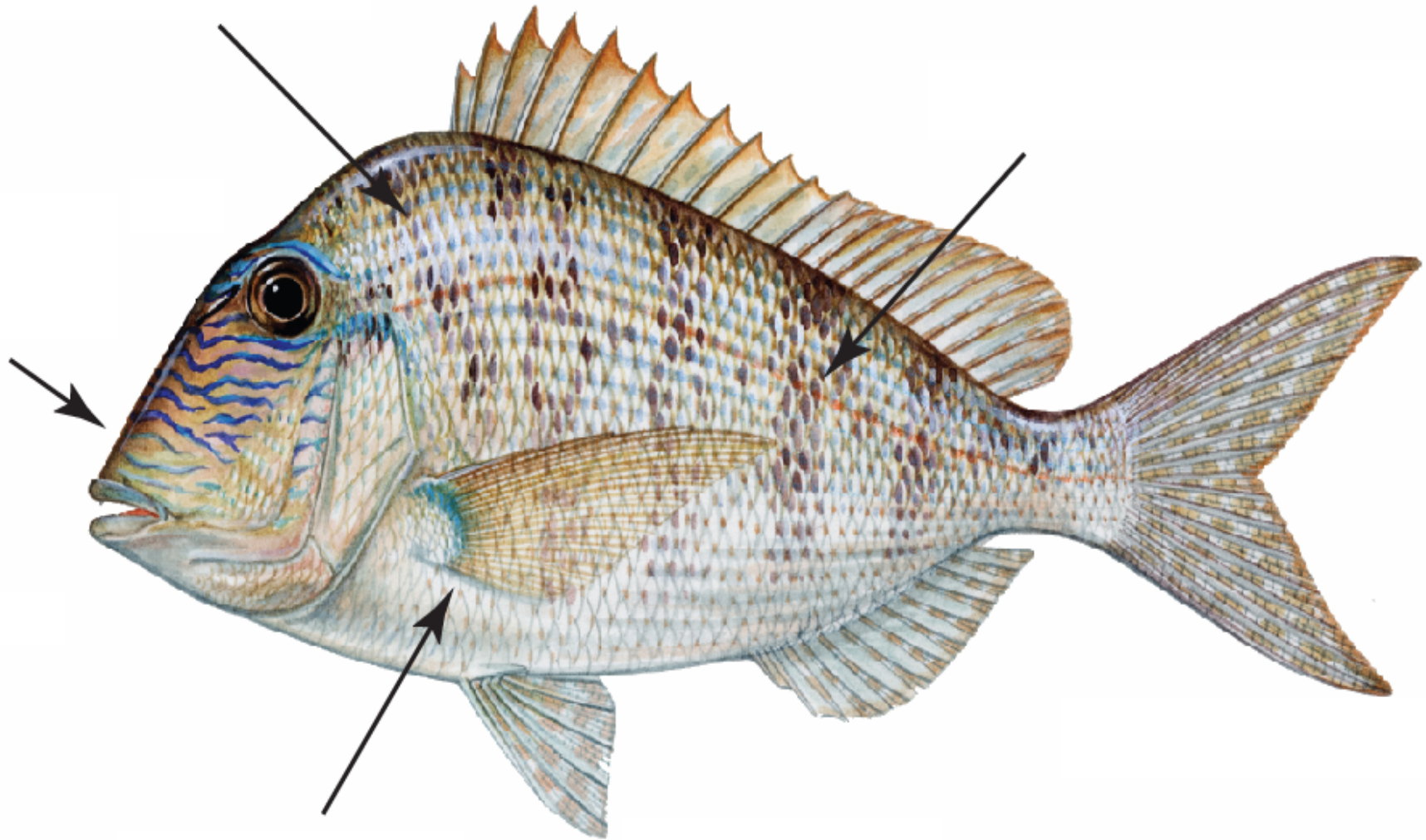


# Something's Fishy...



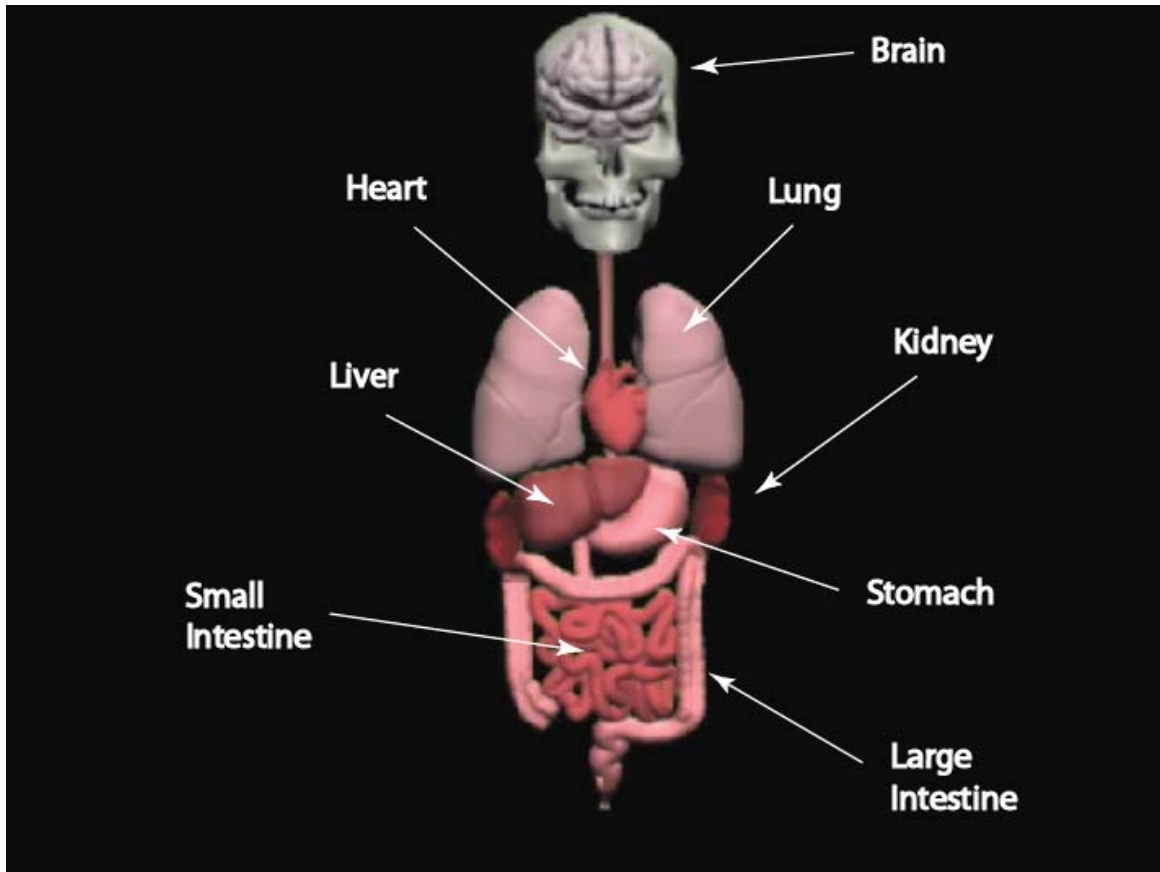
**an anatomy lesson for  
middle school students**

# External Anatomy of a Bony Fish



# Internal Anatomy: Human

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- Six Organ Systems:
  - Circulatory\*
  - Digestive\*
  - Excretory\*
    - Urinary
  - Nervous
    - Endocrine
  - Reproductive\*
  - Respiratory\*

# Circulatory System: Human

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- ❑ Main function: delivery of materials throughout the human body.
- ❑ Includes:
  - Blood
  - Blood vessels
  - Lymph and lymph vessels
  - Heart

# Digestive System: Human

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- ❑ Main function: break down and process proteins, carbohydrates and fats.
- ❑ Includes:
  - Mouth
  - Tongue
  - Stomach
  - Liver
  - Gall bladder
  - Pancreas
  - Small intestine
  - Large intestine
  - Anus

# Excretory and Urinary Systems: Human

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- ❑ Main function: removal of metabolic wastes, such as carbon dioxide, water, salts and urea from the body.
- ❑ Includes:
  - Kidneys
  - Ureters
  - Urinary bladder
  - Urethra

# Reproductive System: Humans

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- Main function: reproduction, continuation of life
- Includes:
  - Male sex organs
  - Female sex organs

