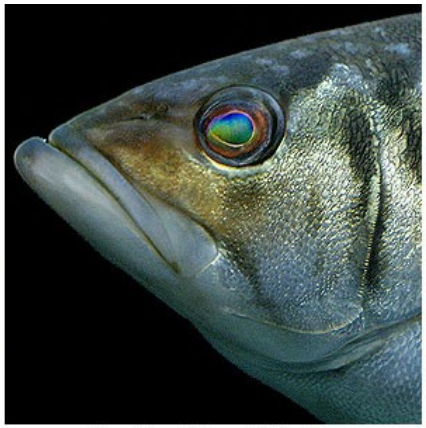
7 classes of subphylum vertebrata

Class Chondrichthyes: Hammerhead Shark



Class Osteichthyes: Kelp Bass

Class Amphibia: Tree Frog

Class Reptilia: Day Gecko

Class Aves: Broadbill

Class Mammalia: Caracal

- **Endotherm:** organism that can maintain a constant body temperature = warm blooded.

- **Ectotherm:** organism that cannot maintain a constant body temperature = cold blooded.

FISH

- **3 classes**:
  - Class Agnatha
  - Class Chondrichthyes
  - Class Osteichthyes

Class Agnatha Jawless fish
ex) lamprey & hagfish

- **Heart:** 2 chambers
- **Respiration:** gills
- **Fertilization:** external in H_2O
- **Egg:**
  - Small
  - No shell (must be in water or dries out)
  - Yolk (food)
- **Metabolism:** Ectotherm

Class Agnatha continued:

- **Skin:** scales
- **Other:**
  - **Notochord** but ***no*** bones at all
  - no jaws
  - Parasite on whales, fish & dolphins (lamprey – sucker like mouth, teeth & rasping tongue)
  - Scavenger on the ocean floor (hagfish)

- Lamprey

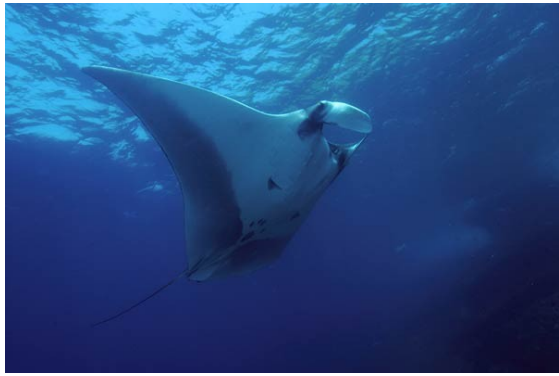
- Hagfish

Class Chondrichthyes Cartilaginous fish
ex) sharks, skates & rays

- **Heart:** 2 chambers
- **Respiration:** gills
- **Fertilization:** external in water or internal
- **Egg:**
  - Small
  - No shell
  - Yolk
- **Metabolism:** endotherm

