

Investigative Lab 23

Mapping a Mollusk

Squid Dissection

Question What are the anatomical features of a squid? How do these features allow a squid to hunt, avoid predators, and carry out basic life functions?

Lab Overview In this investigation you will explore mollusk form and function as you dissect a squid, observe features of its external and internal anatomy, and make sketches based on your observations.

Introduction Squid are a member of the class of mollusks called cephalopods. Cephalopods are much more agile and active than the other classes of mollusks. Squid have unique features that enable them to move quickly and respond rapidly to stimuli. One example of such a specialized structure is the siphon, which the squid can use to propel itself in any direction. You'll observe the action of the siphon in the Prelab Activity. Another specialized structure is the ink sac. When threatened by a predator, a squid can release murky, black ink from its ink sac, concealing the squid. For hunting, squid have two long tentacles that can extend out quickly like whips and grasp the squid's prey tightly. These tentacles, along with eight grasping arms, make up the foot of the squid.

The mantle, an outgrowth of the body surface that drapes over the animal, is a distinctive feature of mollusks. A squid's internal organs are exposed to the external environment as seawater circulates through the mantle cavity (the space between the mantle and the squid's body). When squid reproduce, the male squid reaches an arm into its mantle cavity, obtains sperm, and transfers them to the female squid's mantle cavity.

Prelab Activity Rinse your squid under running water before beginning your dissection. As you rinse the squid, you can observe the action of the siphon. **CAUTION:** *Wear safety goggles, gloves, and an apron at all times when working with the squid.*

Hold the squid vertically in the stream of water with the tentacles pointing upward so that water flows into the mantle cavity. Tilt the head back away from the siphon and stand back! Record your observations below.

Observations:

Prelab Questions

1. The name cephalopod means “head-foot.” How do you think the squid got this name?

2. What are some general characteristics of mollusks that you might expect to see while observing the squid in the lab?

3. Identify at least three structures found in squid, and describe their functions.

Materials

- one fresh or preserved squid
- large paper plate or dissection tray
- small scissors
- dissecting probe or bamboo skewer
- hand lens or stereomicroscope
- dissecting pins (optional)

Procedure

Part A: Studying the Squid’s External Anatomy

1. Sketch the squid and describe its external anatomy.

2. The squid should have eight arms of about the same size, known as grasping arms. The squid should also have two longer arm-like structures called tentacles. How do the tentacles differ from the grasping arms?

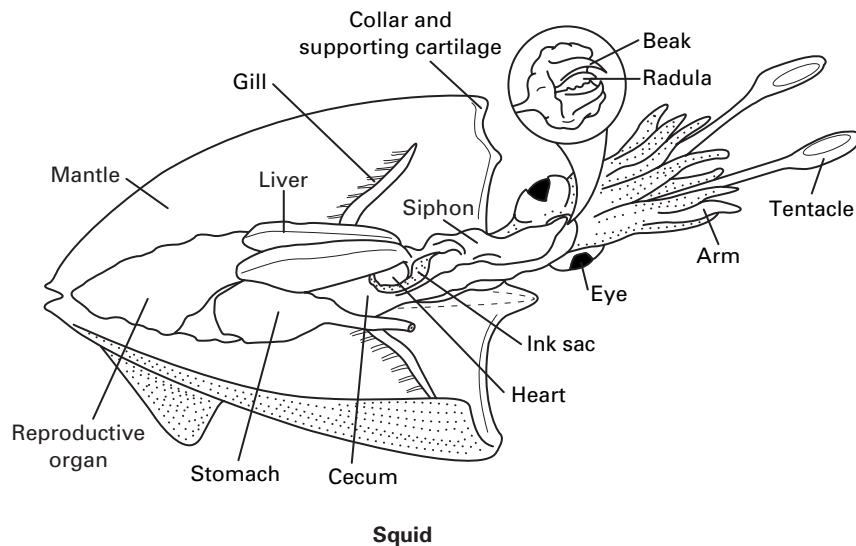
3. Use the scissors to remove one of the squid's tentacles. Observe the suckers with a hand lens or stereomicroscope. **CAUTION:** *Handle sharp instruments with care to avoid injury.* Look for tiny, tooth like structures in the suckers that snag prey. Record your observations below.

