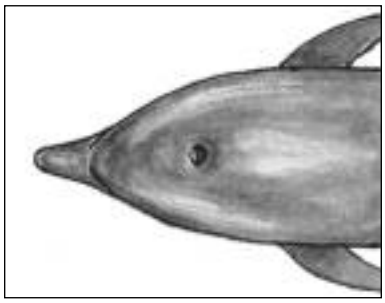
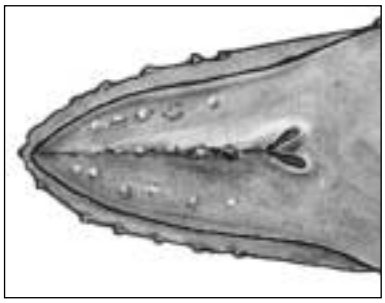
## 4. Marine mammals' breathing

Whales, dolphins and manatees are mammals and need to breathe air as we do. They have to come to the surface regularly to breathe oxygen. If they fail to do so, they will suffocate and die. They breathe air through air passages or "blowholes" that are the equivalent of human nostrils. Toothed whales have one blowhole; Baleen whales have two blowholes. Sirenians also breathe through two blowholes but they are located on their snout. Manatee nostrils have a special membrane - a "valve" - that opens above the water and closes when underwater.



Bottlenose dolphin, one blowhole



Humpback whale, two blowholes

Manatee, two nostrils (blowholes)

**Whales, dolphins and manatees cannot stay underwater forever like fish do.**
They have the ability to hold their breath for a long time. How long varies according to the species. When the humpback dives deeply to get food, it can hold its breath for up to 30 minutes. Sperm whales can stay under water even longer - typically around 40 minutes but have been observed to dive for as long as 90 minutes – to catch their favorite prey, squid that lives at the bottom of the ocean. The longest manatees can stay underwater for is 20 minutes and they typically don't dive deeper than 10 m.

**Breathing is not automatic in marine mammals as it is in land mammals: it is voluntary.**
They must "think" to open their blowholes to breathe air regularly when they get to the surface. Before diving, the cetacean fills its lungs with air and closes its blowhole(s). It keeps the blowhole(s) closed during the dive, and shortly before emerging, opens it/them, and starts exhaling. It immediately inhales fresh air, before closing its blowhole(s) again. Large whales exhale with great force producing a "blow". Sirenians, too, must surface for air regularly - every three to four minutes.

## 5. Blubber insulation

Cetaceans and manatees, like all mammals, are warm-blooded and must keep their body temperature between 95° F and 100.4° F (35° C and 38°C) for cetaceans and 97.52° F (36.4° C) for manatees. They do so thanks to their "blubber", a thick layer of fat cells under the skin that preserves heat in the body, like the insulation on a house. It is also useful for other things such as storing fat, energy and buoyancy. Cetaceans' blubber is very thick: 0.7"/18 cm thick for the bottlenose,1 to 2 ft /30 to 60 cm thick for the sperm whale. The manatee's coat of blubber (0.2"/5 mm) is much thinner than cetaceans' and they can't stand temperatures below 68° F (20° C). Ironically, blubber that safeguards the well-being of whales through thermoregulation also acts as storage for toxic chemicals and pollutants. Today mercury, PCBs, PAHs and pesticides have been documented at high levels in whale blubber, which can be passed on to marine mammal offspring through fetal development stages and nursing.



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## 6. A very complex social life

Cetaceans are social species that live and travel in groups called "pods" . They interact continuously with each other and are nearly always found in groups. Cetaceans that migrate generally do so by congregating in large groups of hundreds or thousands of individuals, depending on the species. The pods are generally stable and well structured, with an established hierarchy. There are subgroups within pods. There are many different compositions of these subgroups depending on the species. Females and their young may form one subgroup while elder males form another, and younger adults, both male and female, may form a third.

**Helping and taking care of each other is part of their social life.** Orcas are well known for protecting each other: they rescue each other from danger and support wounded individuals. Orca females giving birth may be assisted by a "*mid-wife*" who may also help her to bring the baby up to the surface. Sperm whale mothers and their calves form large "nursery schools" within their pods. When a mother dives for food, another whale "*baby-sits*" her calf.
Cetaceans are able to form alliances and cooperate. They are smart predators able to elaborate, adapt, share and teach their hunting strategy. Humpback whales form coalitions to plan and execute hunting strategies that they *teach* to younger whales. Some dolphin mothers *teach* their female calf how to protect her nose with sponge when digging in sand!

**Cetaceans touch and play a lot together.** But playing is more than pure entertainment, it is a way of developing and enhancing skills useful to their very survival in the ocean. While playing, dolphins practice swimming fast and zigzagging, two of the skills necessary to catch prey and escape predators. It helps to strengthen their relationships and develop their communication skills. While taking part in games, they practice team work, which is so essential to hunting together and helping each other. Playing teaches them about their group, their strengths, their needs and their world.
*Your students will see a lot of dolphins playing in the film. They will witness how dolphins throw each other a piece of seaweed as in a game of catch, passing it from beak, to fin, to flukes. The hazards of the game teach them to adapt to life's new and unpredictable situations.*

## 7. Sounds to communicate

Sound production mechanisms are not similar for the toothed whales and the baleen whales, and the sounds they produce are very different. While baleen whales produce long and low-frequency sounds, toothed whales produce high-frequency echolocation clicks, and whistles.

### Communication

Cetaceans use sound as a form of communication. This is not a language like humans use, but is still used to convey moods of excitement or alarm, to direct activity in the group, and to keep track of each other. Dolphins have individual signature whistles that they use the same way we use "names," to identify one another.

