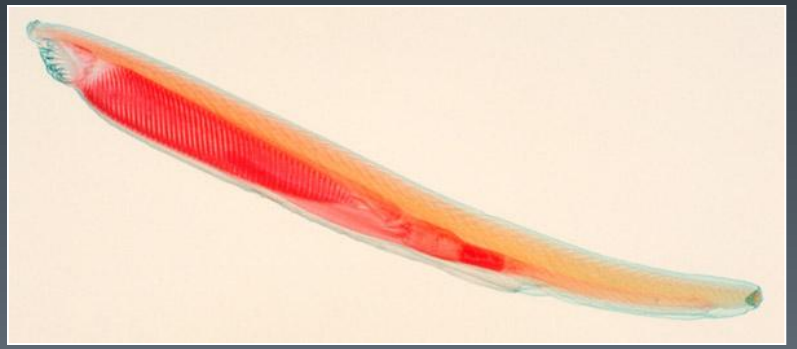
Chapter 12 – Marine Fishes

Marine Protochordates

- Phylum: Chordata (nerve cord)
- Subphylum: Protochordata – *first chordates/primitive*
  - Primitive species of marine vertebrates
  - Do not have *advanced* features (backbone)
- **Sea Squirt (Tunicate)**:
  - Aquatic
  - Larva have a nerve chord and gill slits – disappears in mature organisms
- **Lancelet**:
  - Aquatic
  - Have a nerve cord as adults

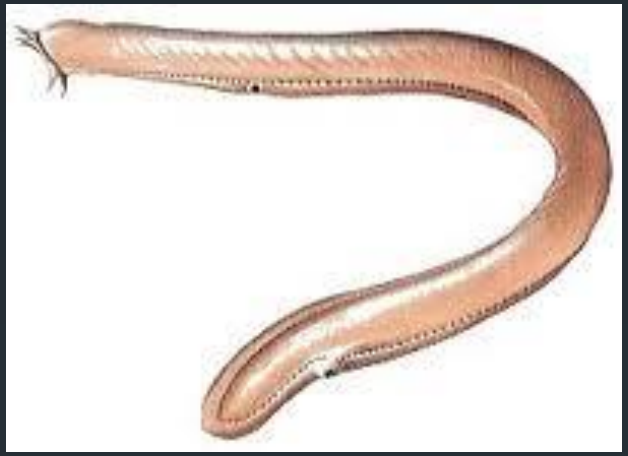


Marine Fishes

- Phylum: Chordata
  - *All chordates have*: notochord, pharyngeal slits, postanal tail, nerve cord
- Subphylum: Vertebrata
  - *All vertebrates have:* nerve cord, closed circulatory system
- Most vertebrates in the ocean are fishes
- **Fish**:
  - Aquatic
  - Have scales, fins, gills
- 3 Classes of Fishes:
  1. Agnatha (jawless fishes)
  2. Chondricthyes (cartilaginous fishes)
  3. Osteichthyes (bony fishes)

Agnatha: Jawless Fishes

- First fish to evolve – very primitive.
- No jaw, no true backbone (notochord).
- Bodies are long, flexible.
- Cartilaginous skeletons.
- **2 types of jawless fish**:
  1. Sea Lamprey
  2. Hagfish



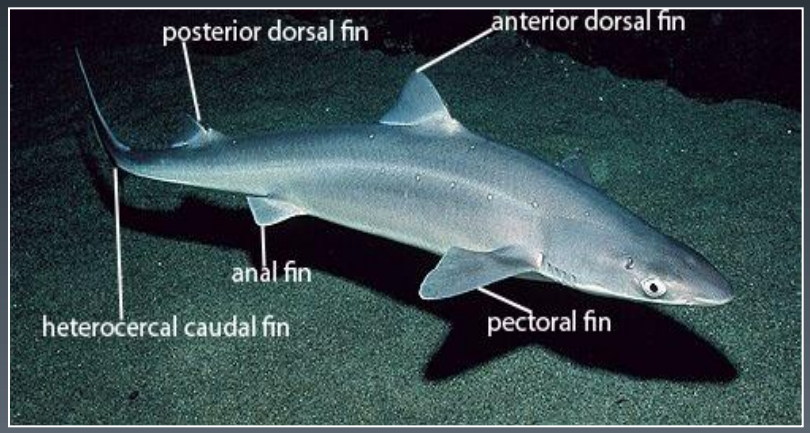
Agnatha: Jawless Fishes

- **Sea Lamprey – parasitic**
  - *Petromyzon marinus*
  - attaches to host using a sucking disc and uses rough tongue to bore hole into host.
  - Found in estuaries along Atlantic coast.

