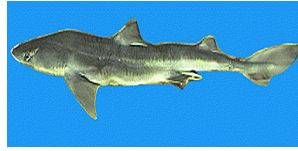




Name _____

Shark Dissection – Dogfish Squalus acanthias



Fun Facts:

- The teeth of sharks are modified scales embedded in the skin of its mouth
- Sharks have pits on their face used to detect electric fields
- Sharks have paired fins that are homologous to your arms and legs
- The skeleton of a shark is made entirely of cartilage
- Sharks have gills located in pouches along the sides of their heads
- A shark's heart pumps blood directly through its gills before the blood flows to the rest of its body
- The liver of a shark is its largest internal organ and is very oily

Materials:

- A dissecting pan layered with wet paper towels
- Dissecting tools (scalpel, scissors, probe, forceps)
- Your textbook and lab manual
- Sheets of paper (or use the blank pages in this lab)

The External Anatomy:

1. Obtain a dogfish shark and record the following data:

Common name

Scientific name

Length overall _____ cm.

Fork Length _____ cm.

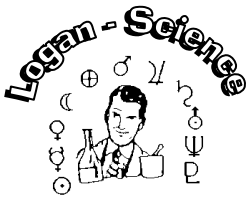
Width at head _____ cm.

Width at posterior (side away from head) to pectoral fins _____ cm.

Width at beginning of caudal fin _____ cm.

2. On your sheet of paper sketch the shape of the fins listed and tell what their function is.

- 1st dorsal fin
- Pectoral fin
- Pelvic fin
- 2nd dorsal fin
- Caudal fin
- Anal fin



Ask Why!

Name _____

Dogfish (Shark) Dissection Words To Know:

Use The Back For The Dogfish Labeled Drawings

Anatomical Terms

Cranial (anterior) -

Caudal (posterior) -

Dorsal -

Ventral -

Medial -

Lateral -

External Anatomy

Eye -

External Nares -

Endolymphatic Pore -

Spiracles -

Rostrum -

Mouth -

Ampullae of Lorenzini -

Gill Slits -

Anterior Dorsal Fin -

Posterior Dorsal Fin -

Caudal Fin -

Pectoral Fins -

Pelvic Fins -

Lateral Line -

Dorsal Spines -

Cloaca -

Clasper -

Dermal Denticles (Skin) -

Body Musculature

Adductor Mandibulae -

Intermandibularis -

Ventral/Dorsal/Septal Constrictors -

Pectoral Levitators -

Myotomes -

Mouth Structures

Teeth -

Pharynx -

Tongue

Gill Area

Gill Filaments -

Gill Pouch -

Gill Arch -

Gill Rakers -

Digestive System

Coelom -

Esophagus -

Papillae (Esophagus) -

Stomach -

Rugae -

Pylorus -

Duodenum -

Liver -

Gall Bladder -

Pancreas -

Spiral Intestine -

Valvular Intestine -

Rectum -

Rectal Gland -

Spleen -

Circulatory System

Heart -

Atrium -

Ventricle -

Sinus Venosus -

Conus Arteriosus -

The Urogenital System

Kidneys -

Rectal Glands -

Archinephric Ducts -

Male Genital System

Testes -

Epididymis -

Vas Deferens (Archinephric duct) -

Seminal Vesicle -

Sperm Sacs -

Siphon -

Female Genital System

Ovaries -

Oviducts -

Shell Gland -

Uterus -

The Nervous System: The Brain

Olfactory Sacs -

Olfactory Lobes -

Cerebrum -

Diencephalon -

Optic Lobe -

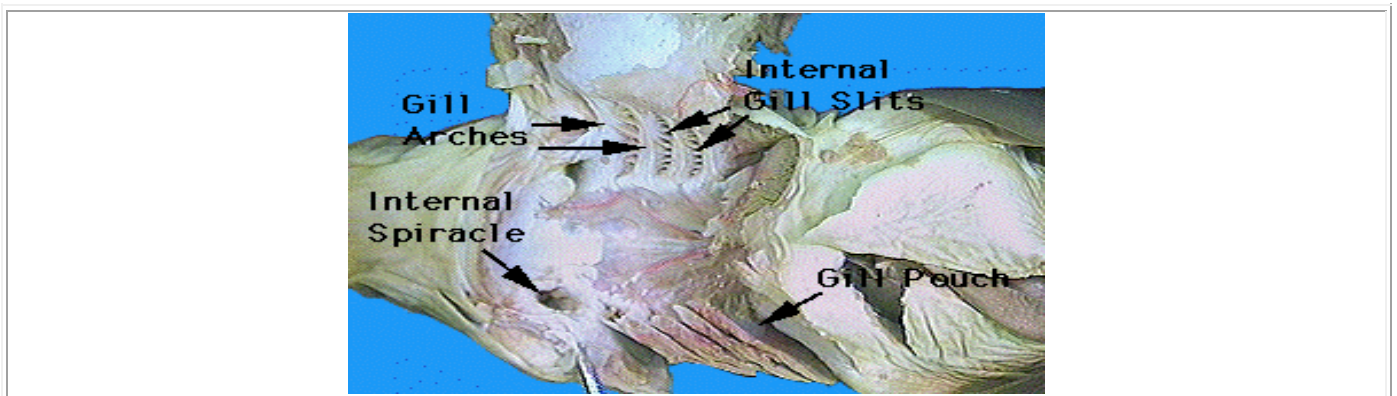
Cerebellum -

Medulla Oblongata -

The External Anatomy:

1. On your sheet of paper **make a side view sketch of your dogfish and label it "Side View"**.
2. The shark has a graceful and streamlined body shape. **Given this body shape, what would you expect its lifestyle to be?**
3. The body is divided into the **head, trunk, and tail**. **Label each of these sections**.
4. Underneath your sketch **make some specific observations (at least 5)** about the shark's appearance, texture, and color. **What is the purpose of the shark's coloration?** **What is the name for this type of coloration?**
5. **Label the lateral line** on your sketch. **What is it and what function does it perform for the shark?** Use the overall length of your shark to determine the percentage of the total length occupied. (Hint: % of body length occupied by lateral line = $\frac{\text{length of lateral line}}{\text{overall body length}} \times 100$)
6. **Label the anterior dorsal fin and posterior dorsal fin**. **What do you think the dorsal fins do?** **How do they compare?**
7. Note the **spines** that are located directly in front of the fins. These spines carry a poison secreted by glands at their base. **Label these on your sketch**.
8. Locate the **caudal fin** on your shark. It is divided into two lobes: a larger dorsal lobe and a smaller ventral lobe. This type of tail is known as a heterocercal tail. **Label the caudal fin on your sketch**. **What is its purpose?**
9. The **rostrum** is the pointed snout at the anterior end. **Label it on your sketch**. **What purpose might its pointy-ness serve?**
10. The **eyes** are prominent in sharks and are very similar to the eyes of man. A transparent cornea covers and protects the eye. A darkly pigmented iris can be seen below the cornea with the pupil at its center. Upper and lower eyelids protect the eye. Just inside the lower lid is a membrane that extends over the surface of the eye to cover the cornea. **Label your eye**.
11. Find the two large openings that are posterior and dorsal to the eyes. These are called the **spiracles**. The spiracle is an incurrent water passageway leading into the mouth for respiration. **Label this on your sketch**.

