

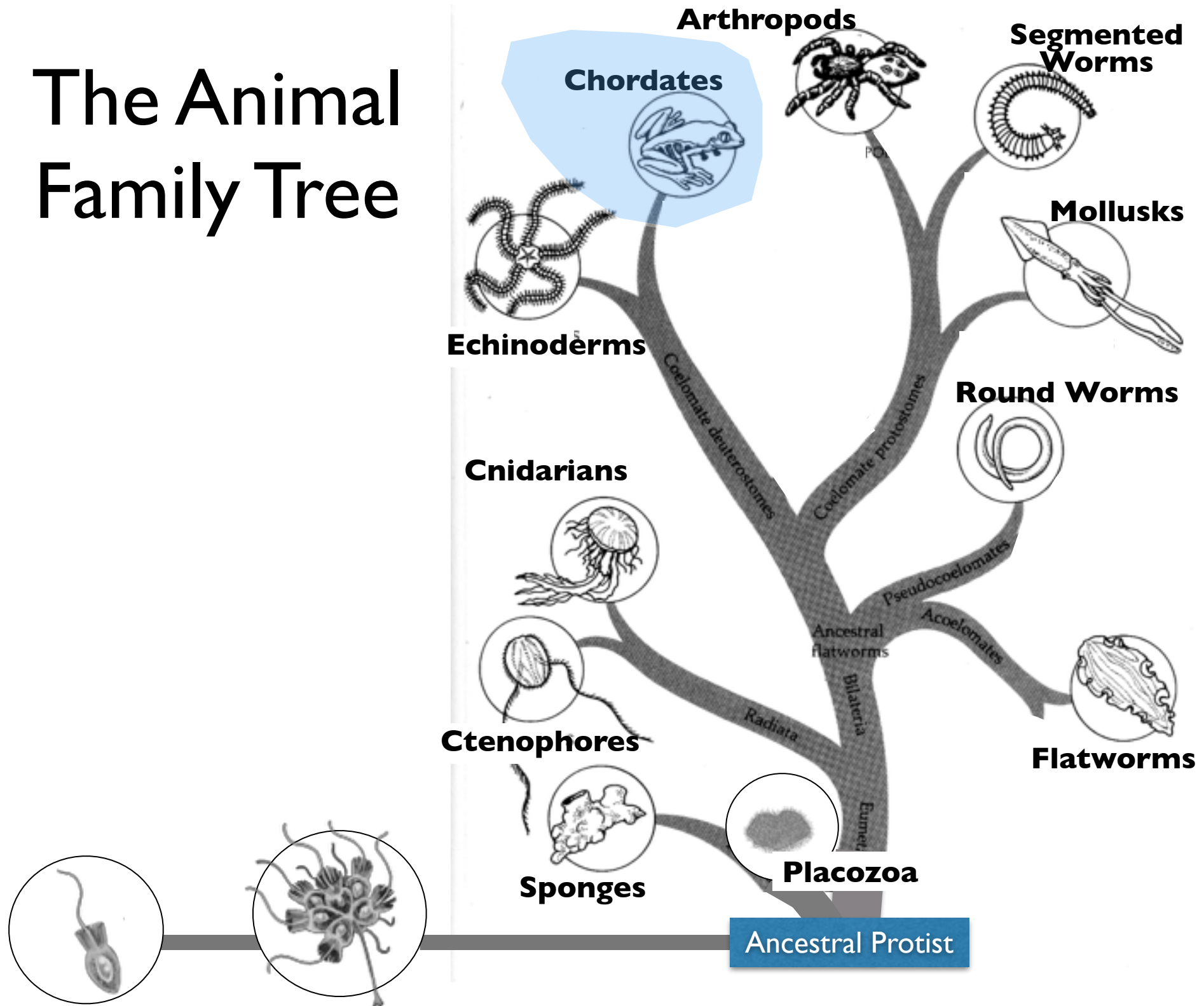
Marine Animals

II. The Chordates



OCN 20I Biology Lecture 7

The Animal Family Tree

