

PART I. OBSERVATIONS

JAWLESS FISHES

- ◆ Lamprey model
- ◆ Lamprey specimens - whole & sliced

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1. Sketch the arrangement of teeth within the lamprey's mouth.

2. What external gill structures are visible in the lamprey? How many pairs are there?

3. Where are the fins located on the lamprey? Are any of them paired?

4. Which invertebrate chordate most resembles the lamprey larvae? (hint: not tunicate)

CARTILAGINOUS FISHES

- ◆ Shark head section & brain
- ◆ Shark skeleton & jaw
- ◆ Shark larva specimen
- 'Devilfish' toy
- ▼ Ratfish specimen

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5. What are the large holes behind the shark's eyes? What is their function? (hint: not nostrils or gills)

6. What are the small pores covering the shark's chin? What is their function?

7. What external gill structures are visible in the shark? How many pairs are there?

8. The shark's brain occupies approximately what proportion of its head? What does this suggest about its intelligence?

9. Sketch a tooth from the front of the shark's jaw (including the serrations typical of Great Whites). Judging from just the jaw, try to guess the total body length of this shark.

BONY FISHES

- ◆ Fish models - including flatfish & coelacanth
 - Fish specimens - including development series
 - ▼ Perch skeleton
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10. What are the peg-like structures extending from the pelvic fins (near the anus) in the shark's skeleton? What is their function?
11. Sketch the shark's tail skeleton (including the vertebrae). What is this type of tail called? (hint: not homocercal)
12. What is the chest sac that hangs off the shark larva? What is its function?
13. Is the shape of the toy 'devilfish' more typical of a skate or a ray?
14. Describe 2 observable differences between the ratfish and a shark.
15. What external gill structure is visible in the perch?
16. Where is the swim bladder in the perch (in relation to its digestive tract)? What is its function? Which mollusc performs the same function with its chambered shell?
17. What is the shape of the bony fish's tail called? How does its orientation (or direction) differ from a whale's flukes?
18. What is the thin line running along the sides of bony fishes? What is its function?
19. Is the development of fishes direct (where the larvae resemble small adults) or indirect (where the larvae are entirely different from the adults)?

REPTILES

- ◆ Sea turtle specimen
- ◆ Land turtle specimen & shell (not marine)
- Crocodilian & cobra specimens (not marine)

20. How does the shell of a sea turtle differ from a land turtle's?

21. Where are the turtle's vertebrae and ribs located, in relation to its shell?

22. How does the legs of a sea turtle differ from a land turtle's?

23. Is the crocodilian on display more likely to be a crocodile or an alligator? How can you tell the difference?

24. The cobra is a close relative of sea snakes. Other than their snakehood, how else are they similar? (hint: chemical) What part of the sea snake is flattened?

BIRDS

- ◆ Cormorant & puffin specimens
- Duck specimen & pigeon skeleton (not marine)
- ▼ Bird eggs - possibly Common Murre

25. How does the size of the throat pouch in the cormorant compare with a pelican's?

26. Sketch a foot of the cormorant, including the webbing. How does it differ from a duck's?

27. Sketch a foot of the puffin. Is it more similar to a cormorant's or to a duck's?

28. A pronounced keel extends from the sternum (or breastbone) in the skeleton of most birds. What is its function? (hint: muscles)

29. The eggs on display are most likely from the Common Murre, a large puffin that nests on cliffsides. How is its shape suited for this location?

MAMMALS

- ◆ Dolphin & sea lion skulls
- Whale baleen

30. Sketch the three different types of teeth found in the sea lion skull, from the front to the back. How are they suited for grasping fish?
31. Sketch a representative tooth from the dolphin skull. How does its size and number compare with the sea lion's?
32. Where are the blowholes located on the dolphin skull? What are they equivalent to in your skull? Are they perfectly symmetrical or lop-sided?
33. What structure is responsible for the caved-in appearance of the face on the dolphin skull?
34. Which group of whales possess baleen? Where is it located in the mouth? What is its function?

PART II. FISH PRINTING (GYOTAKU)

Gyotaku ("fish rubbing") is the Japanese art of capturing impressions of fish and marine organisms such as shellfish, crustaceans, and plants. It first developed over 100 years ago to document and verify fishing successes. Soon it became an accepted art form in Japan, though it didn't reach this country until the 1950's. As with most things, it isn't difficult to perform but requires much practice to master.

MATERIALS

Fish: Use an undamaged fish (either fresh or fresh-frozen) that has been cleaned with detergent or baking soda to remove all the mucus and debris. Small flat fish with large rough scales and pronounced features are best for beginners. After printing, it is no longer suitable for consumption.

Paper: Porous water-resistant paper with long fibers works best (though it is prohibitively expensive). A good substitute is newsprint and other art sheets. Beginners should first practice using the classified section of the newspaper.

Ink: Water-soluble inks, especially for linoleum block printing, work best, but other water-soluble paints or dyes may also be suitable.

METHODS

1. Wipe off the fish, and pat dry with paper towels.
2. Lay the fish flat on newspaper over a tray or pan with the fins posed in a natural position.
3. Brush the entire fish (except the eyes) in both directions with a coat of undiluted paint or ink.
4. Brush off the fish with a clean brush to distribute the pigment evenly and to remove the excess.
5. Place an unwrinkled sheet of paper evenly over the fish, and press firmly with your fingertips over the entire surface. Become one with the fish.
6. Carefully remove the sheet. If the results appear smudged, try a second sheet of paper without any additional pigment. Experiment with different types of paper and vary the amount of pigment.
7. After a clear print has dried, paint in the eye.

Sources: C.M. Dewees 1984. *The Printer's Catch*. C.M. Dewees 7/84. *Oceans* 17(4):40-43.
C. Simons 6/81. *Smithsonian* 12(3):151-153.