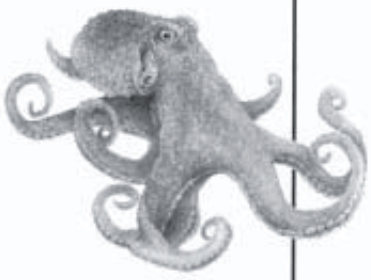
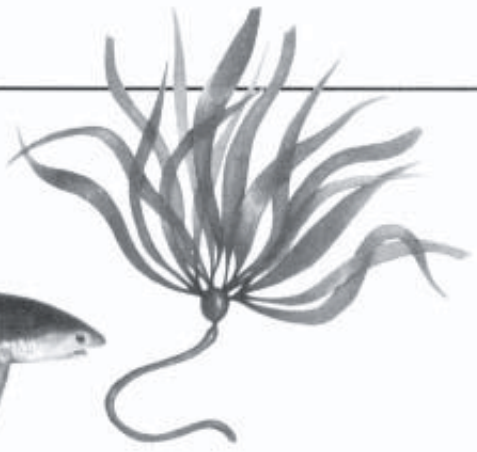
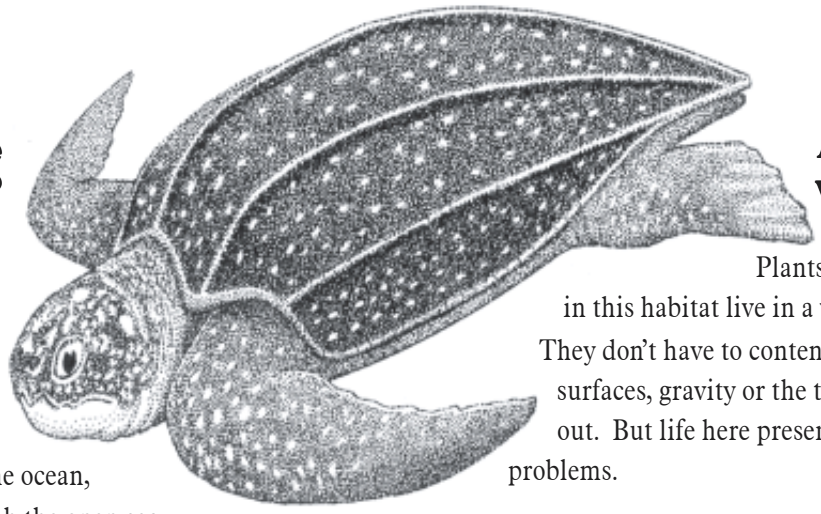
SEARCHING SEA HABITATS

The Open Sea





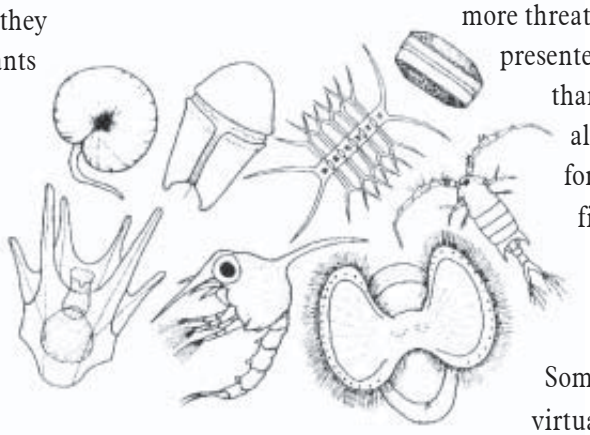
What is the Open Sea?



Leatherback sea turtle

Moving away from the shallow waters along the coast and into the deeper water of the ocean, one travels through the open sea a vast world with no walls. In this habitat, changes in the physical and chemical characteristics of the water create boundaries. These boundaries, seemingly invisible, divide the open sea into different water masses, each with its own characteristic plants and animals. The residents here sense differences in temperature, salinity, available sunlight and dissolved chemicals or nutrients. As the seasons change and their water mass moves, these organisms travel with the water mass that suits them best.

