

"SQUID GUTS!"

Presented by Jenny Cook, Dauphin Island Sea Lab
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National Science Education Standards:

Life Science Content Standard, Grades K-4: *Characteristics of organisms*

Life Science Content Standard, Grades 5-8: *Structure and function in living systems*

Life Science Content Standard, Grades 5-8: *Regulation and behavior*

Ocean Literacy Essential Principle:

The ocean supports a great diversity of life and ecosystems.

References & Resources:

UCLA OceanGLOBE: Invertebrates Lesson Plans – A Curriculum in Marine Sciences for Grades 4 - 8
http://www.msc.ucla.edu/oceanglobe/pdf/Invertebrates/Inverts_Entire.pdf

In Search of Giant Squid Curriculum Guide - Smithsonian

http://www.sites.si.edu/exhibitions/gaint_squid_curriculum_guide.pdf

Making a Foam Squid Puppet

(This activity is designed for teachers to make
a puppet that may be used in the classroom.)

Materials:

- Puppet pattern
- 1" inch thick urethane foam
- ½" inch thick urethane foam
(Caution: Keep in mind that urethane foam is flammable.)
- Industrial Strength Velcro®
- Non-toxic adhesive
- Non-toxic fabric paints (red & pink)
- Empty 0.5L water bottle
- String
- Ping pong balls
- Marbles
- Tape
- White knee-hi stockings
- Polyester fiberfill
- Toy beads
- Black markers
- Scissors
- Clothes pins
- gloves

1. Trace pattern onto foam and cut out pieces. (You may want to use the ½ inch foam for the ink sac, gills, and hearts.)
2. Attach Velcro® to the edges of the mantle.

