Marine Turtles, Mammals and Seabirds

Chapter 9

Seabirds

- Seabirds, like mammals, are able to maintain a constant body temperature derived through metabolic means (homeotherms, endotherm)

Seabirds

- The feathers that cover the body are coated with an oil from glandular secretions
- This oil helps to waterproof the body
- Regularly preen to help spread oils
- Exception… Double-crested Cormorant have poorly developed oil glands
  - Helps with underwater swimming
  - Have to dry off

Seabirds

- The hard shelled egg provides more protection than the leathery shell of reptiles

Seabirds

- Many species of seabirds are colonial nesters
  - they nest in large colonies of individuals near the shore
  - some on cliffs, others in low shrubs or trees
  - others directly on the ground

Seabirds

- Some species are monogamous and mate for life
- Birds are well known for their protection of young and other behaviors such as preening and complex rituals for selecting a mate

Seabirds

- Penguins are flightless with the wing modified into a flipper-like structure
- Penguins spend a great deal of time in the marine environment searching for prey

Seabirds

- Most species of penguins live mainly in Antarctica
- They have a layer of fat and trap air in the feathers to help them survive these cold environments
- Males and females share parenting responsibilities

Seabirds

- Other species of seabirds do exist such as shearwaters, petrels, albatross, frigate birds, pelicans and cormorants
- However, none of these birds are adapted to the marine environment in the same way that penguins are
- Even those that spend long periods of time at sea still have features very much like terrestrial birds

Characteristics of Mammals

- 4600 species
- Skin possesses hair
- Homeotherms
- Mostly viviparous with placenta
- Mammary and other glands
- Larger brain in relation to body size
- Many sexually dimorphic (males and females look different in size, coloration, features, etc)

Major Groups of Marine Mammals

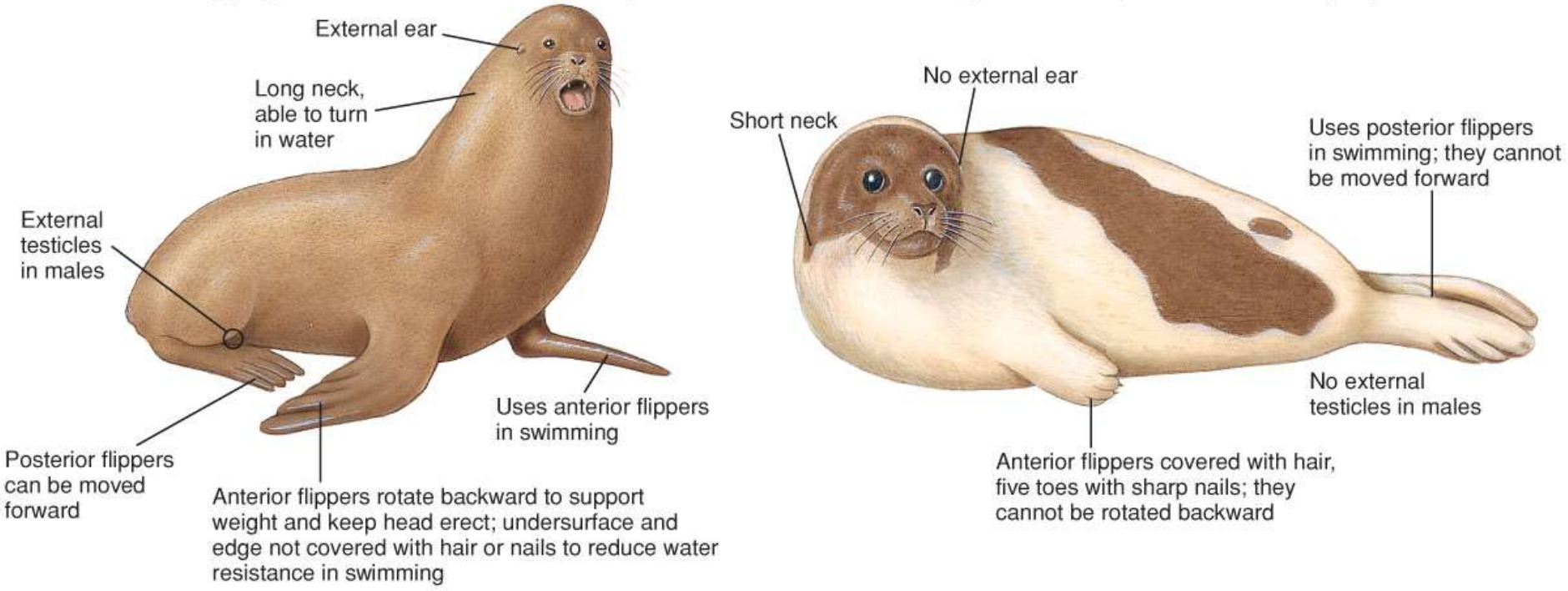
1. Pinnipedia – seals, sea lions and walrus
2. Carnivora – sea otter and polar bear
3. Sirenia – dugong and manatees
4. Cetacea – whales, dolphins and porpoises

Order Pinnipedia

- Have paddle-shaped flippers for swimming
- Still need a portion of terrestrial life for breeding and rest
- Evolved from early terrestrial land carnivores
- Streamlined body
- Most live in cold waters
- Have blubber for warmth, food reserve, and buoyancy
- Skin has bristly hair for warmth
- Large body size to keep warm

Order Pinnipedia

- Below is a comparison of sea lions/fur seals versus true seals.
- Notice the external ear of sea lions/fur seals (not present in seals).
- Also notice that sea lions/fur seals can rotate the rear limbs forward for more efficient locomotion on land.



(a) **Sea lions and fur seals** (b) **Seals**

Order Carnivora

Sea Otters

- Do not have blubber but obtain warmth through dense fur
- Hunted into almost extinction due to their pelts
  - Still considered a Threatened species
- Need to eat about 25%-30% of their body weight daily
- Diet includes sea urchins, crabs, abalone, clams, mussels, octopus, and fishes