## 8. Echolocation

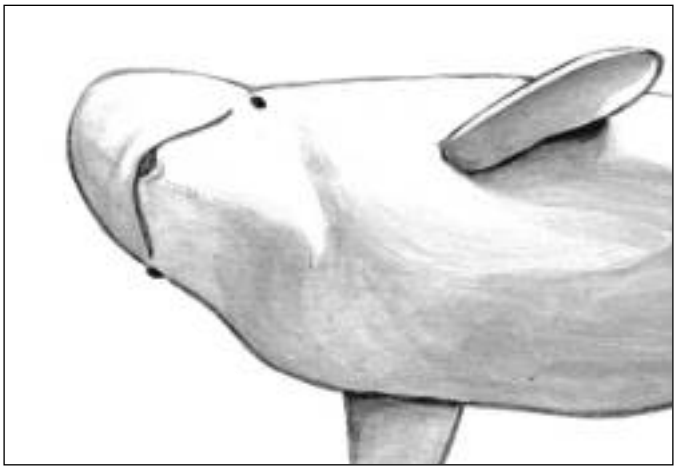
TEACHER'S RESOURCE

Toothed whales have developed an alternative sensory system called "*echolocation*" that functions like a sonar, making and receiving high-pitched sounds to detect and locate objects and prey, orient themselves, avoid obstacles and predators, keep track of one another, communicate underwater, and search for a mate. It is similar to the system used by bats when hunting in the dark. Toothed whales are able to use echolocation simultaneously to navigate and communicate.

## 9. Orientation and directional sense

Baleen whales are not known to echolocate as toothed whales do. But they seem to be able to use a system of "acoustic vision" by producing low-frequency calls to orient themselves and communicate. Studies have revealed that whales navigate thousands of miles using a mental map of the sea floor based on sound. Low-frequency sounds can travel great distances - over thousands of miles - through water because of their longer wavelength and greater energy. Baleen whales also use their low-frequency vocalizations during migration to travel together as a group, and communicate even when the group is spread over many miles.

How can whales migrate for such long journeys in an almost featureless environment where they often cannot see without getting lost? Latest studies suggest that some whales use a *magnetic sense* to orient themselves. The magnetic sense is also called the "direction sense", a sense that can be found in other animals, such as birds, tortoises, and turtles. Particles of magnetite could render the animals' brain sensitive to magnetic fields. Anatomical studies of a variety of whales have revealed the presence of such particles. Research is ongoing in this area to discover if/how cetaceans use a biomagnetic sense.





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TEACHER'S RESOURCE

## 10. The crucial role of mothering

While the group plays a crucial role for cetaceans, so does the mother. Many cetacean pods are matrilineal as the mother and her calf share the strongest ties and this constitutes the basic social unit. Within minutes of giving birth just below the surface, cetacean mothers help their newborn up to the surface to take a breath of air.

The female gives birth to a live baby tail first.

From this point on, and for several years, the cetacean mother will protect her calf and teach it how to survive in the ocean. The young calf cannot fend for itself. It cannot survive without her. *In the film your students will witness a humpback mother carrying her newborn up to the surface. Later on, you will see her swim very close to the calf, constantly taking care of it.*

**FUN FACT**

As mammals, cetaceans and sirenians have a belly button, just as we do!

All cetacean mothers nurse their calf with milk for at least one year and continue to do so even when the calf has already learned to feed itself. For the first 12 months of its life, the humpback mother will nurse her calf with her rich milk 40 times a day. This little 13-15' (4-4.6 m) baby drinks 2 to 3 gallons (7.57 to 11.35 l) of milk at each feeding - that is 100 pounds (45 kg) of milk each day! The young calf grows fast and at 7 months it is already 25' (7.62 m) long. Belugas nurse their calf for up to 24 months and pilot whales for up to 27 months. Sperm whales nurse their young for up to 3 years. Orcas nurse their young for 15 months.

**DID YOU KNOW?**

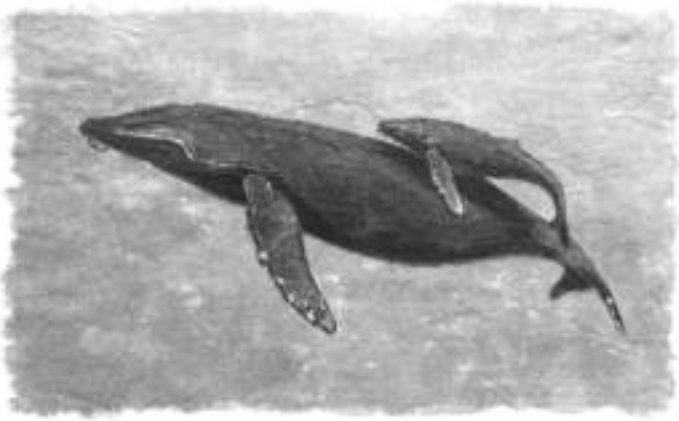
Whales' milk contains about 25-50% fat and is about 7-10 times richer in fat than cow's milk.

Baby orca nursing

Manatees nurse for 24 months. In the film your students will see a manatee nursing her calf. The manatee's teats are located just at the base of her flippers.

**SAD FACT**

A female whale always protects her young calf which stays next to her. Whalers used this strong bond, catching the calf in order to lure the mother.



Without their mother, calves cannot survive. Once weaned all cetacean and sirenian calves stay with their mother for a long time. Calves grow fast, but do not reach sexual maturity for at least 3 years or longer, depending on the species. Bottlenose dolphin calves stay with their mothers until they are 3 or 4 years old; male sperm whales between 4 and 15 years. The bond between an orca and her calf can last for life. Male orcas mate in other pods to avoid inbreeding but return to their mother's pod. (See individual files in Unit 1).

**DID YOU KNOW?**

The name "manatee" comes from the Spanish "manati" that is derived from a Caribbean word meaning "breast". It may be after watching manatees feed their calves that sailors compared them to the mythical half-fish-half-woman creature known as mermaids!



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# C. ANSWERS TO ACTIVITIES

## ACTIVITY 1. What do you know about these marine mammals?

FALSE 1. 4. 5. 8. TRUE 2. 3. 6. 7.

