The Education Program at the
NJ Marine Sciences Consortium/NJ Sea Grant
22 Magruder Road Fort Hancock, NJ 07732 732-872-1300 njmsc.org

NEARSHORE COMMUNITY SAMPLING

OVERVIEW

Using a sampling technique called seining; students can study the **ecology** of shallow water habitats and draw inferences of how an ecosystem works.

OBJECTIVES

Following completion of this lesson, the students will be able to:

- Use a seine net to gather a sample of what's living in the nearshore community;
- Identify organisms (plants and animals) in the nearshore community;
- Classify the organisms collected based on their anatomy/morphology, where they live within the habitat, and their role in the community;
- Describe the community based on the number of each species and type of organism sampled;
- Hypothesize what would happen to the community sampled as a result of changes in environmental variables or the habitat due to natural causes or human impacts.

GRADE LEVELS

K -12th grades

NJCC STANDARDS

Science Indicators:
5.1, 5.3, 5.5, 5.7, 5.10

MATERIALS

- One or more seine nets (see "Build Your Own Seine Net" included in this lesson plan);
- Two pairs of chest waders per seine net (optimum);
- One five or six gallon plastic bucket per seine net;
- Books that can be used to identify fish, invertebrates and algae.
- Clipboards, Pencils, Copies of worksheet, "Nearshore Community Sampling" included in this lesson plan.

PROCEDURES

Two students wearing chest waders walk through the water with the seine net stretched between them. They will use the scoop method of seining to collect aquatic organisms (see "How to Use a Seine Net" included in this lesson plan for detailed information). When the students return to the beach, the sample is scooped up in the pocket formed by the net and placed on the beach. Have students observe and record the type of species collected, the number of each species, **pelagic** or **benthic** organism (**nektonic, planktonic**), the **feeding guild** to which species belongs, and whether the organism is a plant, **invertebrate** or **vertebrate**.

Also have students record the sampling date and time, sampling location, stage of the tidal cycle at the time of sampling, and a description of the **habitat** (e.g. sand bottom, mud bottom, sea grass bed, etc). Have students seine several times in an area and if possible, try different areas in the location to find different species and to make comparisons.

BACKGROUND

Nearshore shallow water areas provide important **habitats** for many marine organisms. Shallow water **ecosystems** such as salt marshes, seagrass beds and reefs, are some of the most productive places in the world. They provide shelter, food, nursery grounds for many different organisms, and harbor very diverse **communities**. In shallow nearshore areas, there is generally higher light and nutrient availability. Therefore, **primary production** is generally greater, which means there is more energy/food to be passed on to higher **trophic levels** (primary consumers, secondary consumers, etc.). This creates more **biomass** and/or greater abundances of organisms at each higher **trophic level**.

Because humans use nearshore environments for recreation and development, more than any other aquatic environments, it is also impacted the most. By sampling nearshore communities' inferences can be made to about the impact humans have had on the health of the habitat and indicate if the habitat has been disturbed either chemically or physically. Disturbances may cause a decrease in the diversity of organisms found and the abundances of each organism found. There may also be a change in the kinds of organisms found, and more stress tolerant species may replace the species normally found in the undisturbed community.

VOCABULARY

Benthic – Living in or on the sea bed or on submerged stationary structures.

Ecology - The study of plants and animals and how they interact with each other and their physical environment.

Ecosystem- The environment, made up of living and nonliving components, in which communities of plants and animals live and interact.

Pelagic - Living in the water column. Bluefish, dolphins, jellyfish and shrimp are all pelagic. Pelagic organisms can be either of the following:

Plankton - Microscopic plants and animals that live in the water column. They are free floating and their direction of movement is controlled by ocean currents.

Nektonic - free swimming organisms that live in the water column.

Trophic level - One of the hierarchical levels in a food chain. Demonstrates feeding position in a food chain such as primary producers, herbivore, primary carnivore, etc.