Photo of Sea Otter in Typical Habitat – Kelp Community

Order Carnivora

Polar Bears

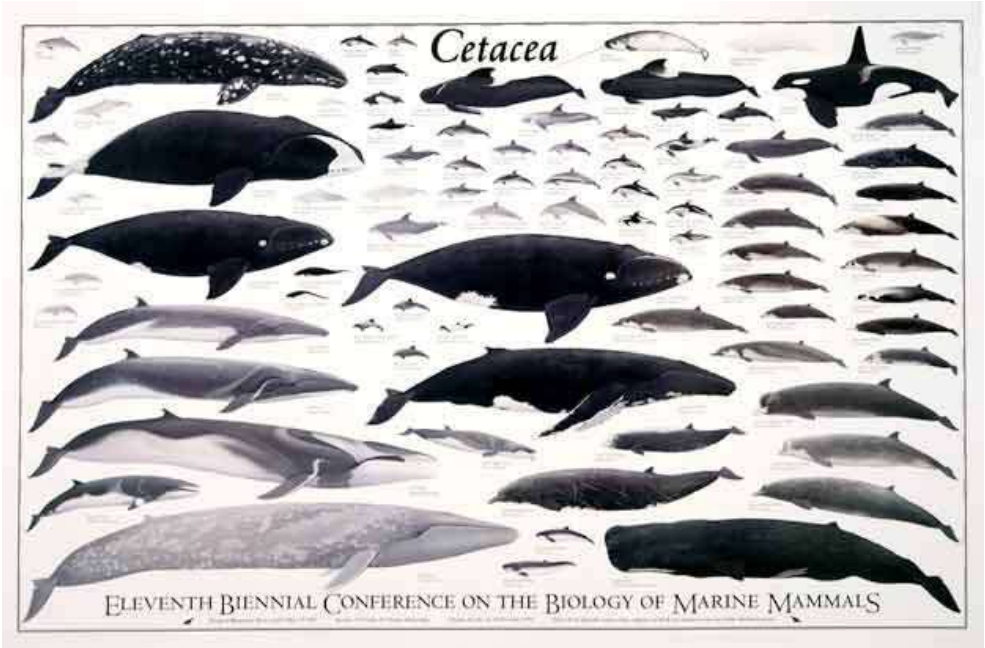
- Semiaquatic
- Feed primarily on seals
- Considered a threatened species due to melting Arctic ice

Order Sirenia

- Includes manatees and dugongs
- Thought to be related to elephants
- Have front flippers but no rear limbs
- Have a paddle-shaped horizontal tail
- Strictly vegetarians

Order Cetacea

- This order includes whales, dolphins and porpoises.
- Fore limbs are modified into flippers.
- Fin-like tail is known as a fluke.
- Nostrils are located on the top of the head as a single or double opening known as a blowhole.



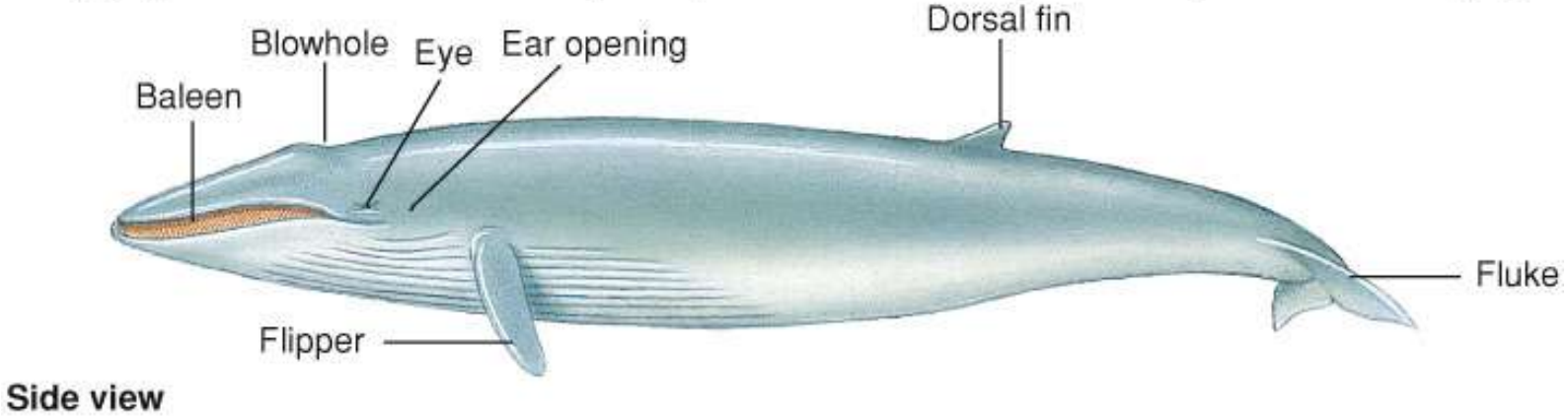
Order Cetacea

- Within the Cetacea, two suborders exist, toothed whales (Odontocetes) and baleen whales (Mysticetes).

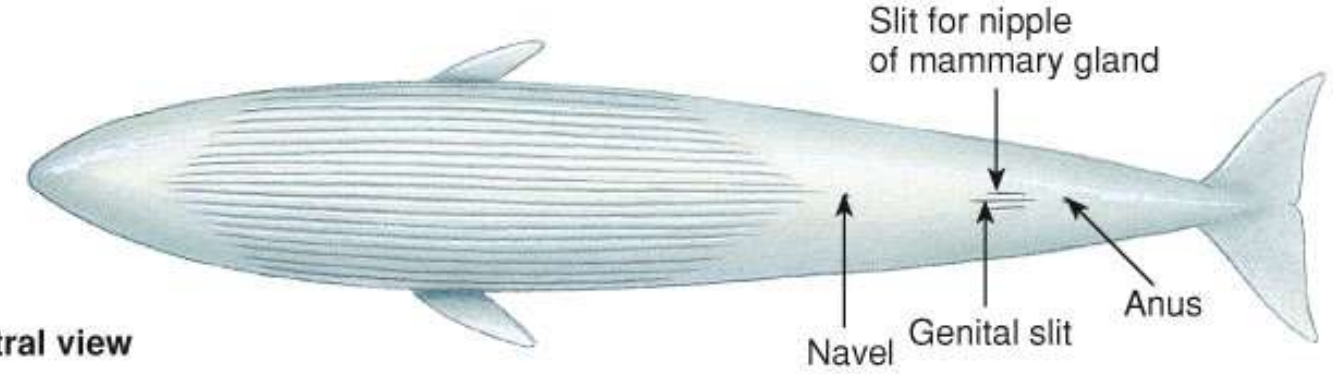
- Visually, the two suborders can be easily distinguished by the presence of teeth and a single blowhole or baleen and two blowholes.

- In general, baleen whales are much larger than toothed whales, ranging in length from about 6.4-27 m (21-85 ft.). Most toothed whales are less than 6.1 m (20 ft.) long.