1. False: see B2 (B= Resources for Educator)
2. True: see B4
3. True: see B1
4. False: see B5. Note: Manatees do indeed have very long, sensitive and thick hair called "vibrissae" that cover their face and - to a lesser extent – their body. This hair plays a crucial role in sirenians, serving as an organ of touch, a bit like a cat's whiskers. It allows them to sense currents, objects and animals, and to navigate easily in the dark, murky waters where they often live. The larger vibrissae located on each side of the mouth help to reach out and grab food like little hands. During the film your students will be able to watch a manatee using its vibrissae to feed.
5. False: see B3. The Sperm whale dives very deeply to catch giant squid that live at the bottom of the ocean.
6. True: See B6
7. True: See B10
8. False: The West Indian Manatee lives and remains in shallow waters along the coast of Florida and Central America only. Other manatees species live in very specific areas and do move willingly! However, in winter they go to a spring or a river to find the warm waters they need. Cetaceans can be found in all the oceans of the world. Some like the warmth of the tropical seas while others, such as the beluga, prefer the icy cold water of the poles. Some remain close to the coast, others live in the open sea. Some are residents, others transients. Baleen whales migrate great distances from their summer feeding areas in the polar regions to their winter breeding grounds in tropical waters. The greatest travelers are the humpback and grey whales which cover a round-trip distance of up to 12,500 miles (20,000 km) a year, almost half the circumference of earth!

## ACTIVITY 2. Do you know their names?

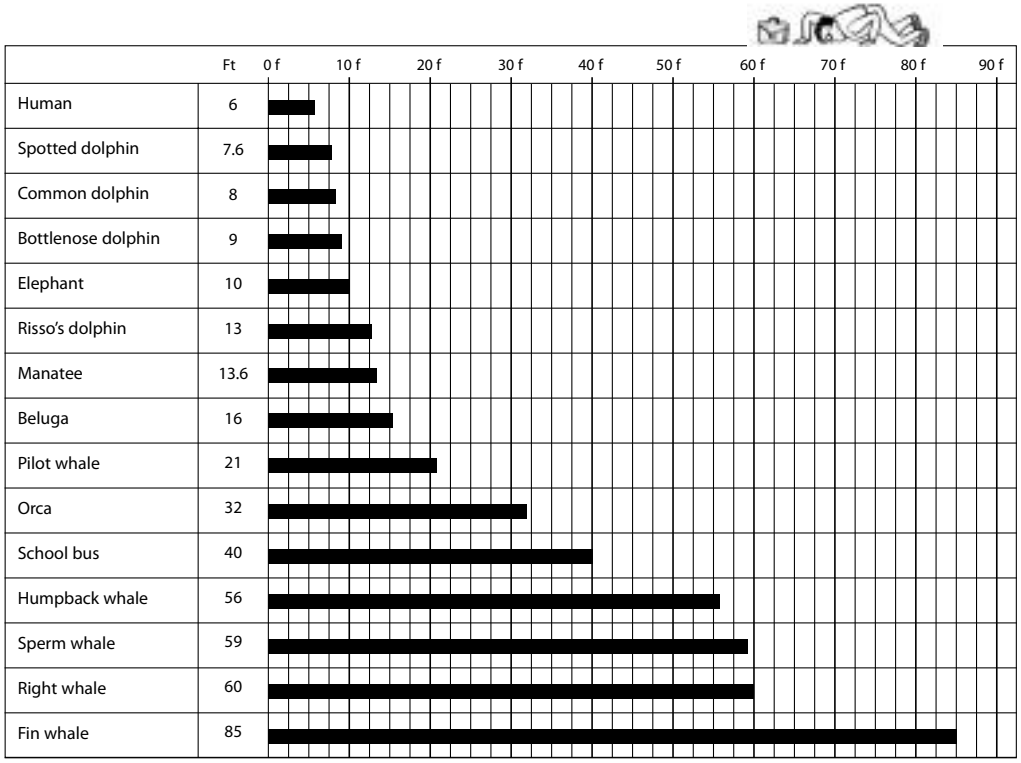
1. Bottlenose dolphin
2. Sperm whale
3. Right whale
4. Humpback
5. Orca
6. Beluga
7. Spotted dolphin
8. Common dolphin
9. Pilot whale
10. Risso's dolphin
11. Fin whale
12. Manatee

## ACTIVITY 3. Identifying the film's marine mammals

See Individual Sheet in Unit 1.

## ACTIVITY 4. What is the size of these animals?

Maximal sizes for all mammals except humans and bottlenose - see graph sample.



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# UNIT 3 - ACTIVITIES ON MARINE MAMMALS IN DANGER

## A. STUDENT ACTIVITIES

In this Unit students investigate the critical situation these marine mammals are facing today, i.e. how endangered they are. It contains five activities, each with a "Student activity sheet" to photocopy and corresponding Answers and Resources for the educators. Activities A, B, and C focus on human-induced causes of endangerment and death. Activities D and E focus on the degree of endangerment of these species using the IUCN official categories.

**Activity A** proposes a brainstorming class activity based on four pictures of dead cetaceans representing 1. Entanglement in fishing nets (main cause of death for all cetaceans), 2. Sperm whale, 3. Orca, and 4. a mass stranding of Pilot whales (unknown causes; maybe noise pollution). Students discuss and describe what they see - the scene and the different types of animals. They first guess the reasons for these deaths without having done any research.

**Activity B** is a questionnaire to be taken before and after the film and/or investigation. Students focus here on the actual - and human-induced - causes of these deaths and what risks these marine mammals are facing today in their natural habitat.

**Activity C**, which you can distribute to your students to fill out, contains 3 panels showing the various causes of human-induced death. Students tape the 3 sheets to one another. They are now faced with a panorama of causes. After researching the topic on the internet and in books, they record the various possible causes of endangerment with the corresponding picture on their 3-panel-sheet.
After they haves found the causes of endangerment, have students figure out the consequences for marine mammals.

**Activity D** is a questionnaire to be taken before and after research and the following activity E. Students check here what they know about species endangerment.

**Activity E** focuses on the degree of endangerment of the marine mammals in the film. It introduces students to the endangerment categories established by the *World Conservation Union or International Union for Conservation of Nature and Natural Resources (IUCN)*. Once familiarized with the categories, students look for the degree of endangerment of all the species in the film.



