Squid Adaptations

Topic

The bodies of squid are highly adapted for their lifestyles.

Introduction

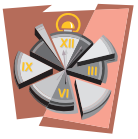
The animals known as *mollusks* are a large and diverse group. All mollusks share some basic characteristics. One is a mantle, a layer of tissue from which the shell grows. Another is a foot, or a modified foot, that is used for locomotion.

Squid do not resemble many of their close mollusca relatives, such as clams and snails. Squid do not have shells. Instead, their bodies contain a modified internal shell that serves as a point of attachment for muscles. A squid also lacks a muscular foot like the one found in a clam and a snail. In a squid, the foot is modified as tentacles and arms, which the animal uses for swimming and food gathering. Both structures are covered with gripping suckers.

The nervous system of a squid is well developed, and its eyes are large. Most squid are about 8 to 12 inches long, although the largest invertebrate in the world is the giant squid, which measures up to 56 feet in length.

Squid are not filter feeders like clams, and they do not scrape up algae as do snails. These mollusks are carnivores that hunt down their prey and grab it with sucker-covered arms and tentacles. Once a meal is subdued, squid tear away flesh with their sharp, beak-like mouths.

In this experiment, you will examine several adaptations of a squid.



Time Required

50 minutes

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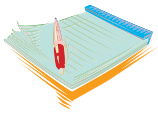

Materials

- gloves
- apron
- goggles
- squid (from grocery store, seafood market, or a preserved specimen)
- dissecting pan
- dissecting microscope
- microscope slides
- scalpel
- scissors
- forceps
- ruler or tape measure
- science notebook

Safety Note **Please review and follow the safety guidelines. Gloves should be worn when handling a preserved squid. Take care when working with the scalpel.**

Procedure

1. Put on your lab apron, safety goggles, and gloves.
2. Place the squid in the dissecting tray.
3. Examine the arms and tentacles of the squid. Tentacles are longer than arms (Figure 1). With scissors and forceps, remove a sucker from a tentacle. Place the sucker on the slide and examine it under the dissecting microscope. Sketch what you see in your science notebook.

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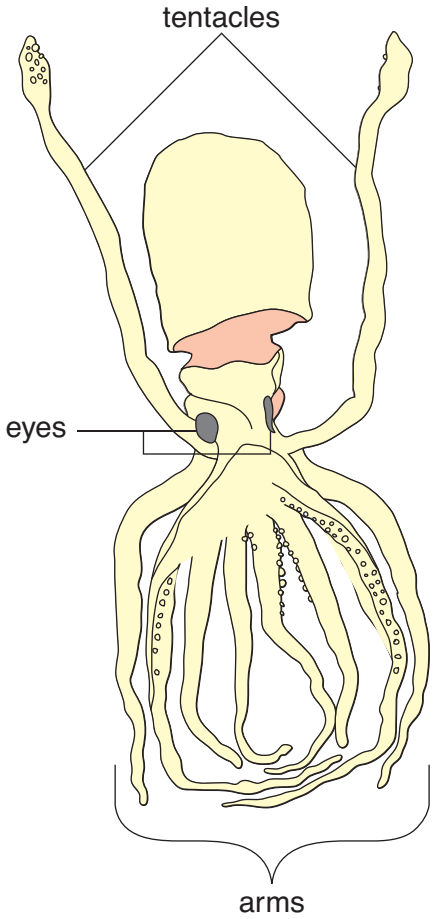

Figure 1

4. Remove a sucker from one of the arms and examine it under the microscope. Sketch the sucker in your science notebook. Note any differences between this sucker and the one you removed from a tentacle.
5. Squid are able to camouflage themselves by changing colors to blend in with the environment. Cells that enable them to change colors, *chromatophores,* are star-shaped and filled with pigments. Chromatophores are very elastic and can be expanded or contracted to change the appearance of the squid. To observe chromatophores, remove a thin section of skin from the squid using the forceps and scalpel. Place the section of skin on the microscope slide and examine it under the dissecting microscope. Locate one or more dark, star-shaped cells, and sketch them in your science notebook.

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6. Locate the squid's mouth at the base of the arms and tentacles (Figure 2). The mouth is equipped with two hard jaws that form a beak. Carefully remove the beak with your scalpel, forceps, and scissors. Place the beak on a microscope slide and examine it under the dissecting microscope. Sketch the beak in your science notebook.

