



Lab: Squid Dissection

Purpose: To investigate invertebrates, in particular squid.
To examine some of the unique features which have allowed squid to adapt and thrive in waters throughout the world.

Gathering of Information: The squid is one of the most highly developed **invertebrates**. It is in the phylum **Mollusca**, which is derived from the Latin word meaning "soft body". It belongs to the class **Cephalopoda**, meaning "head-footed," because its head is pushed down toward the foot. This class also includes the octopus, cuttlefish and ancient nautilus.

All mollusks have a soft body with a special covering called the mantle, which encloses all of the body organs such as the heart, stomach, and gills. Squid have a large mantle, eight arms with two longer feeding tentacles all with suckers, a beak and mouth, a siphon, a large head (with a brain), two large eyes, and three hearts. The tentacles are long and retractable and have suckers only at the tips. Their large eyes are very similar in structure to people's eyes. The shell has been reduced to a chitinous pen that is embedded in the upper surface of the mantle.

Squid breathe using gills. They move by squirting water from the mantle through the siphon, using a type of movement called jet propulsion. They can move both backward and forward just by changing the direction of the water flow through the siphon.

Some of the animal's structures explored in this lab illustrate the ways in which the squid has adapted to life in the ocean. Its streamlined body and jet propulsion make the squid a fast, active predator. This animal also has a very good defense mechanism.

Squid can change the color of their skin to mimic their environment and hide from predators. When in danger, squid release a cloud of dark ink from their ink sac in order to confuse their attacker and allow the squid to escape.

These fast-moving **carnivores** catch prey with their two feeding tentacles, then hold the prey with the eight arms and bite it into small pieces using a parrot-like beak. The esophagus runs through the brain, so the food must be in small pieces before swallowing. Squid feed on small crustaceans, fish, marine worms, and even their own kind!

Squid reproduce sexually by releasing eggs into the water. After mating, a female squid will produce 10-50 elongated egg strings, which contain hundreds to eggs in each string. 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 a major food source for many fish, birds, and marine mammals. Squid are gaining popularity as a food source for humans around the world (calamari). However, over-fishing is a growing concern because there are no regulations on squid harvesting.

Squid can be as small as a thumbnail, or as large as a house. The giant squid, *Architeuthis*, can measure 60 feet in length and weigh three tons! About 6,000 metric tons are taken yearly for human food and bait.

Materials: Dissecting pan Probe Scissors
Squid Paper Towels Plastic Bag
Gloves



Procedures:

Part 1 – External Anatomy

1. Place the squid on the dissecting pan, dorsal side up (darker side). Notice the counter shading. One side is darker than the other.
2. Notice and label on the external squid diagram the chromatophores. The “freckles” allow the squid to change colors. These spots change size to change the squid’s color for camouflage. Try rubbing them to see if you can see a change. Note: rub gently. If nothing happens, try again after the dissection is done (or else you will damage the insides)
3. Look and label the fins on the external squid diagram. These help the squid to change direction when swimming.
4. Locate and label the mantle on the external squid diagram. The mantle is the main part of the squid’s body— all organs are inside. This is the part that is normally eaten by humans, in addition to the arms/tentacles.
5. Locate and label the pen on the external squid diagram. The squid is related to other “shelled” animals like clams and snails. The pen is all that is left of the shell the squids ancestors once had.
6. Look and label the eyes on the squid diagram. Squid have big eyes compared to their head. In comparison, humans’ eyes would be the size of dinner plates if the proportion were the same. They are positioned on the side. Being on the side gives them more peripheral vision, which is great for hunting.
7. Count and label the number of tentacles squid have. The tentacles are longer than the arms and have suction cups only at the tips. These are used to pass food to the shorter arms and then to the mouth.
8. Count and label the number of arms a squid have. Arms have suction all the way down.
9. Label the suction cups on the squid diagram.
10. Look and try to find the beak. The beak is hard and is a dark brownish color. Draw the beak in on the internal anatomy squid diagram and label it. If you look very closely, you may be able to see the radula, too!
11. Now, lay your squid ventral side up (lighter side). Locate the collar. The collar is the opening of the mantle (like the collar of your shirt).
12. Locate and label the siphon (a.k.a. funnel). You can label the siphon on the internal anatomy diagram. Water is pulled into the mantle. The mantle is squeezed forcing water out through the siphon. This type of movement is called *jet propulsion*. Squids are the fastest invertebrates swimming at approximately 30 mph.