Life in the open sea is divided into two groups: drifters (plankton) and swimmers (nekton). Plankton are weak swimmers, carried mainly by currents. A diverse group, they range from microscopic plants and animals to large jellies. Nekton include fishes, whales, sea turtles and squid. They travel great distances to find food. With very different lifestyles, both groups are well-adapted for life in the open sea.



A different world

Plants and animals in this habitat live in a world of water. They don't have to contend with hard surfaces, gravity or the threat of drying out. But life here presents different problems.

Because sunlight and their richest food supplies are in the surface waters, plants and plankton eaters must stay near the surface to survive. To accomplish this, microscopic plants and animals develop elaborate structures to slow their rates of sinking, while many fishes have air-filled swimbladders which support them in the water. Whales rely on blubber or fat for the same purpose. Without places to hide, animals of the open sea must also avoid predators. Many species of zooplankton come to the surface waters at night to feed on small, single-celled plants. During the day, they sink to deeper waters to avoid being seen by predatory fishes or birds. Many fishes school for protection. Their safety comes form the larger and more threatening appearance presented by many fishes rather than by just one. Schooling also causes greater confusion for a predator that's trying to find, follow and catch a single animal in a large group.

Some animals, like jellies, have virtually invisible gelatinous

bodies. Others, like tuna, rely on countershading coloration (light on the bottom, dark on top) to be less visible. Viewed from above, their bodies blend in with the ocean depths; while from below their light undersides blend with bright surface waters.

Floating pastures

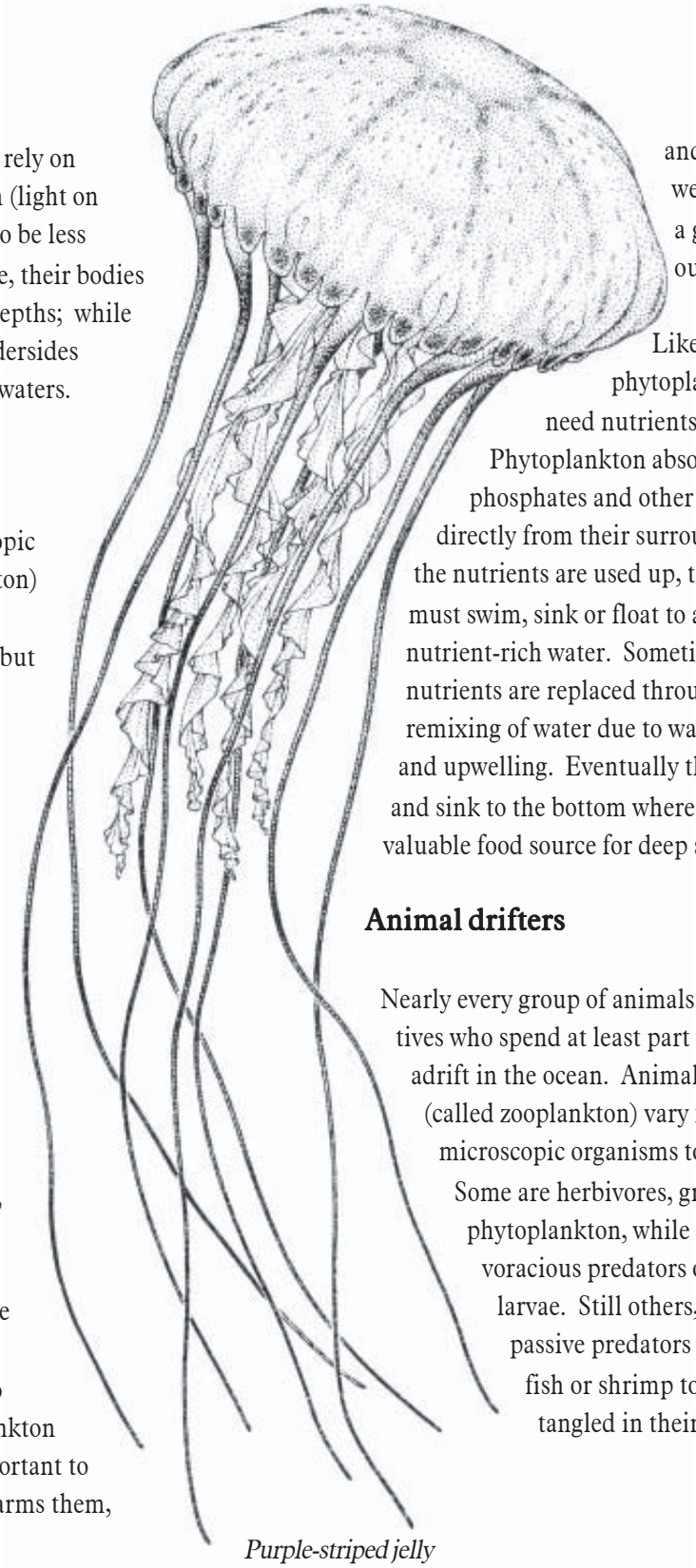
Large "slicks" of microscopic plants (called phytoplankton) are found in patches near the ocean's surface. Tiny, but present in unimaginable numbers, phytoplankton support virtually all life in the oceans.