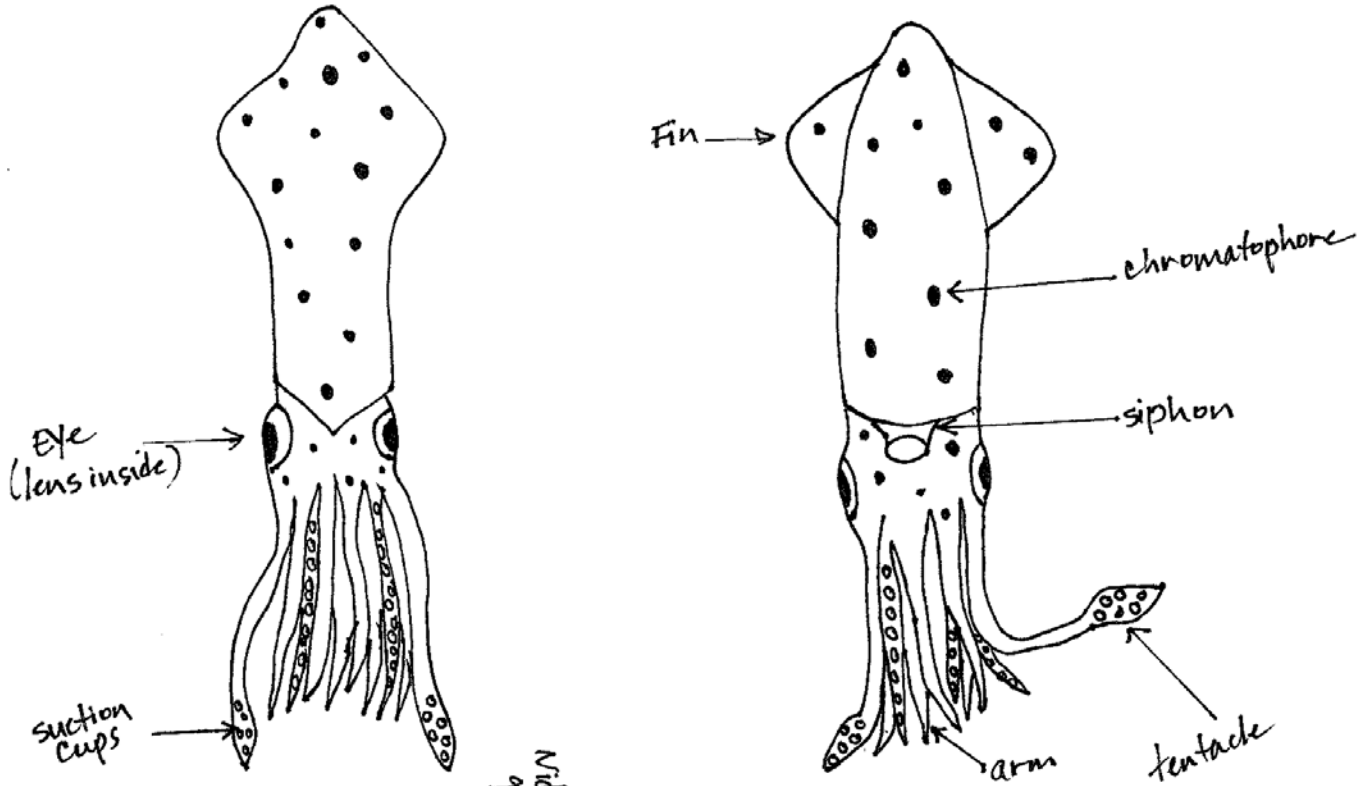
3. Use marker to “paint” ink sac black.
4. Tie string around foam cut out of gills and hearts at designated areas.
5. Glue the hearts to the inside of the mantle. Allow time to set.
6. Glue ink sac to the inside of the mantle. Allow time to set.
7. Use pink paint to draw suction cups on the arms and tentacles. Allow to dry.
8. Smear adhesive to short edges of buccal bulb. It seems to work best if you let the adhesive become almost completely dry – just tacky to touch. Once the glue sets to this stage, bring the edges together. You may need to use a few clothes pins to hold them in place until the adhesive completely sets.
9. Use adhesive to attach fins to the mantle. Allow time for glue to set.
10. Smear adhesive to edges of head (not tentacles). Let the adhesive become almost completely dry – just tacky to touch. Once the glue sets to this stage, bring the edges together. You may need to use a few clothes pins to hold them in place until the adhesive completely sets.
11. Fold siphon as indicated on pattern and glue. You will probably need to attach.
12. Paint red chromatophores on the outer surface of the mantle, fins, head, arms, and tentacles. Allow to dry.
13. Male Testes: Cut knee-hi in half. Fill one half with polyester fiberfill and tie open ends. Fill the other with cut strings and tie ends.
14. Female Nidamental Glands: Fill knee-hi with fiberfill and tie at open end. Twist in middle. Fold in half and glue together. Secure with rubber band until set.
15. Female Eggs: Cut knee-hi in half and fill one piece with toy beads. Tie open end.
16. Cut base of water bottle to form 2 beaks. Wear protective gloves and take extra care. Use marker to darken tips.
17. Pierce ping pong ball and use scissor edge to carve a hole large enough for a marble to pass. Wear protective gloves and take extra care. Draw black pupil on ping pong ball to represent eye pupil. Insert in eye opening in head.
18. Assemble squid. Decide whether or not it will be a male or female. It is ready for use in your classroom.

A note about adhesives: Many adhesives are toxic and have noxious fumes. Non-toxic, low odor adhesives are available.