Note: you can put your blunt probe directly into the siphon and wiggle it around.

IMPORTANT: After cutting, find all the features before removing anything!

Cut through

Part 2 – Internal Anatomy

The fins should be flat on the dissecting tray.

the middle,

1. Place the squid on the dissecting pan, ventral side up (lighter side). Cut the mantle **UPWARDS** to avoid puncturing internal organs. Lift up with the scissors when cutting so as not to cut into the internal organs of the squid. Cut all the way to the tip of the tail. Lay the flaps of the mantle to the sides. going from bottom to top.
2. Label and remove the **gills** from the body (place them in your plastic bag). The gills are feathery structures that absorb oxygen from the water. Your teacher will come around to your table and place the gills in a petri dish filled with water. Notice how in water the gills look feathery. This feature increases the amount of surface area potential for gas exchange.
3. Locate and label the **ink sac**. The ink sac lies on top of the liver. Carefully, pull it up with the tip of your scissors or finger and snip the ink sac away. Lay aside for now in the dissecting pan. The squid releases ink from this gland in times of danger, which is then pushed through the siphon.
4. Locate and label the **heart**. Squid have 3 hearts - 2 brachial and one systemic. The hearts are located at the bottom of the gills. The heart is for blood circulation. If your squid is female, this will be difficult to see.
5. Locate and label the **gonads**. This is the reproductive organ. In males, it is a white-ish mound (sperm sac). In females, it is clear to yellow/orange mass of eggs.
6. Place your fingers on your squid's mantle (on either side of the head). Peel back the head and guts from the mantle. Locate and remove the **pen**, you may have to snip it out using scissors (place this on your dissecting pan to the side).
7. Finally, take the pen and dip it into the ink sac. Then write your name in the space provided on your lab.
8. Observe the siphon retractor muscles, which are used to extend and retract the siphon. These help with locomotion.
9. After attempting to find the esophagus, feel free to cut through the buccal mass (the muscle holding the radula and beak), and extract the beak. Be careful not to cut through or damage the beak itself.

Elaborations

MALE:

Reproductive Structures

- Seminal vesicle: coiled white structure. Secretes fluid that partly composes the semen
- Testis: long fingerlike structure on the left side (hard to see). Produces sperm.
- Vas deferens: whiteish fingerlike structure: is a long coiled tube where the sperm passes through. Could technically follow it all the way down to the siphon, where the sperm is released to the environment.