These plants need sun to grow and photosynthesize so it's vital that they remain in the upper waters where sunlight can penetrate. A small body size, irregular body shape and long fibers help slow their sinking. Worldwide, their photosynthesizing produces most of the oxygen in the ocean. Since all animals - including ourselves - need oxygen to survive, healthy phytoplankton and a clean ocean are important to us. Polluting the ocean harms them, and without them, we'd be short of a gas essential to our survival.

Like all plants, phytoplankton also need nutrients to survive. Phytoplankton absorb nitrates, phosphates and other nutrients directly from their surroundings. When the nutrients are used up, the plankton must swim, sink or float to a new patch of nutrient-rich water. Sometimes nutrients are replaced through the remixing of water due to waves, currents and upwelling. Eventually the plankton die and sink to the bottom where they become a valuable food source for deep sea creatures.

Animal drifters

Nearly every group of animals has representatives who spend at least part of their lives adrift in the ocean. Animal drifters (called zooplankton) vary from microscopic organisms to large jellies. Some are herbivores, grazing on the phytoplankton, while others are voracious predators of planktonic larvae. Still others, like jellies, are passive predators waiting for a fish or shrimp to become tangled in their tentacles.



Purple-striped jelly

Yellowfin tuna

Drifting provides a means to disperse young. Many, like crabs, barnacles and some fishes, produce planktonic larvae. Their young develop adrift at sea. Mortality is high among planktonic larvae - many are eaten by larger predators, others are swept far out to sea. But eggs and sperm are small and require little energy to produce. The parents would invest far more energy if they cared for the larvae until they were fully developed.

The swimmers

Nekton, the open sea's powerful swimmers, face the same buoyancy and predation challenges that plankton do, but they meet these challenges in different ways.

