

# MARINE BIOLOGY - SQUID DISSECTION LAB

Adapted by Anne Maben from HMSS *Living Ocean* text

## INTRODUCTION:

The cephalopods include squid, octopus, cuttlefish, and nautilus. The class name, *CEPHALOPODA*, meaning "head-foot," aptly describes this group. The foot in this group has specialized by dividing into *arms*, which are attached to the head. Most cephalopods do not have external shells. The squid has an internal remnant of a shell, called a *pen*, that looks like a sheet of thick plastic. This long, thin shell helps support the body. The cuttlefish, a close relative of the squid, has a harder, more brittle plate, called a *cuttlebone*. A cuttlebone is made of calcium carbonate (CaCO<sub>3</sub>) secreted by the animal; in composition it is similar to the shells of other mollusks. Gas moving in and out of chambers in the cuttlebone lets the cuttlefish move up and down in the water. Cuttlebones are often put in bird cages for the bird to peck on, sharpen its beak, and eat the calcium, a necessary nutrient.

In the mouth of the squid is a *beak* shaped much like the beak of a parrot. The beak is not part of the shell but a separate tooth-like structure. When a squid catches prey, such as a fish, it bites off and swallows chunks of it. The squid has a small *radula* but it uses it only to pull in chunks of food past the beak.

Cephalopods are also masters of camouflage, using pigment in their skin cells to quickly change its skin color to blend into its surroundings. These skin cells, called *chromatophores*, contain an elastic

sac filled with pigment. The cells are attached to a set of muscle cells. When the muscle cells contract, they pull the chromatophore out flat, spreading the pigment over a larger area and making the skin darker. When the chromatophore is smaller, the skin is lighter. The cells can change shape very rapidly, producing a pulsating patterns of complex color changes. Cephalopods use chromatophores to communicate their moods to others - bright red for anger or passion; white for fear. Pelagic squid even have bioluminescent chromatophore on their ventral side, which they can change the light intensity of to match the light from the ocean's surface (making them invisible to predators below.) The highly intelligent cuttlefish appear to use chromatophores as a visual language between their fellows, a language humans have yet to decipher.

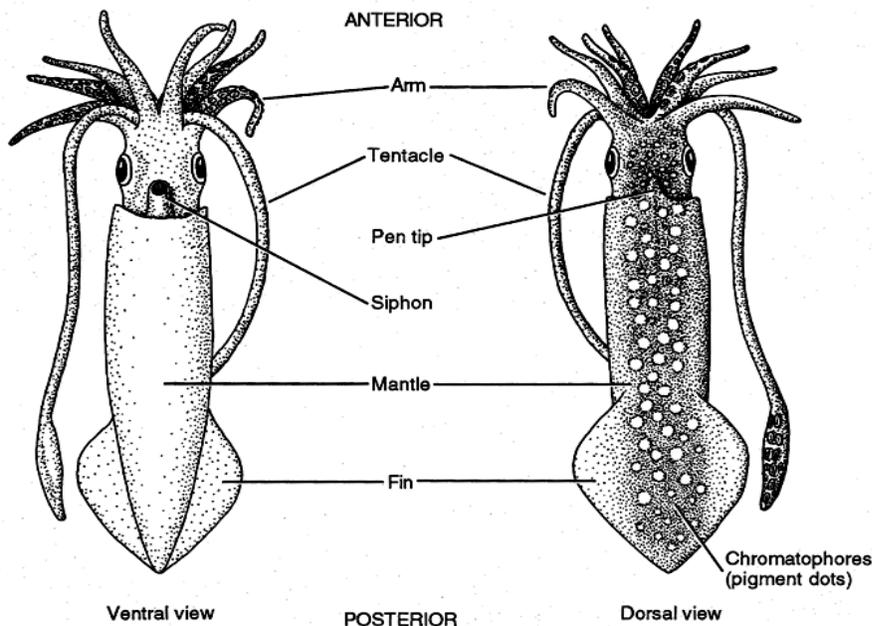
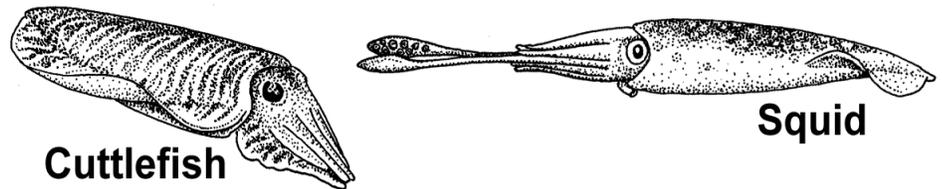


Fig. 6-13. External anatomy of a squid

In cephalopods, the primary swimming organ is the muscular *mantle*, which forms a chamber that opens to take in seawater. When the mantle closes forcefully, seawater ejected through the *siphon* jet-propels the animal in short bursts. Squids and cuttlefish change course by quickly redirecting their siphon. They steer by pressing their arms together. They can speedily elude an attacking predator. They can also squirt ink from the *ink sac* into the water, creating an ink cloud for camouflage and confusing the predator. The squid and cuttlefish can also wave their paddle-shaped *fins* to move slowly forward or backward. The fins also aid the squid in steering and in stabilizing their movements.

Most cephalopods are relatively small. The giant squid, the largest of invertebrates, reaches lengths of 15 m. It is the favorite prey of sperm whales and the basis for many myths about sea monsters.