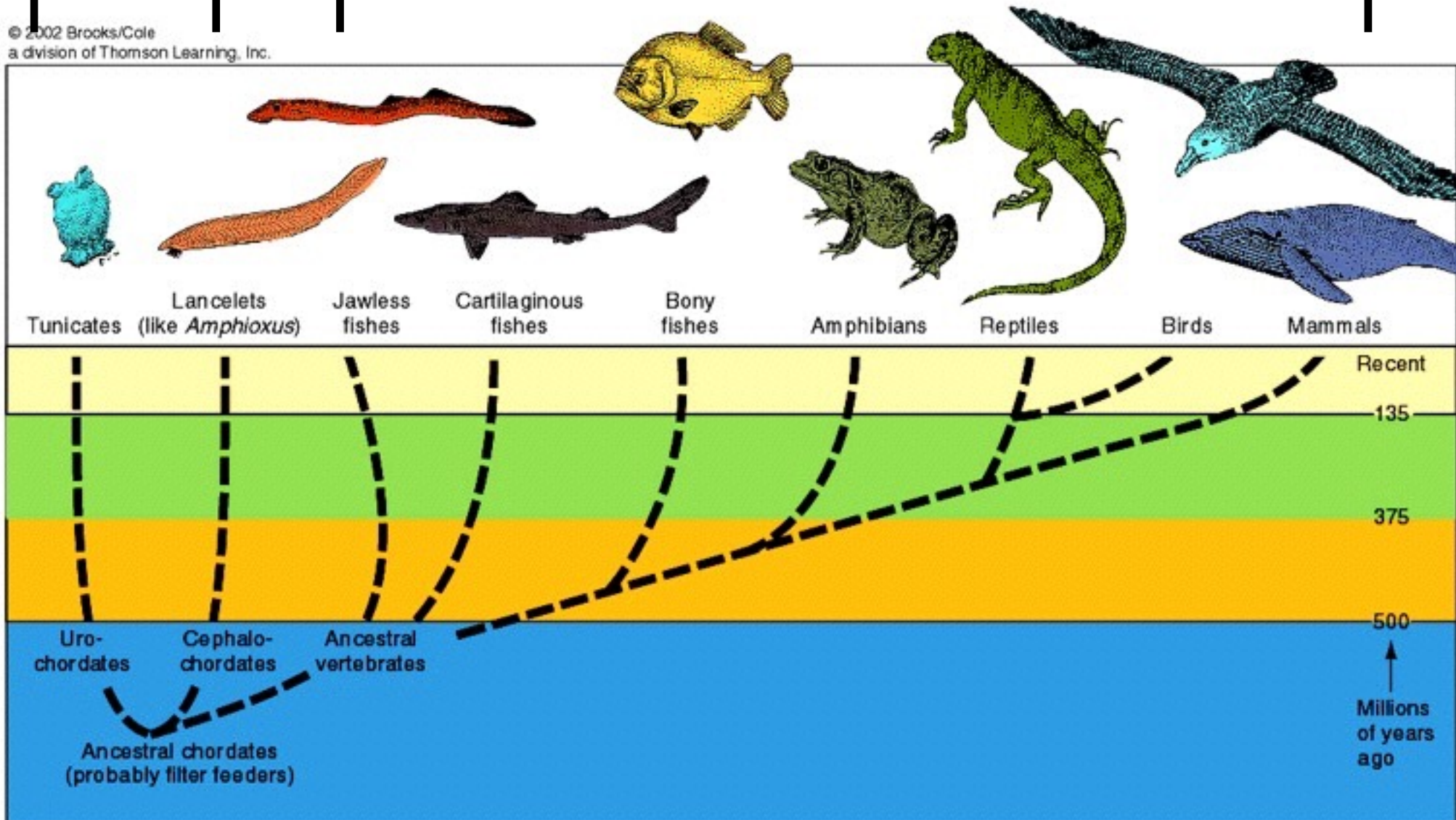


The Chordates

Invertebrates

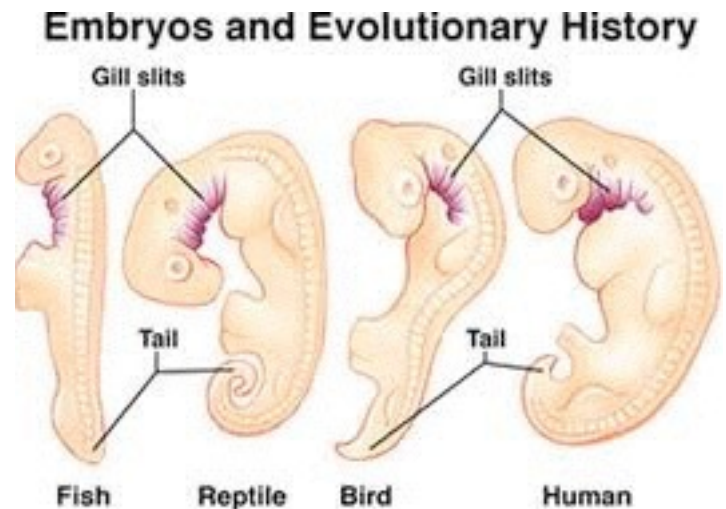
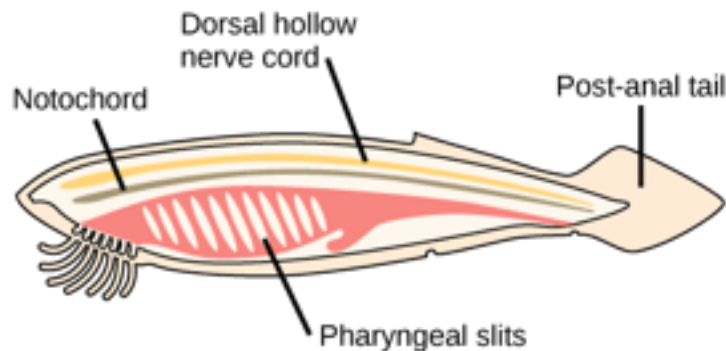
Vertebrates

