

Squid Dissection: From Pen to Ink

Through squid dissection, students will examine some of the unique features which have allowed squid to adapt and thrive in Southern California waters and throughout the world. This beginning dissection lesson will allow students to identify internal and external anatomy of the squid and the various functions of its organs. Being careful not to be wasteful, the dissection will end with a Calamari Cookoff!

Activity time: 40-90 minutes

Materials for dissection:

- fresh or frozen whole squid (*Loligo opalescens*) available at a fish market or grocery
- clean dissection scissors or basic student scissors
- paper plates
- paper towels
- newspapers
- student worksheets

Materials for food preparation:

- portable fryer and oil
- 2 containers for milk and flour
- mallet (for tenderizing)
- seasoned flour (such as *Dixie Fry*)
- buttermilk
- cocktail sauce (optional)

Introduction:

One of the main objectives of this activity is to introduce students to dissection. Dissection is an important part of science discovery that can help us better understand how life works. It is important for students to see the role that dissection plays and develop a sense of responsibility and respect for the animal that they are using as a learning tool.

After the students finish their dissection, the impact of squid in their daily lives should be discussed. Squid are an important food item to many people throughout the world. With this in mind, the students have the opportunity to prepare and cook their squid at the end of the lesson.

Procedure

1. Begin the activity by asking students what they know about squid. (You may wish to refer to the background discussion "About Squid".) Encourage questions, possibly making a list on the board that you may be able to answer as you continue through the dissections. Possible questions (relating to anatomy) might include:
 - How does it eat? What does it eat?
 - How does it swim? How does it "steer"?
 - How does it protect itself?
 - Is it male or female? How can you tell?

2. Using one squid for demonstration, and the diagram of external anatomy (attached), begin to discuss the external anatomy and relate the features to the way the squid functions in its marine environment. Important features include the **arms** and **tentacles**, for hunting and mobility, the **fins**, for stabilizing and turning the squid while swimming, and the **chromatophores**, which can change color to aid in finding a mate, or in warning other squid. You may choose to have the students use the student worksheets in addition to your discussion.
3. Once the students are prepared for the dissection, equip each student, or pairs of students, with a squid on a paper plate. Use newspapers to cover the area where they are working.
4. Ask students identify the external anatomy of the squid. Make sure they count the number of arms and tentacles. Have the students pull back the arms to locate the beak. As they identify the features, they can fill in the spaces on their anatomy handout.
5. After the students have had the opportunity to explore the external anatomy they are ready to begin the dissection. Instruct the students to position the squid on the plate with the siphon facing up.
6. Distribute scissors. (These are the easiest tools to work with; scalpels are not necessary and can be dangerous.) Ask students to make one long incision from the bottom of the mantle, above the siphon, to the tip of the mantle next to the fins. Be sure to instruct the students to lift up with their scissors when cutting so as not to cut into the internal organs of the squid.
7. Spread the mantle open and have the students identify the internal anatomy. Begin with locating the feathery gills and following those to their base to locate the hearts. Next have the students locate the gonads and explain the difference between the male and female gonads. Have the students view both sexes to see the difference.
8. When the students have located all of the internal organs, they can remove the arms and internal organs from the mantle. Have the students pick up their squid by the arms and while holding the mantle in the other hand, pull to separate the arms from the mantle. If done properly, the arms and internal organs will all come off in one piece. Students may notice a the thin shell-like pen inside the mantle. They can pull the pen out of the mantle. (They may need to snip it out using scissors.)

TEACHING TIP:

Depending on the class, you may wish to demonstrate the entire dissection for the class before asking them to do it. A video camera or flexcam could make this even more effective.