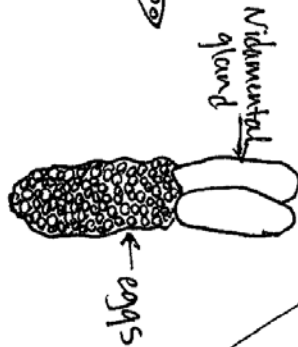
EXTERNAL

Dorsal

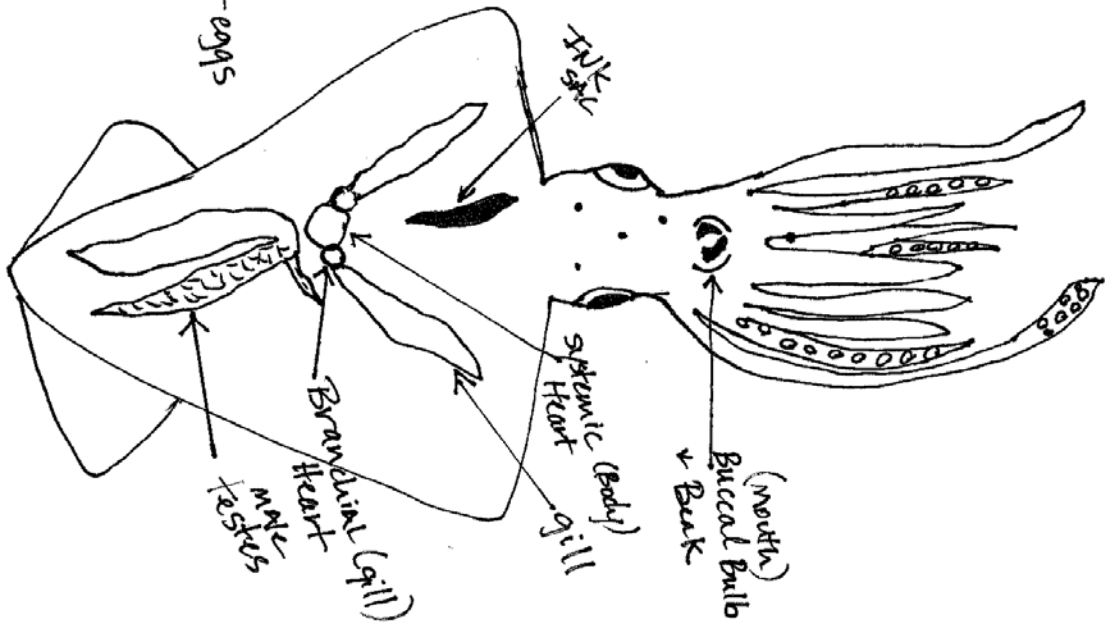
Ventral



Female:



INTERNAL



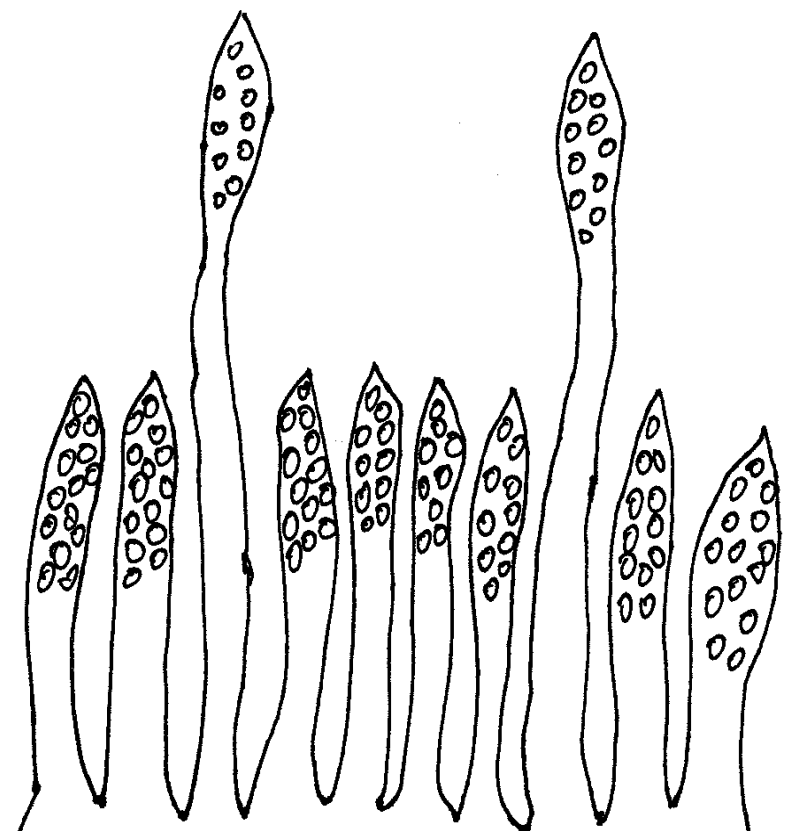
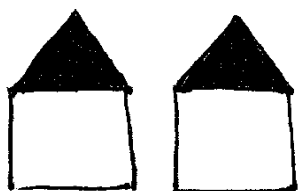
Making a Paper Squid Puppet

Materials:

- Toilet paper roll
- Squid pattern and parts
- Paper clips
- Red Crayon
- Tape
- Wiggle eyes with adhesive on back
- Drinking straw cut about 1 inch long

1. Cut toilet paper tube all the way up one side.
2. Cut out squid pattern and parts.
3. Color chromatophores on squid side opposite the suction cups.
4. Tape outer squid body to toilet paper roll and secure sides.
5. Attach fins to outer body.
6. Select the internal anatomy card for either a male or female. Tape to the inside of the paper roll. If a female is selected, tape one side of the nidamental gland over the hearts. This will allow for viewing organs beneath it.
7. Curl attached head and tape. Attach straw to outside of head for siphon.
8. Apply wiggle eyes.
9. Closing the body: Slip a paper clip under the outer body covering but over the paper roll of one side and attach it to the other. Repeat this at the other end.

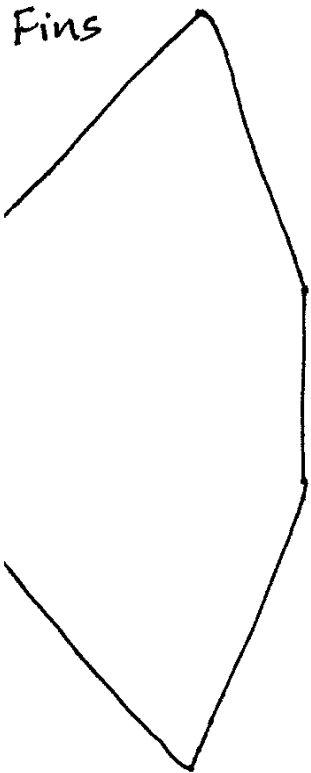
BEAK



Attach
Beak

Attach
Beak

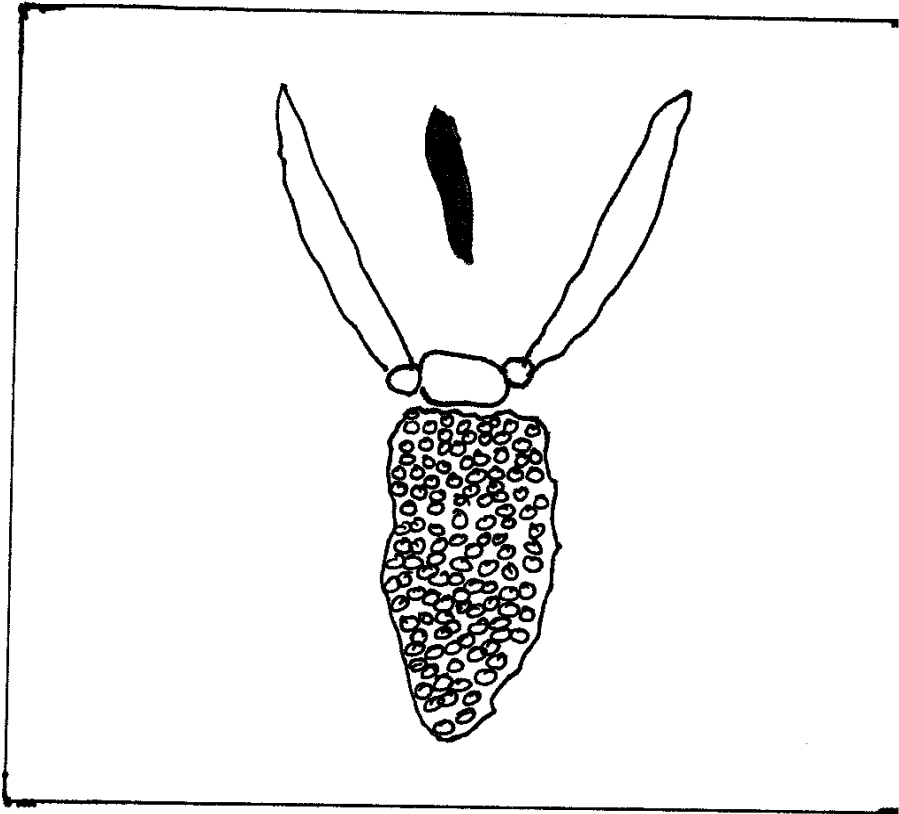
Fins



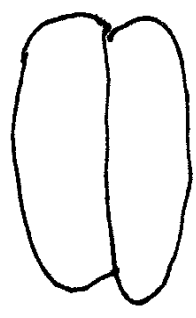
cut

cut

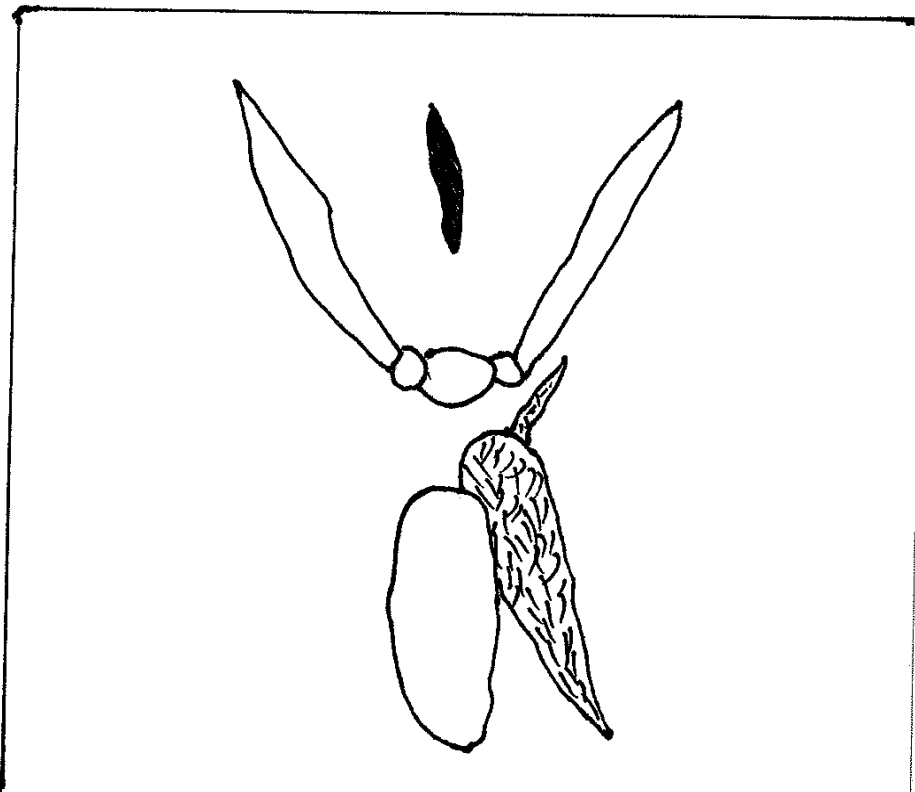
FEMALE



FEMALE
NIDAMENTAL
GLAND



MALE

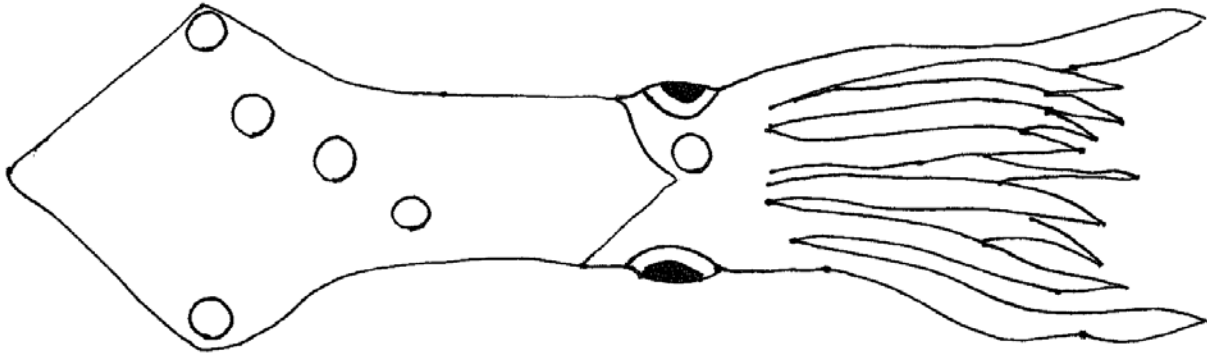


Chromatophores Slide

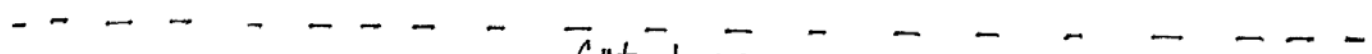
Materials:

- Patterns
- Scissors
- Tape
- Hole punch

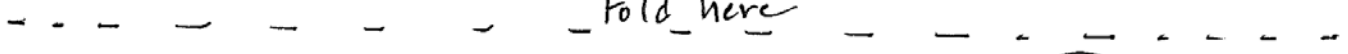
1. Cut where designated. Use hole punch to cut openings.
Fold slightly at the chromatophore and cut a half circle.
2. Fold squid paper where designated and tape unfolded edges together.
3. Cut darkened chromatophore strip and insert into folded squid. Slide back and forth to turn on and off chromatophores.



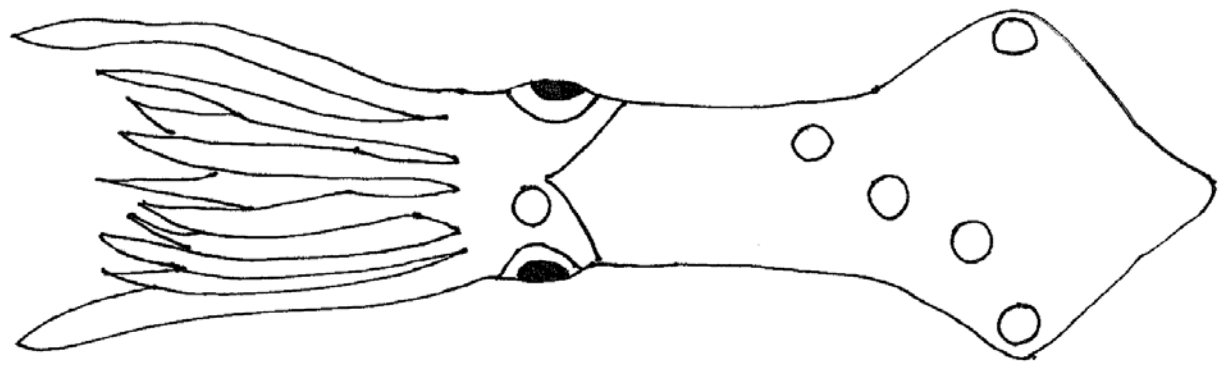
fold here



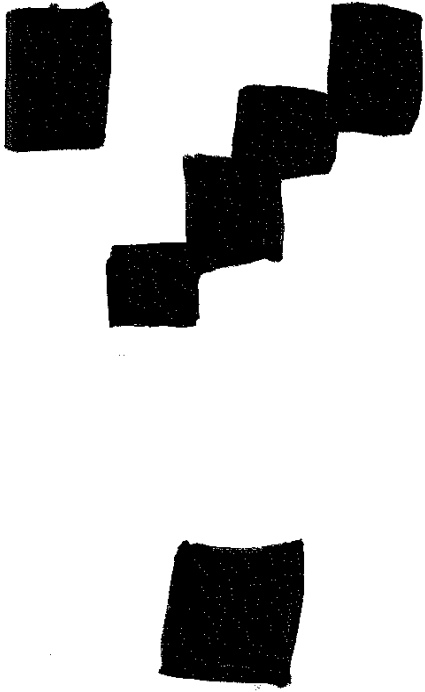
cut here



fold here

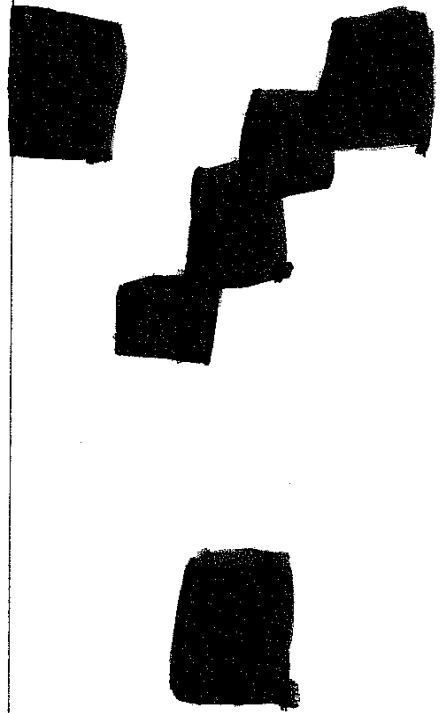


Chromatophores
ON



Chromatophores
OFF

Chromatophores
ON



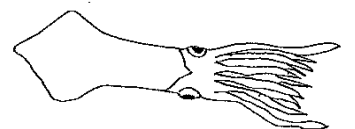
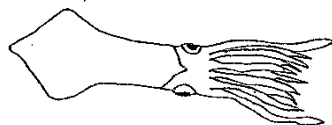
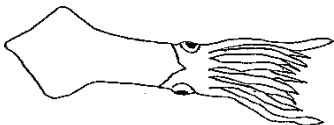
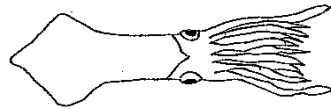
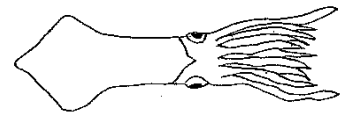
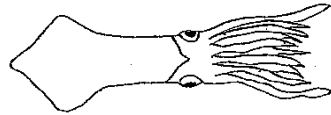
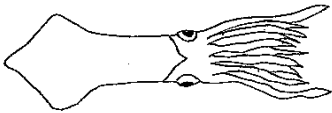
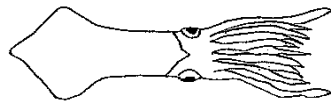
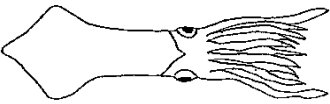
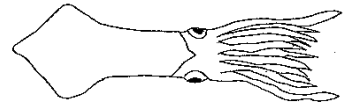
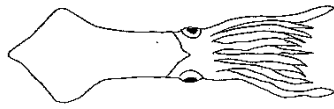
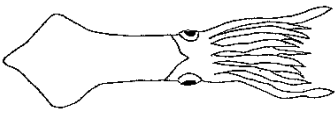
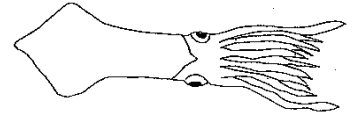
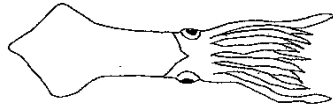
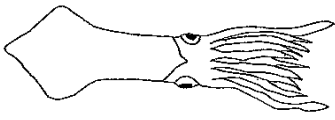
Chromatophores
OFF

Squid Ink

Materials:

- Beral pipet
- Squid Cut Out
- Tape
- Scissors
- Food coloring
- Clear plastic cups
- Water

1. Cut small squid and tape to tip of pipet.
2. Mix food coloring to get as close to black as possible.
3. Pull a few drops of food coloring into pipet.
4. Submerged squid/pipet into cup of water.
5. Squeeze pipet and watch the squid squirt ink!



Investigation #4 - Squid Races