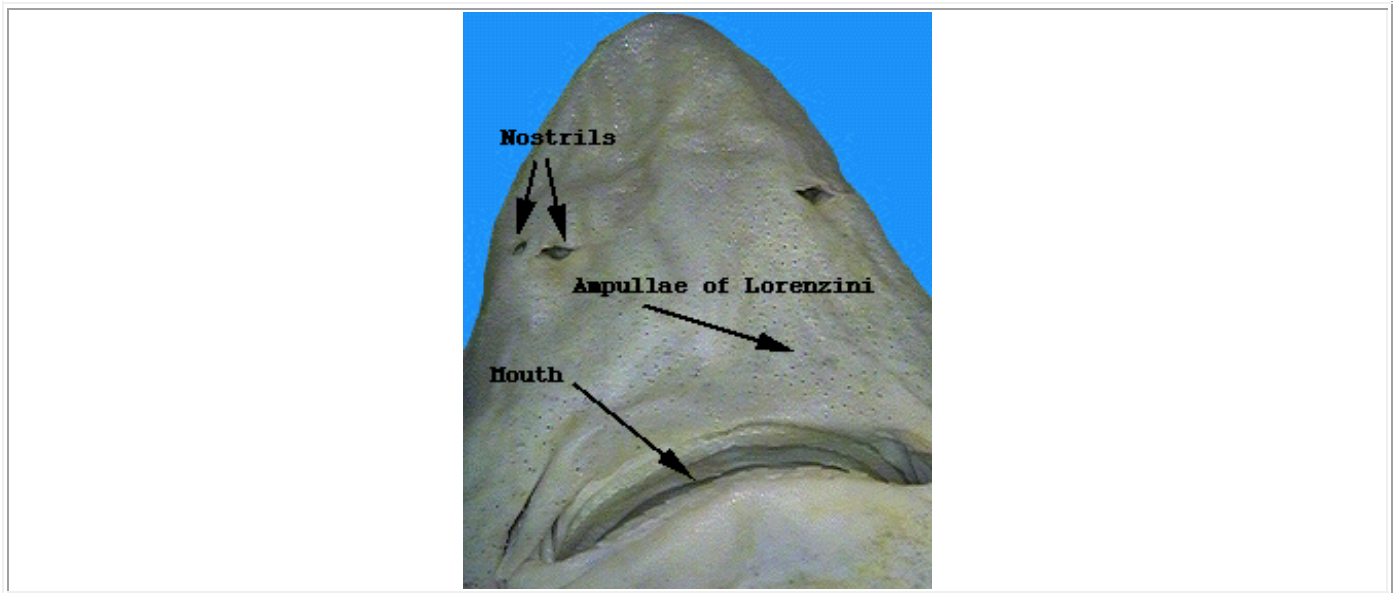
PHARYNGEAL CAVITY



12. Locate your shark's **gill slits**. **How many slits are there?** Record this number on your sheet of paper and make sure that sketch accurately represents this. **Label the gill slits**. Water taken in by the mouth and spiracles is passed over the internal gills and forced out by way of the gill slits.

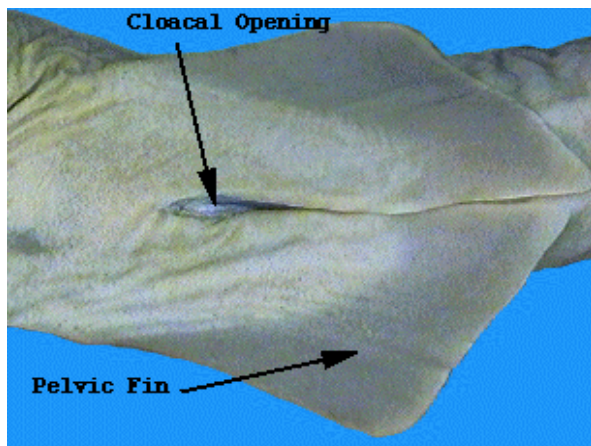
13. **Make a sketch of your shark's ventral side and label it "Ventral View". Draw and label the pectoral and pelvic fins. What purpose do these fins serve the shark?**
14. Locate the shark's **mouth**. Shark's mouths are always located on their underside (ventrally). Look inside the mouth and **write down your observations about the teeth orientation, appearance, and number.**
15. The **nares** or external **nostrils** are located on the underside (ventral surface) of the rostrum anterior to the jaws. **Label them on your sketch.** A nasal flap separates the incurrent from the excurrent opening. Water passes into and out of the olfactory sac, permitting the shark to detect the odors of the water.
16. The patches of pores on the head in the areas of the eyes, snout, and nostrils are the openings of the **ampullae of Lorenzini**. These sense organs are sensitive to changes in temperature, water pressure, electrical fields, and salinity. **Label them on your sketch.**

STRUCTURES ON THE SNOUT

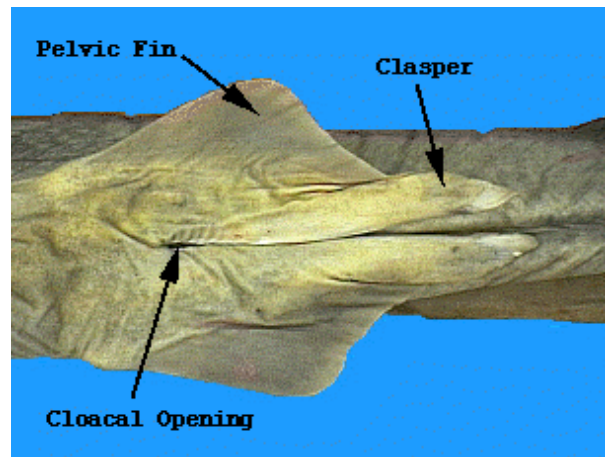


17. Fertilization in the dogfish shark is internal. During copulation, one of the male's claspers is inserted into the oviduct orifice of the female. The sperm proceed from the cloaca of the male along the groove on the dorsal surface of the clasper into the female.