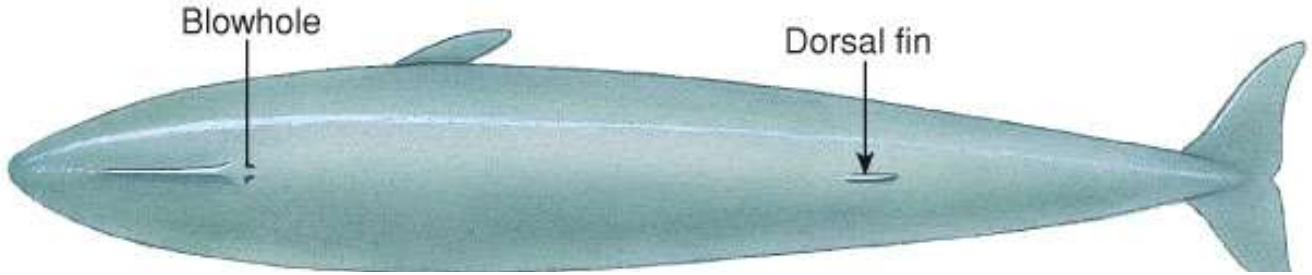
Baleen whales have rows of flexible, fibrous plates known as baleen that hang from the upper jaws (seen in diagram below).



Side view

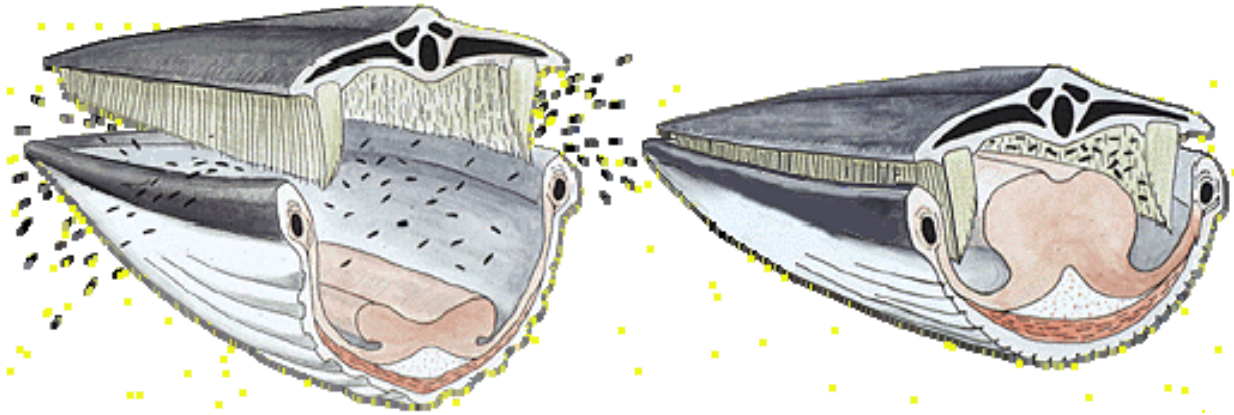


Ventral view



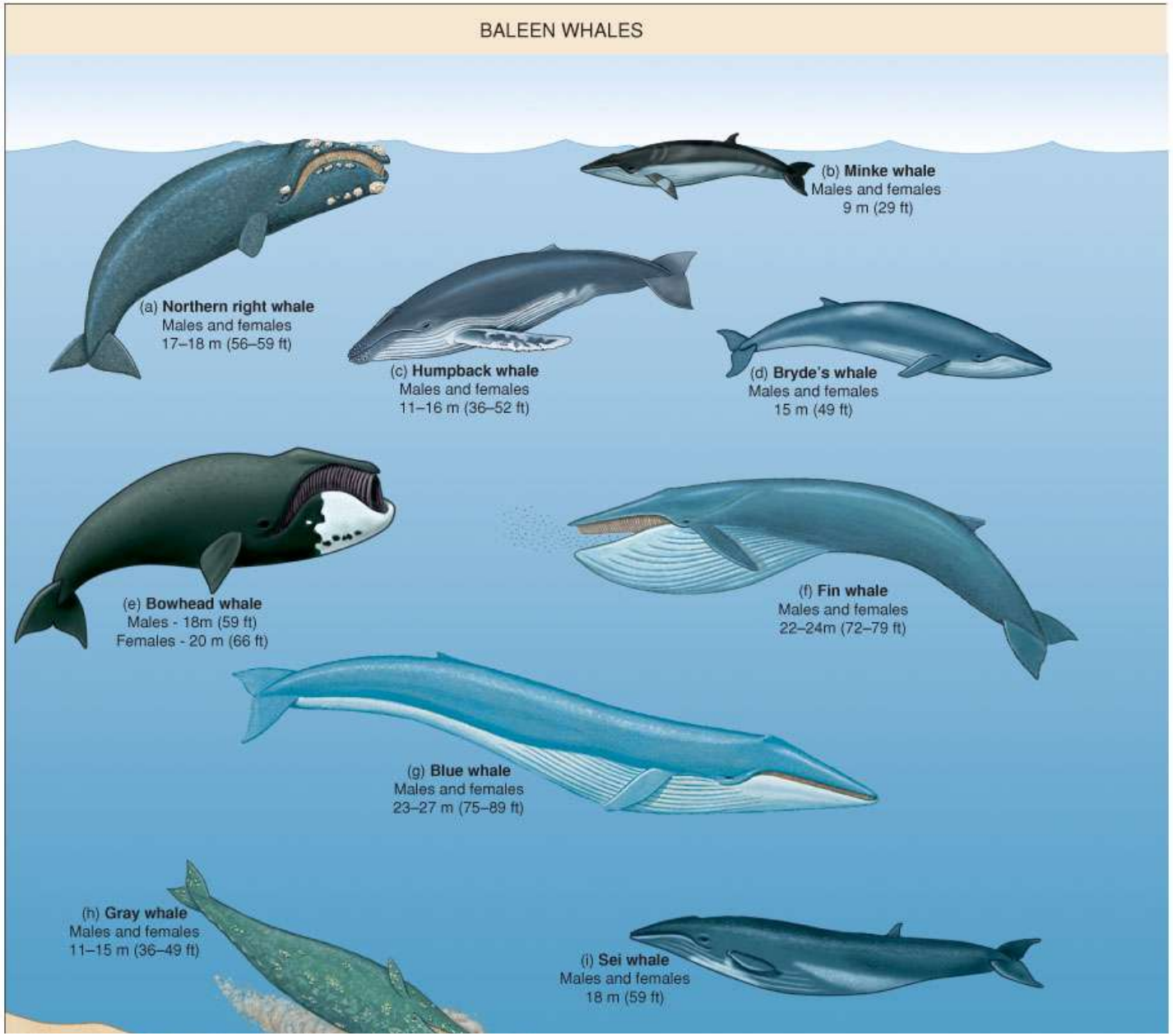
Order Cetacea

- Baleen whales are filter feeders.
  - They take in huge mouthfuls of water containing small fishes or invertebrates.
  - The baleen traps the prey, and water is forced back out of the mouth.
- Baleen whales are represented by 13 species, including the right whale, gray whale, blue whale, and humpback whale.