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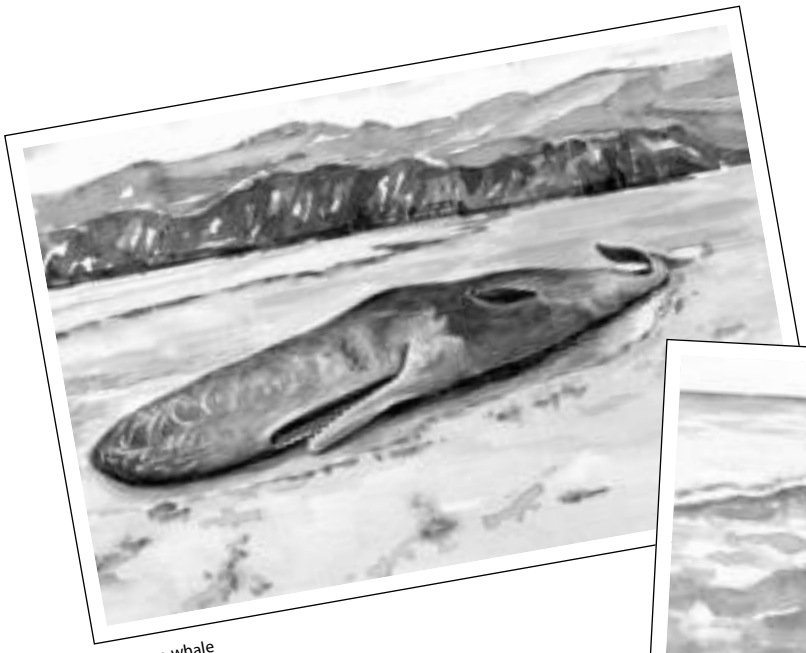
Describe the scenes and share your ideas on the possible causes of death of these animals.



Sperm whale

Orca

Pilot whales

Dolphin



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**Indicate if you agree or disagree with each of the statement below. Then, after having done research, indicate whether or not you now agree with each statement. Rewrite any false statements using complete sentences to make them true statements.** ***Warning! Even if some statements are partially true, they still count as false.***

*Before research*
☐ Agree ☐ Disagree

1. The increased human-made noises in the ocean disturb cetaceans.

*After research*
☐ Agree ☐ Disagree

*Before research*
☐ Agree ☐ Disagree

2. Increasing traffic in the ocean has no effect on cetaceans.

*After research*
☐ Agree ☐ Disagree

*Before research*
☐ Agree ☐ Disagree

3. Many cetaceans drown after becoming entangled in fishing nets.

*After research*
☐ Agree ☐ Disagree

*Before research*
☐ Agree ☐ Disagree

4. Plastic bags are not dangerous for dolphins.

*After research*
☐ Agree ☐ Disagree

*Before research*
☐ Agree ☐ Disagree

5. Manatees are so peaceful that nobody ever disturbs them.

*After research*
☐ Agree ☐ Disagree

*Before research*
☐ Agree ☐ Disagree

6. Direct catch such as hunting and whaling is no longer a danger for cetaceans.

*After research*
☐ Agree ☐ Disagree

*Before research*
☐ Agree ☐ Disagree

7. Commercial over-fishing depletes cetaceans' food resources.

*After research*
☐ Agree ☐ Disagree

*Before research*
☐ Agree ☐ Disagree

8. Cetaceans' body and blubber are contaminated by chemicals.

*After research*
☐ Agree ☐ Disagree



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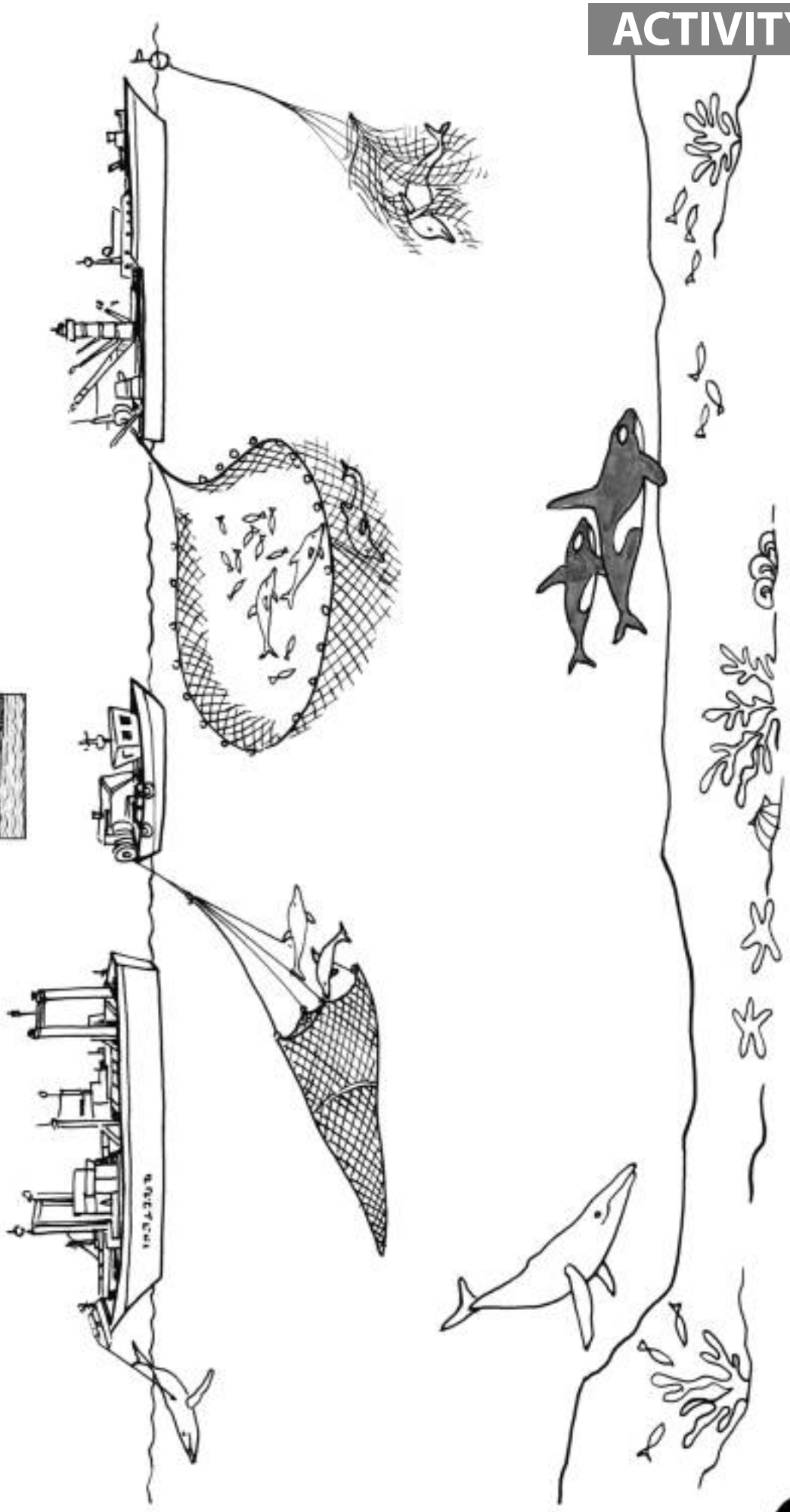
STUDENT ACTIVITY