Using the pictures provided **determine whether you have a male or female shark and record this under your sketch.** Also, **label the proper sex organs on your shark.**



Female



Male

18. Feel your shark's **skin** in both directions. **Describe its texture.** Remove a 2 x 2 inch of the shark's skin. The **muscles** revealed by skinning the side of the shark are arranged in W-shaped bundles. **What is the name of these muscles and what is their purpose?**

19. The "scales" you see are called **dermal denticles**, (literally "skin teeth"). On your sheet of paper draw an example of the dermal denticles.

The Internal Anatomy:

20. Using your scalpel and scissors make an incision down the center of the shark's ventral side that starts in between the shark's pectoral fins and extends down to its pelvic fins/girdle. Be careful to lift with forceps while you cut so as to not damage the internal organs. Make a cut on either side of your incision that extends far enough out so that you can pin back the skin and easily view the organs as illustrated in the following picture.



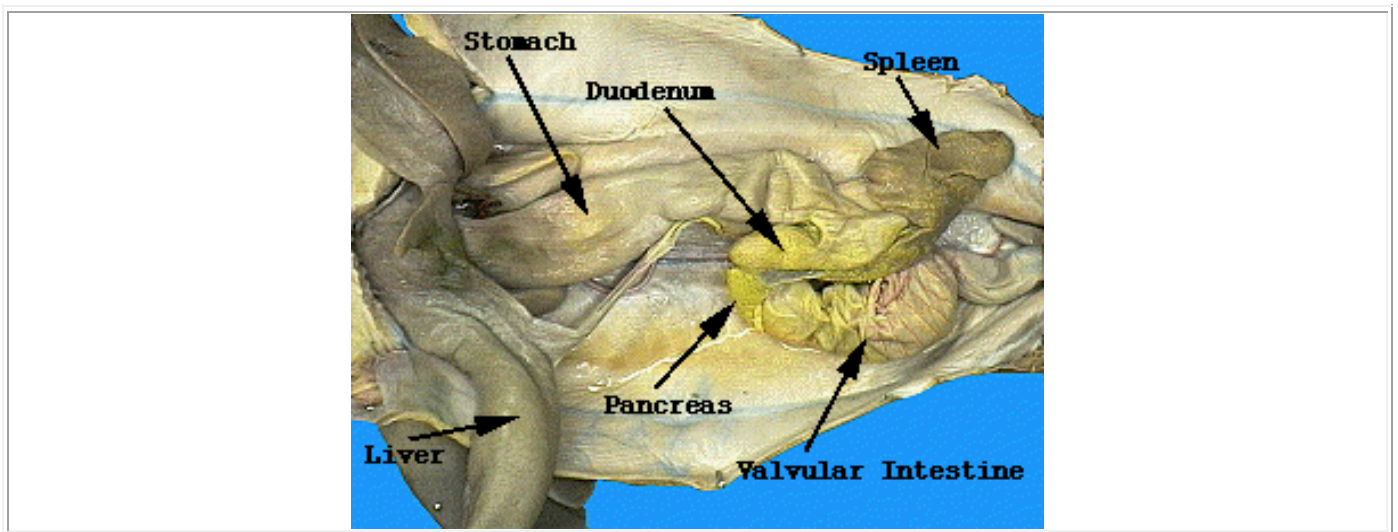
21. A smooth, shiny membrane called **peritoneum** can be seen lining the inside of the body wall. The visceral organs are suspended dorsally by a double membrane of peritoneum know as **mesentery**.

22. **Make a sketch of the shark's internal organs and label it "Internal Sketch".**

23. **Locate the shark's liver.** It is the largest organ lying within the body cavity. Its two main lobes, the right and left lobes, extend from the pectoral girdle posterior to most of the length of the cavity. A third, much shorter lobe is located medially and contains the green **gall bladder** along its right edge. **Label both of these on your sketch.** **What important purpose does the liver serve the shark?** Remove the liver by carefully cutting the attachments to the body wall. Use a scale or balance to determine how much the liver weighs. Record the weight: _____ gm. What percentage of total body weight consists of liver alone? (Hint: You can find the percentage using the same technique you used in number 8.)

24. You can see the **stomach** located immediately posterior to the liver.. **Label it on your sketch and describe its appearance.** The **esophagus** is the thick muscular tube that extends from the top of the cavity connecting the oral cavity and pharynx with the stomach.
25. Cut open your shark's stomach and **describe any contents you find.** The mucosa is the inner lining of the stomach. The **rugae** are longitudinal folds that help in the churning and mixing the food with digestive juices. A circular muscular valve, the **pyloric sphincter**, is located at the far end or pyloric end of the stomach. It regulates the passage of partially digested food into the intestines.
26. Continue past the stomach into the **intestines**. The intestine begins at the posterior end of the stomach where the muscular valve (sphincter) extends to the anus inside the cloaca. The intestine forms an S-shape and then suddenly enlarges. **How long is the intestine _____ cm.**
27. The **duodenum** is a short "U"-shaped portion of the small intestine that connects the stomach to the intestine. The bile duct from the gall bladder enters the duodenum. The **pancreas** is located on the duodenum and the lower stomach. The secretions of the pancreas enter the duodenum by way of the pancreatic duct. The dark, triangular-shaped **spleen** is located near the posterior end of the stomach. Although a part the lymphatic system, the spleen is closely associated with the digestive organs in all vertebrates. The **valvular intestine** is the second, and much larger, portion of the small intestine. It follows the duodenum and rings mark its outer surface. **Label these on your sketch.**