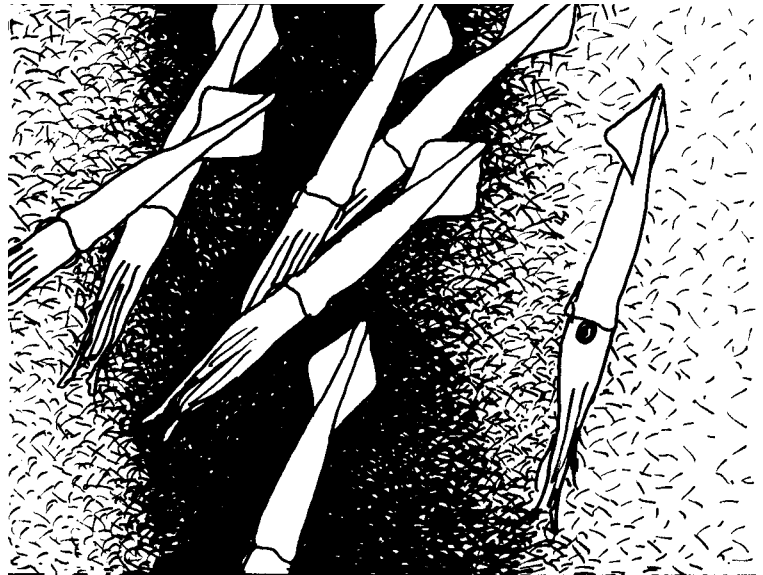
NOW GET READY TO EAT THE SQUID!

9. Have the students remove the fins by grasping the mantle in one hand and the fins in the other and pulling to remove the fins. Then have the students clean the mantle by removing any of the excess skin.
10. When the mantle is clean, have the students cut the mantle into strips, starting from the bottom of the mantle to the tip. Once the strips are cut have the students tenderize the squid by pounding it a few times with a block or meat hammer.