- Skate

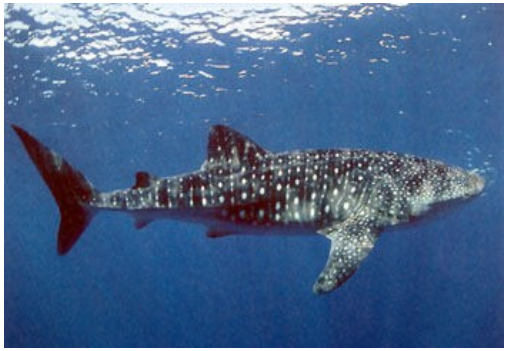
ray



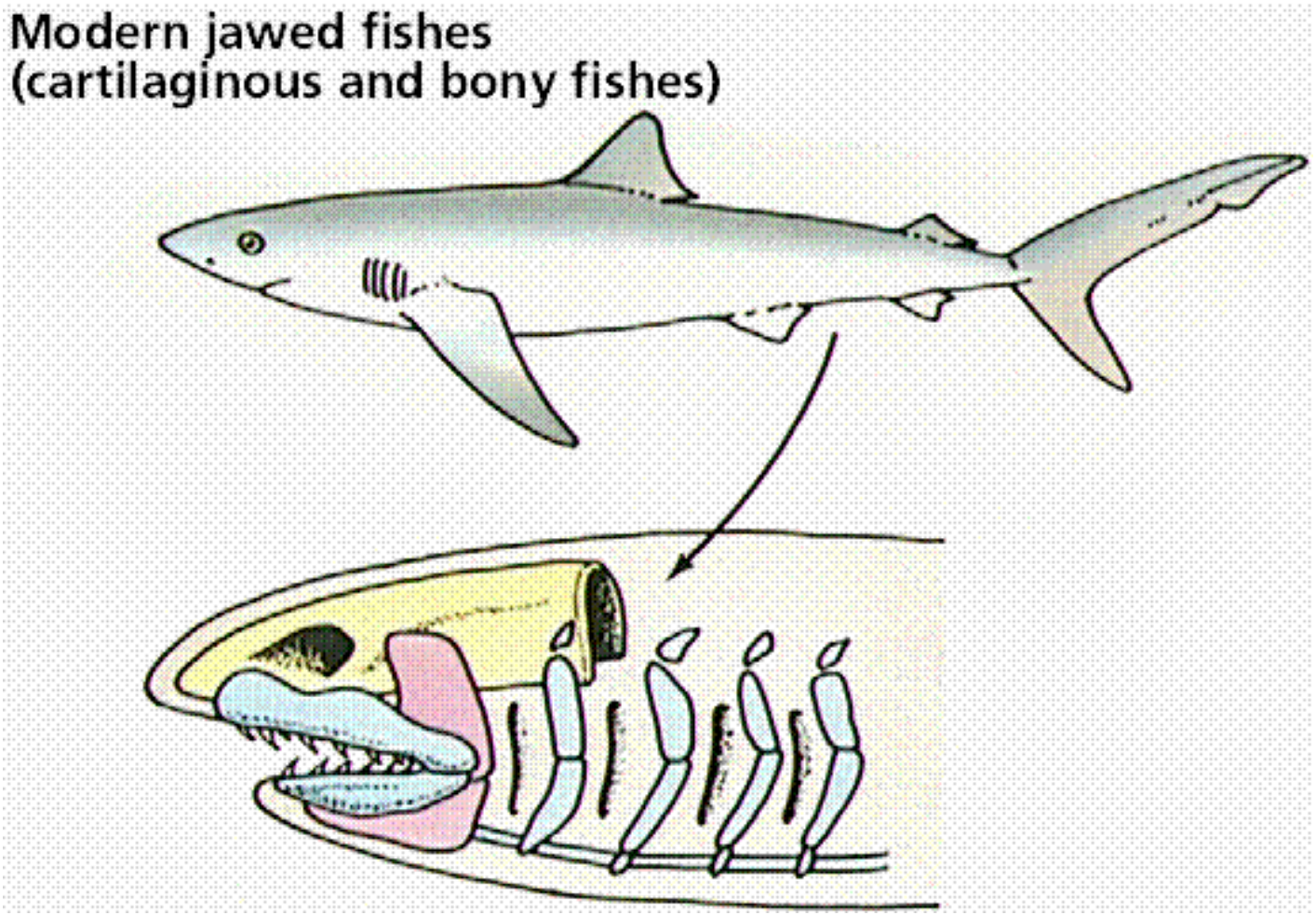
Class Chondrichthyes continued:

- **Skin:** scales & sensory organs

- **Other:**
  - Endoskeleton of cartilage
  - Sharks have rows of teeth



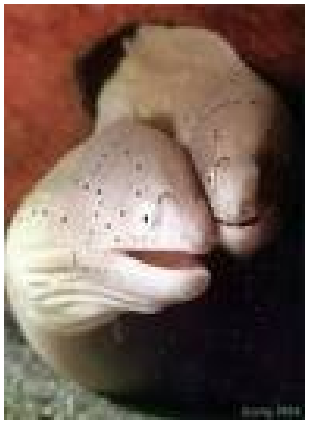
Modern jawed fishes
(cartilaginous and bony fishes)



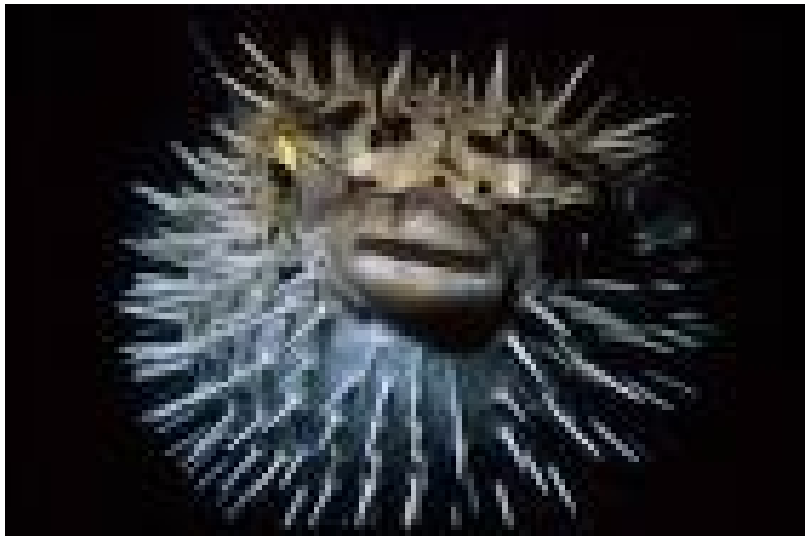
Class Osteichthyes: Bony fish

ex) salmon, eels, seahorse, trout, tuna, porcupine fish

- **Heart:** 2 chambers
- **Respiration:** gills
- **Fertilization:** external in water
- **Egg:**
  - Small
  - No shell
  - yolk
- **Metabolism:** ectotherm



Class Osteichthyes continued:



- **Skin:** scales
- **Other:**
  - **Swim bladder**: regulates buoyancy
  - Some species can spend time out of water (lungfish)

