



Lab: Shark (Dogfish) Dissection *Squalus acanthias*

**TOTTEN
SCIENCE**

General Dissection Instructions:

Strive to make good, clean dissections. Be careful but not so meticulous that you are slow!

1. Keep cutting tools sharp! If your blade has gotten dull, be sure to dispose of it. Dull blades often lead to cut fingers!
2. Keep specimens moist by spraying with the spray bottles provided. If they are drying out, rinse them well before putting them away for the week.
3. Do not cut any structure before identifying it!
4. Try to make clean incisions - avoid ragged edges.
5. When a muscle must be cut, cut across the middle of the muscle belly leaving the origin and insertion in place.
6. Flat muscles that insert on the midline of the body should be cut to one side of the midline, again, leaving the insertion in tact.
7. When removing fat and fascia, cut parallel to nerves, blood vessels and muscle fibers rather than across them. This will avoid damage to structures we want to study later.

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)

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. Below sketch the shape of the fins listed and tell what their function is.

1 st Dorsal Fin	Pectoral Fin	Pelvic Fin
Function:	Function:	Function:
2 nd / Posterior Dorsal Fin	Caudal Fin	
Function:	Function:	

The External Anatomy:

1. **Make a side view sketch of your dogfish and label it "Side View".** Use this diagram to label

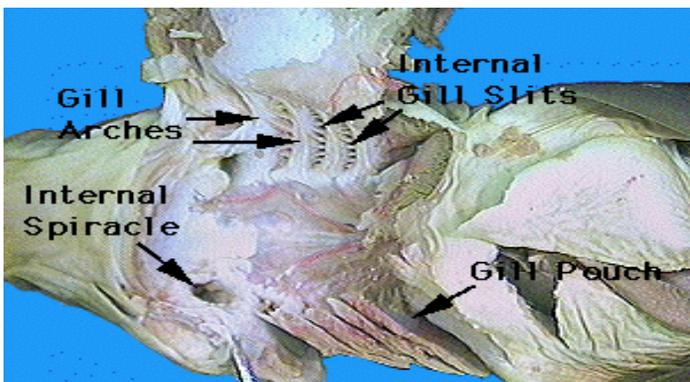


The shark has a graceful and streamlined body shape. **Given this body shape, what would you expect its lifestyle to be?**

2. The body is divided into the **head, trunk, and tail.** **Label each of these sections** in your sketch

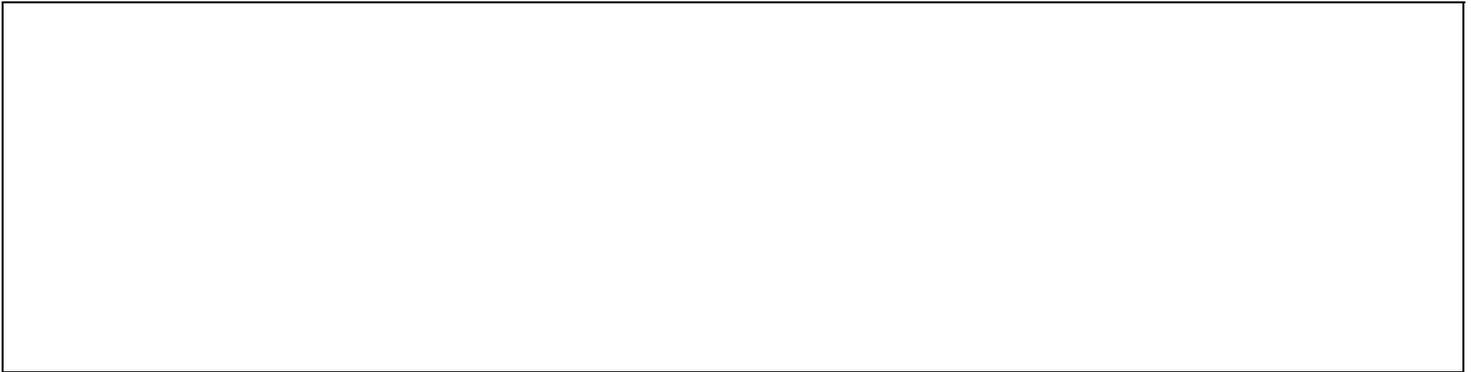
3. Underneath your sketch **make some specific observations (at least 5)** about the shark's appearance, texture, and color. **What is the purpose of the shark's coloration? What is the name for this type of coloration?**
4. **Label the lateral line** on your sketch. **What is it and what function does it perform for the shark?**
5. **Label the anterior dorsal fin and posterior dorsal fin.** **What do you think the dorsal fins do? How do they compare?**
6. 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.**
7. 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?**
8. The **rostrum** is the pointed snout at the anterior end. **Label it on your sketch.** **What purpose might its pointy-ness serve?**
9. 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.**
10. 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.

11. 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?

