

## "KELP FOREST READING AREA"

### QUESTION

What makes up a kelp forest environment?

### UNDERLYING CONCEPT

The kelp forest is a unique habitat supporting many organisms.

### SKILLS

- Designing
- Planning
- Conceptualizing
- Measuring

### METHODS

- Students will create a "kelp forest reading center" in order to learn about the ecosystem of a kelp forest.

### OBJECTIVES

- Students will be able to create a walk-through kelp forest in the classroom.

### TIME NEEDED

- 3 to 5 class periods

### MATERIALS NEEDED

- Rope
- Green trash bags
- Thin wire
- Glue
- Small Styrofoam balls (optional)
- Thin rope or green yarn
- 2 or 3 rocks (as many rocks as kelp plants)

### VOCABULARY

- canopy* - The masses of blades and stipes at the top of the kelp that are seen on the surface of the ocean.
- holdfast* - The anchoring system of the kelp.
- blade* - The "leaves" of a kelp plant.
- stipe* - The "stem" of a kelp plant.
- air bladder* - A small balloon at the base of each blade that helps to keep the stipe and the blades of the kelp to float near the surface of the water, where the sun is.

## BACKGROUND INFORMATION

### Kelp Forest

**Kelp** is a type of marine algae, or seaweed. Seaweeds come in three color variations, red, green and brown. Kelp is a kind of brown seaweed that grows to be very large. Although kelp resembles a kind of weed or tree, it is quite different from plants that grow on land. First of all, kelp has no roots. Kelp does have a way to anchor itself to the bottom of the ocean floor, but this anchoring system, called the **holdfast**, does not take in nutrients like plant roots do. The "leaves" of a kelp plant are called **blades** and the "stem" is called the **stipe**. Another structure unique to kelp is the **air bladder**, which looks like a small balloon at the base of each blade. The stipe of the kelp is very flexible and cannot stand up on its own - the air bladders help the stipe and blades of the kelp float in the water, which allows the kelp plant to grow up toward the surface of the water, where the sunshine is brightest.

Kelp is very good at growing - the giant kelp off the coast of California can grow up to 2 feet per day! Like land plants, kelp uses energy from sunlight to make its own food. This process is called **photosynthesis**. Sunlight is captured by the plant and the energy particles in sunlight (photons) are used to drive a chemical reaction that produces sugar. This sugar is the food for the plant. In a land plant, usually only the leaves are capable of photosynthesis, but all parts of the kelp plant can photosynthesize. A kelp plant starts out as a single flat blade attached to the bottom and then grows into a mature plant. Giant kelp can get to be over 150 feet long! Kelp sometimes grows in dense patches of many individual kelp plants - these dense patches are called **kelp forests**, because they resemble a forest of trees.

Sea urchins (red, white and purple ones), certain types of snails, (sea hares, Norris snails and abalone), and a few fish species (like the halfmoon and the opaleye), regularly feed on kelp. There is another animal that eats kelp, humans! Have you ever eaten ice cream, chocolate milk, apple pie or salad dressing? If so, then you have eaten kelp! Unlike other kinds of seaweed, like red algae, which are used directly as food, kelp is not usually eaten directly by humans. Instead, certain compounds are extracted from the kelp and then used in other foods. **Algin** is one of these compounds and is used to help make different ingredients stick together and form gooey gels. Algin and other compounds from kelp are also used in other products used by humans, like paint, cosmetics and some drugs.

### Kelp Forest Habitat

In addition to providing food for some organisms, kelp is an important **habitat** for many organisms. The structure of giant kelp (*Macrocystis*) affects which organisms live where. Let's start from the top to the bottom:

#### Canopy

Did you know there are nurseries in the kelp forest? The canopy of the kelp (the mass of blades and stipes at the top of the kelp that are seen on the surface of the ocean) can go down a meter or more below the surface. The canopy slows the water currents, making this the perfect spot for tiny organisms like floating (planktonic) eggs, larvae and very small organisms to gather. The organisms grow easily here due to the warmth and light and are protected from hungry predators by the thick kelp growth. The canopy is often called the nursery or brood area for nearshore

fishes and invertebrates. Small seniorita fish and the tiny topsmelt like to dine in this area.