- **Hagfish- scavenger**
  - *Myxine glutinosa*
  - Uses sharp teeth in round mouth to burrow into dead or dying organisms.
  - Atlantic and Pacific species.

Chondricthyes: cartilaginous fishes

- Nearly 1000 species.
- **Skeletons are made of cartilage** (flexible tissue like our ears)
- Placoid scales (very rough, tooth-like)
- NO gill cover (operculum)
- Visible gill slits, spiracles
  - Water enters through spiracles and then over gills
- Rigid fins
- Ventral mouths
- Live births for most



Chondricthyes: skates and rays

- Rigid fins help to provide lift when swimming.
- Have over-developed pectoral fins (like wings).
- Bottom-dwellers.

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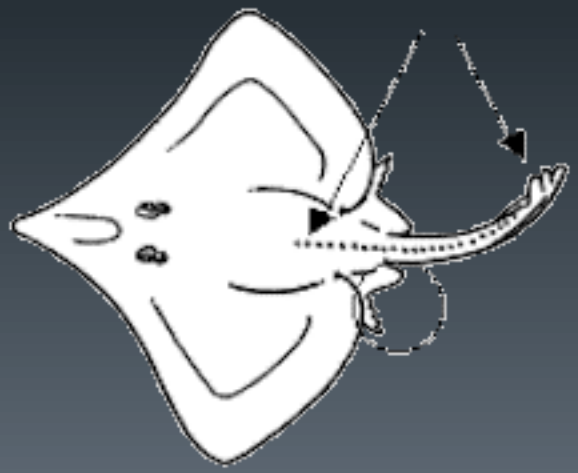
Chondricthyes:

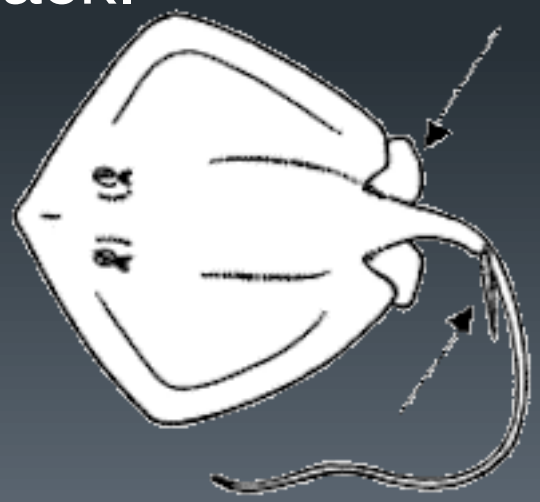
Skates (*Myliobatiformes*)

- Pelvic fins have 2 lobes
- Thick tail, no stinging spine
- Enlarged scales along the back.



Rays (*Rajiformes*)

- Pelvic fins have 1 lobe
- Thin, whip-like tail with a stinging spine.
- No scales along mid-line of back.

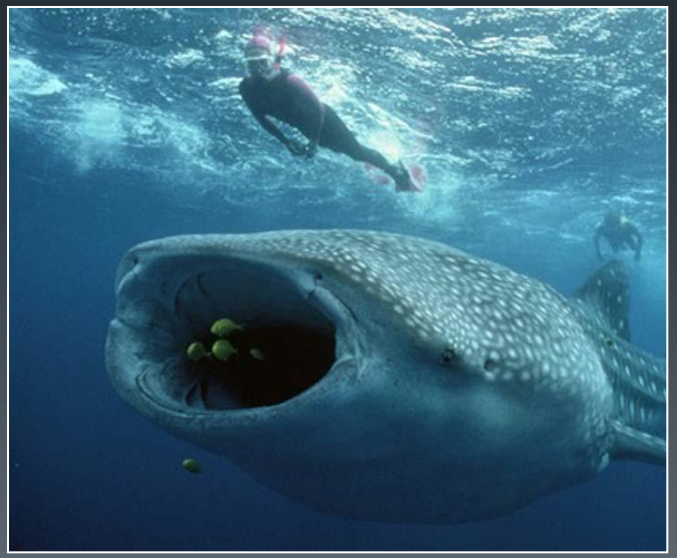


Chondricthyes: reproduction in skates & rays

- **Internal** fertilization.
- Skates have external development – embryos develop in an egg casing (**oviviparous**).
  - *Mermaid's Purse*
- Rays have internal development - give birth to live young (**viviparous**).