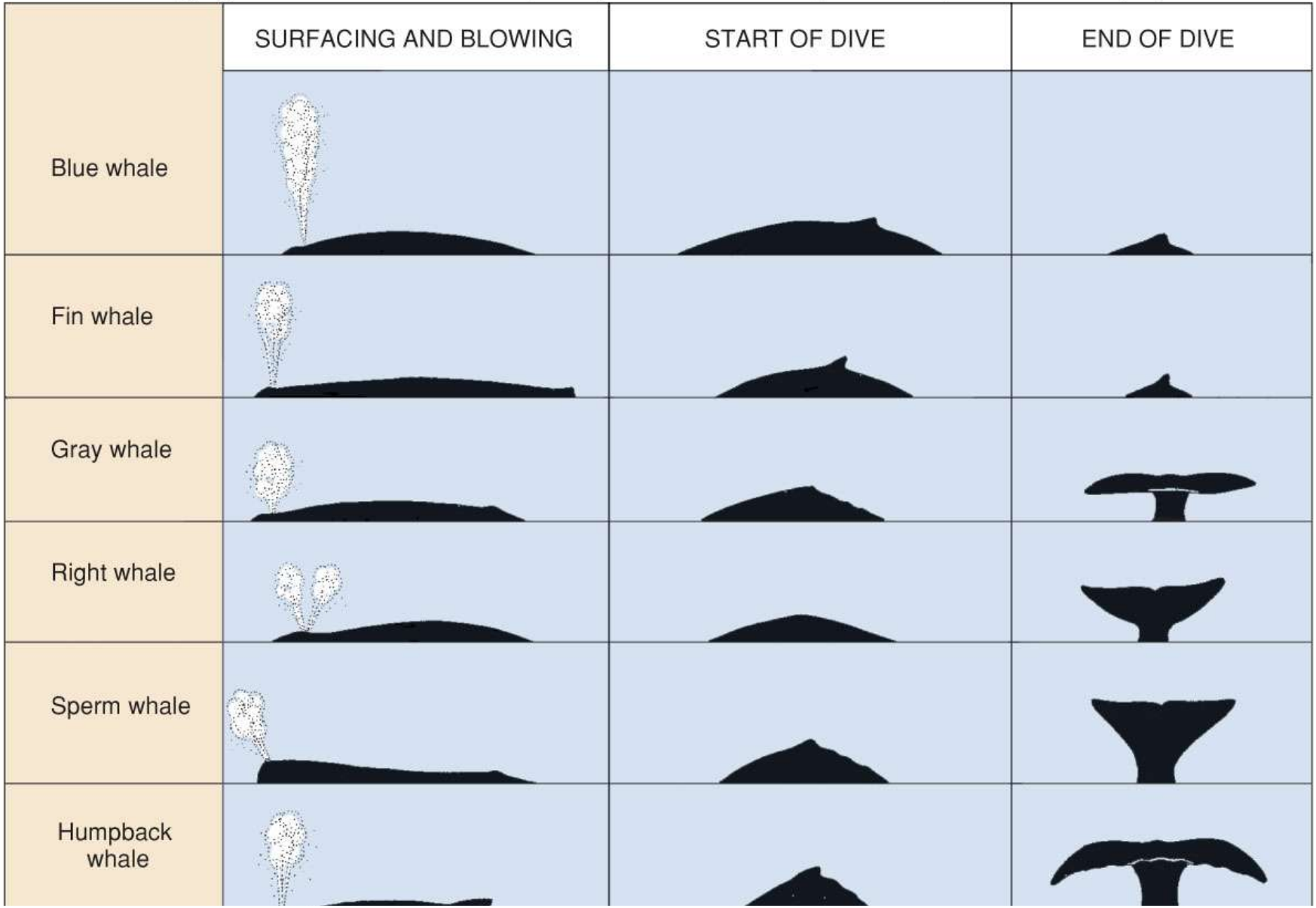



Baleen
WDCS/Brittany Sapyta

Examples of Baleen Whales



Whales may be identified from their fluke shape, blow pattern or side view during a dive (as shown below).