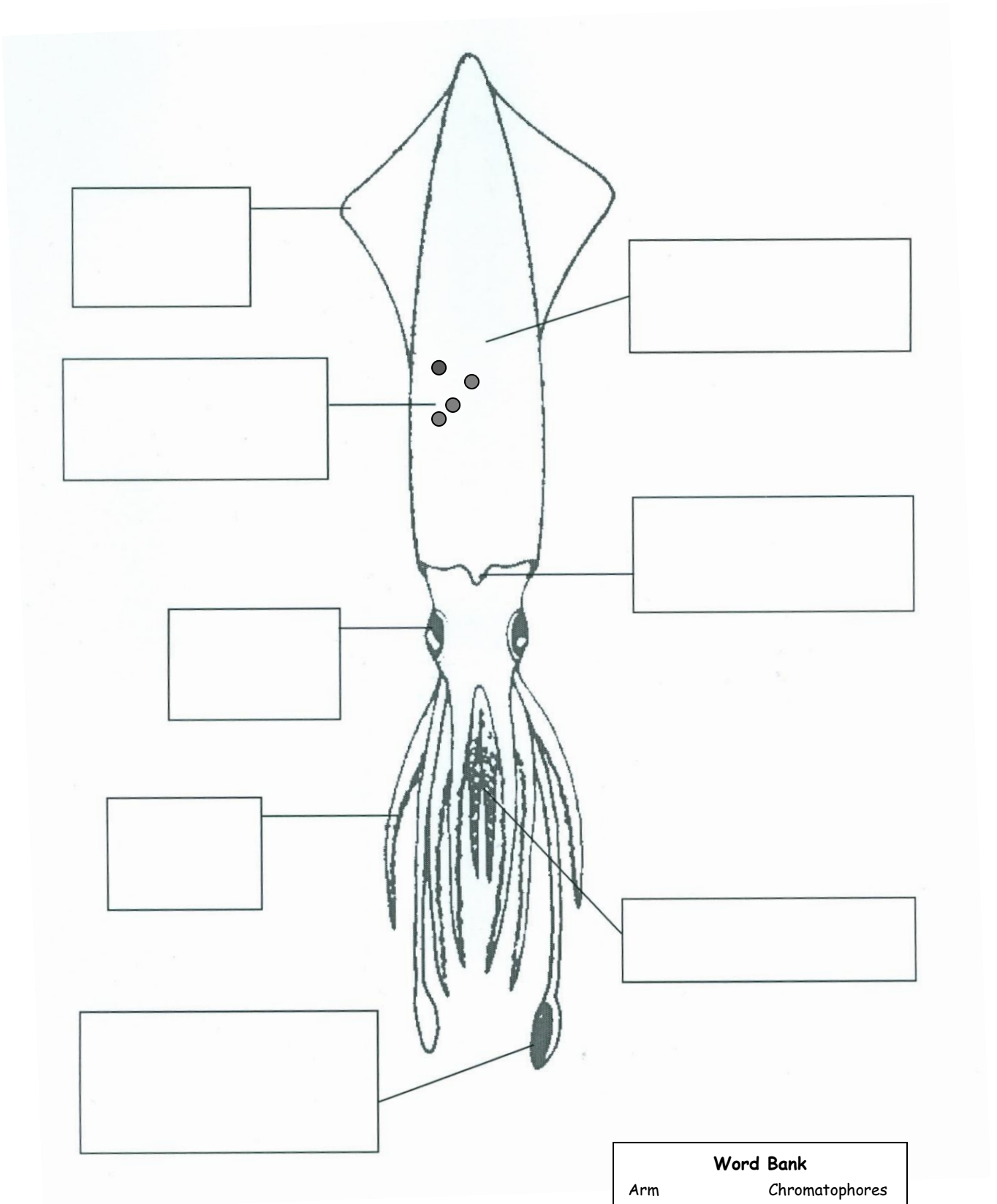
Digestive Organs

- Stomach: clear-ish fingerlike structure on the top-right side (may be hard to see or partially smushed)
- Caecum: white mushy structure on the top, is quite large. Used to secrete digestive enzymes for digestion.
- Esophagus: you may be able to see this. It is a tube near the bottom of the squid that releases into the siphon.