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Chordate Features

- Presence of a notochord
- Dorsal hollow nerve cord
- Pharyngeal slits (originally for feeding, later modified)
- Post-anal tail



Invertebrate Chordates

Tunicates

- Pelagic or benthic
- Often colonial
- Suspension feeders



Lancelets

- Small fish-like
- Suspension feeder
- Can swim, but usually stays partly buried



Amphioxus

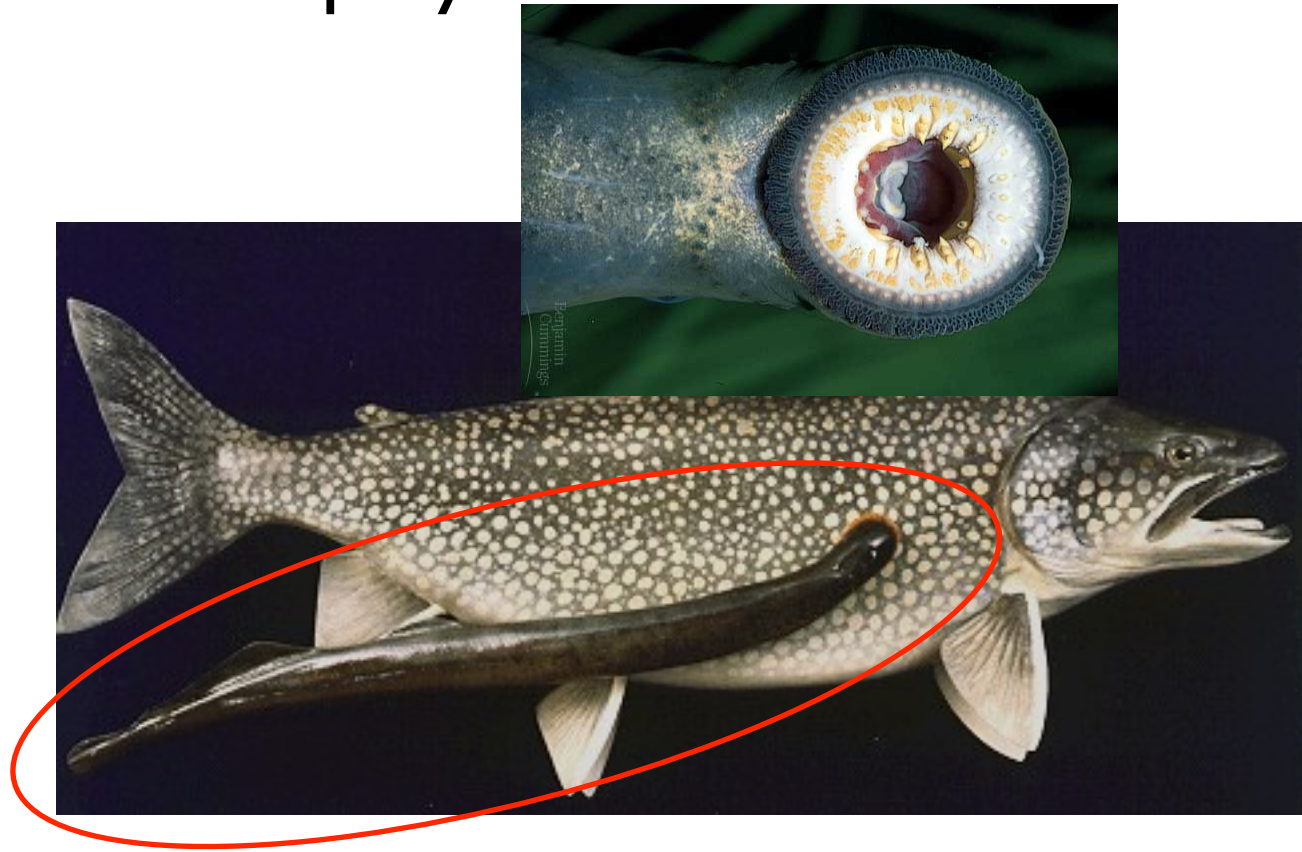
The Major Fish Groups

- Jawless fishes (Agnatha)
- Cartilaginous fishes (Chondrichthyes)
- Bony fishes (Osteichthyes)