1



Human-induced causes of death, panel 1 of 3.



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Human-induced causes of death, panel 2 of 3.

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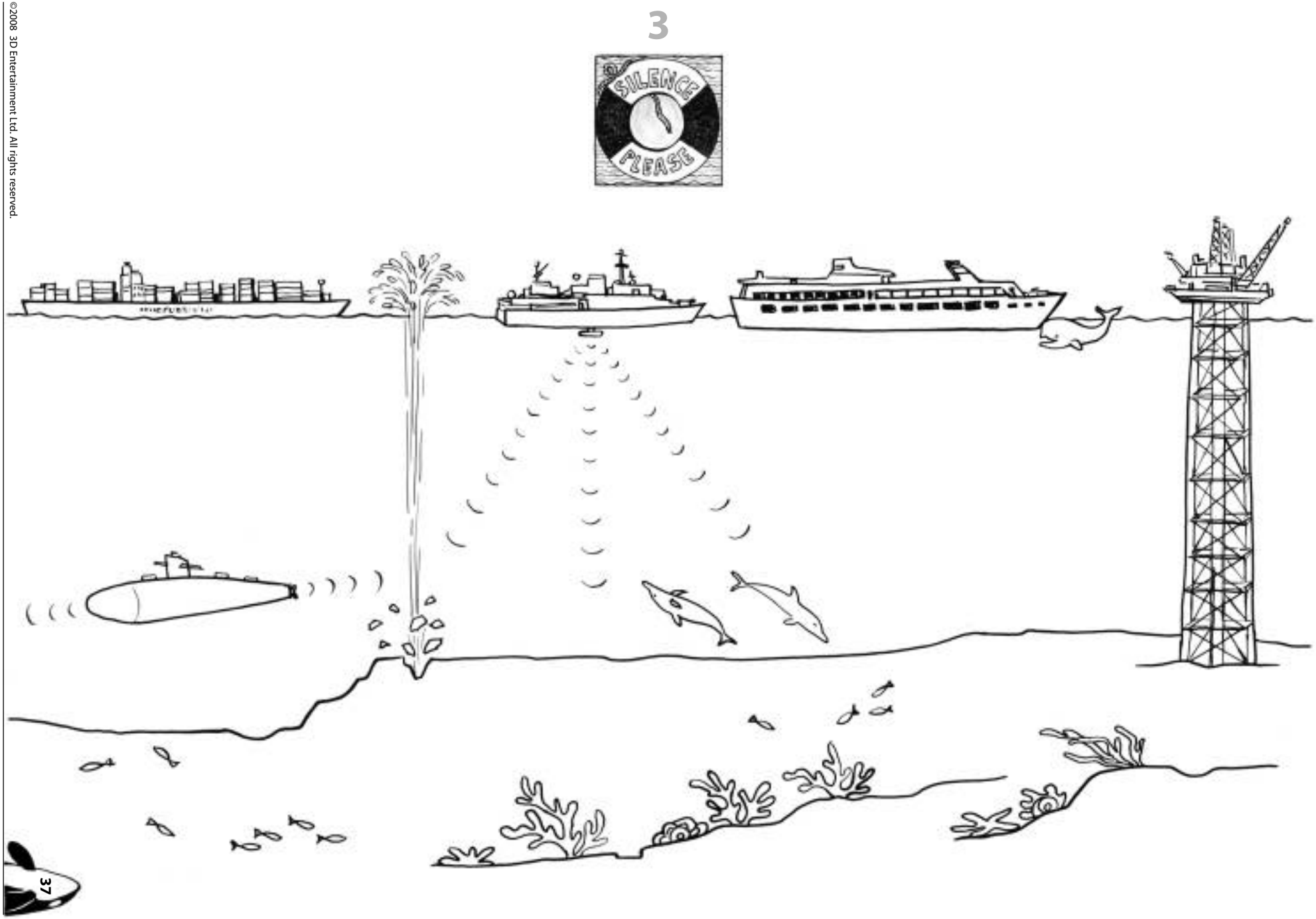


Human-induced causes of death, panel 3 of 3.

# ACTIVITY D

## What do you know about species endangerment?

**Indicate if you agree or disagree with each of the statements below. Then after doing some research, indicate whether or not you now agree with each statement. Rewrite any false sentences using complete sentences to make them true statements. Give an example to support each true statement. Use complete sentences.**

*Before research*
☐ Agree ☐ Disagree

1. A threatened species will become extinct if nothing is done to stop the cause of its decline.

*After research*
☐ Agree ☐ Disagree

*Before research*
☐ Agree ☐ Disagree

2. A vulnerable species is a species with a population dropping slightly.

*After research*
☐ Agree ☐ Disagree

*Before research*
☐ Agree ☐ Disagree

3. One of the greatest dangers facing small cetaceans today is entanglement in fishing gear.

*After research*
☐ Agree ☐ Disagree

*Before research*
☐ Agree ☐ Disagree

4. The greatest danger facing great whales today is whaling.

*After research*
☐ Agree ☐ Disagree

*Before research*
☐ Agree ☐ Disagree

5. Manatees' main threat today is underwater drilling.

*After research*
☐ Agree ☐ Disagree

*Before research*
☐ Agree ☐ Disagree

6. Species in the category DD (Data Deficient) are not threatened.

*After research*
☐ Agree ☐ Disagree

*Before research*
☐ Agree ☐ Disagree

7. Species might become extinct before they make it to the IUCN Red List.

*After research*
☐ Agree ☐ Disagree

*Before research*
☐ Agree ☐ Disagree

8. Today seven out of thirteen great whales are still endangered or threatened.

*After research*
☐ Agree ☐ Disagree



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## How endangered are the species in the film? ACTIVITY E