Class Amphibia

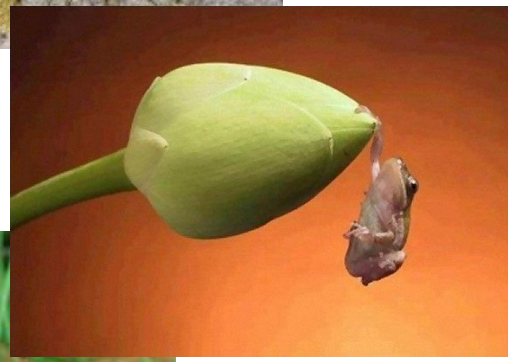
Ex) frogs, toads, newts, salamanders, caecilian (legless)

- **Heart:** 3 chambers
- **Respiration:** gills/lungs (inefficient), skin, and mouth lining
- **Fertilization:** external
- **Egg:**
  - Small
  - No shell
  - Yolk
- **Metabolism:** ectotherm

- caecilian

Class Amphibia continued:

- **Skin:**
  - **NO** claws or scales
  - Smooth, moist skin
  - Some have poison glands
- **Other:**
  - **No** ribcage – if skin dries out it will suffocate. So, tied to water
  - **Amphibia means:** "2 lives"; water (tadpole) & land (adult)
  - **Eats** insects, worms, small birds/fish/mammals



Class Reptilia

ex) snakes, turtles, alligators, crocodiles, lizards

- **Heart:** 3 chambers
- **Respiration:** lungs & ribcage (to protect the lungs)
- **Fertilization:** internal
- **Egg:**
  - Large
  - **Hard** shell (so won't dry out on land)
  - Yolk
- **Metabolism:** ectotherm

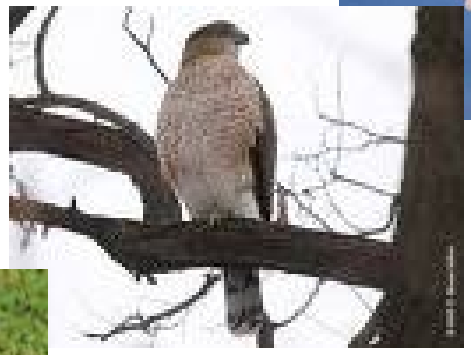
Class Reptilia continued:

- **Skin:**
  - Scaly, dry, leathery skin
  - Skin reduces water loss
- **Other:**
  - Skin must be shed as they grow – sluffing
  - O_2 & CO_2 exchanged through the shell so embryo can breathe

Class Aves

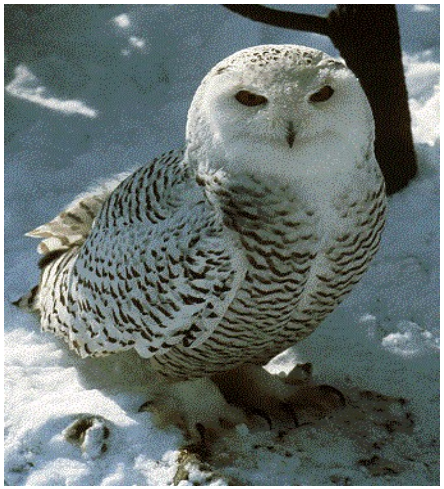
ex) hawk, eagle, penguin, robin, owl, ostrich

- **Heart:** 4 chambers
- **Respiration:** lungs, ribcage, alveoli (to increase gas exchange)
- **Fertilization:** internal
- **Egg:**
  - Large
  - **Hard** shell
  - Yolk
- **Metabolism:** endotherm



Class Aves continued:

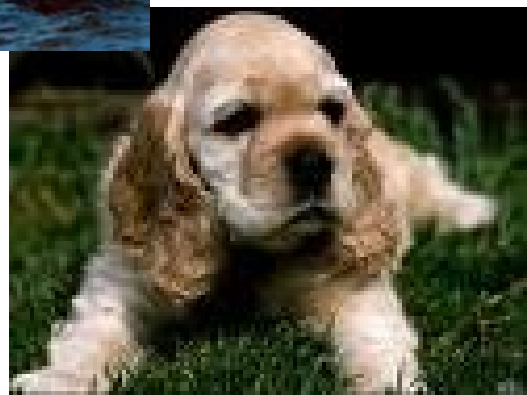
- **Skin:** covered with feathers
- **Other:**
  - Special features for flight
  - **Archaeopteryx** = first bird – in fossil record – links reptiles & birds



Class Mammalia

ex) humans, cats, dogs, horses, koala, whale, duckbilled platypus

- **Heart:** 4 chambers
- **Respiration:** lungs, ribcage, alveoli, diaphragm
- **Fertilization:** Internal
- **Egg:**
  - Small
  - No shell
  - Very little yolk
  - Exception: monotremes
- **Metabolism:** endotherm



Class Mammalia continued:

- **Skin:**
  - covered with fur or hair
  - may have sweat glands
- **Other:**
  - Mammary glands: produce milk to feed young
  - 3 reproductive groups
  - Extinction of dinosaurs allowed mammals to diversify