Jawless Fishes

Lamprey

- No jaws
- No appendages
- Cartilaginous
- Parasites or Scavengers



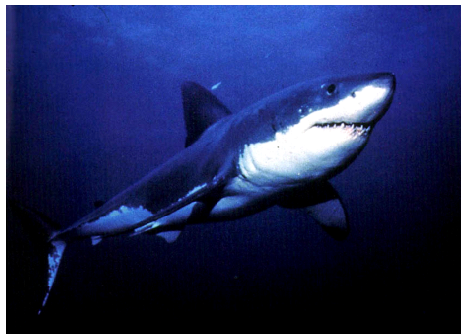
Hagfish



Cartilaginous Fishes

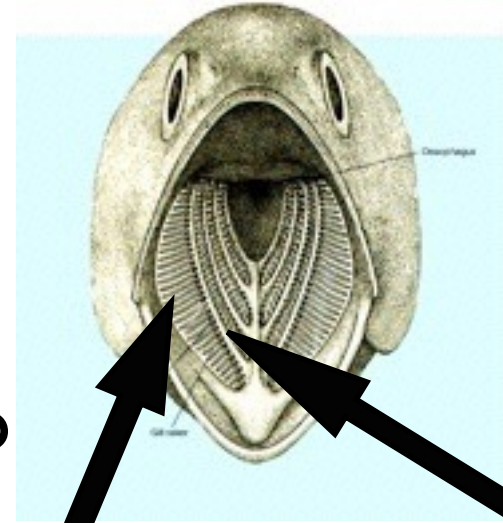
(Chondrichthyes)

- Sharks Skates and Rays
- Skeleton of cartilage
- Have jaws
- Carnivores or Planktivores



Chondrichthyes: Planktivores

- Planktivores (filter feeders) are largest
- Gaping mouth with small or no teeth
- Gill rakers
- Manta Ray (8 m across!)
- Whale Shark (up to 17 m lo