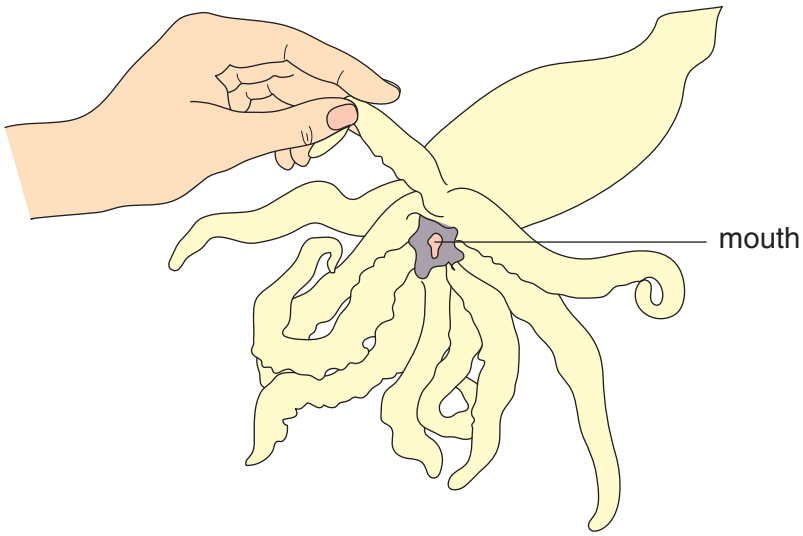

Figure 2

7. Remove one of the eyes from the squid and place it on a microscope slide. Examine the eye under the microscope. Sketch the eye in your science notebook. Measure the eye to determine its diameter, and record that diameter in your science notebook.

Analysis

1. How many arms does a squid have? How many tentacles?
2. Describe the appearance of a sucker removed from an arm. How is it different from a sucker removed from a tentacle?
3. Explain how chromatophores help squid survive.
4. What characteristics of a squid's beak suggest that this animal is a meat eater? Explain your answer.

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5. The human eye has an iris, the colored part, and a pupil, the dark hole in the center of the iris. How does the eye of the squid compare to a human eye? Does the squid's eye possess eyelashes or an eyebrow?
6. The eyes of squids are larger in proportion to their body length than the eyes of humans. Determine your height in inches and record it in your science notebook. To calculate how large your eye would be if you were the squid you looked at today, use the following formula. *U* represents the unknown, in this case the size of your eye if you were a squid. Make all of your measurements in inches.

$$U = \frac{\text{diameter of the squid's eye} \times \text{your height in inches}}{\text{squid's length}}$$

What's Going On?

Even though squid are mollusks, their body structure is very different from most of their close relatives. Squid are highly specialized for their way of life. To feed, a squid hunts prey and captures it with its tentacles and arms. Suction cups on both types of appendages may be edged with teeth or hooks. In some species, arms and tentacles have suckers that are distinctly different. The beak is used to tear food apart so that it can be consumed. The beak is also capable of crushing the shells of animals like crabs and shrimp.

Squid have very advanced nervous systems that help them find prey and avoid predators. Their ability to change color is coordinated by their brain and a system of nerves running to each chromatophore. In addition, squid are equipped with two large eyes that constantly watch for prey and take in information about the environment. Compared to other animals with eyes, the eyes of a squid are disproportionately large.

Some squid have bioluminescent cells in their skin. *Bioluminescence*, or the ability to produce light, is due to a chemical reaction that occurs in these specialized cells. Squid may produce light to signal other animals of their own species or to confuse predators.

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OUR FINDINGS

SQUID ADAPTATIONS

Analysis

1. A squid has eight arms and two tentacles.
2. Answers will vary. Depending on the species, suckers may be smooth, toothed, or lined with hooks. In some species, suckers on tentacles and arms are identical, while in others they differ.
3. Answers will vary. Chromatophores enable squid to blend in with their environment, making it more difficult for predators to see them. The camouflaging due to chromatophores also makes it easier for squid to get close to their prey.
4. Answers will vary. Beaks are sharp and designed to tear flesh.
5. The squid eye has a rectangular iris and pupil. It does not possess lashes or eyebrow.
6. Relative to body size, the squid eye is about 100 times larger than the human eye.