# Respiratory System: Humans

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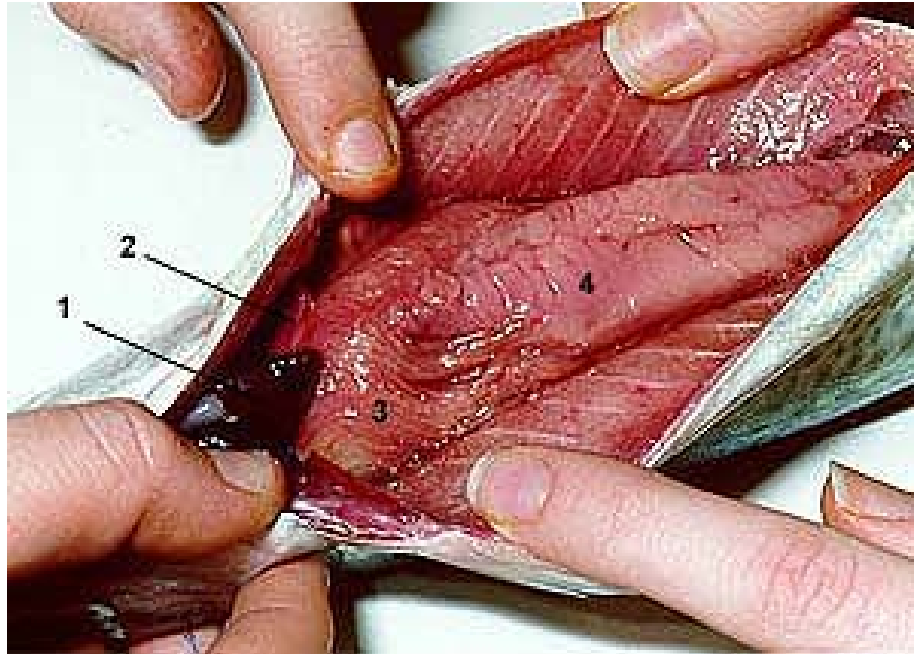
- Main function: breathing and gas exchange
- Includes:
  - Lungs
    - Bronchi
    - Bronchioles
    - Alveoli
  - Network of passageways
  - Diaphragm



# Fish Dissection: Organ Identification

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1. Heart
2. Liver
3. Pyloric caecae
4. Adipose, fatty tissue



# Definitions

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- Heart
  - The heart of slow moving fish are small, whereas active swimming species are large.
  
- Liver
  - The liver has many digestive and storage functions. One of these is the production of bile, a solution which emulsifies fats.
  - The liver is also responsible in some species for the storage of fats, blood sugar, and vitamins A and D.
  
- Pyloric Caecae
  - Pyloric caecae are fingerlike pouches connected to the gut.
  - Pyloric caecae may play a principal role in protein digestion.

# Fish Dissection: Organ Identification

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- ❑ Pull the adipose tissue (1) and gut (2) aside to expose the swim bladder (3), gonads (4) and kidneys (5).
- ❑ As a general rule, carnivorous fishes have relatively short guts. Herbivorous fishes have much longer guts.
- ❑ The gonads and kidneys are paired. One of each can be seen on both sides of the swim bladder.

# Definitions

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## □ Gonads

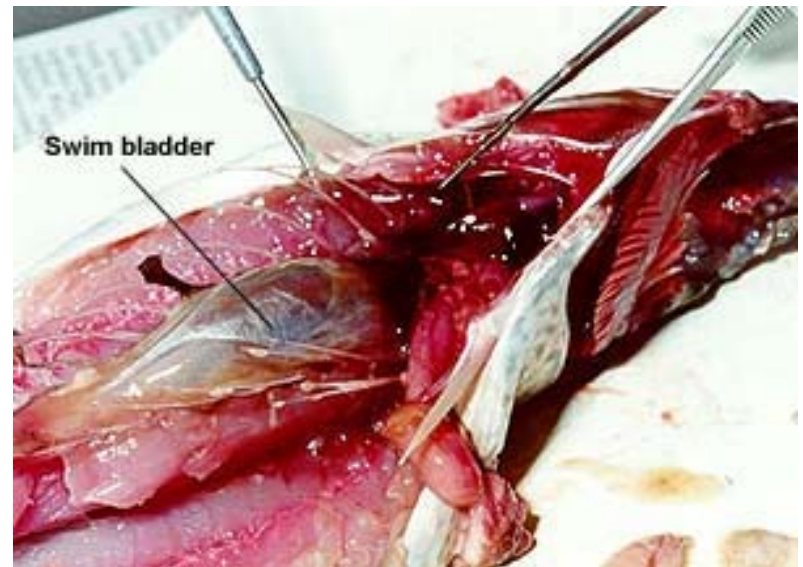
- Gonads are sex organs; ovaries in females and testes in males.
- In most cases, fertilization of eggs is performed externally, called spawning.
- Often these organs are found separate in fish, male and female. However, some fish are hermaphroditic, meaning they carry both types of gonads.