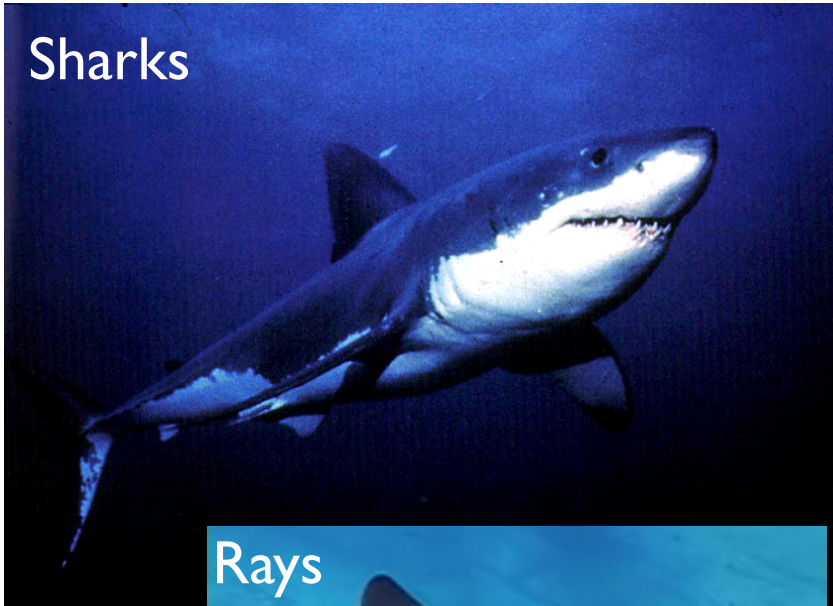
Gill Rakers

Gill Arch

Cartilaginous Fish: Carnivores

The Big

Sharks



Rays



...and the small

Cookie-Cutter Shark

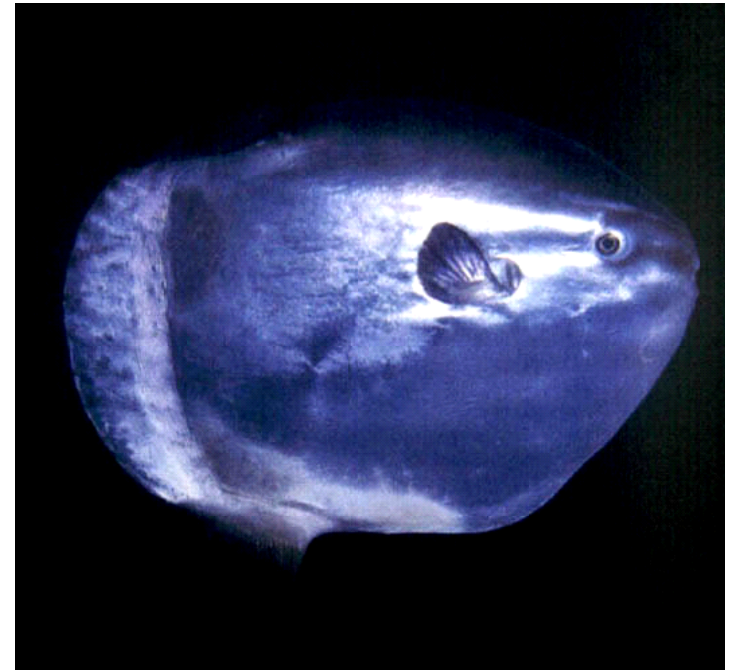
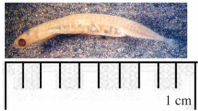


Goblin Shark with cookie-cutter shark wound

Osteichthyes

- 22,000 species
- From about 1 cm to 8 m
- Surface to deep ≥ 8370 m

Smallest, lightest:
Stout Infant fish



Most Massive:
Ocean sunfish (*Mola mola*)
Up to 1300 kg and 3 m tip to tip

Longest: Oarfish (3 to 10 m)

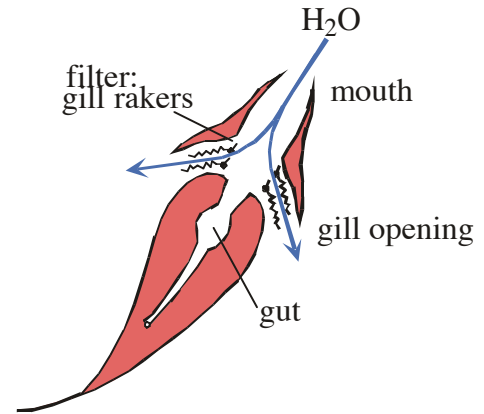
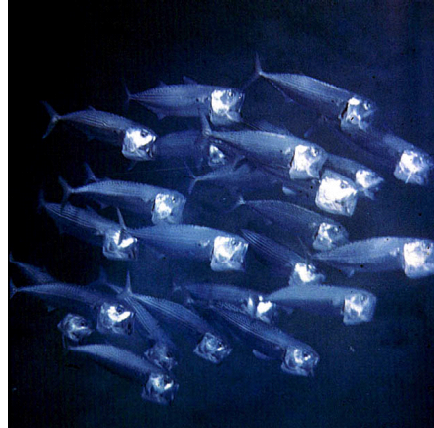


Examples of feeding strategies

Herbivores (algae)



Planktivores (Filter Feeders)



Predators



Parrot Fish - eats coral



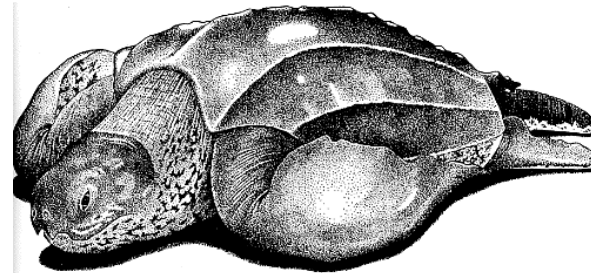
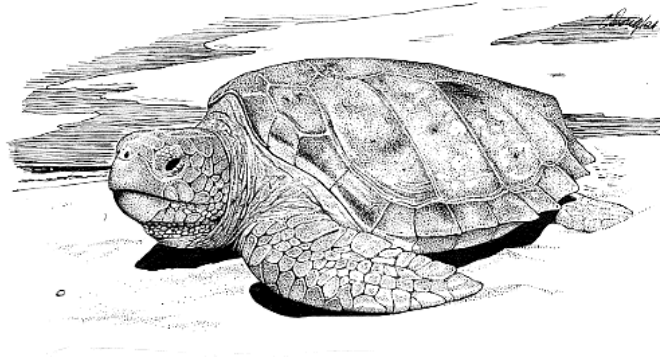
Tuna - eats fish

Reptiles, Birds, and Mammals



LARGEST?