Feeding guild - A group of organisms that feed in the same manner or utilize similar resources. Types of feeding guilds include the following:

Producer (autotroph) - An organism that obtains energy by making its own food.

Consumer (heterotroph) - An organism that obtains energy by eating other organisms. The following are types of consumers:

Herbivore - An animal that eats plants.

Omnivore - An animal that eats plants and other animals.

Carnivore - An animal that eats other animals.

Biomass - The amount in weight of living matter.

Invertebrate - An animal without a backbone.

Vertebrate - An animal with a backbone.

Community - A group of plants or animals that live in the same area and interact with each other.

Species richness - The number of species in a community (sometimes called species diversity).

Species diversity - The number of species in a community and the relative proportions of their abundances.

Habitat - the specific place where a community of organisms live (that is, its "address"), where the basic elements needed by all living creatures to survive-food, water, shelter, and space-are provided.

EXTENSIONS

- Have students calculate the following measures of diversity:
  a) Species richness: Count the number of different animal species collected
  b) Trophic diversity: Count the number of different animal feeding guilds present in the samples.
  c) Pelagic zonation: Count the number of each pelagic zone represented in the samples.
- Which species dominates in terms of abundance (has the higher number of individuals)?
- Which species dominates in terms of biomass (has the most weight)?

Have students describe the community based on the measures of community diversity, observations made, how they think the organisms relate to each other (e.g. who eats whom, who lives in the algae, etc.)

Create scenarios of ways that humans change shallow water habitats. Have student hypothesize how these scenarios may affect the communities that utilize these habitats? Example 1: If motorboats stir up the bottom- light cannot penetrate to as great a depth and there is less primary production (plant growth).

Therefore, there is less food (energy) available to higher **trophic** levels (primary consumers, secondary consumers, etc.). Example 2: If a sea grass bed or marsh is cleared away to build a marina- it takes away food and habitat for many animals. The numbers and **biomass** of organisms will decrease, and the species composition will change from animals that use the sea grass or marsh **habitat** to animals that can use the marina **habitat**.

Have students collect samples at different times of year, at different tidal

stages, at different salinities, from different locations, or different **habitats**. If this cannot be done, obtain data sets with this information from previous or different class trips. Have students create bar graphs of the numbers of individuals (y-axis) of each species (x-axis) collected and make comparisons between different data sets. When/where were there higher numbers of organisms collected? When/where was there higher **species richness**, evenness and diversity? When/where was there higher **biomass**? What were the dominant species, **pelagic zones**, and **feeding guilds** for each data set? Draw conclusions as to why these differences are observed.

Bring some organisms back to the classroom to maintain in an aquarium, observe how the organisms interact and what niche they take on in the aquarium.

REFERENCES

Gosner, K.L. 1978. The Peterson Field Guide Series - A Filed Guide to the Atlantic Seashore from the Bay of Fundy to Cape Hatteras. Houghton Mifflin Company, Boston.

Robins, C.R., G.C. Ray and J. Douglass. 1986. The Peterson Field Guide Series - A Field Guide to Atlantic Coast Fishes of North America. Houghton Mifflin Company, Boston.

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Nearshore Community Sampling

Date: _____

Time: _____

Location: _____

Stage of the tidal cycle: _____

Habitat description (e.g. sand bottom, mud bottom, seagrass, marsh):

_____

_____

_____

Species	# Collected	Pelagic zone (plankton, nekton, benthic)	Feeding guild (Producer, Consumer: herbivore, carnivore, omnivore)	Plant, Vertebrate or Invertebrate

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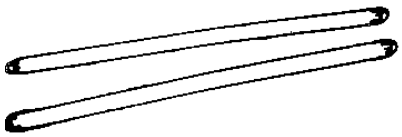
HOW TO CONSTRUCT A SEINE NET