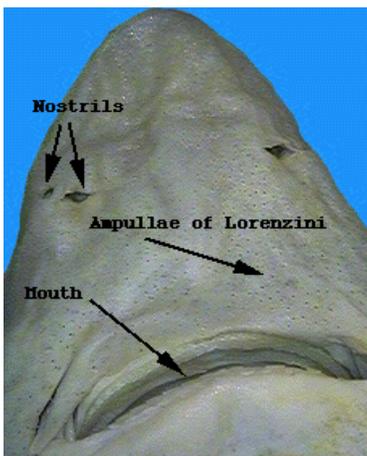


13. Locate the shark's **mouth**. Shark's mouths are always located on their underside (ventrally). Look inside the mouth and write down your observations about the teeth orientation, appearance, and number.

13. 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.

14. 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.

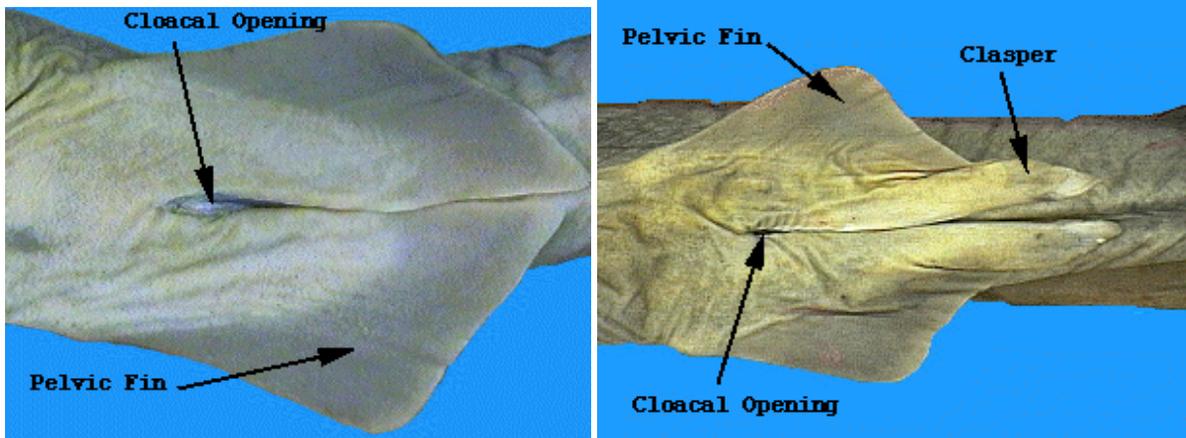
STRUCTURES ON THE SNOOT



Reproductive System- External

1. 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.**

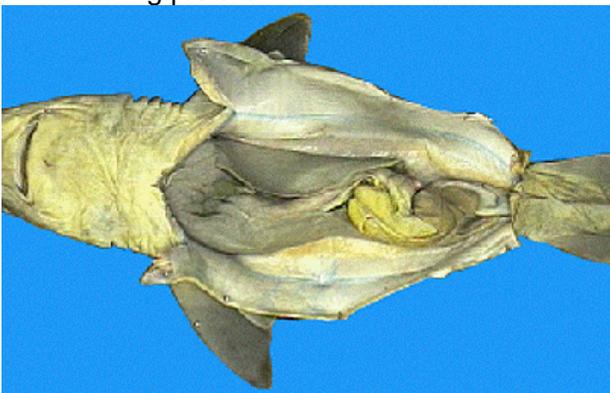


12. Feel your shark's **skin** in both directions. **Describe its texture.** Remove a 2 x 2 inch of the shark's skin. The **muscles** revealed by skinning the side of the shark are arranged in W-shaped bundles. **What is the name of these muscles and what is their purpose?**

The "scales" you see are called **dermal denticles**, (literally "skin teeth"). Draw an example of the dermal denticles

II The Internal Anatomy:

1. 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.



2. 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 known as **mesentery**.

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

4. 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?**

Optional : 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.)

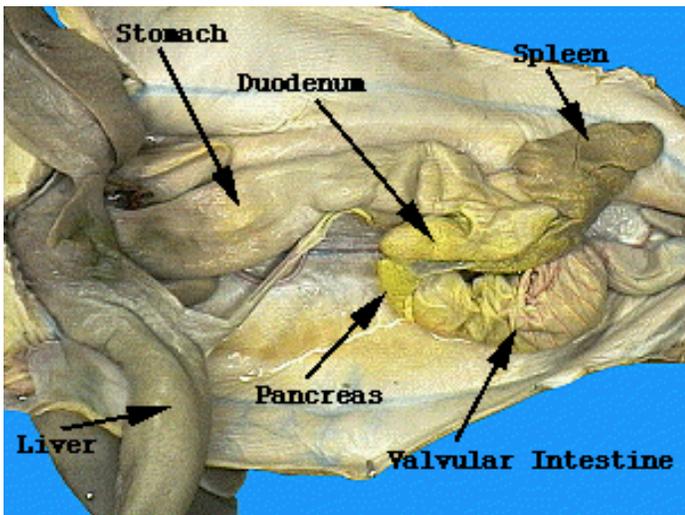
5. You can see the **stomach** located immediately posterior to the liver.. **Label it on your sketch and describe its appearance.** The **esophagus** is the thick muscular tube that extends from the top of the cavity connecting the oral cavity and pharynx with the stomach.