FEMALE:

- Nidamental gland: produces protective covering for eggs before they are released
- Ovary: large structure at the top, covering the caecum and stomach. Makes eggs.
- Oviducal gland: produces shell for eggs
- Oviduct: releases eggs. (difficult to see)

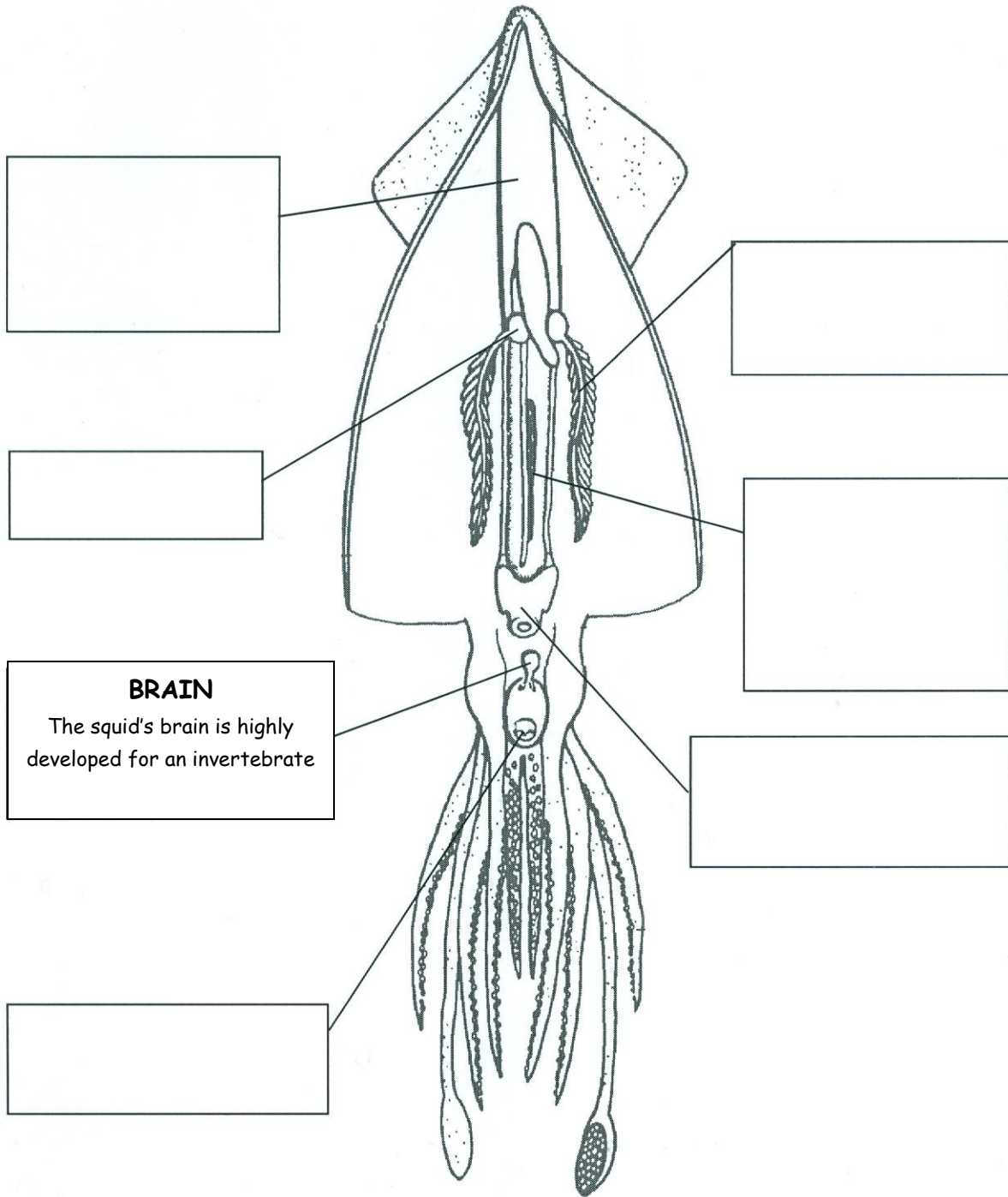
EXTERNAL SQUID ANATOMY



Word Bank

Arm	Chromatophores
Eye	Fin
Mantle	Pen
Suction Cups	Tentacles

INTERNAL SQUID ANATOMY



Word Bank	
Beak	Gills
Gonad	Heart
Ink Sac	Siphon