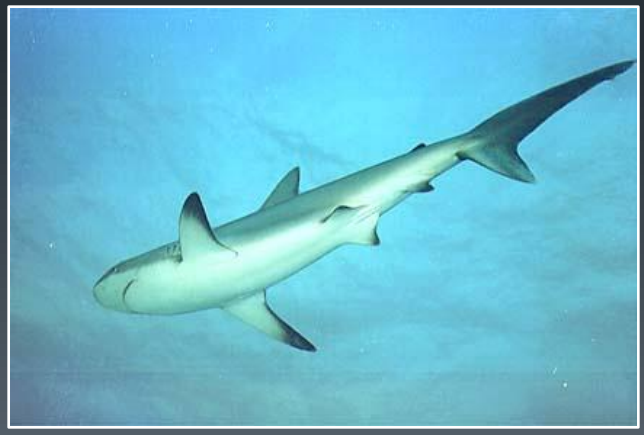
Chondricthyes: sharks

- 400+ species of sharks.
- Filter feeders (basking shark) and predators (great white).



Chondricthyes: shark behavior

- Streamlined body allows for quick swimming.
- Several rows of sharp teeth help predators feed.
  - Rows are constantly being replaced.
- Swimming: shark breathe more efficiently when swimming (ram breathing)
  - moves water over gills.
  - Resting sharks breathe by buccal pumping.
  - Very large, oily liver for buoyancy.



Chondricthyes: shark reproduction

- **Internal** fertilization.
- **Claspers** in males transfer sperm into the female.
- Most have internal development; give birth to live young (**viviparous**)

Chondricthyes: sharks

- **SHARKS HAVE 7 SENSES**:

1. **Lateral line:**
   - a sensory organ that helps sharks pick up **vibrations and pressure changes in water**. Runs length of the body.

2. **Scent:**
   - can smell some things 10,000x better than us
   - Can **smell** a drop of blood from far away – hundreds of meters.

3. **Sight:**
   - excellent eye sight.
   - can see under water from 0-50 meters.

Chondricthyes: sharks

4. **Ampullae of Lorenzini:**
   - Nerve receptors in tiny pores on head
   - Sense weak electrical charges generated by the muscles of other fish, prey in water.
5. **Hearing:**
   - Very sensitive– works over far distances.
   - Ears are small opening on top of head.

Chondricthyes: sharks

6. **Taste:**
   - Tastebuds on palate determine if things are edible – if yes, it is eaten, if not, it is spit back out.
7. **Touch:**
   - curiosity will often lead to sharks nudging things with their snout.

- Discovery:

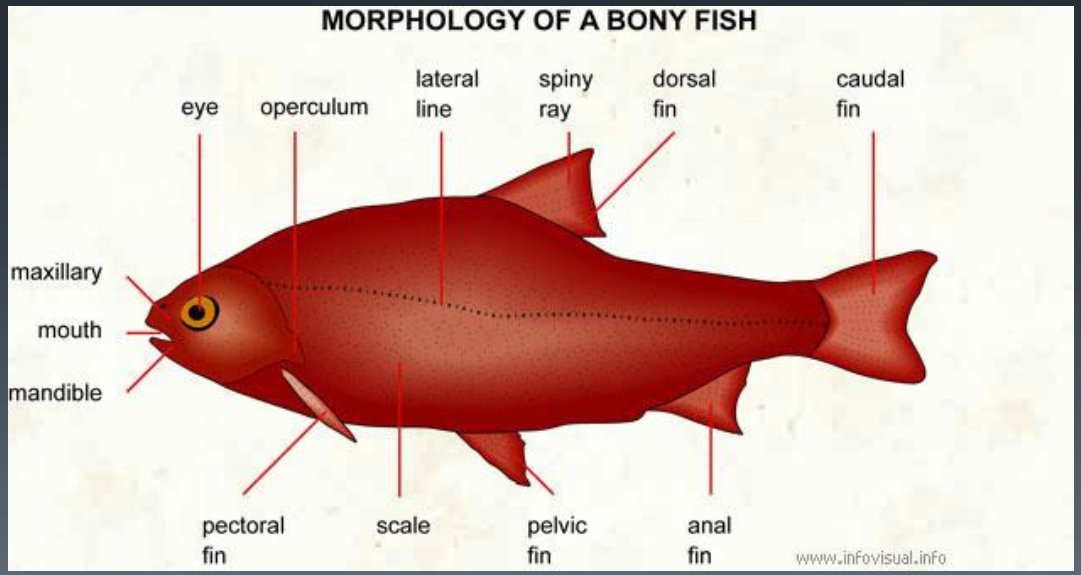
  http://www.discovery.com/tv-shows/shark-week/videos/sharks-survive-by-their-senses/
- Nat Geo:

  http://video.nationalgeographic.com/video/worlds-deadliest/deadliest-shark-senses
- PBS:

  http://www.pbs.org/video/2365721038/

Osteicthyes: Bony Fishes

- More than 95% of all fish belong to this class.
- Bony skeleton
- Gills are covered - operculum
- Slimy scales, loosely attached to skin.
- Swim using fins, paired pectoral and pelvic fins



Osteicthyes: Bony Fishes

Ray-finned

- Most fish are this type
- Fins are supported by bony structures called rays.

Lobe-finned

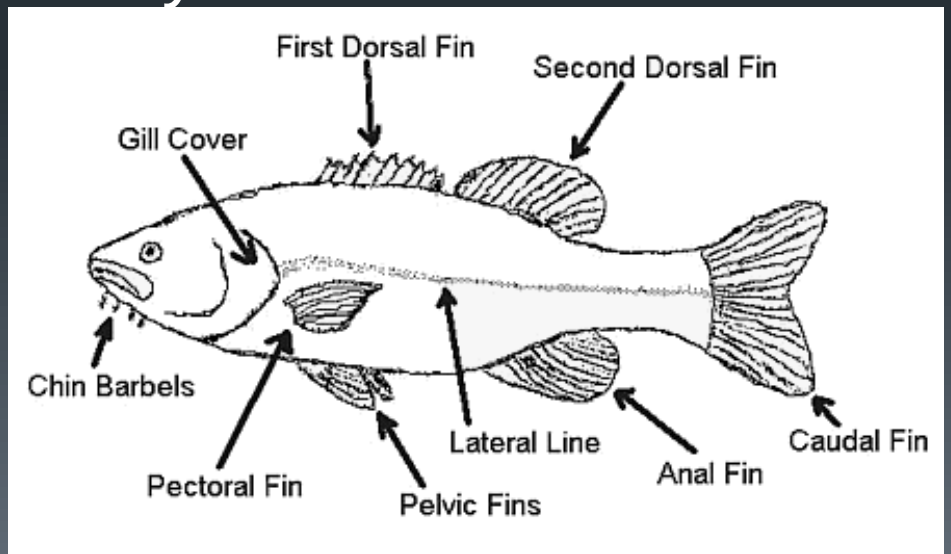
- Fins are long, fleshy, muscular, supported by central core of bones.
- Thought to be ancestors of amphibians

Osteicthyes: Bony Fishes

- Eye: used for sight; bulges out so that it can take in as much light as possible to see more, one on each side of head for wide field of vision.
- Fins: used to move through water.
  - **Nekton**: fish that can swim (*plankton can't swim*)
  - Paired fins are attached to muscles - movement.
  - Single fins stabilize
- Mouth: used for feeding; position of mouth can tell you what type of feeder it is.