**Investigate (internet-research, books) how endangered each species featured in the film is and discuss how critical the situation is today. Use the *World Conservation Union or International Union for Conservation of Nature and Natural Resources - IUCN* (www.iucnredlist.org) - categories below. Write down the definition of each category. Mark the name of the species next to the appropriate category.**

| | DEFINITION | MARINE MAMMAL NAME |
|---|---|---|
| EXTINCT (EX) | | |
| EXTINCT IN THE WILD (EW) | | |
| CRITICALLY ENDANGERED (CR) | | |
| ENDANGERED (EN) | | |
| VULNERABLE (VU) | | |
| NEAR THREATENED (NR) | | |
| LEAST CONCERN (LC) | | |
| DATA DEFICIENT (DD) | | |



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## B. RESOURCES FOR EDUCATORS

Cetaceans and sirenians are in peril and certain species are facing extinction. Today "seven out of the 13 great whale species are still endangered or vulnerable after decades of protection, as are further 17 small whale, dolphin and porpoise species or populations" (WWF source, May 2007).

While **hunting and whaling** have been major causes of the cetaceans' endangerment, they now face a greater threat than ever before due to other human activities that have caused terrible environmental changes, for example, climate change (in the form of global warming), chemical and noise pollution, overfishing (depletion of their food resources), increased sea traffic, etc.

Manatees are also victims of human disturbances: they are slashed through and killed by boat propellers (25% of deaths), or are the victims of fishhooks, litter and other objects they accidentally swallow. They are losing their habitat to humans as they live in coastal shallow waters. They are suffering from environmental changes and pollution. In Florida there are only 3,000 left.

Cetacean and sirenian populations are biologically unable to withstand such increased rates of unnatural mortality as they cannot recover quickly: they mature late, reproduce at a slow rate, and take care of their young for an extended period of time.

**SAD FACT**

With only 300 individuals left, the North Atlantic right whale and its North Pacific cousins, of which less than 100 remain, are both facing extinction.

## Causes of Endangerment and Death

### Cetacean

- **Climate change** in the form of global warming has many consequences including habitat destruction, food supply depletion, and the release of chemicals into the water. Krill, the baleen whale's basic food, is in decline due to the melting of the sea ice cover in the polar regions. Polar ice cover melting is also releasing old chemical pollutants into the sea.
- **Commercial catch**: By-catch, direct catch, whaling, live catch for display, culling (cetaceans are culled as they are believed to eat fish caught by fishing industry.)
- **Entanglement in fishing nets** and gear that kills globally an estimated 300,000 cetaceans (small and great alike) annually is the greatest cause of cetacean mortality. They can also die of starvation if the net gets caught in their baleen plates.
- **Overfishing** leads to primary food resource loss that in turn leads to starvation.
- **Chemical pollution** (industrial, domestic, agricultural) contaminates cetaceans and the prey they feed on. Body, blubber and meat are poisoned by contaminated water and prey. Impact on health and reproduction. Many diseases, cancer, sterility and deformities. Litter such as plastic bags are a real cause of asphyxia.
- **Noise pollution** due to increased vessel traffic, ship and military sonars, explosives, underwater construction, offshore oil drilling, seismic testing for oil and other related activities alter the perceptions of cetaceans, who depend on sound and magnetic waves for navigation, hunting, communication, etc.
- **Collision** with commercial ships, super tankers, merchant vessels, recreational boats, military vessels, oceanographic researcher boats, etc. A major threat for great whales.

**SAD FACT**

**One of the greatest human-induced causes** of death today is entanglement in fishing nets and gear that annually kills an estimated 300,000 cetaceans worldwide (small and great alike). Once entangled they drown or are speared to death.

### Sirenian

- **Increased boat traffic**: They are struck, slashed through and killed by boat propellers (25% of deaths).
- **Litter accumulation**: victims of fishhooks, litter and other objects they accidentally swallow.
- **Human development**: They are losing their habitat to humans who are settling near the coastal shallow waters where manatees live.
- **Climate change** and chemical pollution: victim of the "red tide", a toxic algae that affects mammals' central nervous system. The red tide is caused by a rise in temperature and in man-produced nutrients dumped into the sea. A drop in temperature below 68° F (20° C) would be fatal.



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# Whaling, an infamous threat

Whaling depleted oceans of many great whale species. Great whales were heavily hunted for their oil, blubber, baleen and meat. It was a prosperous and lucrative activity as whale products had many uses and were in high demand. Whale oil was used as fuel for lamps, a lubricant for machinery and glycerine for explosives, as well as for cosmetics, soaps, detergent and margarine. Baleen plates were greatly used in the women's clothes industry for corsets, hoop skirts, bustles and collars.

Man standing in front of baleen (1900's) Baleen sizes vary from 27.6" to 13 ft (70 cm to 4 m) depending on the species.

**Measures to protect great whale stocks and populations** started as far back as the 1930's, but the whaling industry went on exterminating them at an incredible rate until the 1986 moratorium on whaling. Between 1904 and 1986 whaling was responsible for more than 2 million great whale deaths in the southern hemisphere alone. Between 1964 and 1974 a quarter of a million sperm whales were killed. The number of Antarctic whales is estimated at less than 10 percent of what it was before whaling began.

Thanks to the increasing involvement of environmental groups and people worldwide, the International Whaling Commission (IWC, founded in 1946) passed a moratorium on commercial whaling that took effect in 1986. (Unfortunately, too many countries kept participating in commercial whaling activities, some under hiding behind false scientific purposes.) Some animals that were on the brink of extinction have since been able to recover somewhat.