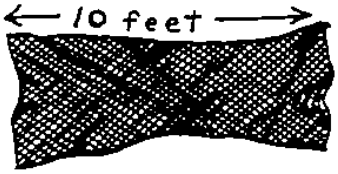
Materials:



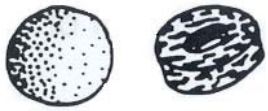
Two broomsticks

Heavy Cord

10-12 fishing sinkers



Netting or mesh material

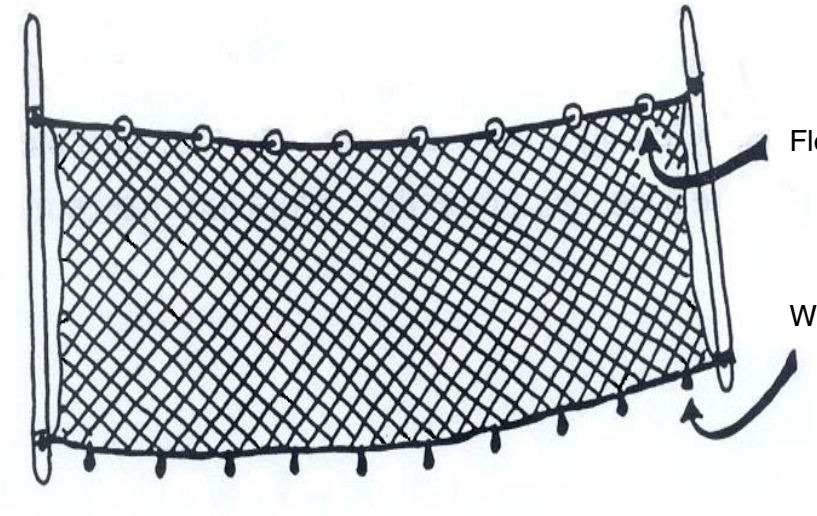


Cork floats or Styrofoam balls

Top

Bottom

1. File grooves or drill holes at top and bottom of each broomstick. Distance between groves/holes must equal width of net. Cut the lower groove/hole close to the end of the stick.
2. Secure four corners of the net to poles with cord tied to grooves or holes.
3. At equal intervals of about 10 inches, tie sinkers along the bottom edge of the net with short lengths of cord. Punch holes in Styrofoam balls with an awl or pencil. Tie balls along the top of the net.



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HOW TO USE A SEINE NET

There are a few simple, but important points to remember as you use the seine net.

They are:

- Two people are needed to handle the poles. A third person may walk towards the outstretched net to drive fish into it.
- Walk *slowly* with the net. Let it form a broad arc in the water
- Always walk *against* the current
- Keep the poles at an angle, with the top of the poles tilted back. The bottom of the poles should be away from you and in contact with the seabed. The net will more effectively sweep the bottom for ground dwelling marine organisms.
- Having a large bucket or pan full of seawater ready on the shore to receive your live specimens.
- For safety, *never* seine in the heavy ocean surf or water deeper than your waist. Aside from the obvious dangers, the net will not be productive. Seine in a protected bay or harbor.

The most abundant and varied catches are made in waters near a salt marsh. This is the nursery of the sea where great numbers of fish spawn. It is where the complex marine food web begins.

To seine, the pole handlers walk parallel to the shore for a short distance. The person closest to the shoreline will then stop and pivot slowly as the partner walks in a wide sweep towards the shore. When the net is parallel to the shore, tilt the pole tops sharply back and walk the net onto the beach, stretched flat out like a bed sheet.

If you've made a good sweep, the net will be jumping with anything from killies to crabs, shrimp to toadfish, eels to pipefish.

Quickly, but gently, pick the animals from the net and drop them into your collecting pan of seawater, where you can study and enjoy their behavior.

Do not worry about seining in an area where you can see no fish in the water. The reflected sunlight on the water's surface obscures your vision and, thanks to nature's design, protective coloration makes most species all but invisible.