11. The students should first coat the squid strips with buttermilk, and then roll them in the seasoned flour mix. The teacher can then drop them carefully into the pre-heated deep-fryer, and let them cook until they curl up and float to the top of the oil, approximately 1 minute. The cooking should be done by an adult to prevent burns or other injuries.
12. Garnish with cocktail sauce and enjoy!

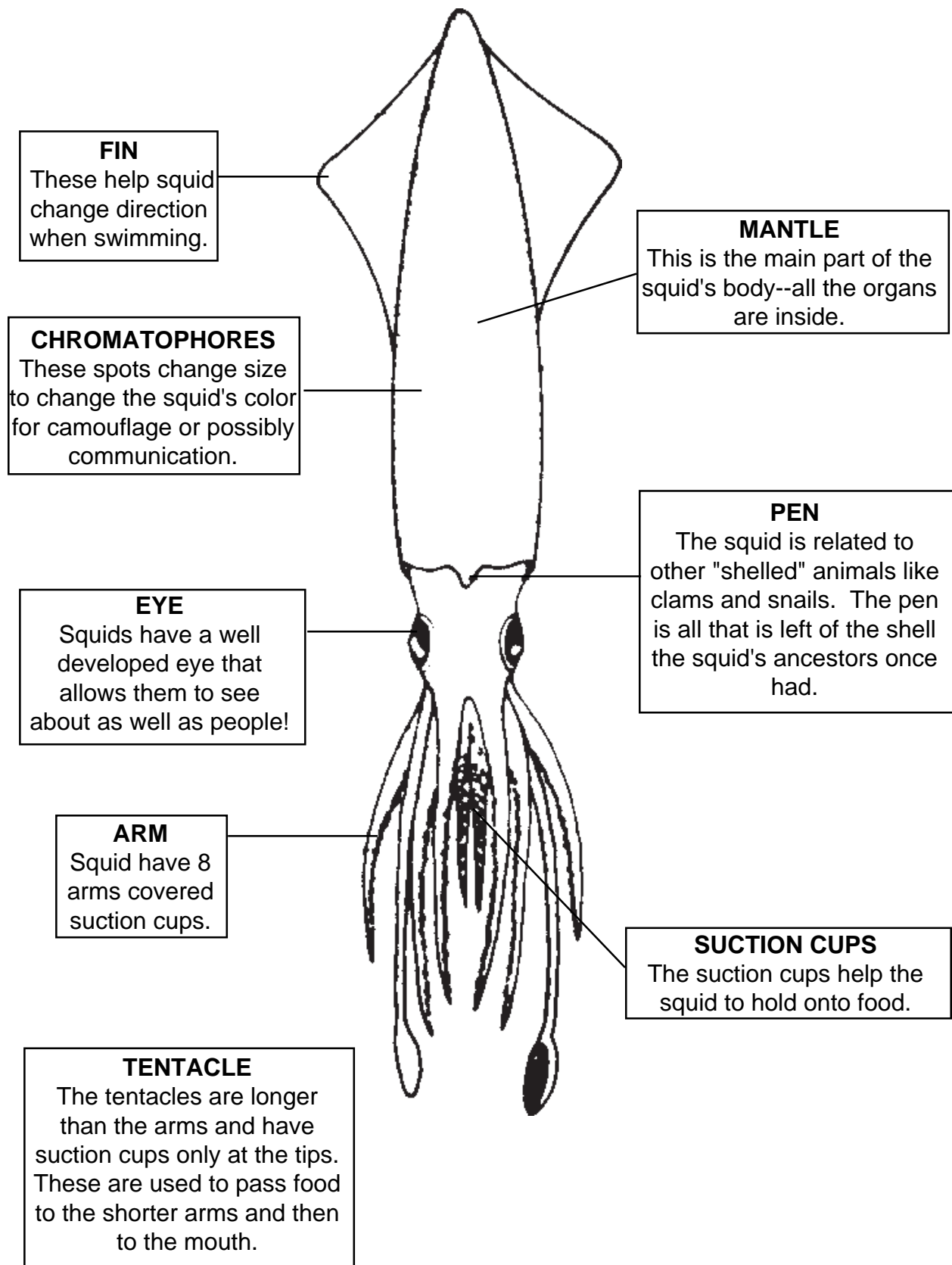
Discussion:

While the students are dissecting the squid, consider asking some questions to encourage discussion about the squid.

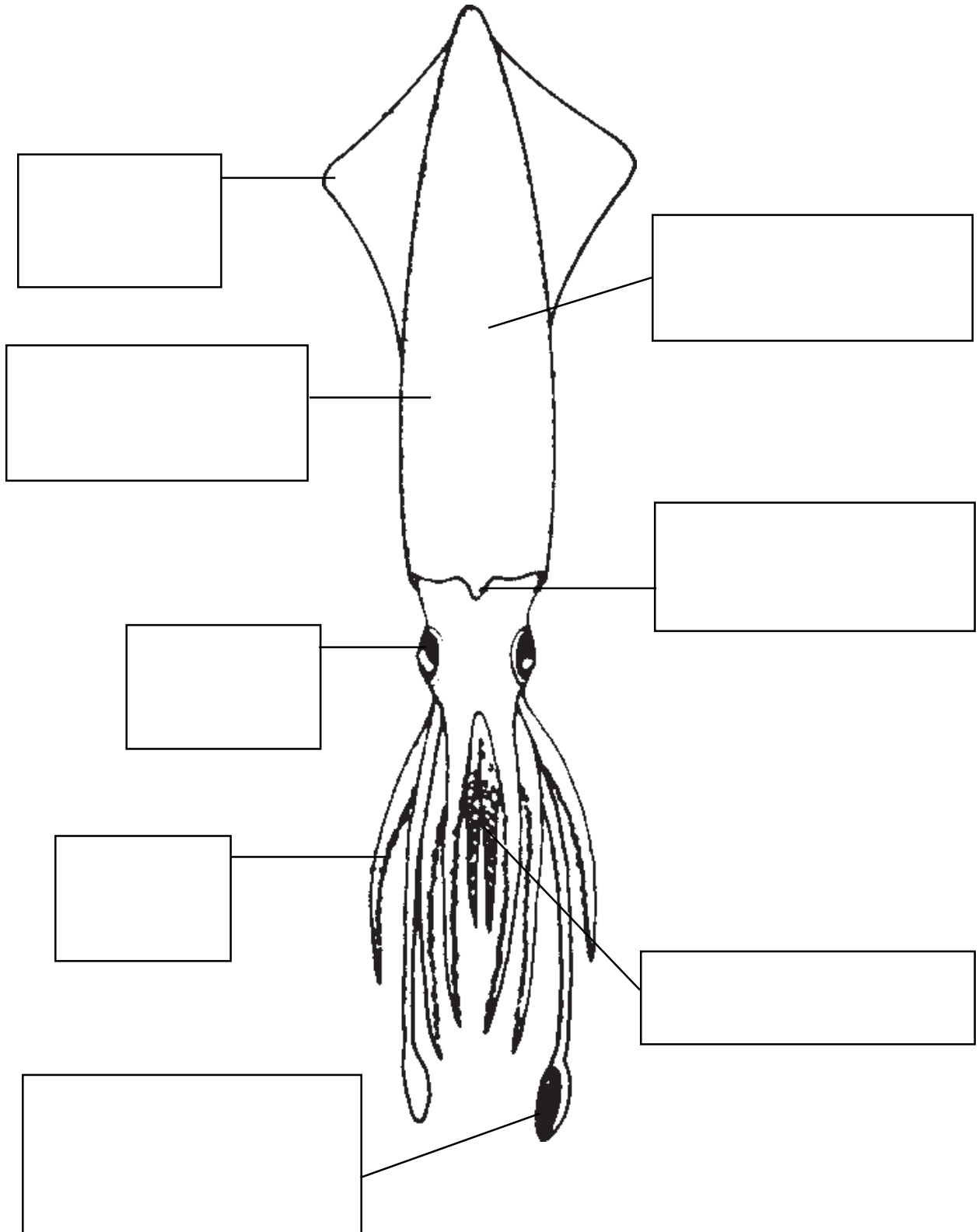
1. Where does the squid fit into the marine food web?
2. What role does the squid play in the ocean ecosystem?
3. What adaptations does the squid have that allow it to play this role?
4. Can you think of other animals that play a similar role in other ecosystems?
5. Have you ever used a squid for food or as fish bait?