INTESTINAL AREA

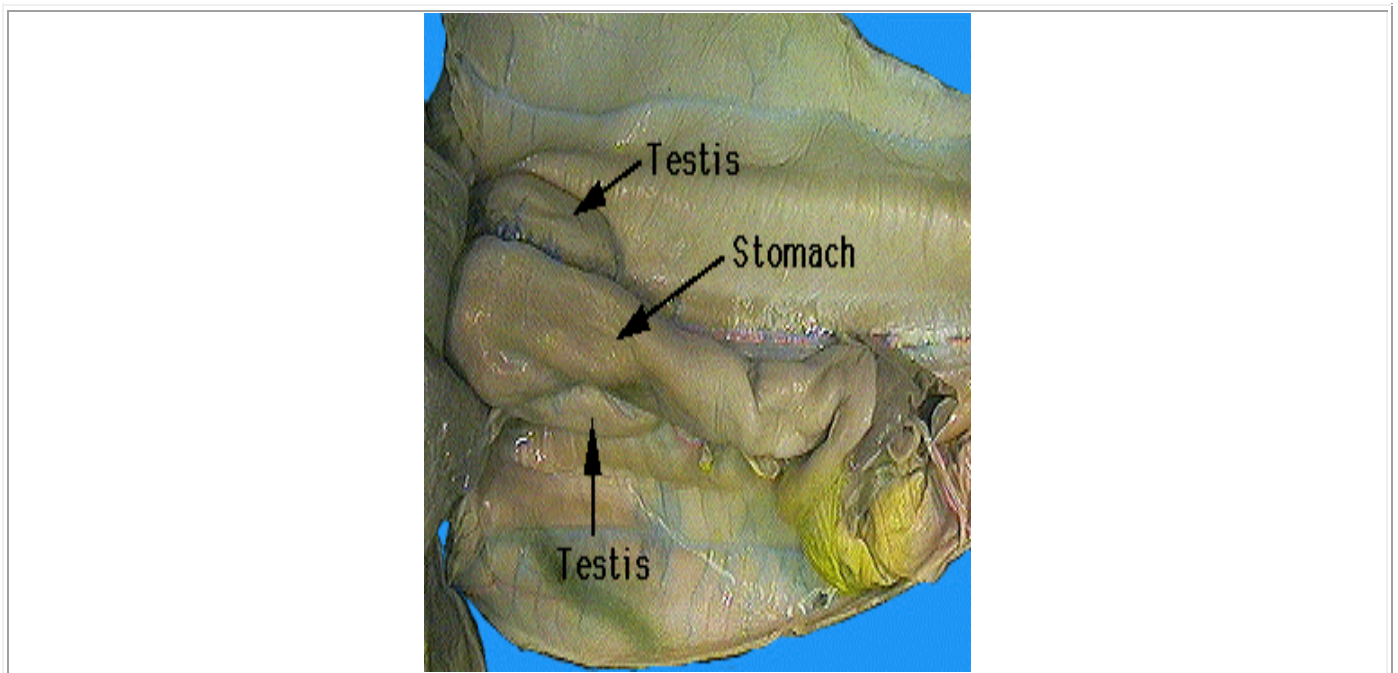


28. Cut open the valvular intestine so that you can view the **spiral valve**, which is the screw-like, symmetrical shape within the valvular intestine shown below. **What purpose might it serve?** (Hint: Think surface area) The spiral valve is not found in bony fish.



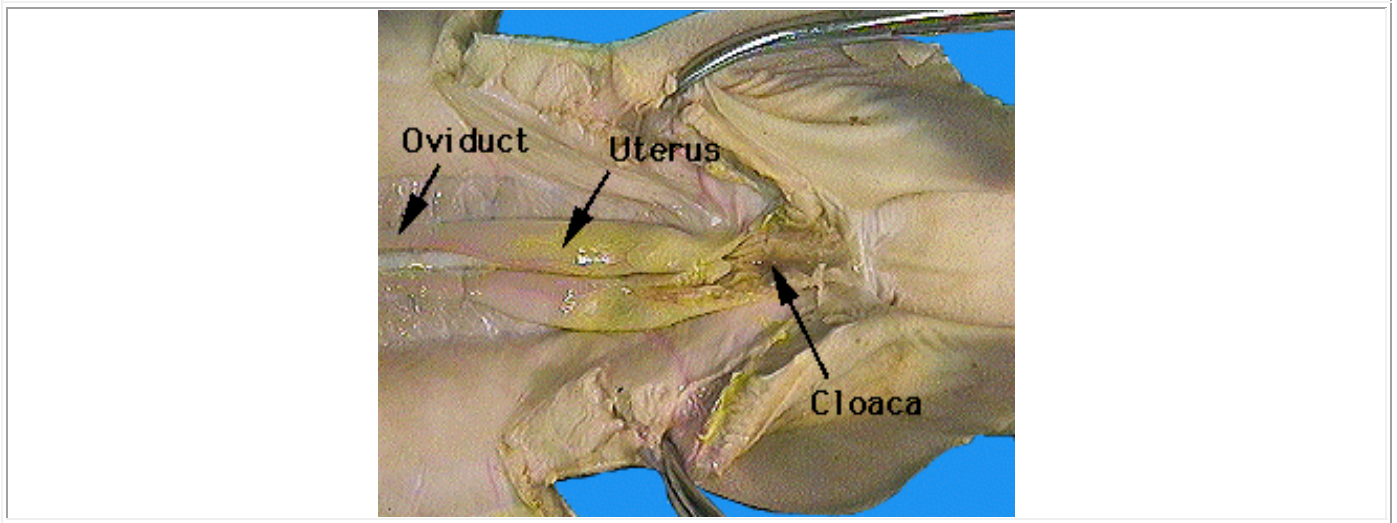
29. Pull the intestine forward so that you can view the **colon**, which is the narrowed continuation of the valvular intestine. It is located at the posterior end of the body cavity. The **rectal gland** is a slender, blind-ended, finger-like structure that leads into the colon by means of a duct. **Draw and label this on your diagram.** It has been shown to excrete salt (NaCl) in concentrations higher than that of the shark's body fluids or seawater. **Why would that be important for the shark?** (Hint: Think about osmoregulation)
30. The **cloaca** is the last section of the canal. It collects the products of the colon as well as the urogenital ducts. It is where the wastes of the body are removed via the cloacal opening.
30. Remove the liver pancreas, and spleen in order to reveal the urogenital structures: **gonads (testes or ovaries) and kidneys.** **Label these organs on your shark diagram.**

