**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

**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.

**Pre-Lab**
1. What do you know about squid?

2. How does it eat? What does it eat?

3. How does it swim? How does it “steer”?

4. How does it protect itself?
Procedures
1. Lay your squid flat on the plate or tray. Identify the external anatomy of the squid. Be sure to count the number of arms and tentacles.
2. Pull back the arms to locate the beak.
3. Using scissors 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 lift up with your scissors when cutting so as not to cut into the internal organs of the squid.
4. Spread the mantle open and identify the internal anatomy. Begin with locating the feathery gills and following those to their base to locate the hearts.
5. Locate the gonads and explain the difference between the male and female gonads.
6. When you have located all of the internal organs, remove the arms and internal organs from the mantle.
7. Pick up your 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. You may notice a the thin shell-like pen inside the mantle. Pull the pen out of the mantle. (You may need to snip it out using scissors.)
8. Remove the fins by grasping the mantle in one hand and the fins in the other and pulling to remove the fins. Clean the mantle by removing any of the excess skin.
9. When the mantle is clean, cut the mantle into strips, starting from the bottom of the mantle to the tip.
10. If desired season and cook the squid for consumption...calamari! Coat the squid strips with buttermilk, and then roll them in the seasoned flour mix. 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 carefully to prevent burns or other injuries.
Squid: External Anatomy (student worksheet)

Identify the external anatomy of the squid. Make sure they count the number of arms and tentacles. Fill in the spaces on your squid anatomy handout.
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.
Discussion:

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?