# Marine Biology in the Elementary School

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**The role of the marine environment is described here in the biological education of elementary pupils.**



When Louis Agassiz was queried about how he had spent his summer, he replied, "I traveled this summer—I got half-way across my backyard." The Great Neck Public Schools, with their proximity to Long Island Sound, have just such a backyard through which their students may travel in the elementary school science program.

## Ecological Approach

Using an ecological approach to the science curriculum, the program emphasizes the study of living things in relation to their environment and each other through a series of field trips to the seashore where the students are able to observe plants and animals in their natural setting. The approach stresses the importance of observing living things in their relationship to the environment rather than looking at them individually. Each living thing is observed in relation to its habitat, its particular niche, its food, its partners and enemies.

This method of introducing students to the study of living things through a study of their natural biomes differs sharply from the traditional biological approach of classroom observation, examination, classification and dissection. In this program, students learn that all organisms have special means of adaptation, all are interrelated and dependent upon their community and no organism lives without affecting its environment and in turn, being affected by it.

Before the first field trip is undertaken, the students are briefed in this ecological approach. Students learn that distinct regions, biomes, are areas which are distinguished on the land or in the sea by the dominance of particular types of plants and animals.

A brief study of the major biomes—temperate deciduous forest, coniferous forest, tropical forest, the grasslands, the tundra, the savanna, the desert and the ocean—and their particular characteristics is undertaken; this is followed by a study of the living things of each biome and their specific adaptations necessary to survival. Factors common to all living things in all biomes—basic needs, oxygen carbon-dioxide cycle, nitrogen cycle, food chains and energy cycles, the constituents of the community (producers-consumers-predators-scavengers-decomposers), the balance of nature—are discussed.

The program now highlights the ocean biome, and more specifically, the Atlantic seashore of Long Island, one of the few remaining natural biomes relatively undisturbed by man. From day to day, constant change may be observed as this shore is pounded upon by the surf, exposed to the sun and the air and claimed or spared by the tides.

## At The Seashore

On their first trip, the students who have already learned where to look for living things through the use of personal slides,

collect their specimens (using dip nets, seining nets, fish traps, digging, prying, sifting, etc.) and place them in suitable containers for transportation to the classroom. With plankton nets, the children collect the numerous plankton which they study through a stereo microscope which they have brought to the seashore. As the students are collecting specimens, they are constantly observing the total picture; they are learning how each living thing, in its unique manner, must adapt in order to survive its own environment. From this excursion along a 50 yard shore, wading knee deep into the sound, the students become cognizant—from the rich harvest in their seine nets—of the vastness and complexities of living organisms in the sea.

### In The Classroom

In the classroom, a salt-water aquarium is set up and filled with the collected specimens. Periodically, small groups of students accompany the science consultant on further trips for new living things for the aquarium, which becomes—like the sea itself—a constantly changing phenomenon. Within this miniature biome, the observer sees and learns many things, including the dramatic, competitive struggle for existence among these sea animals.

Simple salt-water tanks of pine wood frames, in which a plastic bag containing an individual specimen is suspended, are constructed by individual students. The purpose of these temporary tanks is for the observation of and the controlled experimentation with specific organisms. For example, the reproduction and growth of broken-back or grass shrimp (Spirontocaris) can be observed in such a set-up. In these simple tanks, sea life may be expected to survive without additional care for approximately one week. To perpetuate the life of these isolated organisms, the animal can be temporarily removed while fresh sea water is placed in the plastic tank. This simple salt-water tank offers many possibilities for individual research by the students and is a salient feature of our program in marine biology.

Fig. 1.