According to the International Whaling Commission IWC Scientific Committee (May 2007) the Blue whale is slowly recovering from commercial whaling. However, the Blue whales of the Antarctic are still less than 1 percent of their original abundance despite 40 years of complete protection. Humpback and sperm whales are returning to viable levels but their stocks are far from returning to their original numbers. Some species may never recover and will be lost forever.

The recovery of some great whale species has led pro-whaling countries to ask for the 1986 ban to be lifted in order to resume the commercial hunting. Anti-whaling advocates and countries argue that resuming whaling will only lead once again to the very situation that necessitated the ban as whale populations cannot biologically withstand the pressure of commercial whaling. They cannot recover quickly once endangered, even when the cause of danger is removed.

Japanese efforts to stop the 1986 moratorium have stirred up the on-going controversy between whaling supporters and opponents. However, at the 59th IWC conference (Anchorage, May 2007) Japan's proposition was opposed by an anti-whaling voting majority and the whaling ban remains valid for now. But for how long?

**The plight of small cetaceans** did not attract real attention leading to protection measures until the 1970s. Today the many regulations to protect small cetaceans are difficult to enforce and illegal captures and trades are reported. The main cause for concern for small cetaceans is by-catch (being incidentally caught with other species) and direct catch followed by pollution, habitat degradation, overfishing (food depletion, starvation), culling and noise pollution. (See: *Review of small cetaceans*, 2004.)

Tens of thousands of small cetaceans are killed year round for their meat, their oil or for use as bait, fertilizer, shark bait and livestock feed. Japan alone kills approximately from 17,000 to 20,000 small cetaceans a year mainly for their meat. Orcas and other smaller cetaceans are sometimes deliberately killed by industrial fishermen who view them as competition for fish stocks (culling).

Aboriginal whalers in the Arctic regions have the right to harvest around 2000 belugas, 1000 narwhals and numerous dolphins for their oil and meat. Many indigenous communities are harvesting belugas sustainably and working with scientists to do so. They have high incentive for long-term resource management in that they depend on the species for subsistence.

**Today a few countries are still hunting whales.** In 2005 Japanese whalers caught 853 minke whales and 10 fin whales in the Antarctic, and 220 minke, 100 sei, 50 bryde's and 10 sperm whales in the North Pacific. In December 2007, Japan announced it will postpone the whaling of 50 humpbacks in the Antarctic for one to two years, but still plans on killing around 1,000 whales, including the endangered fin whale, in 2008 under the pretext of "scientific research", while whale meat ends up in Japanese supermarkets.
Norway caught between 200 and 600 minke whales in the 1990's, 639 in 2005, and "only" 592 (they had planned to catch more than a thousand) in 2007 due to low market demand. Iceland has been catching 39 minke whales per year since 2003. It had resumed commercial whaling in 2007, but is stopping because of low market demand for whale meat.



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# C. ANSWERS TO ACTIVITIES

**Activity A** - See page 43 and Resources for educators.

## Activity B - What kills these marine mammals?

1. TRUE. Cetaceans rely on sound for survival (orientation, hunting, communication).
2. FALSE. Increasing traffic is the cause of many collisions with cetaceans, and causes extra chemical and noise pollution detrimental to their survival.
3. TRUE: This is the main cause of death for small and big cetaceans (300,000 estimated a year). Once entangled, if they cannot come to the surface to breathe regularly, they will die.
4. FALSE: Ingestion of plastic bags causes intestinal problems, suffocation, death. Litter accumulation in the sea is lethal to all marine life.
5. FALSE: Living close to coastal areas that are increasingly populated, manatees are losing their habitat, killed by boat propellers and contaminated by pollutants.
6. FALSE: It is. Some countries resumed whaling, others never stop hunting small cetaceans. Culling is still practiced.
7. TRUE: They can starve or need to go somewhere else to feed themselves.
8. TRUE: Because they are at the top of the food chain, whales like belugas and orcas have ingested many pollutants in their food and are contaminated.

## Activity C - What do you know about species endangerment?

See page 43 and Resources for educators.

## Activity D - What do you know about species endangerment?

1. Agree.
2. Disagree. A vulnerable species has a constantly dropping population and is at risk of extinction.
3. Agree. Other great dangers are fishing, overfishing (causing depletion of their food resources) and global pollution.
4. Disagree. Thanks to international protection, great whales are no longer hunted to extinction. However, they are facing other threats.
5. Disagree. Manatees are mainly struck, slashed through and/or killed by boat propellers.
6. Disagree. Not enough information has been gathered on species in this category. This does not mean they are not endangered.
7. Agree. The IUCN Red List is not complete yet. Many species are still being evaluated and others have not been evaluated yet.
8. Agree.

## Activity E – How endangered are the species in the film?

Conservation Status can be found in each individual species file in Unit 1, The Cast of the Film. *Fin whale*: EN; *Humpbacks*, *Sperm whales*, *Belugas* and *Manatees*: VU; *Southern Right whale*: LR-CD while Northern Right whales, not featured in the film, are CR or critically endangered; *Orcas*: LR-CD; *Risso's*, *Bottlenose*, and *Spotted dolphins*: DD; *Common dolphins*: LR/LC.

## Extra Resources for Activities D and E

A tremendous number of these marine mammals die each year, victims of diverse and increasing human activities, but it is still difficult to give precise figures for many species and populations. This is due partly to the immensity of their habitat. Some numbers are available as there are studies surveying certain species and populations in local areas. However, there are not enough facts known for almost 50% of cetaceans. This does not mean that they are not threatened.

To determine the degree of endangerment of each species the *World Conservation Union or International Union for Conservation of Nature and Natural Resources (IUCN)* - has established categories into a "*Red List*" based on estimated numbers. Unfortunately the Red list is not complete yet. Many species are still being evaluated; certain have not been evaluated yet and some might become extinct before making it in the list.

## Definition of IUCN Categories for use in Activities D and F

The IUCN "threatened" category includes species that may become extinct if measures aren't taken to protect it. There are three categories of threatened species:

- Critically Endangered (CR) for animals at an extremely high risk to become extinct very soon,
- Endangered (EN) for animals that have a very small population and are facing a high risk of extinction,
- Vulnerable (VU) for animals with a population which is constantly dropping and thus at risk of extinction.