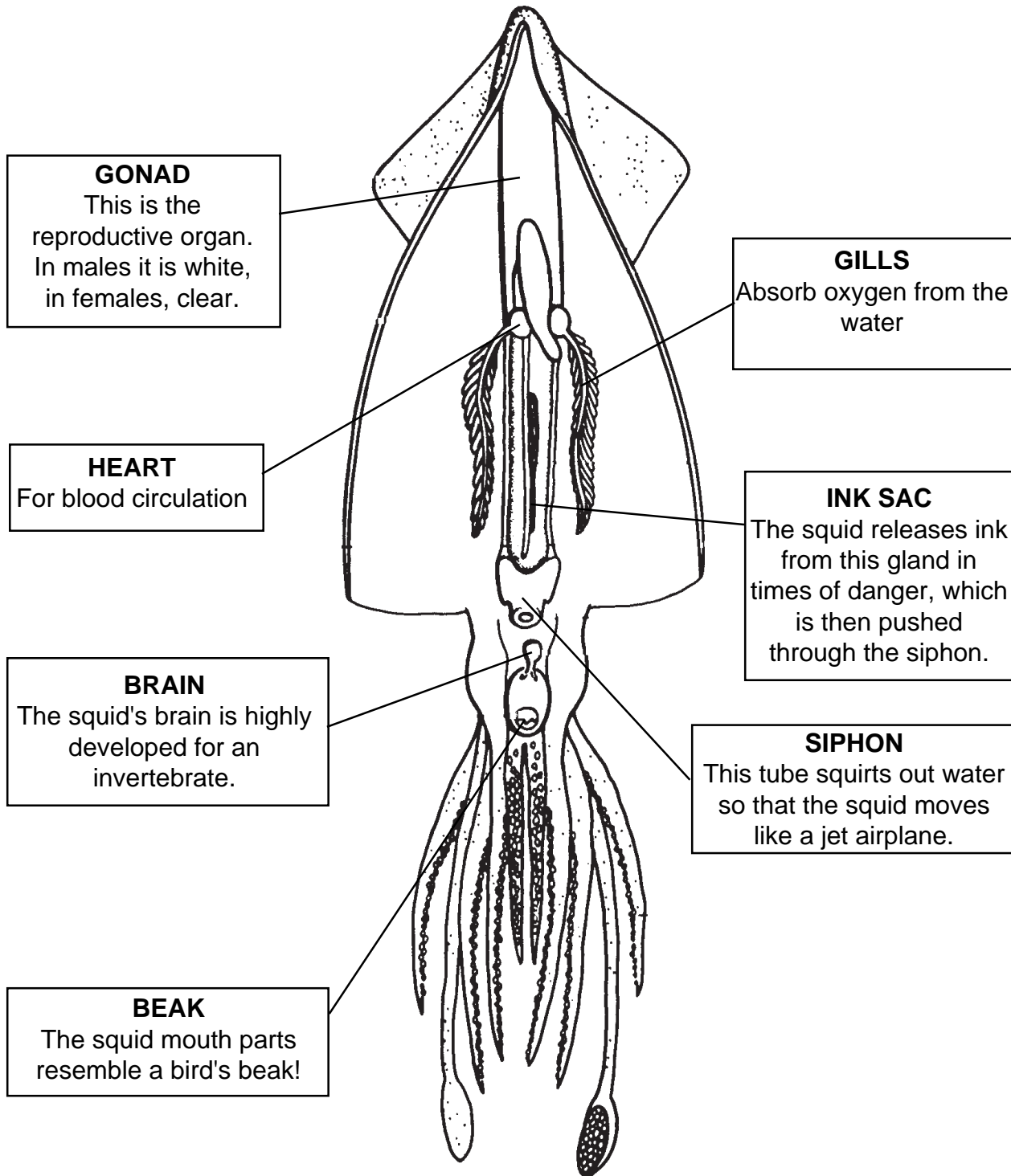
Squid: External Anatomy



Squid: External Anatomy (student worksheet)