### Below the canopy

Below the canopy the waters are filled with fish life. Surfperches may feed in a variety of places in the canopy, in the water between the plants or around the holdfasts (on the bottom). Most fish prefer the area of the kelp forest where their prey lives. Kelp bass find the middle of the kelp forest to be a good hunting area, while Sheephead, a boldly colored fish, like to feed on the algae invertebrates that live among the kelp stipes and tend to hang out towards the bottom of the kelp forest. A variety of species of rockfishes feed on other fishes and invertebrates near the bottom.

### Holdfast and rocky bottom dwellers

More little creatures live down here! It's the spot where a variety of attached (nonmoving) invertebrates live: sponges, sea anemones, sea squirts, and barnacles. Among these attached animals, motile or moving animals can be found...by the millions! Brittle stars, snails, and small crustaceans are abundant. The large amount of plant material attracts plant-eaters (herbivores) like sea urchins, sea hares and abalones. Sea stars, such as sea bats and sunflower stars, also are found in the kelp bed, often eating sea urchins, other sea stars and many other invertebrates.

Some animals like sea otters and sea lions hunt through all areas of the kelp. Sea lions consume vast quantities of fish, and find all areas of the kelp forest to be an abundant "fish market." Also, many small animals, and certain types of algae actually live *inside* the kelp plant, making the kelp holdfast their home. The inside of the holdfast provides protection from predators and from strong ocean currents. Animals that you might find in a holdfast include worms, baby sea urchins, snails, brittle stars, tiny crustaceans, and maybe even mussels or barnacles.

## **ACTIVITY**

Into:

View pictures, videos or online sites that illustrate a kelp forest. (The Sea Grant online site for kelp is given in the Extensions section of this activity.) Engage in a teacher directed discussion of what kelp is like, how it differs from land plants, and what it would be like for an animal to live in that habitat. Students can also do more in-depth research projects on kelp and kelp forest inhabitants as part of this overall activity

- 1) Choose a spot in your classroom to designate as the "kelp forest" area. The space that you choose does not need to be a large one, a 6' x 6' space is fine.
- 2) Suspend rope from the ceiling (this will be the stipe) and attach kelp blades that the students cut from heavy green trash bags. A piece of thin wire glued up the middle of the "blade" will allow the students to bend the blades, this will make the kelp more life-like, and can also be used to attach the blade to the "stipe."
- 3) For additional realism, small Styrofoam balls painted green can be strung onto the wire at the base of the blade before it is attached to the stipe.

- 4) Holdfasts can be made from many strands of thinner rope or green yarn, attached to the base of the stipe and then glued in a tangled mass to a rock or two.

### **Research**

After the students create their classroom kelp forest, they can research the animals that live in the kelp forest, and then make them from various materials to inhabit the kelp forest. Don't forget the tiny crabs, shrimp, worms, and sea stars that hide in the holdfasts.

### **Literacy**

The reading room can be the center for all types of reading. Of course, any marine science books and/or stories and books relating to the ocean would fit perfectly into this reading area!

### **Extensions**

- 1) Students can have reading and research projects that make use of the resources in the reading room.
- 2) Throughout the year or semester as new information is gained, continue to make additions to the kelp forest.
- 3) Use the reading room kelp forest as a comparison to other marine environments; interesting comparisons can also be made to terrestrial forests.
- 4) Refer to the zonation activities and create an extended zonation map to use as a wall decoration for the kelp forest.
- 5) For an interactive kelp activity, see, [www.usc.edu/go/seagrant](http://www.usc.edu/go/seagrant); click on Education, next click on Online Activities, then click on "Help With Kelp"