The IUCN "Lower risk" category is twofold:

- Lower Risk/Conservation Dependent (LR/CD) and
- Lower Risk/Lower Concern (LR/LC).

LR/CD is used for species that are part of a conservation program and would switch into the vulnerable category within a few years should the program stop. LR/LC means that the species is not conservation dependent and its population abundant.

The IUCN category "Data Deficient (DD)" implies that there is not enough information to assess the extinction risk for the species under scrutiny. This does not mean that the species is not threatened.



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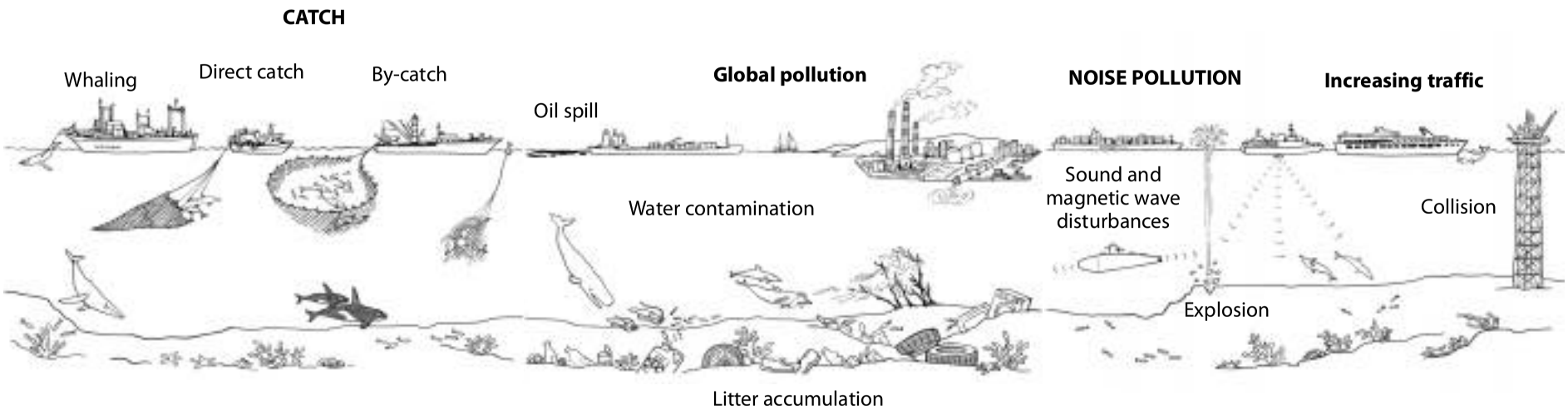
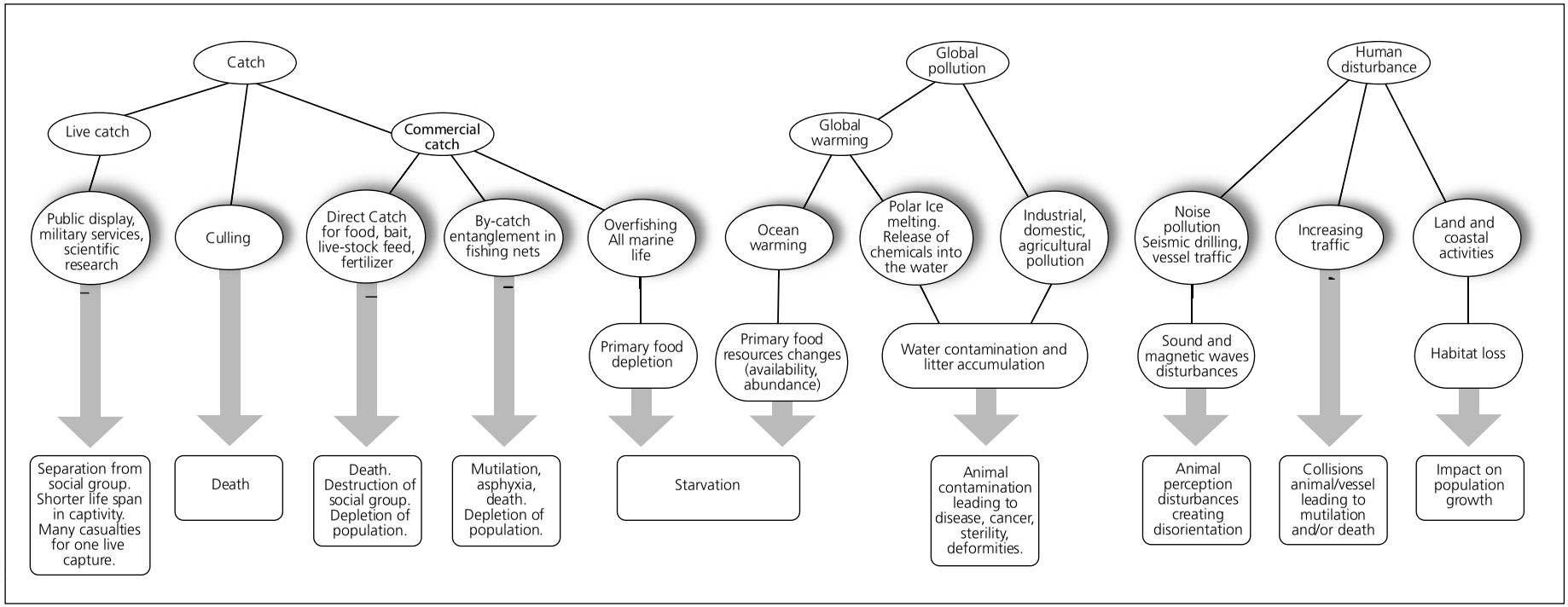
# HUMAN-INDUCED CAUSES OF ENDANGERMENT



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# DOLPHINS AND WHALES
## TRIBES OF THE OCEAN 3D

Narrated by Daryl Hannah and presented by Jean-Michel Cousteau
Directed by Jean-Jacques Mantello and produced by François Mantello

A 3D Entertainment & McKinney Underwater Productions Film

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