- Loggerhead
- Leatherback
- Hawksbill
- Olive Ridley
- Green Sea Turtle
(*Honu*)



> 2 m long up to 1300 lbs

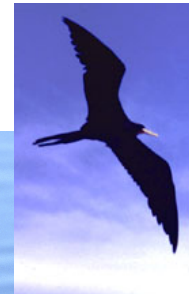
Other Marine Reptiles

Tropical West pacific/Indian Ocean

- Crocodile - one living marine species
- Snake - 50 species



- albatross, shearwaters
- gulls and terns
- pelicans, cormorants, frigate birds
- penguins



Mammals

Features:

- Endotherms (warm-blooded)
- Breathe Air
- Have Hair
- Live Young
- Milk Production in Females

Marine Mammals

(Class Mammalia)

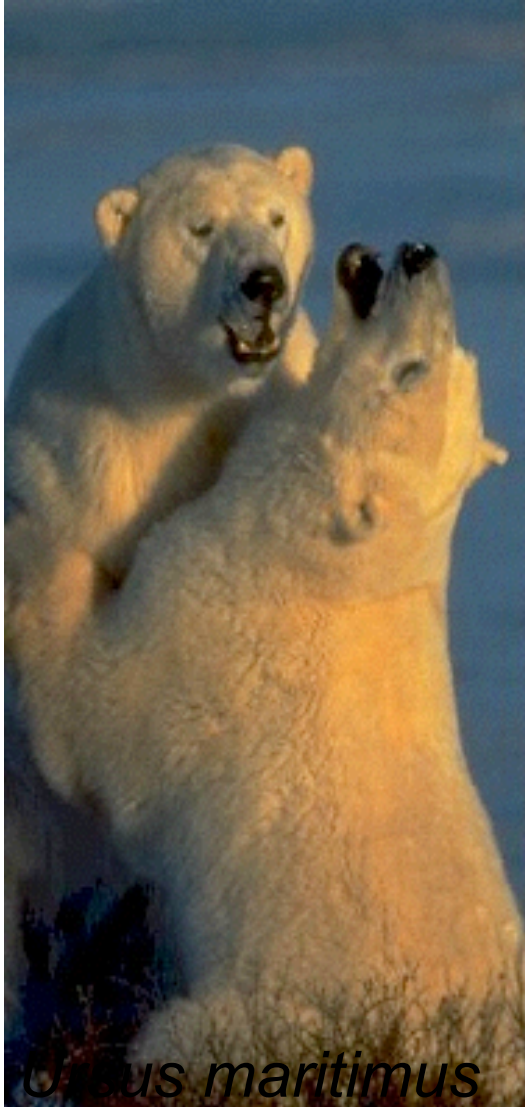
Carnivora - polar bears, sea otter, pinnipeds

Sirenians - dugongs and manatees

Cetaceans - whales and dolphins

CARNIVORA

Polar Bears



Ursus maritimus

Pinnipeds (seals and sea lions)