Testes



Male

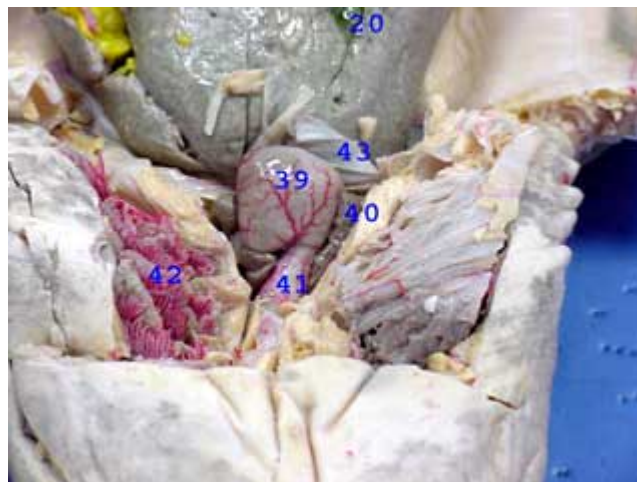
UTERUS



Female

31. Cut across the gill slits from the pectoral fin to the corner of the mouth. You will have to cut across the ventral musculature to lay the area flat.
32. Use your scissors or bone clippers to cut through the cartilage of the pectoral girdle. Fold back the skin flaps. Locate the heart within the pericardial cavity. **Is there a partition separating the heart from the other organs?** _____ The sac around the heart is called the **pericardial sac**. In life it is filled with fluid. Remove the pericardial sac. **What is the length overall of the heart** _____ **cm. What is the width of the heart** _____ **cm.** Find the **sinus venosus** which carries blood to the heart. **Does it enter the heart on the anterior or posterior end?** _____ Carefully open the heart. The **atrium** of the heart is the receiving chamber for the blood, while the **ventricle** of the heart pumps blood to the body cavity. Locate the atrium. **Which blood vessel enters this chamber?** _____ The gills are provided with a rich blood supply. Arteries run directly from the nearby heart to the gills bringing deoxygenated blood into the gill **lamellae**. Lamellae are thin plates or disks that are in rows in the gills and greatly increase the surface area through which gas exchange can take place. Oxygen diffuses from the ventilating water current flowing over the gills into the blood. **Label the gills and heart on your diagram.**

Heart and Gills



33. **What is the term used to describe this blood flow and why does it occur?**

34. Wrap up your shark and throw it away in the garbage bag provided by your teacher. Wash off all dissecting equipment and return items to area you got them from. Clean off dissecting area with disinfectant so classroom doesn't stink! **WASH YOUR HANDS!!!!**

Analysis & Conclusion Questions:

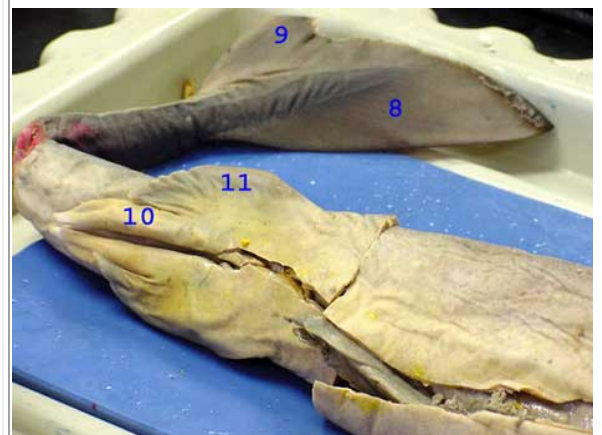
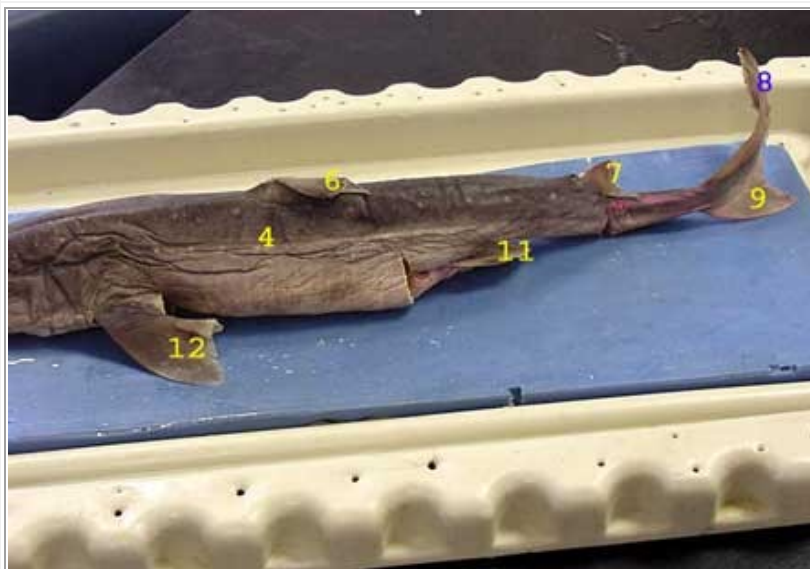
1. List 5 traits of the shark (general fish traits).
2. Was your shark male or female? Explain how you can tell.?
3. What sensory organs did the shark have? List them all including what each did.
4. Discuss 3 adaptations for life in the water that the shark had.
5. What purpose do the spiracles serve? What do the gill lamellae do?
6. What type of scales does the shark have?
7. What is the purpose of the cloaca?
8. How does a shark maintain buoyancy (what does it use)?

