

Charismatic Megafauna (Marine Mammals)

Marine Mammals

- Who's Who Among Marine Mammals**
- Adaptations**
- Whales and Whaling**

Review for Final Exam

Reading: 6.24-6.25

15.35-15.38
17.22

Graphic: Humpback whale breaching. Cmmdr. J. Bortniak, NOAA Corps, photographer. Courtesy of NOAA.

Classification of Marine Mammals

Cetaceans:

- Porpoises**
- Dolphins**
- Whales**

Carnivora (Pinnipedia):

- Seals**
- Seal lions**
- Walruses**

Sirenia:

- Manatees**
- Dugongs**

Graphic: (top) Manatee. National Marine Fisheries Service Historical Collection. Courtesy of NOAA,
(bottom) 38 Ma, Dorudon atrox skeleton at the Univ. of Michigan.

Traits Common to All Marine Mammals

- Streamlined body shape**

- Generate internal body heat**

- **Modified respiratory system**
- **Adaptations to salt water environment**

Graphic: Orca pod. Courtesy of NOAA.

Adaptations Common to Many Marine Mammals

Large body size

- **reduces heat loss**

Blubber/fat layer

- **insulates against cold**
- **stores food reserves**
- **aids in floatation**
- **improves streamlining**

Graphic: Walrus contemplating the photographer. Capt. B.Christman, photographer (NOAA Corps). Courtesy of NOAA Photo Gallery.

The Diving Reflex

Per kg of mass, marine mammals store more oxygen than humans most oxygen is stored in body tissues, not the lungs.

Graphic: Humpback whale's tails have distinctive markings which identify each individual. Cpt. B.Christman (NOAA Corps), photographer, courtesy of NOAA.

Seals and Sea Lions - What's the Difference?

Seals:

- **smooth heads**
- **use webbed hind feet spread vertically like the back fin of fishes**

Sea Lions:

- **protruding ears**
- **front flippers as paddles**

- hind limbs have greater range of motion

Both leave the ocean to mate and raise young

Graphic: Top: Monk seal. Dr. J.P. McVey, NOAA Sea Grant. Courtesy of NOAA. Bottom: Stellar sea lion. Capt. B. Christman, NOAA Corps. Courtesy of NOAA.

Whale Migrations and Navigation

Whales can migrate 1000's of kilometers

Many whales move between

-warm water wintering grounds

-cold water feeding grounds

Navigation

- based on sensing Earth's magnetic field

- fluctuations in the magnetic field may explain mass strandings of whales

Graphics: Modified from Garrison, 4th Ed., Box 15.2b (top) and 15.2a (bottom), pg 407.

Migrations, Whale Songs and Identification

During migrations, whales vocalize ("sing") to stay in contact

This is particularly important for young whales, who must remain near their mothers

A whale's song is as distinctive as its markings

Graphic: Humpback whales. R. Wicklund, OAR/National Undersea Research Program and Univ. of N. Carolina at Wilmington. Courtesy of NOAA.

Breaching and Spyhopping

Whales exhibit many complex behaviors

Breaching may help establish dominance

Spyhopping in coastal waters may help whales get their bearings

Graphics: Whale behavior (top) humpback breaching, (bottom) orca spyhopping, both courtesy of NOAA.

Giant Size from Tiny Food!

Baleen whales are the largest known animals

A diet abundant in plankton provides the energy that these giants need to survive

Graphic: Humpback whales feeding on krill, courtesy of NOAA.

Baleen Whales

Baleen:

- sheets of closely-spaced parallel plates
- used to strain food

Feeding strategies:

- sieve while moving forward
- lunging into schools of prey
- scooping mud from the bottom

Each feeding strategy corresponds to different body types

Graphic: Garrison, Fig. 15.41a.

Baleen Whale Species

Sieving (right, bowhead)

- large mouths
- long baleen fringes

Lunging (minke, blue, humpback, fin, sei)

- smaller mouths (that open wide)
- pleats or furrows in throat

Bottom feeders (grey)

- adapted for scooping sediment

Graphic: Garrison, Fig. 15.39 pg 436.

Toothed Whales

Toothed whales hunt using echolocation

(biological

equivalent of sonar)

Modifications of head and respiratory systems allow

- sending and receiving sounds over a wide range of frequencies
- focusing the direction of the sound they emit

Graphic: Garrison, Fig. 15.40.

Toothed Whale Species

Large brains for advanced sound processing

Prey depends on size

Small (porpoises, dolphins)

- small squids and fish

Larger (killer)

- fish, penguins, seals, sea lions, porpoises

Very large (sperm)

- giant squid

Graphic: Garrison, Fig. 15.39, pg 437.

A Timeline of the Whaling Industry

- | | |
|--------------|---|
| 1600s | First major commercial whaling |
| 1868 | Invention of explosive harpoon gun |
| 1900s | Use of motorized ships and "factory" ships |

1930s **Blue whales reduced to 4% of original numbers**

1946 **Formation of International Whaling Commission (IWC)**

Graphic: Whale fishery. From a painting by J.S. Ryder. NOAA Historic National Marine Fishery Service Collection.

A Timeline of the Whaling Industry

1979 **IWC moratorium on whaling (Indian Ocean) outlaws
use of factory ships**

1985 **Start of global commercial whaling moratorium**

1994 **Establishment of whale sanctuary (Antarctic waters)**

1994 **Grey whale is 1st marine mammal removed from US species list** **endangered**

Commercially extinct whales: fin, sperm, sei, blue, humpback

Graphic: Whaling vessels, New Bedford MA, 1901. C. Stevenson, 1902.

The Marine Mammal Protection Act (1972)

Bans:

(1) Taking of marine mammals in US territorial waters

(2) Imports of marine mammal products

(3) Taking of marine mammals on the high seas by persons or vessels subject to US jurisdiction

Significantly reduced the dolphin "bykill" from the tuna industry

Graphic: top: Dolphins in bow wake. Cmmdr. G. Tuell, NOAA Corps, bottom. Dolphin safe logo; Both Courtesy of NOAA.

Oceanography Final Exam