4. Observe the squid's skin. Look for spotted areas. These spots contain color-producing pigments (called *chromatophores*) that allow the squid to change its color and pattern. Pull off a section of this thin layer of skin and observe it with a stereomicroscope. What do you think might be the benefit to the squid of being able to change its appearance?

5. Sketch the sucker and chromatophores below.

Part B: Studying the Squid's Internal Anatomy

1. Locate the squid's siphon. Place the squid so the siphon is on top and the fins lie flat against the plate (the ventral [abdominal] side of the squid should be facing up). With scissors, make a cut along the mantle toward the pointed end of the squid. Cut only the mantle—take care not to damage the organs beneath it.



2. Pull the mantle open to study the internal organs. If you are using a dissection tray, you can use dissection pins to hold the mantle open. Notice the ridges of supporting cartilage on the inside of the mantle. This part of the mantle is called the collar. Now you can see how the siphon is attached. Locate the long tough white muscles on either side of the siphon. Carefully cut these muscles and gently pull the siphon out so you can better see the organs below it. The actions of these muscles move the siphon, changing the angle at which the water is pushed out. This propels the squid in different directions.
3. The digestive system extends from the esophagus into the stomach. Food then passes into a long pouch off the stomach called the cecum. Most absorption occurs in the cecum. From the cecum, the intestines go back towards the head and end in the anus near the mantle collar. Wastes exit from the opening of the mantle. To begin your exploration of the digestive system, first locate the liver. The large, white liver consists of two side-by-side lobes. Underneath the liver is the stomach, which is also white. Carefully remove the liver without removing the stomach or any other organs. Be careful also not to remove the ink sac, which looks like a silver pouch.

4. Next locate the mouth. At the point where all of the arms meet, look for a tiny black structure. This is part of the beak. Squid use their sharp beaks and the radula located inside of the beak to crush or rip prey apart. To access the esophagus, pry the beak apart and gently insert the probe into the beak. When you slide the probe down the esophagus, you should be able to see the probe inside of it. Remove the beak by pulling on it and observe how the two halves fit together. Sketch the beak and the radula in the space below.

5. On either side of the stomach, look for the almost transparent, feathery gills. As water circulates through the mantle, it washes over the gills. Oxygen diffuses through the gills and enters the squid's blood. Two hearts (called *branchial hearts*) pump blood from the gills. One branchial heart is located at the base of each gill (the end furthest from the head). Gently remove one gill by snipping it with scissors. Observe the gill with a stereomicroscope. Sketch the gill in the space below.

How do you think the shape and texture of the gill relate to its function?

6. Squid have a flexible internal shell called a *pen* that gives a squid its shape. To find the pen, gently remove the rest of the internal organs. Look for the pen lying along the whole length of the mantle.
7. Cephalopods (squid, octopus, and their relatives) have very complex nervous systems and keen vision. Examine an eye with the

hand lens and note the cornea (a disk-shaped structure). Sketch your observations below.

Analysis and Conclusions

1. Most mollusks have a mantle, mantle cavity, foot, radula, and a shell. Describe these structures in a squid.

2. Identify at least three squid adaptations you observed and explain how they help the squid's survival.

3. Which squid feature did you find most interesting? Why?

4. Which features that you observed in the squid would you also expect to find in a snail? Which would you not expect to find?

Extension

Squid have the largest nerve cells of any animals in the world. The cells can be 100 times wider than mammalian nerve cells, but they function in much the same way. Scientists have used the long nerves in a squid's body to study how a brain sends signals through nerve cells and how nerve cells repair themselves. Research and write a report describing squid nerve cells and what researchers have learned from studying them.