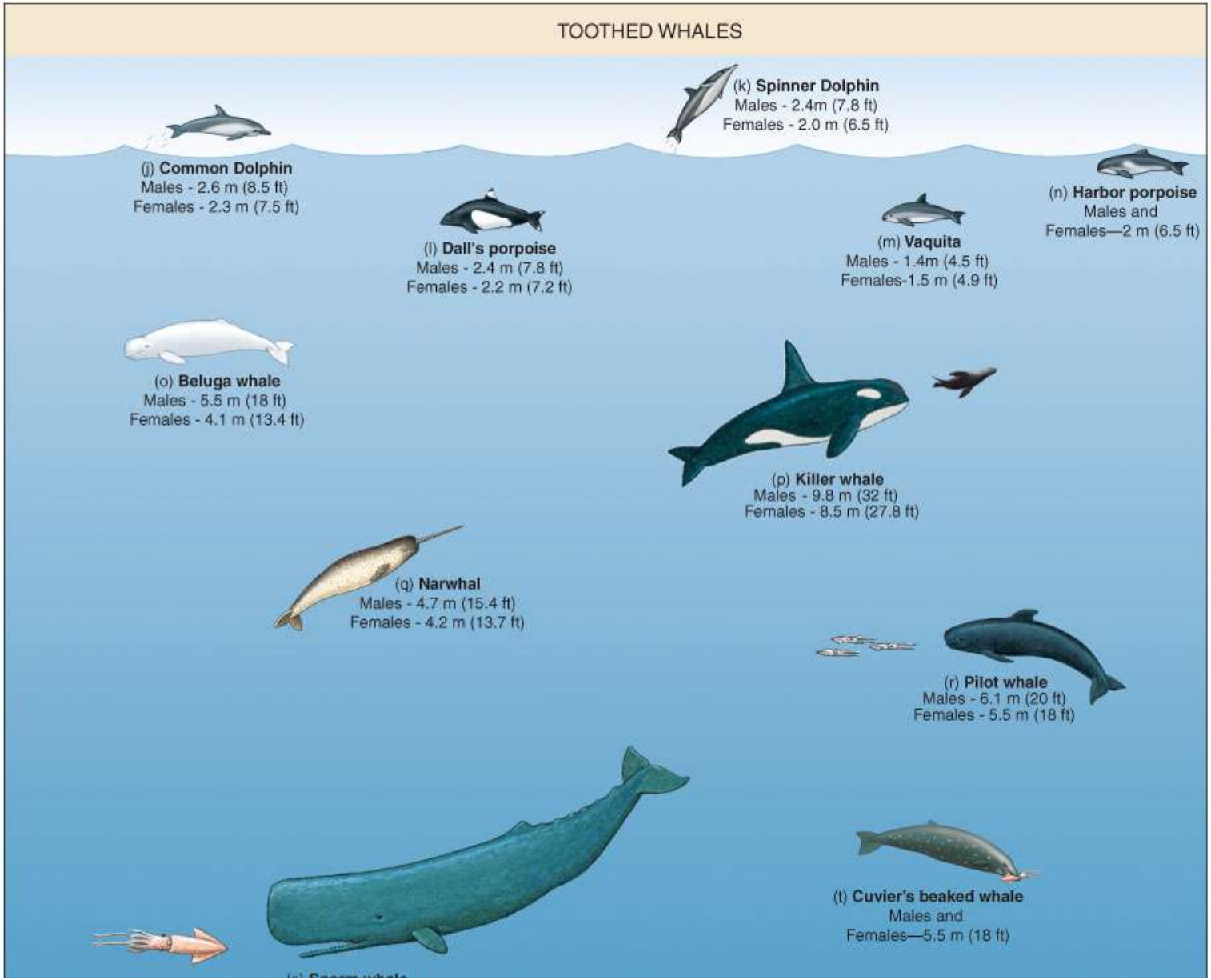
Order Cetacea

- Toothed whales are named for their simple, peg-like teeth
- Teeth vary considerably in number and size among the species.
  - Dolphin's teeth are conical and interlocking where as porpoises are spade-shaped.
  - River dolphins have numerous teeth
  - Most beaked whales have only one or two visible pairs which are adapted for grasping and tearing, rather than chewing.

Order Cetacea

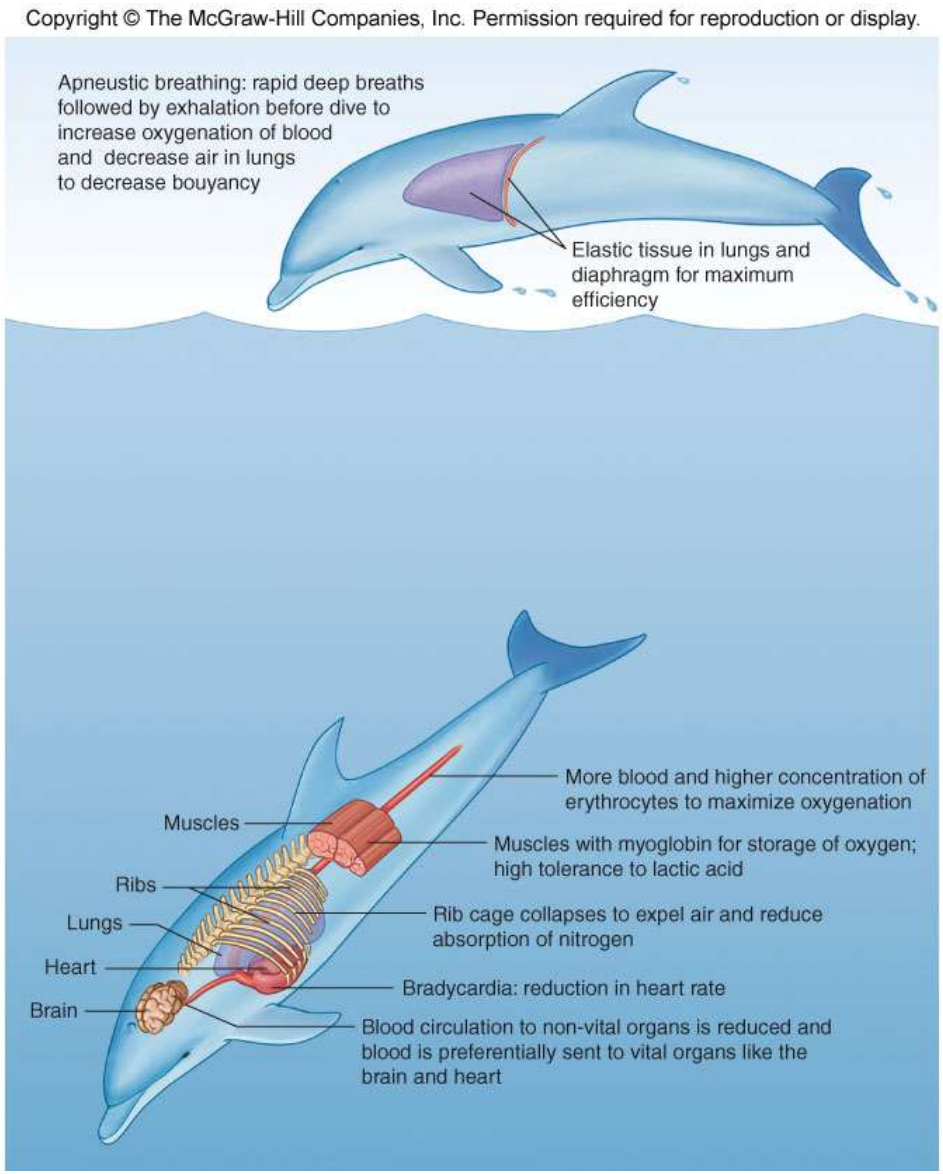
- Toothed whales include dolphins, porpoises, belugas, narwhals, sperm whales, killer whales, river dolphins, and beaked whales.
- Depending on the species, toothed whales may be found in coastal waters, rivers or in the pelagic environment.

Examples of Toothed Whales



Adaptations for Diving

- Rapid breathing prior to dive -known as apneustic breathing
- Lungs remove 90% of O_2 from air (as opposed to 20% for humans)
- Elastic tissue in lungs helps them expand the lungs temporarily during apneustic breathing