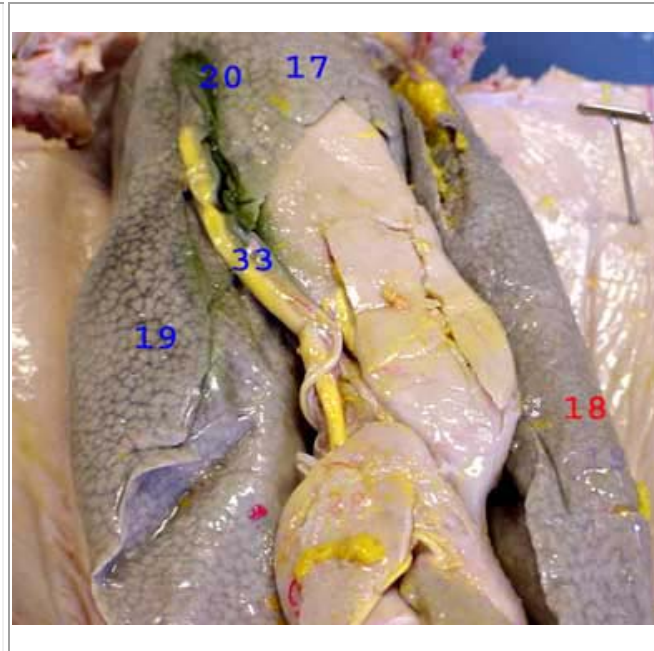
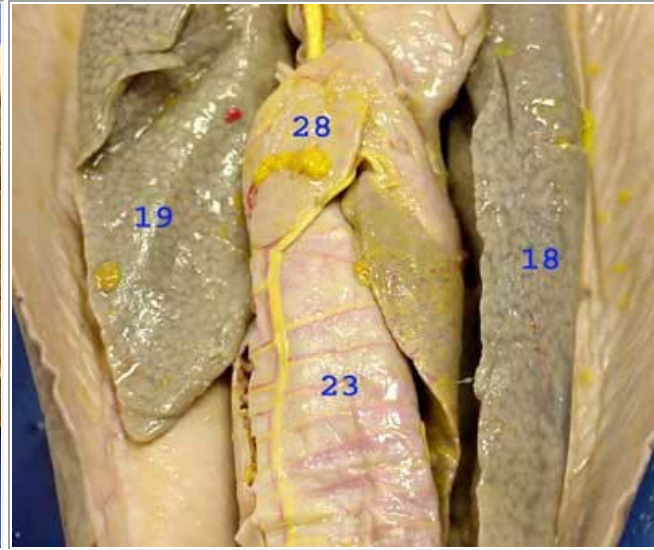
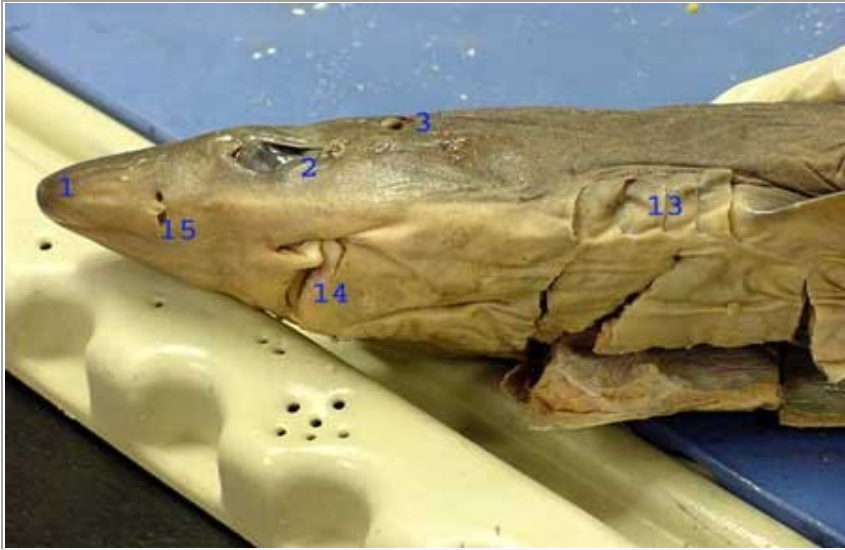
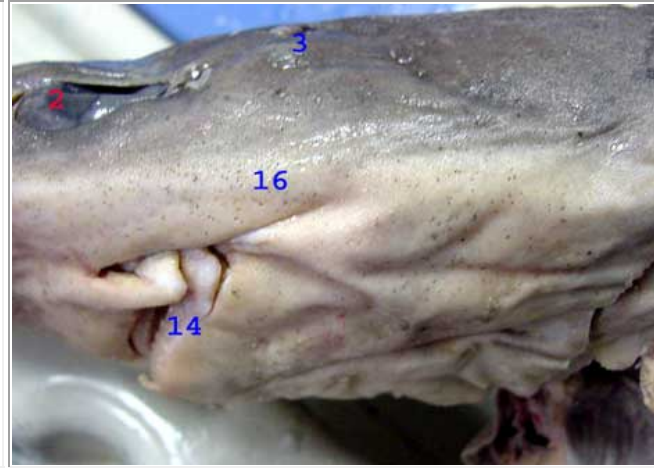
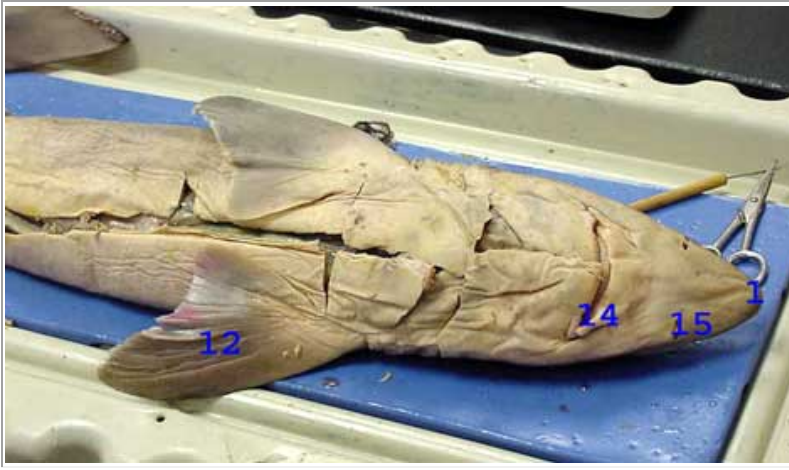
9. How does the size of the liver compare with the sizes of the other visceral organs?
10. How many lobes are present in the liver?
11. What color is the liver?
12. What is the scientific name of the dogfish?

