

Design an Aquarium Exhibit

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Topic: Introduce the different species that depend on different physical & biological properties (temperature, salinity, sunlight, food, habitat) in the ocean and how they move to find their ideal habitat.

Audience: Grades 5 – 8

Length: 45 to 60 minutes

NJ State Standards:

5.3.8.C - Interdependence

Objectives:

- Compare and contrast the environments different marine species inhabit
- Interpret and apply layers of water quality data
- Consider food web dynamics, temperature ranges, and salinity ranges in designing an aquarium.

Introduction:

Students will create an aquarium exhibit. According to what they have learned about the ocean, the students will determine which types of species they are going to put in the aquarium. The students only have one tank that can be maintained within a five-degree temperature and salinity range - they must determine what temperature and salinity will support the species they choose. The students will be creating a plan to find, collect, and transport the species they choose to have in their exhibit. Students must also make sure the species they choose do not eat each other leaving an empty tank with a few fat fish. A list of species with habitat requirements for each species will be given to the students. The students will be given a 10,000 gallon aquarium to populate, and can choose up to 5 large fish (over 3 feet) and up to 12 smaller fish (less than 3 feet) to use in the aquarium. If time allows, students can present their exhibit to the rest of the group.

Background:

Knowing and maintaining the water properties fish need to survive is vital for any aquarist. Aquariums attempt to replicate the conditions species would live in, in the wild. When capturing species yourself, using ocean data can make the job easier if you can select water conditions where you are likely to find the animals you are looking for. The ocean is a fish eat fish world, however in an aquarium you generally want to avoid tank mates eating each other; knowing what everyone eats and ensuring compatibility prevents having just a few really fat fish who ate everyone else in their tank.

Materials:

- Marine Species Information Booklet (Marine_Species_Book.pdf)
contains: List of local species and their habitat requirements (temperature range, salinity levels)
- Aquarium Planning Worksheets (Aquarium_Planning_Worksheets.pdf, pages 1-2)
- Map of fishing area (Maps_and_Data.pdf, page 1)
- Maps showing sea surface temperature (SST) data and map legend (Maps_and_Data.pdf, pages 2-5)
- Pictures of marine species (Fish_Cutouts.pdf)
- Aquarium worksheet students can sketch or paste fish and ornamentation into (Aquarium_Planning_Worksheets.pdf, page 3)

- Colored markers/pencils/crayons
- Scissors
- Paste/glue
- Pencils

Procedure:

I. Preparation

- A. Download the booklet, worksheets, data sheets, and marine species photos from this site.
- B. Print out the materials you will need:
Students should work in pairs or small groups of 3-4. Each group should be given:
 1. The Aquarium Planning Worksheets
 2. Map of the collection area
 3. Pencils
 4. Marine Species Information booklet

II. Activity

- A. Explain that the students will be acting as a museum curator and will need to stock a new exhibit with fish that they will collect.
- B. Review the characteristics that fish require for their habitat. Some fish are more sensitive to salinity or temperature; some are confined to their particular environment. All fish need to eat; how will you feed the fish? Will they eat each other?
- C. Like any real curator, the students will need to plan within constraints of: exhibit space and water properties (temperature and salinity), finding the fish, fish feeding behavior, and unpredictable ocean conditions.
- D. Students should take some time and look through the Marine Species Information booklet and start thinking about which fish they would like in their exhibit. They should start to notice the temperature and salinity requirements for each fish, as well as the size.
- E. Take a moment and talk about each of these points, especially if the students are not familiar with salinity.
- F. Students will have to make some decisions: for example, they may realize their two favorite species cannot live in the same salinity range, and have to choose only one of those.
- G. Size must be considered to limit the amount of biomass for the exhibit. Discuss some of the problems that could occur with keeping too many fish in one tank.
 1. Water quality control (more fish, more fish waste)
 2. Disease (more fish allow diseases to spread more rapidly through a tank population)
 3. Care taking (more fish to feed, and monitor health on for museum staff)
- H. Also point out that there are different environments the fish will be found within the water column. These will effect where the fish can be found in the tank as well.
 1. Benthic - bottom
 2. Demersal - near bottom
 3. Pelagic – constant swimmer / open ocean
 4. Shallow / (reef, sea grass, sand) – these fish will probably need a place to hide, and stay out of view most of the time, worthwhile for visitors to try and find them though.
 - If you pick only benthic fish, all you fish will spend their time on the bottom, it is a good idea to get a mix of fish with different environmental preferences.
- I. Students should make a tentative list of the fish and quantity of each they would like to collect for their exhibit. Students are limited to a maximum of 5 large fish (over 3 feet) and up to 12 smaller fish (less than 3 feet) to use in the aquarium. If students choose not to use a large fish they may substitute 2 smaller fish for each large.
- J. Explain that they might need to adjust their exhibit plan a little during the collection process. Students will have 3 collection days to get their fish. The days will be four months apart to potentially give students the opportunity to catch species in many temperature ranges.

(Flexibility is required for real aquarists too - this happens in real life also!)

- K. Once students have a plan of the fish species they want, it is time for the first day of collecting!
- L. Give each group the “Day 1” temperature data. Students will use this information to locate where they will collect each fish, (assume that if the student is collecting in the temperature range of the fish they want, they will get it). Students may collect no more than 7 fish per day. (space limitation on collection boat). Have students record the coordinates that they captured each fish at by letter and number (for example, E-10). Students may need help using the SST maps.
- M. Go through the other two days of collecting: pass out the data maps one at a time, just before the collecting will begin. Students again must record fish coordinates, and can collect no more than 7 fish per day.
- N. Once complete allow the students to sketch and color their completed tank exhibits. If time allows, have student group present it to the class.

Evaluation:

1. Students are asked to explain why they chose the species that they did.
2. Students are asked to explain why their species will survive in the aquarium.
3. Talk about what difficulties they encountered (what was hardest, easiest?)
4. What educational value will their aquarium add to our museum? Convince me why I should make your aquarium vs. someone else’s in the class.