### Animal Worksheets

The role of the individual student as a creative thinker now comes into focus. Utilizing the marine animals collected for the aquarium, each student is provided with an animal of his own—for intensive study, observation and experimentation. To this exciting and rewarding experience, each student brings his creative, analytical powers. Animal worksheets are provided to serve as a guide for this individualized study. (See Figs. 1 and 2) However, the approach is basically non-directive, choosing rather to rely on the particular student's interest and ability. As the student carefully observes his own animal, he learns how that organism's characteristics help him to adapt successfully to his environment. This knowledge helps the student to a complete awareness of the ecological approach—not only as it relates to marine biology but to all life including his own.

Fig. 1

**Animal Worksheet**

Grass Shrimp Student's Name———

1. Carefully observe your animal for a few moments. Draw a simple, but accurate picture of the animal. Label all body parts that you know.
2. Describe the shrimp's antennae. Include number, size, and degree of movement.

#### Adaptation to Environment

How well does your animal adapt to its environment? Put it through some simple "tests," noting all observations and results.

3. How well does the shrimp swim? What parts of its body seem to help the most?
4. Place some food in the animals container. How do you think the shrimp located the food? Observe the process of ingesting the food. What discoveries have you made?

5. Devise some tests to find out how the shrimp protects itself. (hint-there are at least four ways)
6. Does your animal prefer light or dark conditions? Record your results, including the test you devised.
7. Other Tests

Fig. 2.
**Animal Worksheet**

Carefully observe your fish

1. Draw a picture of your fish. Include all fins, sensory organs, color and other physical characteristics.
2. Describe all movements of the fish as it swims. Which fins help the most?
3. Do any fins move when the fish is at rest? Do any other parts move? Try to explain the reason for this movement.

### Adaptation to Environment

How well does your fish adapt to its environment? Put it through some simple "tests." Note all observations and results.

Hearing Test—Tap very lightly on your tank. Did the fish respond? Repeat the tapping in different ways and places. Note all results. How do you think the fish hears?

Food Test—Place some food near the fish. If this is eaten, continue to place small amounts of food further away. What senses do you think the fish uses in locating its food?

Other Tests

### Enrichment

It is this individual research that gives the program its real meaning and significance. The possibilities within this framework are broad; exploration and discoveries are only limited by the student himself. Individual long-range projects have included:

determination of a fish's age through scale study

growth studies of sea anemones, shrimp, pipe fish, crabs

breeding experiments with the stickleback fish

regeneration studies involving sea star, crab, planaria

coloration changes of the flounder

biological time-clock of the fiddler crab

temperature changes of the eel and killifish

### Return To The Seashore

The culmination of this marine biology unit is a return to the seashore where the student once again observes—this time, with greater comprehension—the wonders of the sea around him.

The skills developed in this program are tools to be used throughout the student's science education and the ecological approach, once learned, can provide the key to increased comprehension of the biological sciences.

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Edited by George Vuke
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ANIMALS WITH BACKBONES: EXPERIMENTING WITH ANIMALS (WHITE RATS), 11 min., color, sd., 1966, Encyclopaedia Britannica Films, 425 N. Michigan Ave., Chicago, Illinois 60611.

The organization, content and photography are excellent and probably most suited for the upper elementary or junior high levels. The film shows the proper handling of animals in the classroom, controlled experiments and ways of seeking out information. A question is asked, "Will lack of Vitamin D change rats?" and a controlled experiment is set up. Two groups of rats are used, each getting the same diet except for the lack of Vitamin D in the test group. The learners weigh the six rats every day and in 11 days the trend becomes clear. The next question is "Will Vitamin D change rats?" After adding Vitamin D to their diet for 11 days, the test rats are back to their normal weight. A third question is raised "Is there any difference between the two groups that can be measured with a maze?" This question is not answered in the film but left to the discussion and experimentation of the viewers. There are several films with similar content, but this is one of the better presentations of how to set up a controlled experiment. The film *Controlled Experiments*, available from the Audio-Visual Center, Indiana University, has the primary purpose of showing the viewer *why* there are basic requirements for a good controlled experiment. Each of these films could be used without the other, but it seems that the student should not only know *how* but also, *why* there must be, two parts to compare, a single variable and many samples.