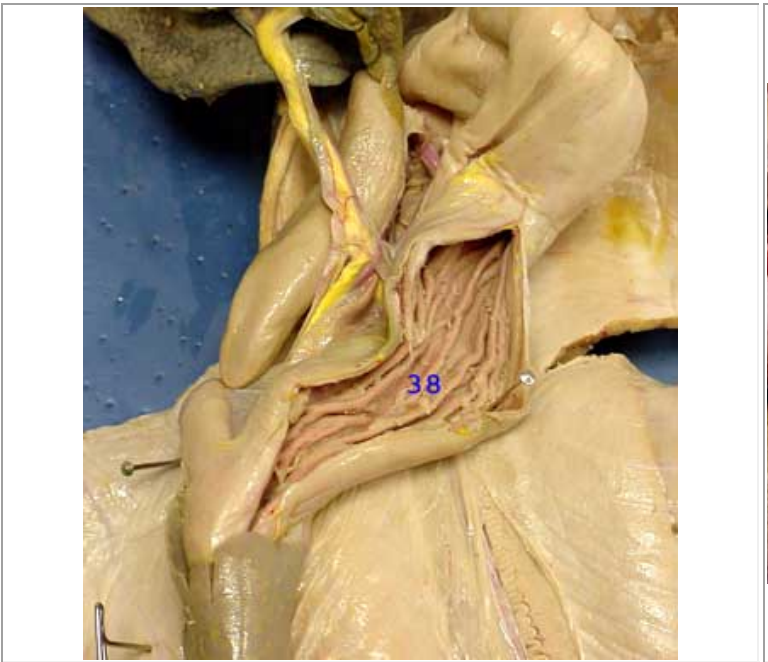
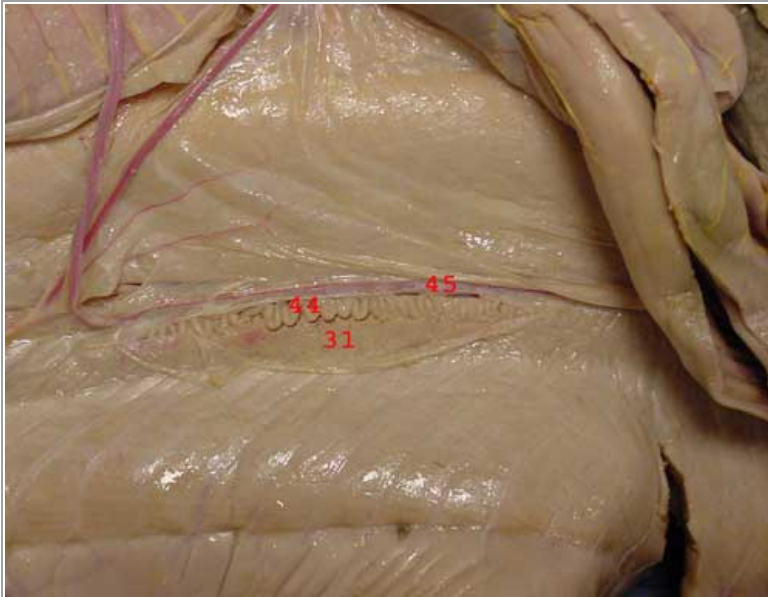
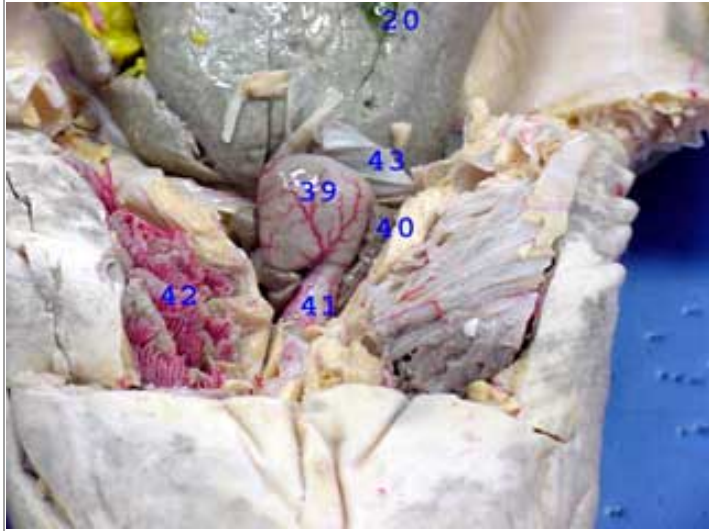
VERTEBRATE BIOLOGY SHARK DISSECTION