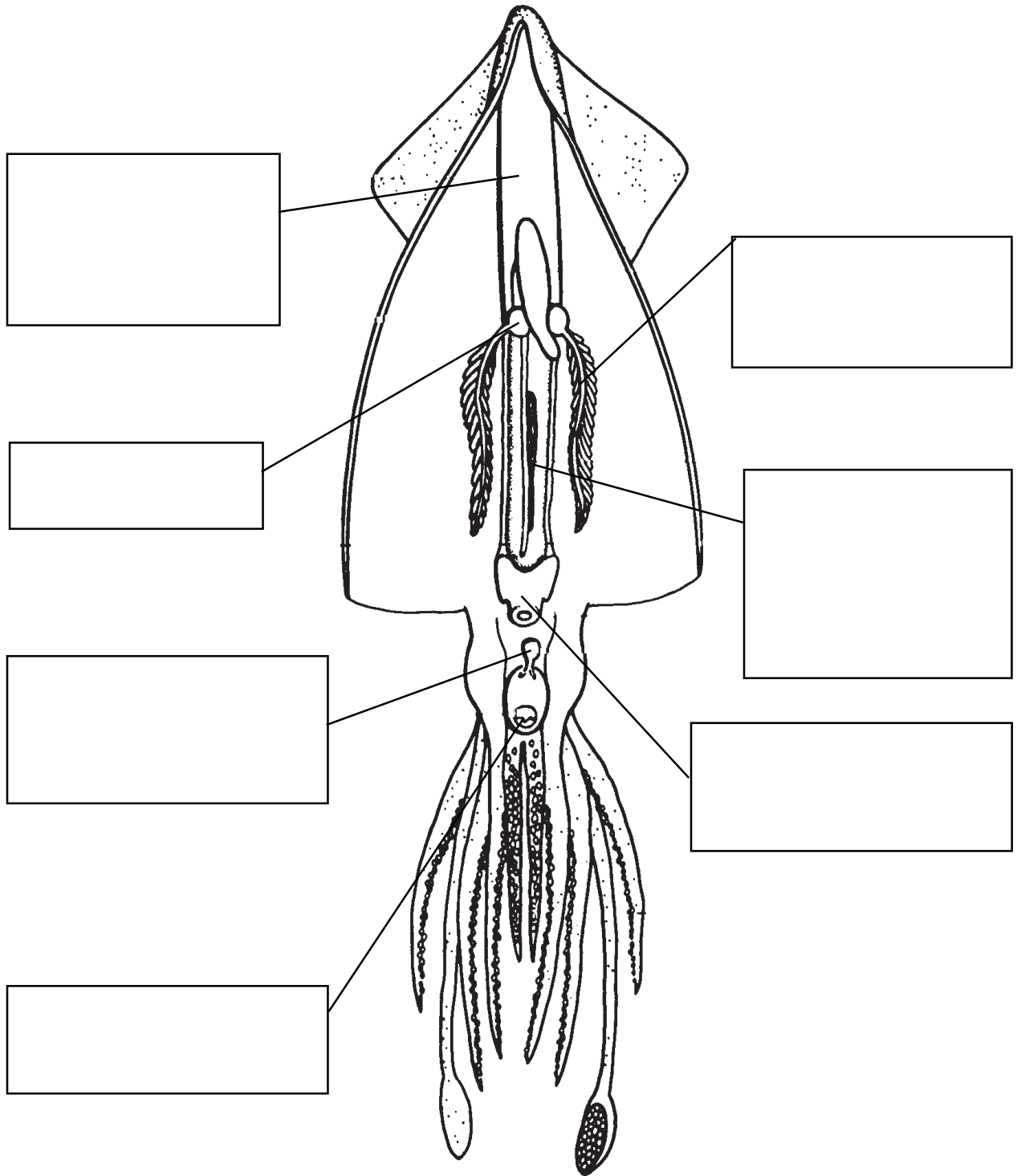


Squid: Internal Anatomy



From Pen to Ink

Squid: Internal Anatomy (student worksheet)



About Squid

The squid is one of the most highly developed **invertebrates**. Some of the animal's structures explored in this lesson illustrate the ways in which the squid has adapted to life in the ocean. Its streamlined body and "jet propulsion" which occurs as the squid squeezes water out of its body through its **siphon**, make the squid a fast, active predator. This animal also has a very good defense mechanism.

- All mollusks have a soft body with a special covering called the mantle, which encloses all of the body organs such as heart, stomach and gills.
- Squid can be as small as a thumbnail, or as large as a house. The giant squid, *Architeuthis*, can measure 60 ft. in length and weigh three tons!
- Squid have ten arms, which are wrapped around the head. Eight are short and heavy, and lined with suction cups. The ninth and tenth are twice the length of the others, and are called tentacles. Suction cups are only on the flat pads at the end of the tentacles.
- Squid feed on small crustaceans, fish, marine worms, and even their own kind! They use their tentacles to quickly catch their prey, which is pulled in by the arms and down to the radula, or beak, which uses a tongue-like action to get food to the mouth so it can be swallowed whole.
- Squid are a major food source for many fishes, birds and marine mammals.
- Squid produce a dark ink that they use to escape from predators. When a squid is startled, the ink is released through the anus, and the cloud of inky water confuses the predator while the squid swims away.
- After mating, a female squid will produce 10-50 elongated egg strings, which contain hundreds of eggs each. In many species, the parents will soon die after leaving the spawning ground. The egg strings are attached to the ocean floor, are left to develop on their own, and hatch approximately ten days later.
- Squid are an important part of the ocean food web. Squid are gaining popularity as a food source for humans around the world. Overfishing is a growing concern because there are no regulations on squid harvesting.
- Southern California squid populations spawn mainly in the winter (December to March). Squid are seined commercially at their spawning grounds. About 6,000 metric tons are taken yearly for human food and bait.