Objective:

Students imitate squid propulsion using a balloon and experience Newton's third law: for every action there is an equal and opposite reaction. Various anatomical designs are tested and analyzed. Can be used to tie into several other physics concepts and calculations

Materials:

- balloons
 - markers
 - fishing line or string.
 - drinking straws
 - tape
 - paper clips
 - misc. cardboard, paper, plastic and other scraps of material
 - stopwatches
 - metric ruler or tape measure
 - graph paper
- } optional for math extension

Procedures: (one squid balloon for each team of students)

1. Blow up a balloon of your choice but do not tie it. Twist the end of the balloon around a small paper clip to keep the air from escaping until the race begins.
2. Tape fins, stabilizers, tentacles and any other body features decided upon by your team to result in the squid that will move the fastest and travel the greatest distance. Tape drinking straw pieces to the dorsal (top) of the squid to act as guides that hold the contest string. Decorate the balloon to look like a squid. (Note: The open end of the balloon must be the rear of the squid!)
3. Stretch two strings or fishing lines across the room and tie both ends to the backs of the chairs or tape them to a wall.
4. Get ready to race two squids head-to-head, one on each string, by threading the string through the drinking straw guides. Assign a "timer" with a stopwatch for each squid.
5. When ready, release the paper clips and let the squids travel down the string. Time the travel, then use a metric measuring device and record the total distance travelled.