## □ Kidneys

- Kidneys are paired organs located ventral to the spinal column. They are involved in excretion and regulation of water in fish.

# Fish Dissection: Organ Identification

- ❑ Push aside other organs to expose the swim bladder; located at the top of the body cavity.
- ❑ The swim bladder is a flexible-walled, gas-filled sac located in the dorsal portion of body cavity. This organ controls the fish's buoyancy and is used for hearing in some species.



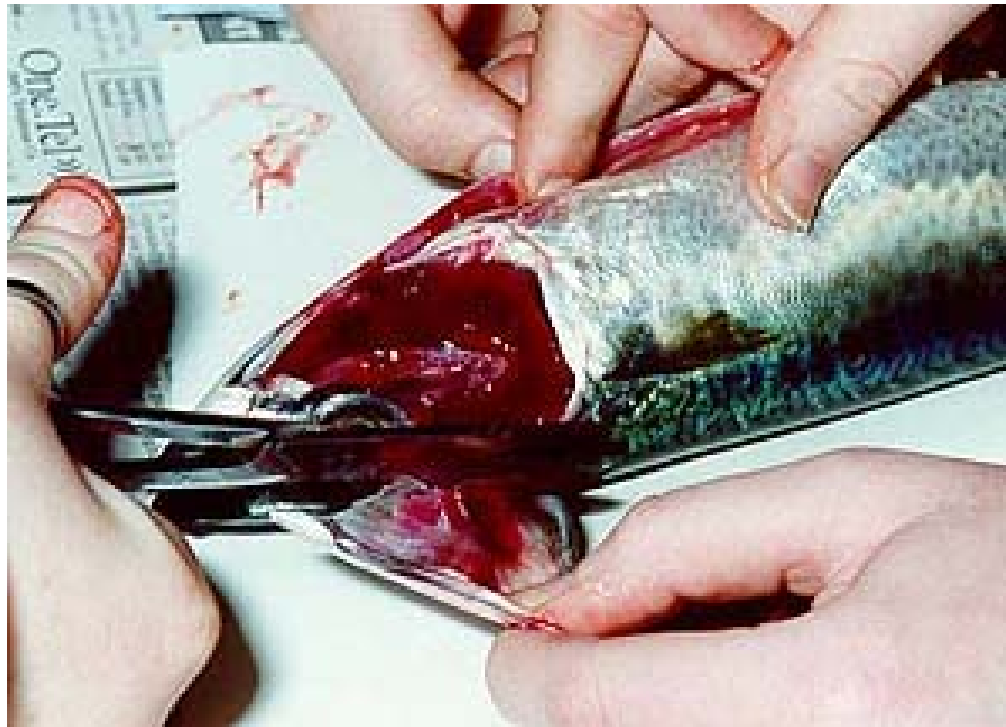
## Swim Bladder

- If a fish becomes buoyant, and starts to float upwards, gas diffuses out of the swim bladder into the blood. This occurs at a site known as the oval. The gas in the blood is removed from the body at the gills, and expelled into the surrounding water.
- Conversely, if a fish starts to sink, air enters the swim bladder at a region called the gas gland. The way the fish does this involves three processes; the acidification of the blood, an increase in the concentration of lactate and hydrogen ions, and the movement of blood through a complex structure called the rete mirabile.