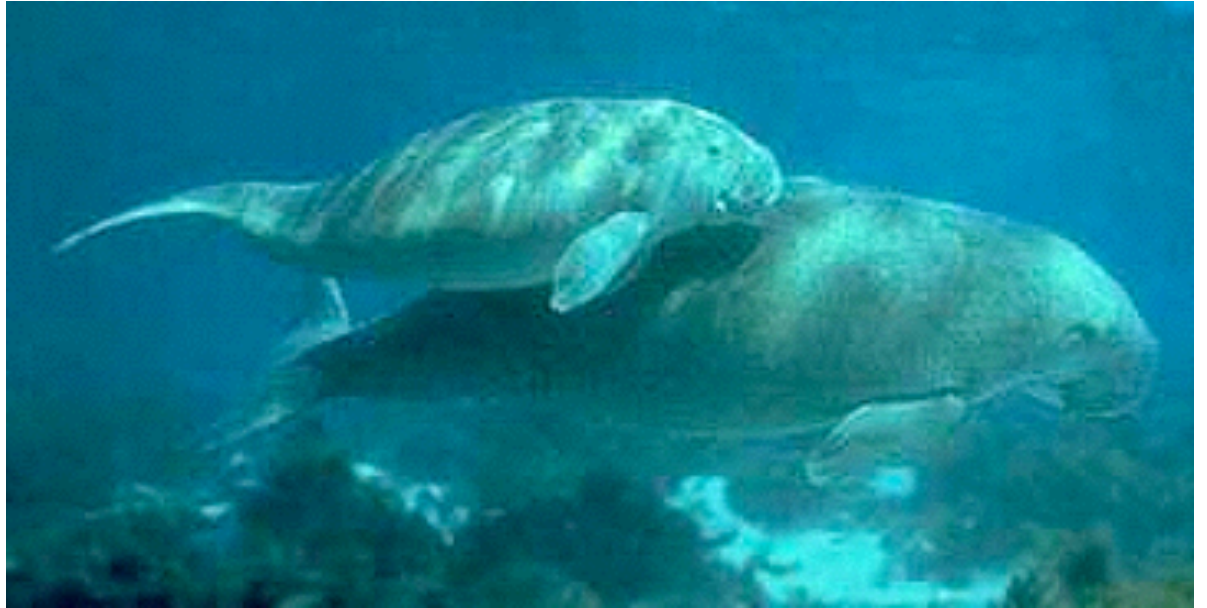


Sea Otters



Enhydra lutris

Sirenians



- dugongs and manatees
- Herbivores - eat sea grasses
- Near shore inhabitants of warm tropical waters
- Only ~2300 alive today

Cetaceans



Includes the whales, dolphins and porpoises

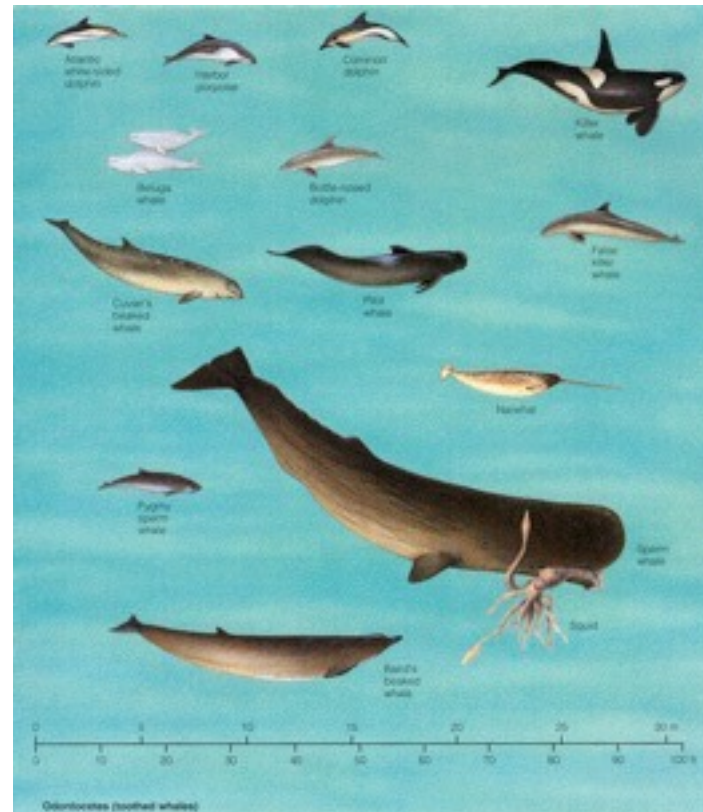
Two Sub-orders

- Mysticetes (11 living species)
 - large
 - baleen whales - filter feeders
 - 2 blowhole openings
- Odontocetes (about 67 species)
 - smaller
 - toothed whales, dolphins, and porpoises
 - 1 blowhole opening

Mysticetes (baleen whales)



