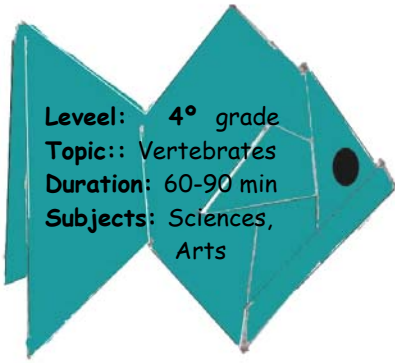
My Paper Fish



Objective:
Recognize the appearance of a vertebrate along with observing various parts of a fish.

Learning Skills: Observations, descriptions, fine motor skills, and comparisons.

Materials: 1-2 sheets of paper per child, colored pencils, scissors, and a clipboard to write on (or use the floor). Poster with fish parts and the large paper fish to begin the activity. Step by step guide to origami for the docent.

Information Base:
Vertebrates have bilateral symmetry (**head + trunk + extremities**), **internal support**, either bone or cartilage (skeleton with spinal chord) which encloses the nervous system. They have a **cranium** which protects a brain (attached to the nervous system) and **paired appendages**.
Vertebrates are divided into five main groups: fish, amphibians, reptiles, birds and mammals. The first two are differentiated from the other four groups ("tetrapods") by important characteristics: appendages in the form of flippers or **fins and gills**.
Other characteristics used to distinguish the groups are:
Skin covering – scales (reptiles and fish), naked (amphibians), hair (mammals), or feathers (birds)
Internal temperature – cold blooded, or the same as the ambient temperature and cannot self-regulate (fish, amphibians, and reptiles), warm blooded which regulate internal temperature (birds and mammals).
In the vertebrate world, fish are most abundant, perhaps because 3/4th of the planet is covered by water. Fish have adapted perfectly to their aquatic environment: their **hydrodynamic shape**, appendages transformed into **fins** for propulsion along with undulating body movement, and the presence of **gills** covered by a bony **operculum**, which enable them to obtain oxygen from the water.
The **unpaired fins** are located in the medial line of the body and are held by radials or spines joined to the vertebral column. They may have 1 or 2 dorsal, 1 caudal or

tail, and an anal fin. These prevent the fish from rolling and help in directional movement.
The **paired fins** are on the side of the body are supported by bones that are different from those of the vertebral column. Around the "waist", the bones that support the fins are called the pectoral (anterior) and pelvic (posterior). These fins are important for propulsion and directional movement.
To breathe, water enters the mouth and move toward the rear passing over the gills to exit through the operculum. The movement of the operculum creates a suction that circulates the water.

Group	Respiration	Appendages	Body Temperature	Skin
Amphibians	Gills/lungs (& through their skin)	Fins/feet (2 pairs)	Do not self regulate	Naked
Fish	Gills	Fins (2 paired & 3-4 unpaired)	Do not self regulate	Scales
Reptiles	Lungs	2 pair of feet	Do not self regulate	Scales
Birds	Lungs	2 pair of feet	Self regulate	Feathers
Mammals	Lungs	2 pair of feet	Self regulate	Hair

Vocabulary:
Gills: fine filaments filled with blood vessels which interchange the carbon dioxide of the blood with the oxygen in the water (similar to the way the lungs exchange oxygen with the air).
Fins: flat appendages that extend from the body and aid in movement through water like paddles. Fish can have paired (pectoral, pelvic) and unpaired (dorsal, anal, caudal) fins.
Radials: structures that provide support to fins.
Operculum: Bony covering which protects the gills in fish
Scales: structures which cover fish skin. They are flat in bony fish and spine-shaped in the cartilaginous fish (sharks and rays).

Procedure:
1. To introduce the theme show the children the completed, enlarged and colored model of the origami fish. Ask them if they know whether it's a vertebrate or

invertebrate animal and how they know this. The idea is to come to a conclusion that the vertebral column, characteristic of vertebrates, is not visible so we cannot be sure if it is a vertebrate animal. Therefore we must learn other characteristics of fish that are observable and can help us recognize them as a group. We will later do an activity to learn these other characteristics: create their own fish, similar to the one we showed them.

2. In the classroom, each child will be given a piece of paper to make a fish (smaller than the sample fish) using origami. Guide them through each step by making one with them (see attached - steps for origami). Afterwards tell them that their paper fish will be based on a real model of a fish that is waiting for them at the aquariums.

3. At the aquariums each child will choose which fish to be his/her model to color with colored pencils provided. Give them 10-15 minutes. At this point try not to give them much help. Later when they discuss and comprae in a group, each child can improve on their observations and add details to their fish.

4. Have the children compare their fish with the poster of fish parts, and clarify the different parts and variations (attached is a small version of the poster). During the comparison, they will observe the presence or absence of the fins shown on the poster, the different fin shapes, the body, and the mouth.
Are there fins on the top of the fish? What does the tail look nice? Are there fins on the bottom of the fish? Do they have fins on their sides? Where is the operculum? Does it move? What does it do? How does water get to the gills? Let is look deeper into the different fin movement What are they for? What covers the body?" Invite the children to observe at the aquarium agai, and complete the details of their fish which help differentiate them from other fish on the poster.

5. Now compare humans who are vertebrates , with fish. "What do we have in common? What is different? " Guide them toward external characteristics without rejecting correct answers for internal characteristics that they may have already learned. Orient the conversation toward the discovery that vertebrates have a head, trunk and extremities and that people have two pairs of appendages. "Do these correspond to the paired fins of fish? Do fish have necks? Can they turn their head without turning their body?"

6. Finally we can ask the children to look for invertebrate animals in the aquarium and observe if they have the same external appearance as vertebrates, give them time to enjoy the aquarium.

7. Each child will take home his origami fish.

Evaluation: The comparison of man to a fish is considered an evaluation. We can also ask the children to help us distinguish the parts of our paper fish, the one we showed at the beginning of the activity to see if they recognize them. Using these characteristics, we can conclude that it is a verttebrate and a fish.

Suggestions for the Docent:
If time permits, you can compare fish to the birds, sloth and iguanas at Culebra. Try to observe the presence of scales, hair, or feathers and complete the general table of vertebrates.

Suggested Classroom Activities:

- Teachers may ask the child to investigate exceptions: fish without fins, lung fish, animals that live in the water but are not fish, (they don't have gills.)
- You can give the teacher drawings of the most common fish which can be obtained in the supermarkets. They can make copies and give to the children to color. They can also buy the fish themselves or find recipes using these fish.
- Go to the Fish Market to look at different commercial fish.

Reference:
Peter Alexande, Mary Jean Bahret, Judith Chaves, Gary Courts and Naomi Skolky D'Alessio. 1987. **Biologia**. Printice Hall. New Jersey. USA.

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