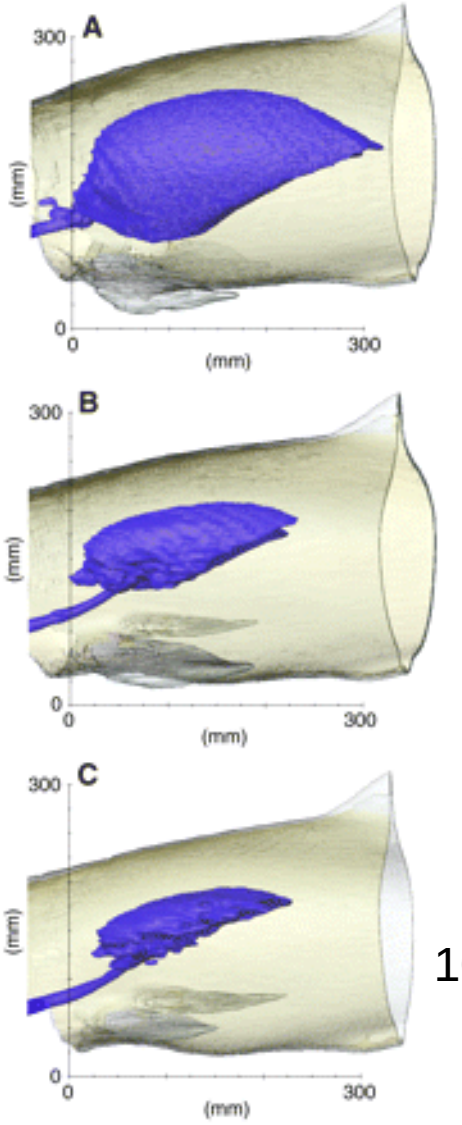


Adaptations for Diving

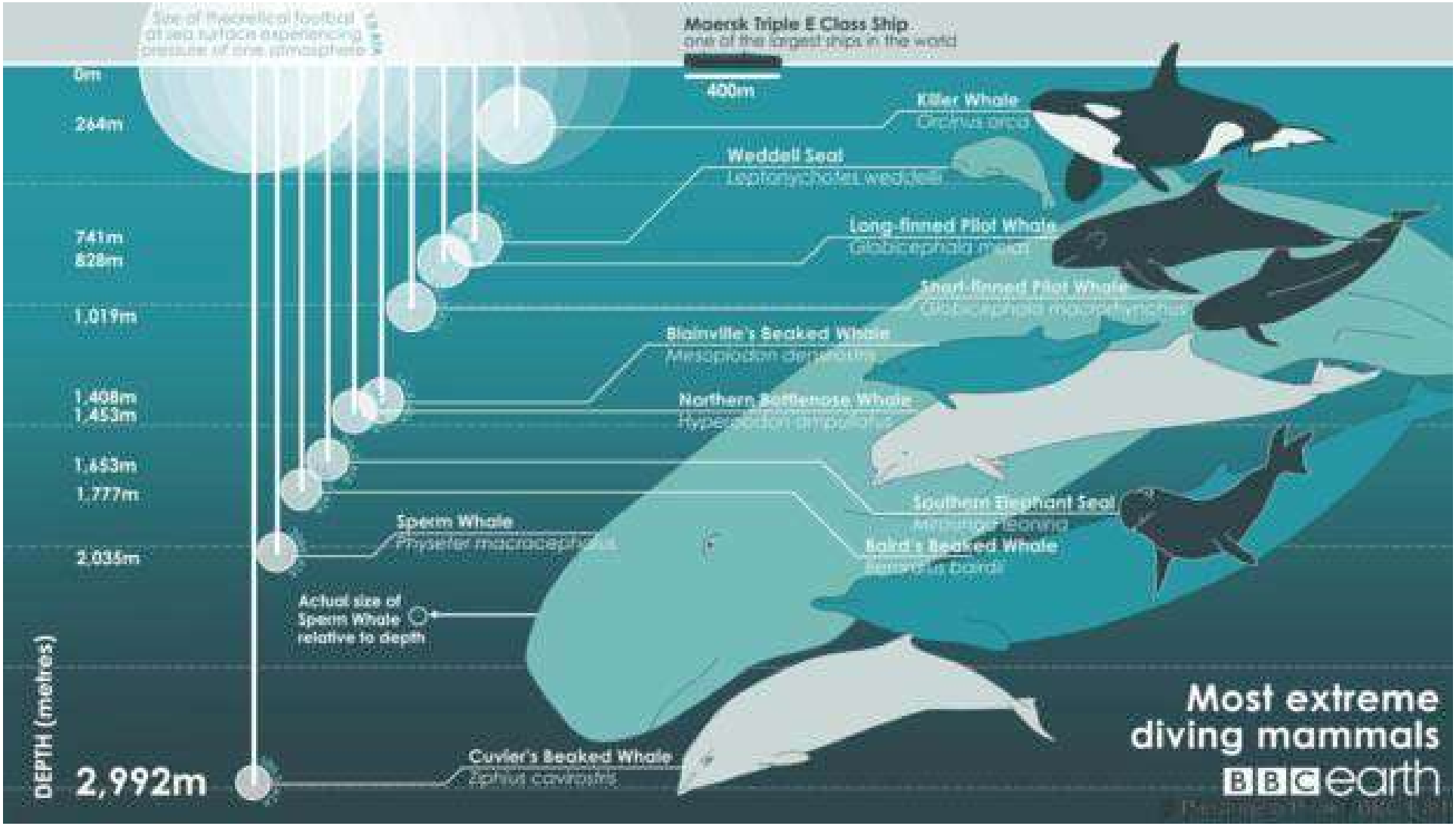
- Marine mammals have more blood than non-diving mammals for their size (means more hemoglobin to carry oxygen)
- Muscles contain more myoglobin to hold oxygen in tissues
- The heart rate slows dramatically during a dive – known as bradycardia
- Blood flow is reduced to extremities and digestive system

Adaptations for Diving

- Muscles employ anaerobic respiration as necessary (results in lactic acid build-up)
- Marine mammals can tolerate more lactic acid than other mammals
- Rib cage and lungs collapse during dive to force air into tissues and prevent decompression sickness