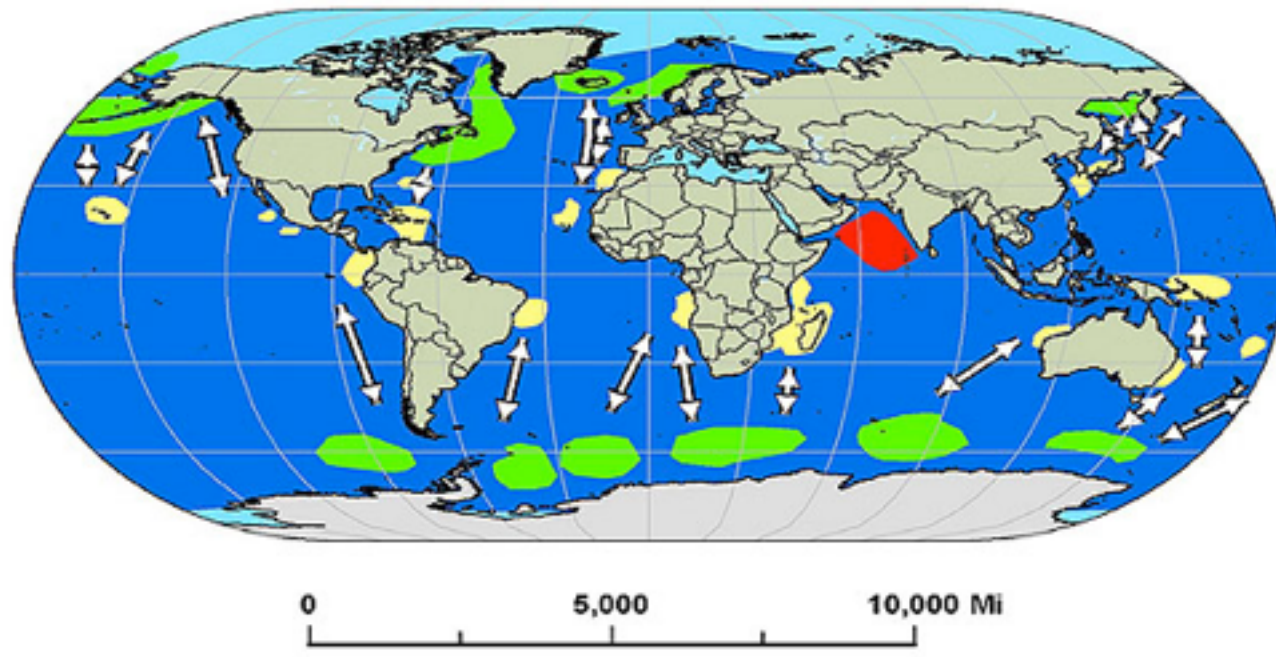
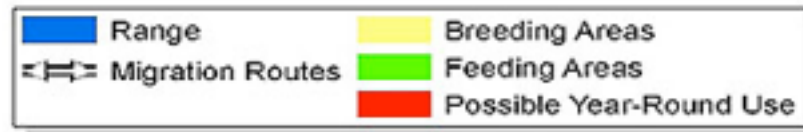
Odontocetes (toothed whales)



Baleen



Mysticete Migration patterns



Gray Whale



- Great whales migrate:
 - Polar feeding areas in the summer
 - Warmer breeding areas in the winter
- Gray whales - longest migration of any mammal, can cover 200 km per day!

Humpback Whale Surface Sightings and Estimated Surface Density 1993 - 2003

Data Courtesy of Joseph R. Mobley, Jr., Ph.D. NOAA Permit #810

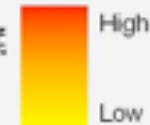
Humpbacks around Hawaii (Mid-December to May)



Map Key

- Whale Sightings
- Sanctuary Boundary
- 100 fathom isobath
- [---] Study Limit

Humpback Whale Surface Density



This map shows humpback whale surface sightings and estimated surface density based on aerial survey data provided courtesy of Joseph R. Mobley, Jr., Ph.D. NOAA Permit #810. Sighting data collected during 5 winters from 1993 through 2003. The surveys were conducted during humpback whale season from an airplane using trained spotters flying a transect grid pattern. Density is estimated only within the survey area. Time past the 1000 fathom isobath.

The surface density raster layer was created using the density tool in ESRI ArcGIS Spatial Analyst extension.

By definition, the Hawaiian Islands Humpback Whale National Marine Sanctuary boundary extends to the 100 fathom isobath as determined by nautical charts. All data depicted on this map are intended for visual purposes only, and are not intended for navigation or legal purposes.

Contact Information

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(808) 397-2651

hawaii.humpbackwhale.noaa.gov
humpbackwhale@noaa.gov

This map can be used to provide a general idea of where humpback whale densities or concentrations are highest. **There is always some risk of disturbing or colliding with humpback whales anywhere in Hawaiian waters during whale season** (roughly Oct. - May). On this map yellow (lower density) areas should not be viewed as areas where there are no whales, rather as areas where density is lower than in orange/red (higher density) areas. The terms in the map key: "High" and "Low," are relative terms.

The most recent research indicates that the Humpback population has been growing at a rate of 5-6% per year since 2003. It is possible that relative densities have changed slightly over time as well.

This map should not serve as the only source of information used to make a final determination of possible areas where humpback whales are found in high densities. In some instances it may be useful to reanalyze the source data for a specific location, but in all cases every effort should be made to obtain more detailed, fine-scale, location-specific information through local land or boat-based surveys.

The aerial survey data used only counts whales at the ocean surface. It may be inferred that this map is also representative of the distribution of whales below the surface, but there may be some areas where the whales stay at the surface more often and others where they stay below the surface more often.