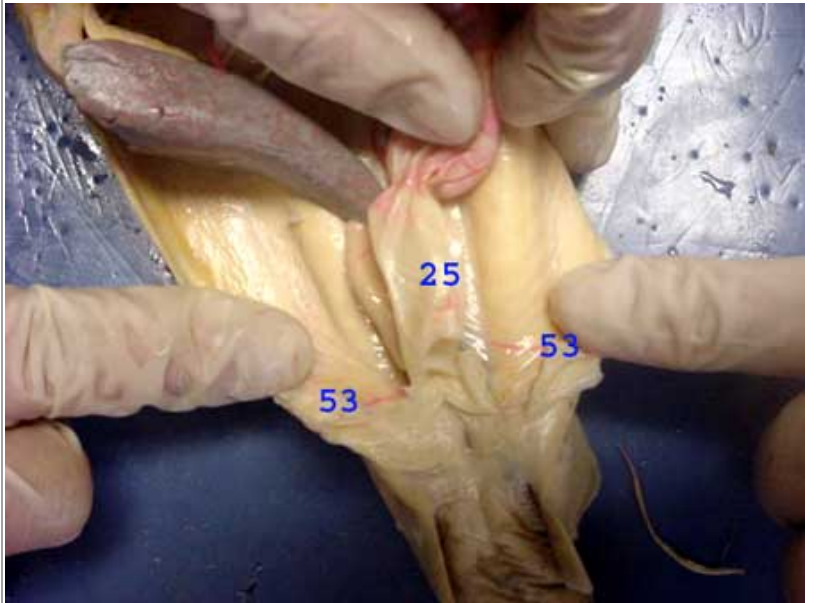
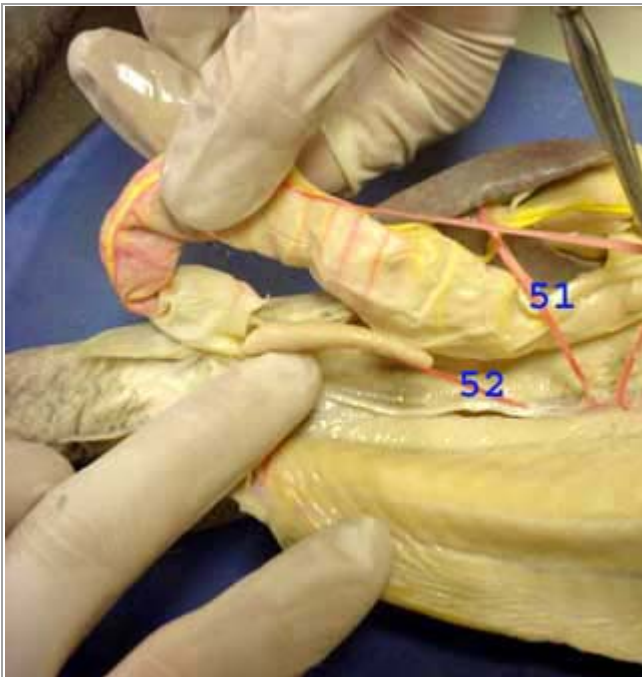
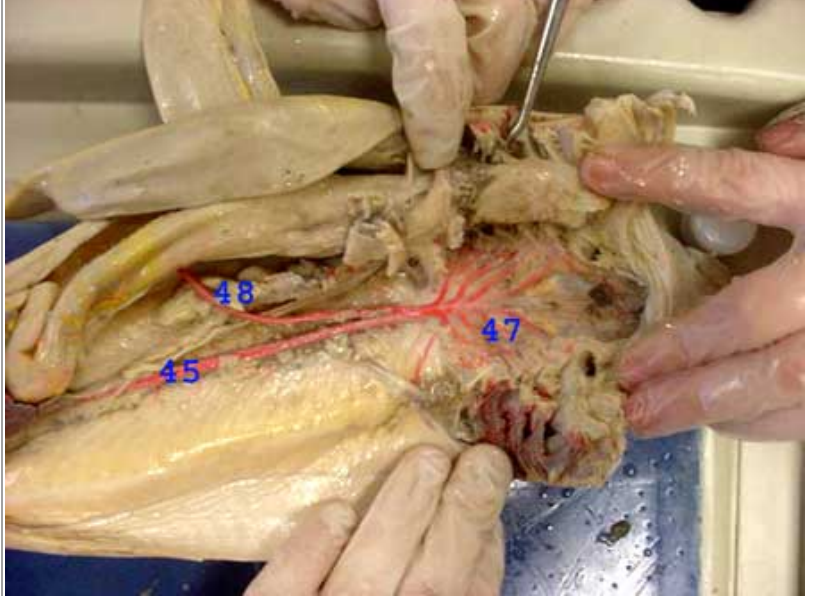
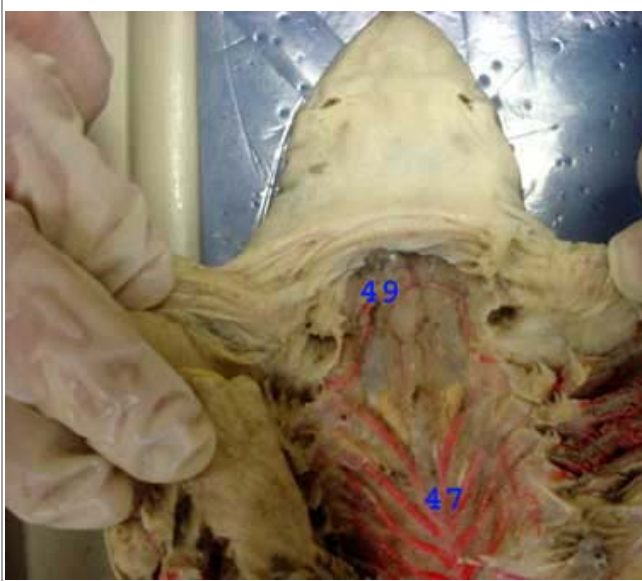
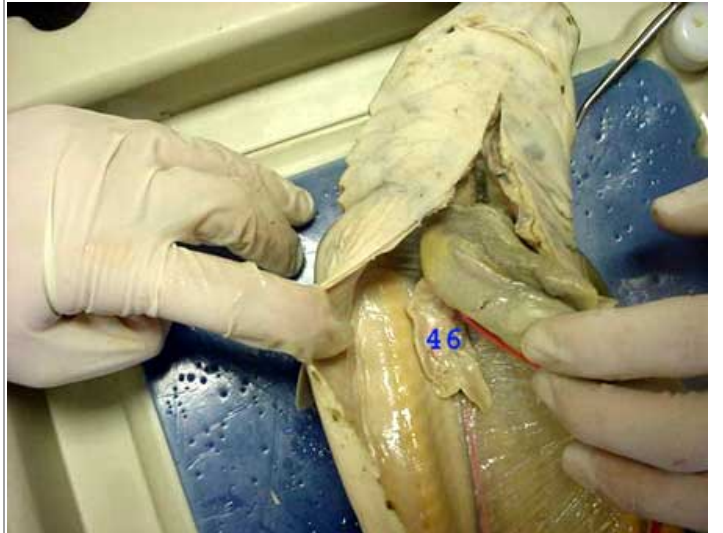
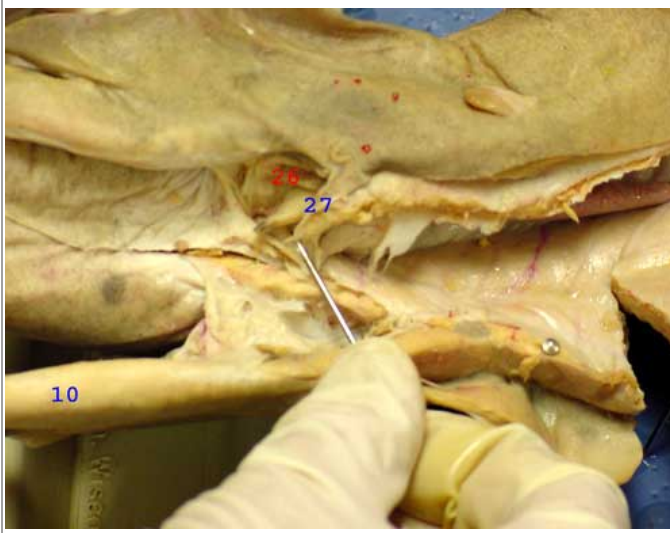
Identify the numbered structures.

To check your answers, check the table on the last page of this lab.









Shark Structures

1. Rostrum	19. Right Lobe of Liver	37. Sperm Sac
2. Eye	20. Gallbladder	38. Rugae in Stomach
3. Spiracle	21. Stomach	39. Ventricle
4. Lateral Line	22. Duodenum	40. Atrium
5. Fin Spine	23. Ilium	41. Conus Arteriosus
6. Anterior Dorsal Fin	24. Spiral Valve	42. Gills
7. Posterior Dorsal Fin	25. Colon	43. Transverse Septum
8. Dorsal Lobe of Caudal Fin	26. Cloaca	44. Ductus Deferens (Sperm Duct)
9. Ventral Lobe of Caudal Fin	27. Urogenital Papilla	45. Dorsal Aorta
10. Clasper	28. Ventral Lobe of Pancreas	46. Ovary
11. Pelvic Fin	29. Dorsal Lobe of Pancreas	47. Efferent Branchial Arteries
12. Pectoral Fin	30. Spleen	48. Celiac Artery
13. External Gill Slits	31. Kidney	49. Internal Carotid Artery
14. Mouth	32. Rectal Gland	50. Anterior Mesenteric Artery
15. Nostril	33. Bile Duct	51. Lienogastric Artery
16. Ampulla of Lorenzini	34. Right Testis	52. Posterior Mesenteric Artery
17. Medial Lobe of Liver	35. Left Testis	53. Iliac Artery
18. Left Lobe of Liver	36. Sinus Venosus	

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