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SAFETY PRECAUTIONS

Review Before Starting Any Experiment

Each experiment includes special safety precautions that are relevant to that particular project. These do not include all the basic safety precautions that are necessary whenever you are working on a scientific experiment. For this reason, it is necessary that you read and remain mindful of the General Safety Precautions that follow. Experimental science can be dangerous, and good laboratory procedure always includes carefully following basic safety rules. Things can happen very quickly while you are performing an experiment. Materials can spill, break, or even catch fire. There will be no time after the fact to protect yourself. Always prepare for unexpected dangers by following the basic safety guidelines during the entire experiment, whether or not something seems dangerous to you at a given moment.

We have been quite sparing in prescribing safety precautions for the individual experiments. For one reason, we want you to take very seriously every safety precaution that is printed in this book. If you see it written here, you can be sure that it is here because it is absolutely critical.

Read the safety precautions here and at the beginning of each experiment before performing each activity. It is difficult to remember a long set of general rules. By rereading these general precautions every time you set up an experiment, you will be reminding yourself that lab safety is critically important. In addition, use your good judgment and pay close attention when performing potentially dangerous procedures. Just because the text does not say “be careful with hot liquids” or “don’t cut yourself with a knife” does not mean that you can be careless when boiling water or punching holes in plastic bottles. Notes in the text are special precautions to which you must pay special attention.

GENERAL SAFETY PRECAUTIONS

Accidents caused by carelessness, haste, insufficient knowledge, or taking an unnecessary risk can be avoided by practicing safety procedures and being alert while conducting experiments. Be sure to check the individual experiments in this book for additional safety regulations and adult supervision requirements. If you will be working in a lab, do not work alone. When you are working off site, keep in

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groups with a minimum of three students per group, and follow school rules and state legal requirements for the number of supervisors required. Ask an adult supervisor with basic training in first aid to carry a small first-aid kit. Make sure everyone knows where this person will be during the experiment.

PREPARING

- Clear all surfaces before beginning experiments.
- Read the instructions before you start.
- Know the hazards of the experiments and anticipate dangers.

PROTECTING YOURSELF

- Follow the directions step-by-step.
- Do only one experiment at a time.
- Locate exits, fire blanket and extinguisher, master gas and electricity shut-offs, eyewash, and first-aid kit.
- Make sure there is adequate ventilation.
- Do not horseplay.
- Keep floor and workspace neat, clean, and dry.
- Clean up spills immediately.
- If glassware breaks, do not clean it up; ask for teacher assistance.
- Tie back long hair.
- Never eat, drink, or smoke in the laboratory or workspace.
- Do not eat or drink any substances tested unless expressly permitted to do so by a knowledgeable adult.

USING EQUIPMENT WITH CARE

- Set up apparatus far from the edge of the desk.
- Use knives or other sharp-pointed instruments with care.
- Pull plugs, not cords, when removing electrical plugs.
- Clean glassware before and after use.
- Check glassware for scratches, cracks, and sharp edges.

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- Clean up broken glassware immediately.
- Do not use reflected sunlight to illuminate your microscope.
- Do not touch metal conductors.
- Use alcohol-filled thermometers, not mercury-filled thermometers.

USING CHEMICALS

- Never taste or inhale chemicals
- Label all bottles and apparatus containing chemicals
- Read labels carefully.
- Avoid chemical contact with skin and eyes (wear safety glasses, lab apron, and gloves).
- Do not touch chemical solutions.
- Wash hands before and after using solutions.
- Wipe up spills thoroughly.

HEATING SUBSTANCES

- Wear safety glasses, apron, and gloves when boiling water.
- Keep your face away from test tubes and beakers.
- Use test tubes, beakers, and other glassware made of Pyrex™ glass.
- Never leave apparatus unattended.
- Use safety tongs and heat-resistant gloves.
- If your laboratory does not have heat-proof workbenches, put your Bunsen burner on a heat-proof mat before lighting it.
- Take care when lighting your Bunsen burner; light it with the airhole closed, and use a Bunsen burner lighter in preference to wooden matches.
- Turn off hot plates, Bunsen burners, and gas when you are done.
- Keep flammable substances away from flames and other sources of heat.
- Have a fire extinguisher on hand.

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FINISHING UP

- Thoroughly clean your work area and any glassware used.
- Wash your hands.
- Be careful not to return chemicals or contaminated reagents to the wrong containers.
- Do not dispose of materials in the sink unless instructed to do so.
- Clean up all residues and put them in proper containers for disposal.
- Dispose of all chemicals according to all local, state, and federal laws.

BE SAFETY CONSCIOUS AT ALL TIMES!

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