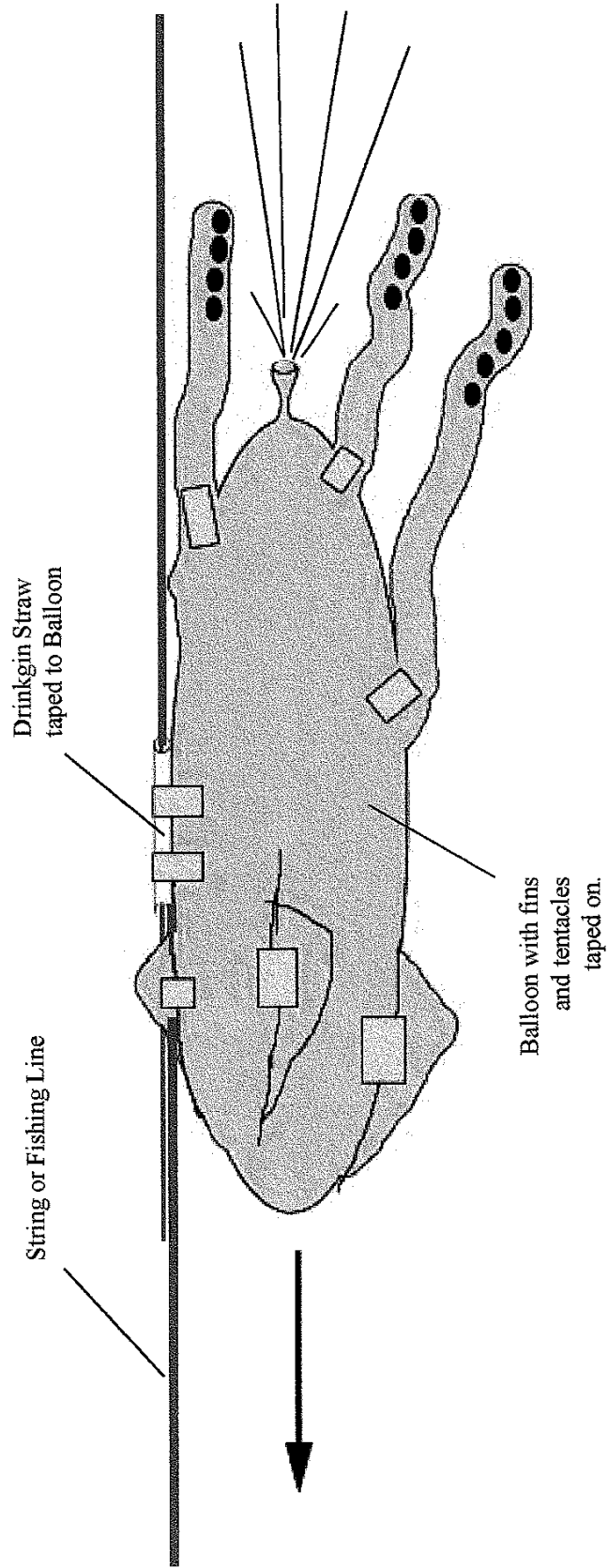
Discussion:

- A. What is the propulsion system on a squid?
- B. What caused the squid balloon to move forward?
- C. Consider the balloon that won the race. What body modifications gave this squid the winning edge?
- D. Draw a diagram of a squid and label its body parts.
- E. How do the actual squid body features compare to those of the winning balloon?

Extension:

- F. Calculate the speed of each squid using the time and distance. (Speed = distance/time)
- G. Make a bar graph comparing the speed of each squid in the class.
- E. What can we learn from this graph?

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Exmple: Balloon Decorated as a Squid