O'opu Prints and Dissections

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HCPS III Science Standards Addressed: SC.BS.4.6

Grade Level: 9th-12th
Project Time Span: 2-3 class periods

To The Teacher:
This lesson is designed to fit within lessons on vertebrates within the modern classification system. Using specimens of o'opu caught in streams and ponds, the students will be better able to understand the concepts being taught. The fish print (gyotaku) will give the students something fun to do while giving them a visual of the external appendages of the fish. Dissecting the fish (the o'opu can be substituted with a fish that is more readily available) gives students a hands-on lesson that may prove to be more successful in learning about fishes.

Goals of the Lesson:
- Students will be able to correlate information about the modern classification system with the o'opu, which is found here in Hawai'i within bioremediation systems, ponds and natural streams.

Student Learning Objectives (Benchmarks):
This lesson addresses grades 9-12 benchmarks for HCPS III Science Standards:
- SC.BS.4.6: Explain the organization of life on Earth using the modern classification system.

Resources and Materials:
Books

Websites
http://filaman.ifm-geomar.de/summary/SpeciesSummary.php?id=27290 (O'opu nākea fact sheet)

Materials
- O'opu for fish printing and/or dissection
• Substitute fish for dissecting
• Appendix 1: Fish Prints and Dissection handout
• Appendix 2: O’opu External Anatomy Handout

Student Learning Activities:
• Students will first learn about the different animals found within bioremediation systems. Focus will be placed upon the o’opu for further study of the modern classification system. The students will catch the fishes themselves and do the fish printing. If there are not very many o’opu, tilapia may be substituted for the dissection part of the lesson. The class, for the printing section, may share one or two o’opu. After a lecture on fishes, the students will do the handouts and printing in groups of two or three. The dissection will also be done in groups.

Assessment:
• Fish Prints and Dissection Handout
• O’opu External Anatomy Handout
  Answers: 1) Dorsal fin, 2) 2nd dorsal fin, 3) Caudal peduncle, 4) Caudal fin (tail), 5) Anal fin, 6) Anus (vent), 7) Pelvic fins, 8) Gill plate (operculum), 9) Mouth, 10) Eye

Extension: (optional section)
• This lesson may be extended to include the other fishes within a bioremediation system.
Fish Prints and Dissection (50 points)

Fish Printing: (Gyotaku) - (20 points)

OBJECTIVE: To handle fish and become familiar with the external anatomy. To have a lasting print of a specific fish.

PROCEDURE: Read completely before starting on fish print
- Prepare the work area by covering the table with a layer of newspaper. Also have paper towels handy for wiping your fish and any spilled paint.
- Choose a fish from the cooler. Make sure to wash the fish thoroughly to remove any slime, and expose the texture of the scales.
- Use pins and/or toothpicks to place fins, mouth and gills in desired display. Periodically blot the fish near the mouth, gills and anus to remove any water that may dilute the paint. Pieces of paper towel may be inserted into these areas to keep them dry and keep the mouth open for printing.
- Use the paintbrush to coat your fish with a thin layer of paint, being careful to avoid any excess water coming out from the fish. The fish may be painted by brushing in a single direction - with or against - the scales. Be careful not to use too much paint because that will distort the painting.
- Once the paint is applied, pick up the paper towel square and carefully place it over the fish. Different types of paper produce different fish prints. Place the paper towel directly onto the fish to avoid smudging the print. Adjust the position of the fish carefully before it comes into contact with the paper. More than one print may be made using different species of fish from others in the class. Be sure to allow each print to dry a little in between each printing.
- Once the paper is on the fish, gently press the paper with your fingers from head to tail and top to bottom. Carefully remove the paper when done, straight up, to avoid smearing, and quickly repeat the printing process again if desired. This will provide different looks for the print because of the decreasing amount of paint left on the fish through each printing.
- Carefully set aside the fish prints to dry. Do not forget to write your name on the paper towel.
- Wash any paint off the fish to prepare it for dissection.

Discussion Questions - 5 points
1. How does fish printing (gyotaku) compare with photography as a means of getting and displaying information about a specific fish? What are the advantages and disadvantages of each?
2. What techniques worked best to bring out the details of your fish print?
3. What measurement can be made from a fish print?
4. Suggest two other uses for this kind of fish printing technique.

Fish Dissection - (25 points)

OBJECTIVE: To become acquainted with the external and internal anatomy of reef fish. Be sure to make careful observations with attention to detail, agreement between group members on names for the parts of the fish and consistent use of these names. Be sure to use past handouts for references.

- Position the fish with the head pointing towards the left. Make a sketch of the fish on the blank papers provided in your packets. Make sure to draw large outlines, as well as fine
Details. Drawings should be based on observation of your specific specimen. The drawing of the fish must match the species of fish in the fish print. Make one sketch of the external anatomy and another of the internal organs after the fish is dissected.

- One student of the group will need to find out the common and scientific name of the specimen using reference guides found in the classroom.
- Use previous handouts as reference guides for the external and digestive system of your fish, label the external anatomy of the fish drawing.
- Use the chart provided below to describe the fish. State where on the fish each appendage is located using dorsal, ventral, posterior and anterior. Also describe the appendage using colors, shapes, and other descriptive adjectives. Count all fin spines on the dorsal fin, anal fin and pelvic fin and record this in the last row of the table.

| Dorsal fin(s) |  
|---|---|
| Pectoral fins |  
| Pelvic fins |  
| Anal fin |  
| Caudal fin |  
| Gill cover |  
| Gill opening |  
| Lateral line |  
| Anus |  
| Eye |  
| Mouth |  
| Nostril |  
| Scale type |  
| Fin spine |  

**Internal Anatomy**

- After completing the descriptions of the external anatomy, make sure the fish is prepared for dissection.
- Scissors works better than a scalpel for this dissection. Start by cutting from the anus to the lateral line (up towards the dorsal fin) with the scissors. Next, make a shallow cut through the skin of the fish’s belly. Starting at the anus, cut forward (anteriorly) towards the throat. Be sure to make shallow cuts to avoid cutting the internal organs.
- Make an upward cut through the skin and muscle along the edge of the gill plate towards the dorsal fin. Fold the flap of the skin up and pin or cut it out of the way.
- Observe the digestive system using the handout given earlier. Sketch your fish as best as you can and label the different parts of your fish’s digestive system.
- After finishing the dissection, gather all trash and fish parts and dispose into the allotted trash receptacle.
- Staple your fish print to the back of the dissection packet. Be sure there are three pages: dissection worksheet, white sheet of paper with fish drawings (external anatomy and digestive tract) and paper towel fish print.
Appendix 2: O‘opu External Anatomy Handout

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2. 
3. 
4. 
5. 
6. 
7. 
8. 
9. 
10.