Octopus

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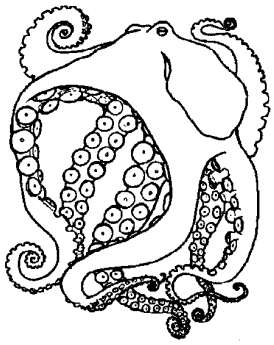
Key Concepts

1. Octopus use their eight, sucker-lined tentacles for grasping prey.
2. An octopus moves quickly using jet propulsion.



Background

The octopus is a very amazing and misunderstood creature. With a warty, bag-shaped body, yellow eyes that stand out on top of its head, and eight, rubbery arms or tentacles covered with suction cups, the octopus has been written about for many centuries, but until recent history, little was known. If the truth were told, all sinister descriptions of the octopus were written from the crab's point of view. A timid creature, the octopus is a very neat and tidy housekeeper, a devoted mother, and a very intelligent problem solver.

There are more than 150 different species of octopus. They range in size from two inches to 30 feet in diameter. Octopus live in tropical seas to the Arctic and Antarctic Oceans. Some of the largest are found in Puget Sound, in Washington State.

Scientists place the octopus, along with squid and nautilus, in a group of animals they call cephalopods, which means "head-footed". This reflects the fact that the grasping tentacles found in this group look as if they grow directly out of the head. The octopus belongs to a major division of the animal kingdom called mollusca, which includes clams, oysters, snails and other shellfish. The octopus has no real shell, the only hard part of its body is the sharp parrot-like beak located in the middle of the tentacles, under the head.

Eating

The favorite food of octopus seems to be crabs. If an unsuspecting crab wanders past its den, the crafty octopus quickly sticks out a tentacle to grab it. The octopus will also leave its den to find crab, abalone, lobster, clams, and many other shellfish. The common octopus has 240 suckers on each arm with which it quickly moves its meal to the mouth hidden at the center of all eight arms on the underside of the body. The octopus then squirts its prey with a poison that paralyzes it, and proceeds to eat it by cracking open the shell with its sharp beak.

Because octopus are such a good housekeepers, a stack of crab shells just outside a cave gives away an octopus' home. When an octopus is finished eating, it will tidy the cave by using its siphon to blow away the empty shells.

Movement

An octopus uses a kind of jet propulsion system to move very quickly. Water is drawn into the octopus' mantle cavities through valved openings on either side of its body. Then with a strong muscular contraction, it forces the water through the nozzle-like funnel, propelling itself strongly and smoothly, the eight arms trailing gracefully behind. The octopus will usually only swim in this manner when trying to get away from danger. At other times it glides along the bottom by throwing its leading arms forward, quickly drawing up its body from behind, then repeating the process. An octopus can move along the bottom of the sea at two to four miles an hour.

Protection

The octopus has many enemies. Sea lions, seals, sea otters, ling cod, wolf-eels, and scuba divers are a few of the known predators. The octopus protects itself in three main ways:

1. Octopus are born with chromatophores - large pigmentation cells that can be contracted or expanded to change color at will. One of its greatest defenses is the ability to change color and texture to match the surrounding area. Some scientists think that the octopus may change colors as a form of communication including communicating the message "Don't tread on me!"

2. Another defense from predators is the ability to spray a black ink. This ink seems to confuse the predator by temporarily blinding it and making it unable to smell. Leaving a phantom, "painted" octopus, the real octopus swims away.

3. An octopus can lose an arm to a predator and then regenerate another arm.

4. Octopus have very good vision, possessing "camera" eyes, similar to ours, which is unique in invertebrates and viewed (sorry!) by scientists as a somewhat curious evolutionary development.

Life Cycle

Octopus generally live to be 4 or 5 years old. The female lays 30,000 to 100,000 eggs in the autumn, which she tends until they hatch up to six months later. The female will find a den in which to string her eggs. These eggs are about the size of grains of rice. She spends the next five to six months gently moving the eggs and blowing clean water on to them. The female will usually not hunt or eat during this time and when the eggs hatch her life is over.

The hatched octopus spend the next two months of their life as drifting, plankton. The tiny young can change color and give off ink, but they are unable to jet or crawl away and hide in dens. Most of the young will become food for fish, with about two out of the entire group of 30,000 living to adulthood.