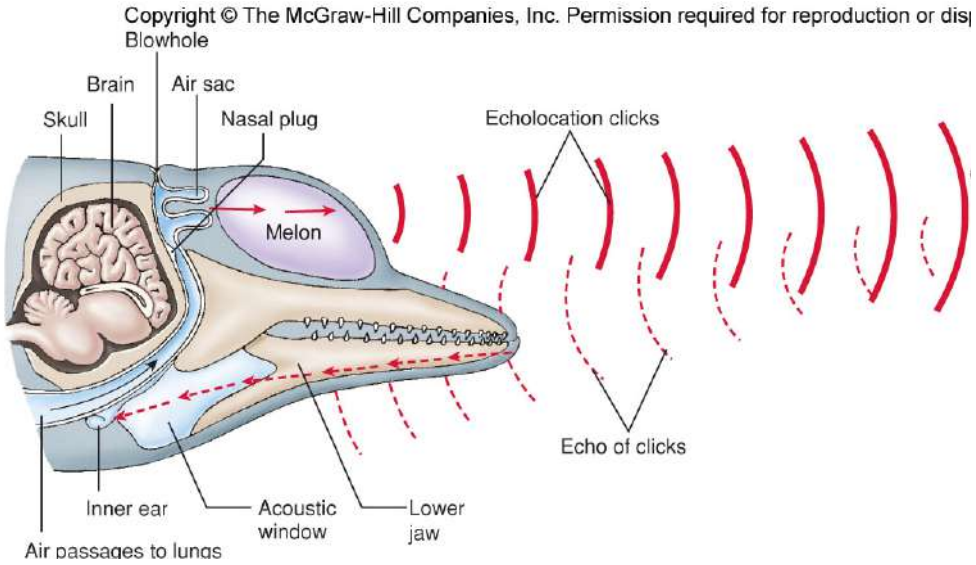


Lung capacity of harbor porpoise


Size of theoretical football at sea surface experiencing pressure of one atmosphere
Maersk Triple E Class Ship
one of the largest ships in the world
400m
0m
264m
741m
828m
1,019m
1,408m
1,453m
1,653m
1,777m
2,035m
2,992m
DEPTH (metres)
Killer Whale
Orcinus orca
Weddell Seal
Leptonychotes weddellii
Long-finned Pilot Whale
Globicephala melas
Short-finned Pilot Whale
Globicephala macrorhynchus
Blainville's Beaked Whale
Mesoplodon densirostris
Northern Bottlenose Whale
Hyperoodon ampullatus
Southern Elephant Seal
Mirounga leonina
Baird's Beaked Whale
Berardius bairdii
Sperm Whale
Physeter macrocephalus
Actual size of Sperm Whale relative to depth
Cuvier's Beaked Whale
Ziphius cavirostris
Most extreme diving mammals
BBC earth

Echolocation

- Sound waves are emitted as a series of clicks of varying frequencies
- Melon directs the outgoing sound waves
- After the echo strikes an object, it is reflected back
- These reflected echoes are received back by the melon and lower jaw
- The longer it takes a echo to return, the farther away the object is located



Marine Mammal Behaviors

- Marine mammals as well known for their vocalizations such as the “barking” of sea lions and songs of the humpback whale.
- Marine mammals engage in play activities regularly including sexual play.

Marine Mammal Behaviors

- Many species of marine mammals are known to jump out of the water and crash back into the water on their backs. This is known as breaching.
- The reasons for this behavior may be removing parasites, a warning signal, to avoid suitors or to have fun!

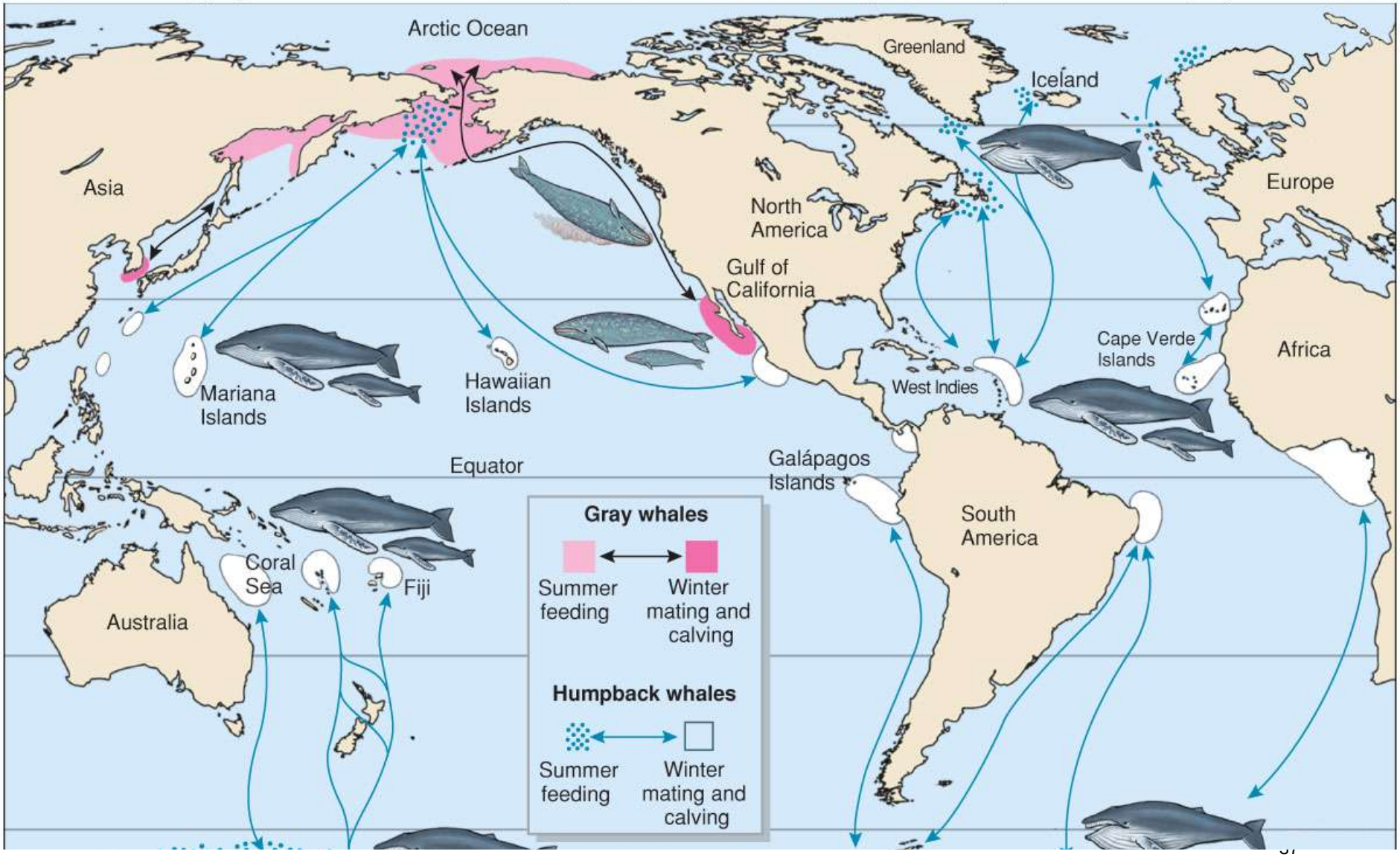
Marine Mammal Behaviors

- Marine mammals sometimes hold their bodies out of the water. This behavior is known as “spyhopping.”

Marine Mammal Behaviors

- Many marine mammals are known for their long migrations.
- The longest migration is that of the gray whale; this migration is over 11,000 miles!!