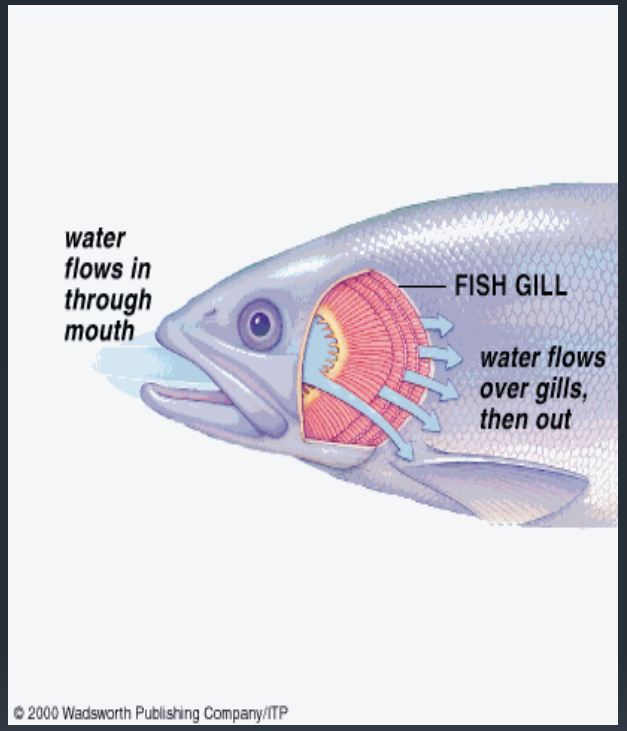
Osteicthyes: Bony Fishes

- Nostrils (nares): for smelling; nerve endings inside detect chemicals in the water.
- Lateral Line: sensory cells along the side of the fish receive sound waves and send electrical impulses to brain.
- Operculum: flap of tissue that covers the gills; opens and closes every time a fish breathes.



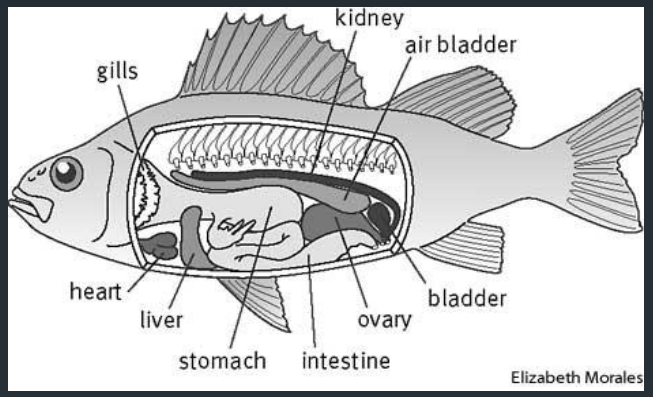
Fish Respiration

- Gills are covered by the operculum.
- Water flows over gills as fish opens mouth and swims.
- O_2 diffuses from the water into the blood.