Intelligence

Many different experiments have been done with octopus. If given a glass jar with a crab inside, an octopus can figure out how to open the jar after several attempts. It has been said that an octopus that cannot open a clam or oyster will wait until the shellfish opens itself. Then the octopus will place a pebble between the two shells so that the shellfish can no longer close tightly. Because of its ability to solve problems, some scientists say that an octopus has the same intelligence as a house cat.

Materials

Part One: Tentacle Movement

For the class:

- a stuffed crab or similar object to represent octopus food
- large area for movement

Part Two: Octopus Art

For each student:

- octopus pattern
- construction paper
- scissors
- glue
- paint or crayons
- Cheerios (approximately 80)

Part Three: Jet Propulsion

For each pair of students:

- balloons
- permanent markers
- curling ribbon (8 pieces- 6 inches long)
- tape

Teaching Hints

Part One: Tentacle Movement

Part One is designed to show how a single tentacle works to pass food from the tip of the arm to the mouth on the underside of the head.

Procedure:

1. Have students form a long line to represent an octopus tentacle. This line does not need to be perfectly straight, as an octopus tentacle is often bent.

2. Give a stuffed crab or other object to the student at the front of the line. The front of the line represents the tip of the tentacle. Explain that the object (representing food) needs to travel down the tentacle to the mouth. Encourage students to see how quickly and smoothly they can pass the object from one end of the line to the other. Remind students that an octopus is a very quiet creature and can do this without any sound.

3. Discuss with students how an octopus does not have hands on its tentacles but two rows of suction cups to do the passing. Show students what a suction cup looks like. This discussion leads to the next activity.

Part Two: Octopus Art

In Part Two, students create an octopus and add Cheerios "suction cups".

1. Provide an octopus pattern to each student. Have students paint or color the octopus pattern.

2. Have students cut out the octopus pattern and glue it onto construction paper.

3. Discuss the tentacles of an octopus (discuss number, function, etc.). Talk about the suckers on the tentacles. A common octopus has 240 suckers on **each** tentacle. Challenge students to figure out the number of suckers that a common octopus has all together.

4.To add suckers to the octopus' tentacles, have students glue two rows of Cheerios along each tentacle.

Part Three: Jet Propulsion

Part Three is designed to show how an octopus swims through the water. It can either be done as a demonstration or as a class activity.

1. Distribute a balloon to each pair of students. Explain the balloon will represent an octopus. Have the pair of students use a permanent marker to draw two small circles at the top of the balloon, to represent the eyes of the octopus.

2. Give each pair of students eight, 6 inch pieces of ribbon. Have them place a small piece of tape at the end of each piece of ribbon. These represent the tentacles of the octopus and will be attached when the balloon is blown up.

3. Have one child blow up a balloon. Instruct these students to hold the ends of their balloons closed so that the air does not escape. Now have the second member of each team quickly tape on the eight, ribbon tentacles.

4. When all tentacles are attached, have the child let the balloon go. The balloon should sail across the room in the same manner as an octopus glides through the water. When the balloon squeezes out the air, it shows how the octopus squeezes out the water propelling itself forward. It is important to reinforce that the balloon pushed out air as it moved. An octopus pushes out water to make it move through the water quickly.

5. Discuss with students the reasons that an octopus might need to jet away quickly. Emphasize that this is one of the defense mechanisms that the octopus uses to escape from its predators.

Key Words

jet propulsion - propulsion of a body produced by the forwardly directed forces of the reaction resulting from the rearward discharge of a jet of fluid

octopus - a mollusc with a bag-like body from which eight tentacles extend; suction cups are found on the underside of the tentacles

tentacle - in this case, an arm of an octopus

Extensions

1. Locate and read *An Octopus Is Amazing* by Patricia Lauber which provides students with more information about octopus.

2. Sing an octopus song (tune "Skip to My Lou")

Eight long arms, two big eyes,
Salty tears when he cries,
Lives way down on the bottom of the sea.
Who can guess what he can be?

Watch him wiggle, see him slide;
You can't catch him if you tried;
Toss him a crab so he won't fuss;
He's a baby octopus!

-Author Unknown