Notable Migrations



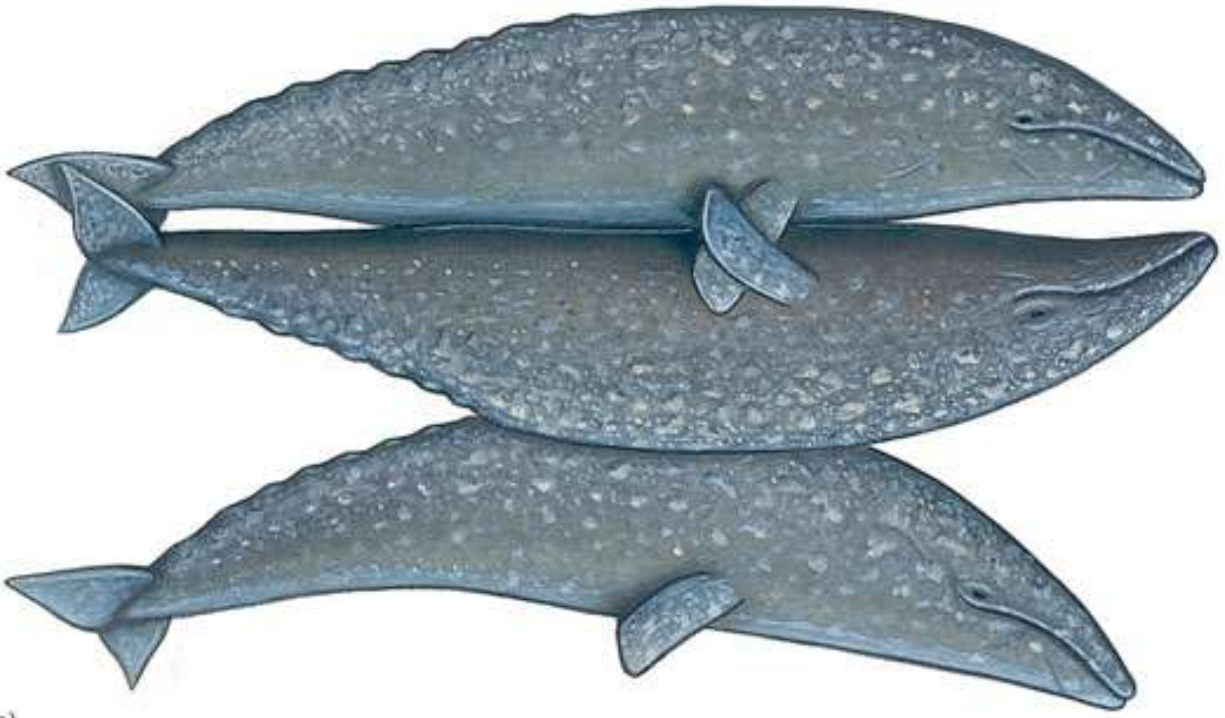
Marine Mammal Behaviors

Care giving and Strandings:

- When one member of a group (pod) of animals is sick/injured, other members will care for it.
- Mass strandings are often the result of caregivers following a sick/injured animal to shore.

Reproduction in Marine Mammals

- Fertilization is internal via copulation
- Copulation occurs on land for pinnipeds where males compete for "harems"
- Other marine mammals copulate at sea
- Sexual play is common in marine mammals
- Some marine mammals use delayed implantation of the fetus – this allows the calf to be born at a time that is best for the survival of the calf



(a)

(b)

Reproduction in Marine Mammals

- Gestation time varies in marine mammals; normally 11-12 months in cetaceans.

- Calves are born tail first so that they can remain attached to the placenta until the entire body is out and the animal can be forced to the water's surface to take its first breath.

Most Important Characteristics of Marine Reptiles, Seabirds, and Marine Mammals

Table 9.3 Most Important Characteristics of the Marine Reptiles, Seabirds, and Marine Mammals

Group	Distinguishing Features	Temperature Regulation	Feeding	Reproduction	Significance in the Marine Environment
Sea turtles 	Body covered by shell, scales on exposed parts of body, legs modified as flippers, found mostly in tropical seas	Poikilotherms, ectotherms	Toothless jaws adapted for crushing hard invertebrates or for picking soft invertebrates	Oviparous, laying eggs on sandy beaches	Predators of jellyfishes and bottom invertebrates, grazers of seagrasses and seaweeds
Sea snakes 	Skin with scales, no legs, laterally flattened for swimming, venomous, found only in tropical Indian and Pacific oceans	Poikilotherms, ectotherms	Small teeth adapted for capturing small prey	Ovoviviparous, giving birth at sea, or oviparous, laying eggs on land	Predators of bottom fishes; some feed mostly on fish eggs
Marine iguana 	Skin with scales, tail laterally flattened for swimming, found only in the Galápagos Islands	Poikilotherms, ectotherms	Three-cusped teeth adapted for grazing	Oviparous, laying eggs in nest on land	Grazer of seaweeds
Saltwater crocodile 	Skin with scales, massive jaws and tail, found in coastal regions in Australia, Southeast Asia, and some western Pacific islands	Poikilotherms, ectotherms	Heavily toothed jaws for capturing wide range of prey	Oviparous, laying eggs in nest of mud and vegetation on land	Predator of wide variety of coastal animals, including fishes, seabirds, sea turtles, crabs
Seabirds 	Feathers for insulation, webbed feet, light bones as adaptation for flight, found in all coastal regions	Homeotherms, endotherms	Beaks adapted for capturing wide range of prey, including filtering	Oviparous, laying eggs in nest on land	Predators of fishes and many groups of surface-dwelling and shallow-water invertebrates, including plankton
Pinnipeds 	Seals, sea lions, walrus: blubber, flippers, found mostly in temperate and polar waters	Homeotherms, endotherms	Teeth for capturing and eating prey	Viviparous, giving birth on land	Predators of mostly fishes, crab-eater seal filters water for krill, leopard seal hunts mostly seabirds, walrus feeds on clams and bottom invertebrates
Sea otter 	Dense, dark fur, dorsoventrally flattened tail, flattened hind feet, found only in northern and northeastern Pacific Ocean	Homeotherms, endotherms	Flattened teeth for capturing and crushing prey	Viviparous, giving birth at sea or on land	Predator of sea urchins and wide range of bottom invertebrates and fishes in kelp forest
Polar bear 	Dense, white fur, found in Artic region, mostly on drifting ice	Homeotherms, endotherms	Powerful jaws and teeth for capturing and eating prey	Viviparous, giving birth on land	Predator of seals
Sirenians 	Manatees, dugong: blubber, reduced hair, front flippers, paddle-shaped tail, tropical seas (one species only in fresh water)	Homeotherms, endotherms	Teeth as thick ridge pads for crushing vegetation	Viviparous, giving birth at sea	Grazers of seagrasses and other coastal vegetation
Baleen whales 	Blubber, streamlined body, reduced hair, front flippers, tail fluke, blowhole, found in all seas	Homeotherms, endotherms	Baleen on upper jaw for filtering small plankton	Viviparous, giving birth at sea in warm waters	Filter feeders of plankton and small fishes, mostly in polar waters; gray whale feeds on small animals (mostly amphipods) in soft bottoms
Toothed whales 	Blubber, streamlined body, reduced hair, front flippers, tail fluke, blowhole, found in all seas (some dolphins live in fresh water)	Homeotherms, endotherms	Conical teeth for capturing prey	Viviparous, giving birth at sea	Predators of fishes, squids, other marine mammals, and some large bottom invertebrates such as lobsters