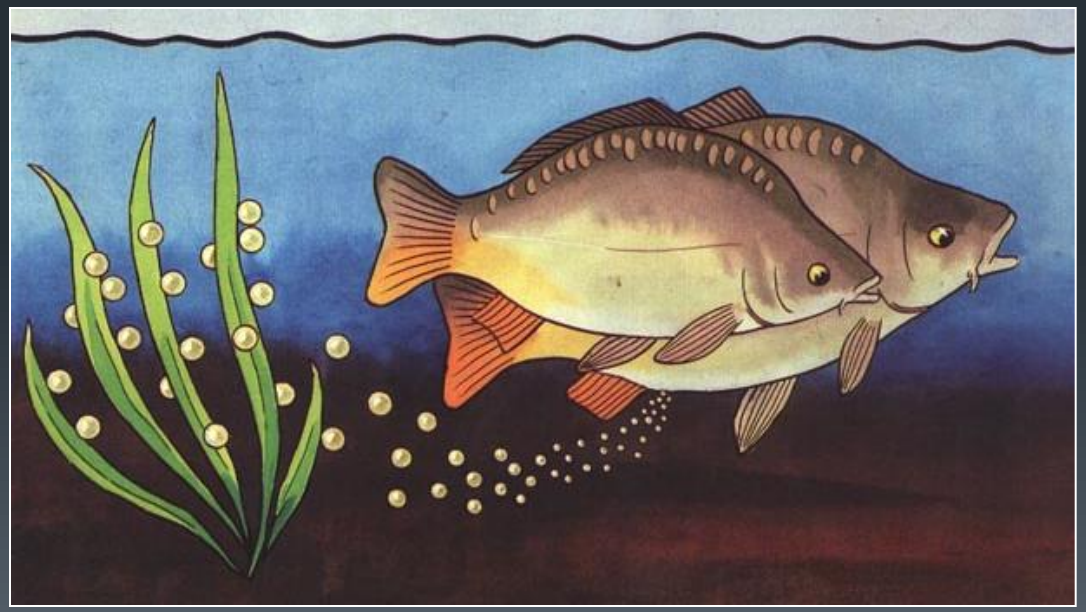
Osteicthyes: Bony Fishes

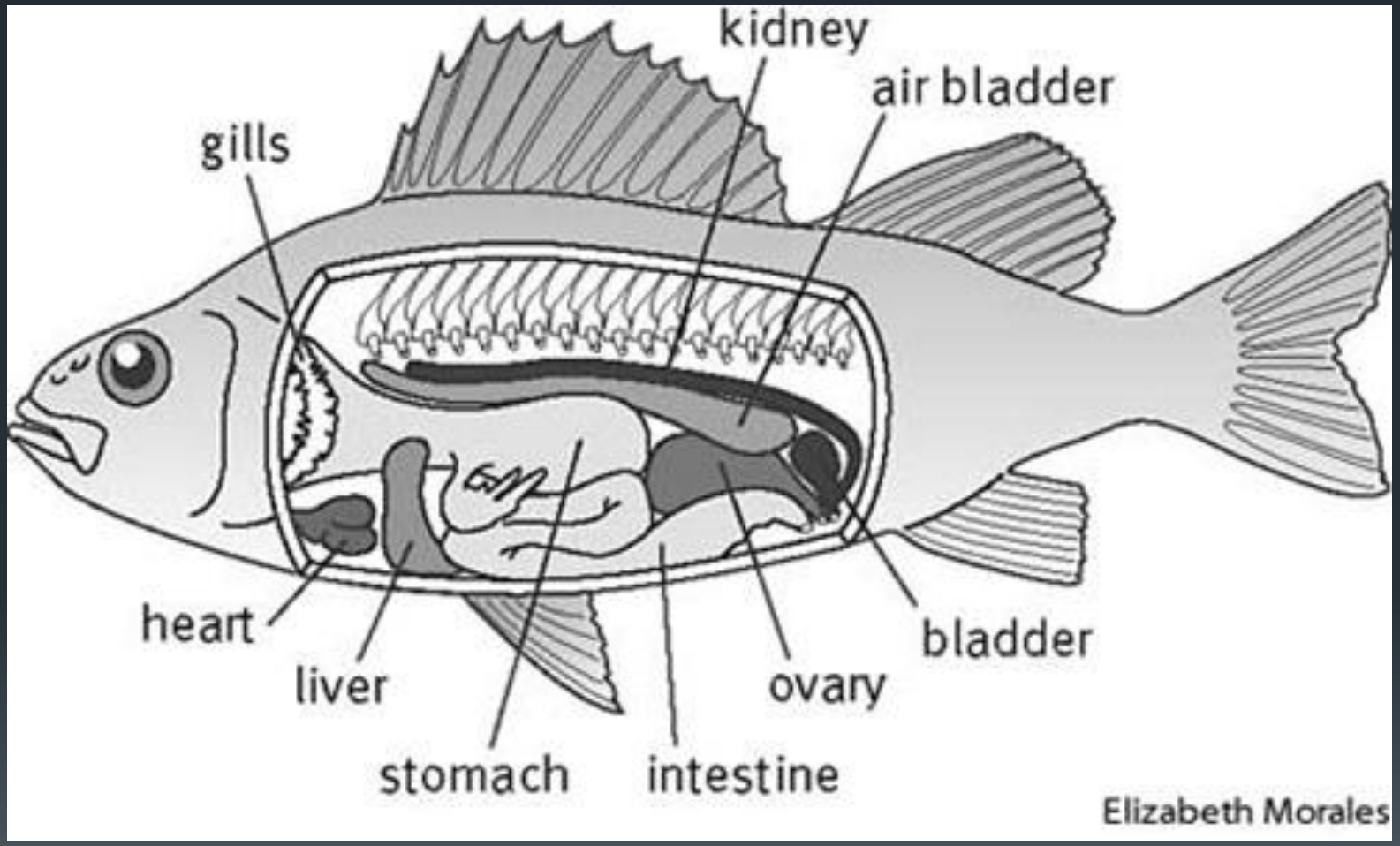
- Gills: used for respiration.
- Heart: pumps blood through fish; 2 chambers.
- Liver: removes toxins from blood.
- Stomach, intestine: digestion of food.
- Kidney: filters out waste from blood.
- Swim bladder/air bladder: gas-filled sac inside fish; fills with air to float; deflates to sink.
- Ovary: reproductive organ.



Fish Reproduction

- Most fish reproduce sexually, and fertilize their eggs externally (sharks do this internally).
- Spawning: the process of fertilizing eggs.
- Baby fish are called FRY.




kidney
air bladder
gills
heart
liver
stomach
intestine
ovary
bladder
Elizabeth Morales