6. 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.

7. 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.**

8. 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 of 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



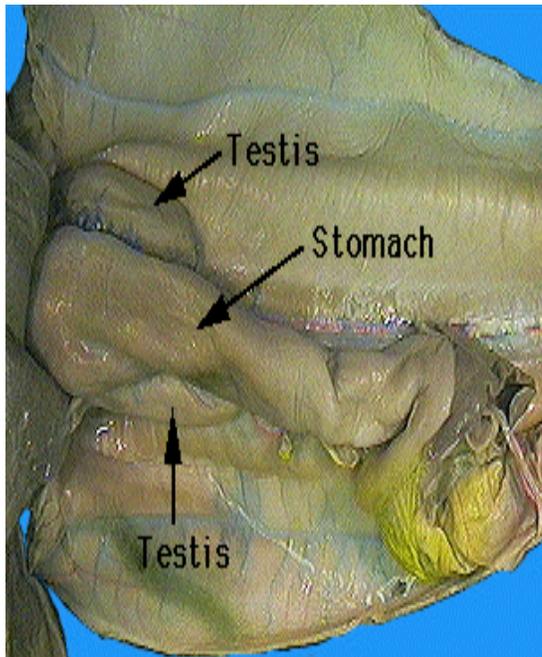
1. Cut open the valvular intestine so that you can view the **spiral valve**, which is the screw-like, symmetrical shape within the valvular intestine shown below. **What purpose might it serve?** (Hint: Think surface area) The spiral valve is not found in bony fish.



2. 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)
3. 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.
- 4.. 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.**

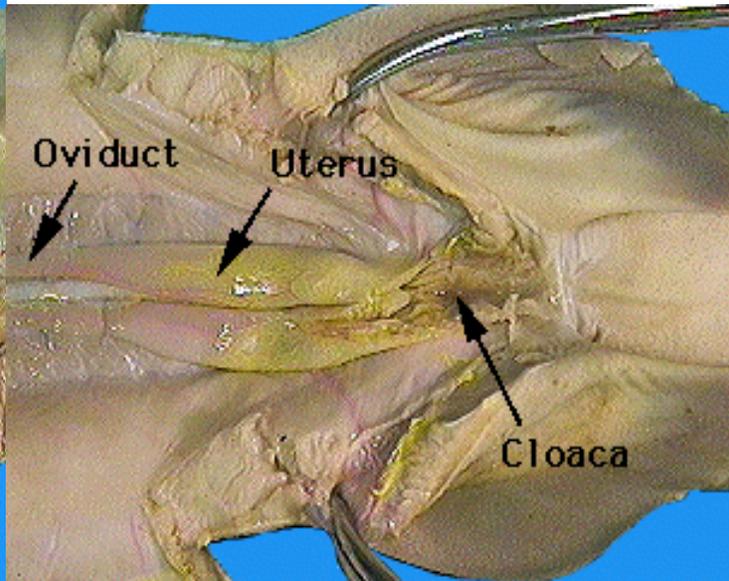
Testes

Male

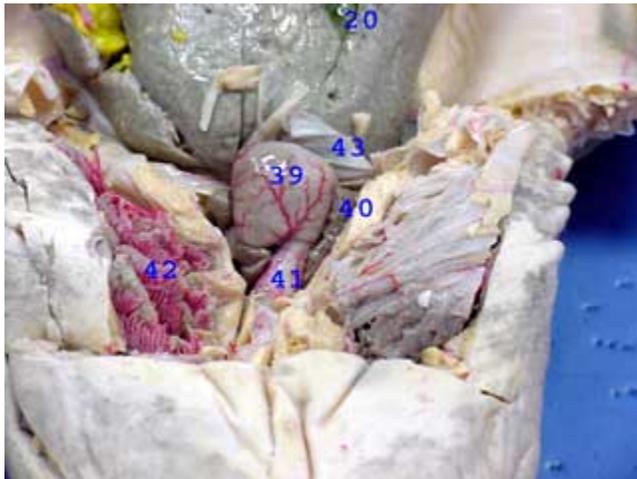


UTERUS

Female



Heart and Gills



1. 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.
- 2.. 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.**

Clean Up *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: On Separate Paper (Attach to Perch Lab)

1. List 5 traits that the perch and shark shared (general fish traits).
2. List 5 traits/characteristics that were different between the perch and the shark (bony vs. cartilaginous fish traits).
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?