# Fish Dissection: Organ Identification

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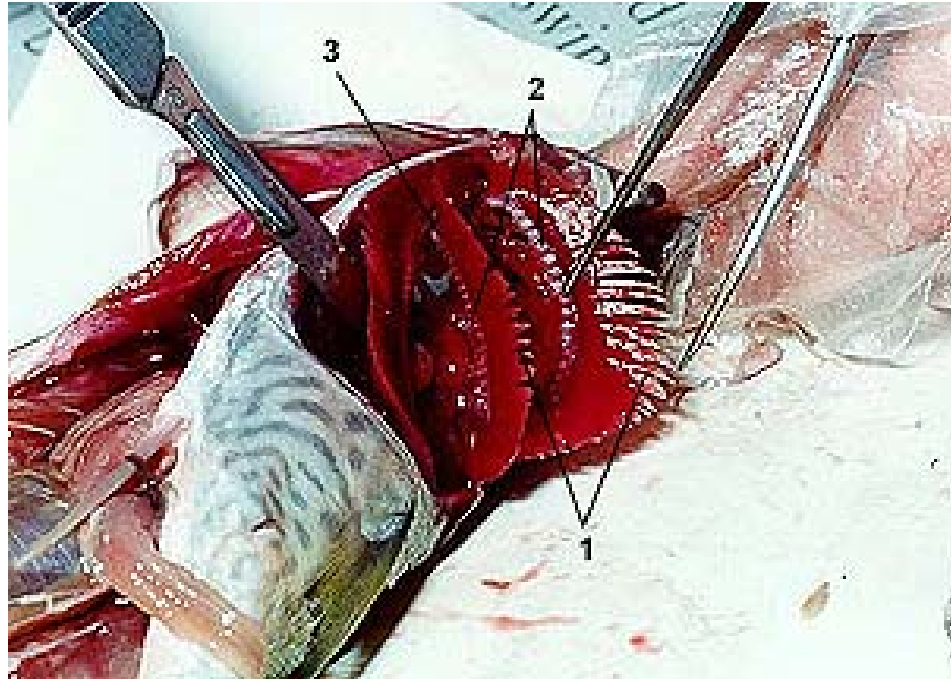
- ❑ Remove the right gill cover (operculum) to expose the gills.
- ❑ Bony fish have a single opening behind each operculum.



# Definitions

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1. Gill filaments
2. Gill rakers
3. Gill arches



## Gills: Filaments, Rakers, and Arches

- Gills are organs used for breathing. Water enters the mouth, and passes between the gills. Gill filaments absorb the oxygen from the water, and release carbon dioxide. Gill rakers, which aid in feeding processes, are appendages along the front edge of the gill arch. The gill arch provides support for the gills.

# Dissection Derby

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- ❑ Each dissection group will work as a team
- ❑ Question will pop up on screen
  - Team works together to determine the answer
- ❑ Each team selects a vocal representative
  - Person answers the question as soon as the group comes up with an answer
- ❑ Team which answers the most correct questions wins!



# Question One


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Q: What is the organ involved in the secretion and regulation of water? Is this organ found in both humans and fish? 

A: Kidneys; yes

# Question Two

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**Q:** Fins of a fish are used for movement, balance, and steering. What has similar functions for a human? 

**A:** Legs and arms

# Question Three

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Q: Skin is to human protection as \_\_\_\_\_ is to fish protection? 

A: Scales (slime)

# Question Four


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Q: Name the main organ in humans and fish that is responsible for breathing. 

A: Lungs and gills

# Question Five


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**Q:** What is the function of the lateral line?  
Is there a similar organ in humans? If so,  
what is it? 

**A:** Helps the fish hear vibrations in the  
water. Yes. The ear.

# Question Six

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**Q:** This organ has many digestive and storage functions. One of these is the production of bile, a solution which emulsifies or breaks down fats. Name the organ. 

**A:** Liver

# Question Seven

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**Q:** Name the six organ systems found in both humans and fish? 

**A:** Circulatory, Digestive, Excretory (urinary), Nervous (endocrine), Reproductive and Respiratory Systems

# Take Home Messages

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- ❑ External anatomy features can help us when fishing.
  - For example, where to fish, what rig to use, etc.
- ❑ External features are also important for protection.
  - Slime
    - ❑ When handling live fish, never use a rag or shirt.
  - Dorsal fin
    - ❑ Fins can cause injury and infection.
- ❑ Organ systems of fish are similar to those of humans.
  - Digestive, reproductive, excretory, etc.



# References

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- Australian Museum Fish Site: [http://ohs-bio.www1.50megs.com/Biology\\_Notes/Fish.htm#BF%20Senses](http://ohs-bio.www1.50megs.com/Biology_Notes/Fish.htm#BF%20Senses)
- Illustrations by Diane Peebles, Florida Fish and Wildlife Conservation Commission