## MATERIALS

fresh or defrosted squid  
wax paper  
dissecting scissors  
dissecting tray  
blunt probe  
microscope slide  
dissecting microscope

## PROCEDURE

1. Lay the squid dorsal side down on a piece of wax paper laid a dissection tray. Lay the squid with its head to the left and its siphon up. See Fig. 6-13.
2. Reach under the animal and remove the pen from the dorsal side by grasping it firmly with your fingers and pulling it free from the mantle.
3. Using a scalpel or dissection scissors, cut the mantle from its anterior edge next to the siphon to its posterior tip. Do not cut into the internal organs.
4. Using a blunt probe, find these structures and describe their functions. Refer to Fig. 6-14 as needed.
 

a. caecum	f. ovary or testis
b. intestine	g. gills
c. pen	h. chromatophores
d. ink sac	i. kidney
e. heart	j. nidamental gland
5. Examine a single sucker from an arm.
  - a. Cut off a 0.5-cm piece of the arm and place it on a glass slide.
  - b. View it under the dissection microscope.
  - c. Draw a picture of it in the Discussion section.
6. Observe the chromatophores, small freckle-like spots on the outer layer of the mantle. Cut out or peel off a small piece of the skin that contains the spots. Observe at about 20X under a dissection microscope. Stretch the skin, noting any apparent change of color. Record your observations.
7. Remove the beak.
  - a. Cut the arms from the head with scissors at line (A) as shown in Fig. 6-15
  - b. Push out the beak. Wash it and save it. Draw a picture of it in the Discussion section.
  - c. Remove the internal organs and wrap them in a plastic bag or newspaper. Give them to your teacher or save them for feeding aquarium organisms.

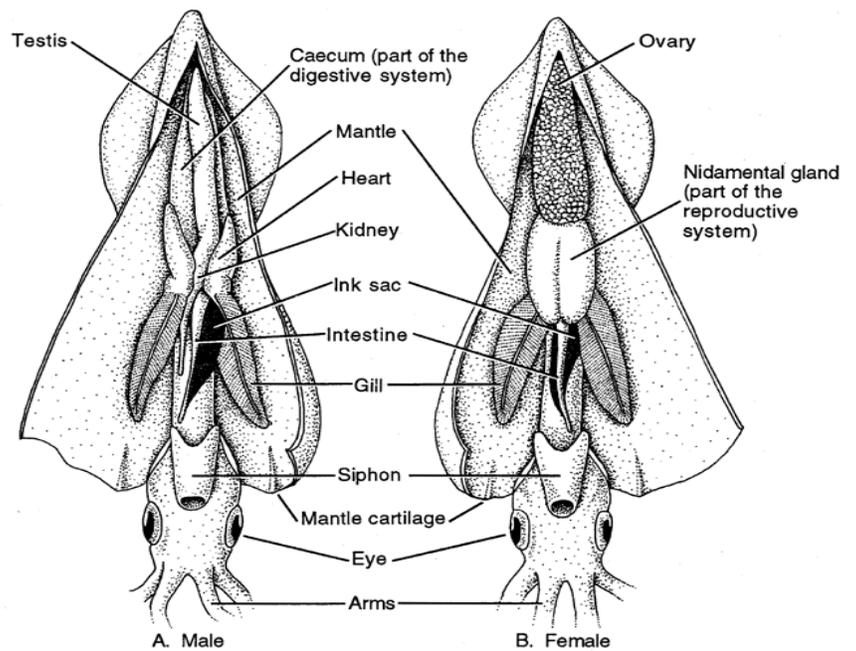


Fig. 6-14. Internal anatomy of a squid

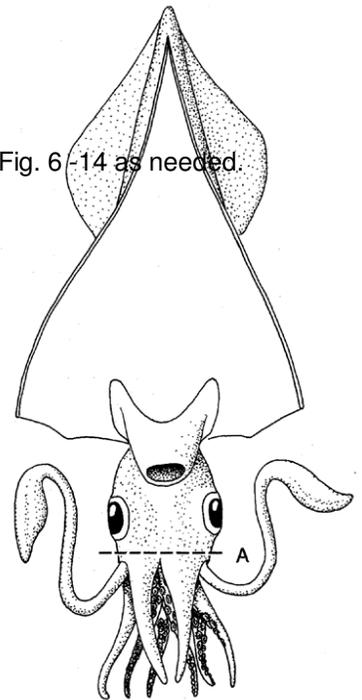
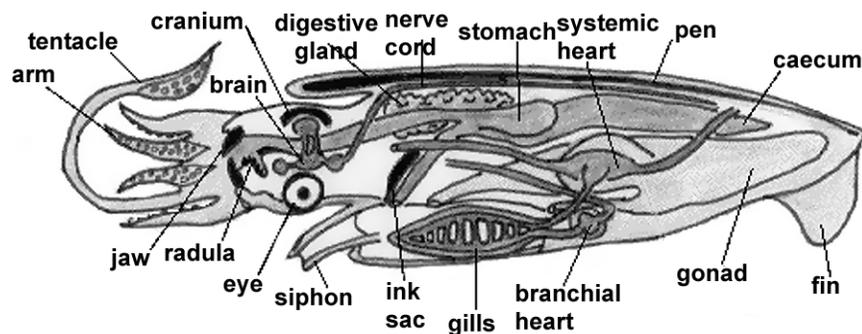


Fig. 6-15. Outline of a squid



Name \_\_\_\_\_ Date \_\_\_\_\_  
 Period \_\_\_\_\_ Group \_\_\_\_\_

**DISCUSSION:**

<b>STRUCTURE</b>	<b>FUNCTION</b>
caecum	
ovary or testis	
intestine	
gills	
pen	
chromatophores	
ink sac	
kidney	
systemic heart	
brachial heart	
nidamental gland (&)	
beak	
siphon	
fins	
retractor muscles	
brain	
optic nerve	

1. What are the distinguishing features of cephalopods?
2. What features relate cephalopods to other mollusks?
3. What advantages do cephalopods get from their chromatophores?
4. Describe jet propulsion and control of direction in a squid.
5. Describe several methods of escape (defense mechanisms) used by cephalopods.