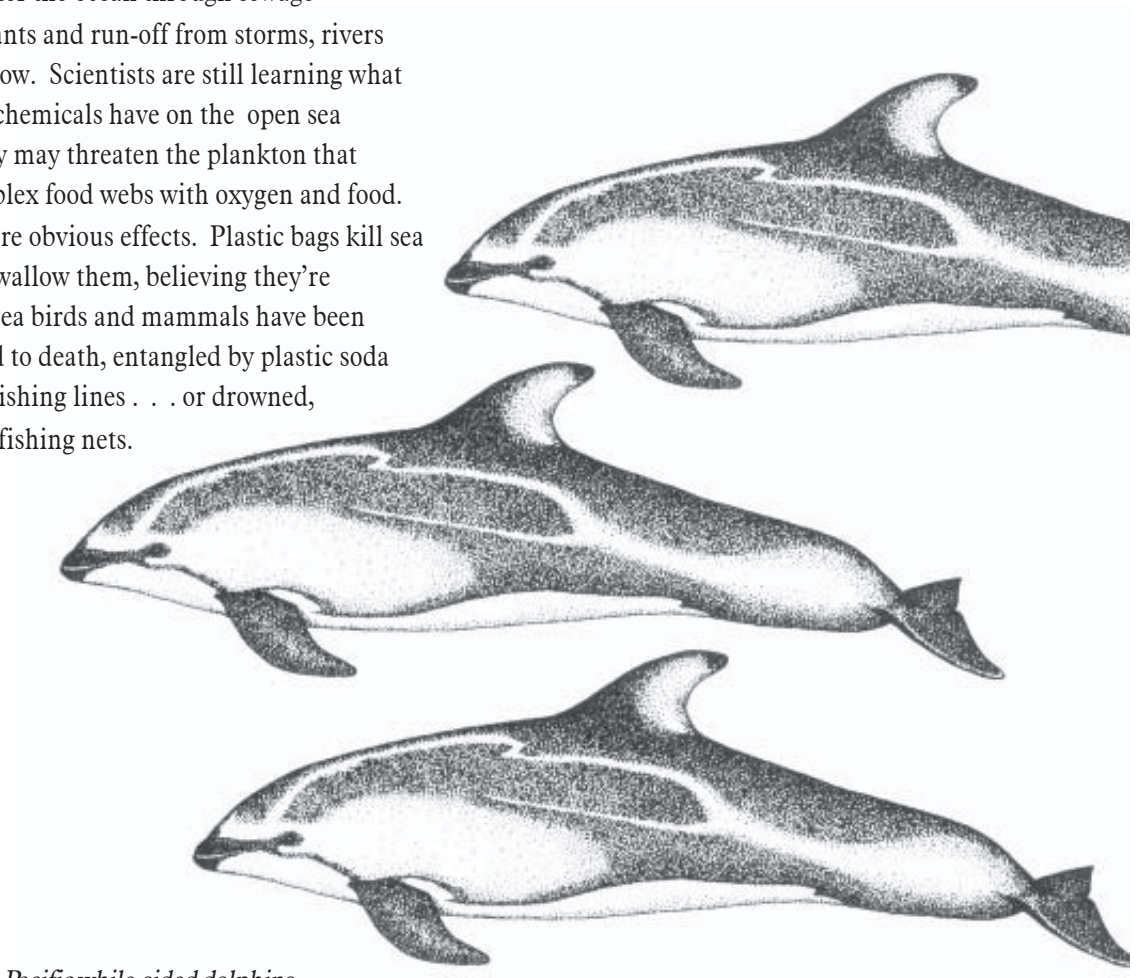
Nekton are built to chase down prey and avoid predators. Tuna have muscular, torpedo-shaped bodies and crescent-shaped tails. Streamlined and powerful, they can travel at speeds of up to 40 miles per hour! When tuna swim fast, their fins lie flat against their body, reducing both drag and turbulence. Event their eyes fit smoothly into the outline of their bodies.

Swimming takes energy - which these active swimmers get by eating large amounts of food. Adults seek areas of the ocean where food is abundant and migrate seasonally to seek out and stay with these water masses. Since conditions in these water masses usually aren't suitable for larvae or young, adults migrate to other areas at certain times of the year to spawn or give birth. Gray whales migrate up and down the California coast every year, traveling between their Alaskan feeding grounds in summer and their winter nursery lagoons off Baja California.

Responsible for the open sea

With a growing human population, an increase in consumption by some people and advancing technology, people are having a greater impact on the ocean's inhabitants and water quality. In the Monterey Bay area of California, sardines, anchovies, tuna, gray whales and sea otters have all been overfished or overhunted. The habitat is also being harmed by the accumulation of chemicals and trash. Chemicals, oils, herbicides and pesticides from our homes, yards, streets, factories and farms enter the ocean through sewage treatment plants and run-off from storms, rivers or melting snow. Scientists are still learning what effects these chemicals have on the open sea habitat. They may threaten the plankton that support complex food webs with oxygen and food. Trash has more obvious effects. Plastic bags kill sea turtles who swallow them, believing they're jellies. And sea birds and mammals have been found starved to death, entangled by plastic soda can rings or fishing lines . . . or drowned, entangled in fishing nets.

Laws regulate how many fishes can be collected and which type of substances may be released into the sea. We can help keep the sea healthy by learning more about it as well as coastal habitats and by following current events in the news, supporting effective environmental legislation, respecting and obeying fishing regulations, keeping trash off of our beaches and safely disposing of toxic chemicals.



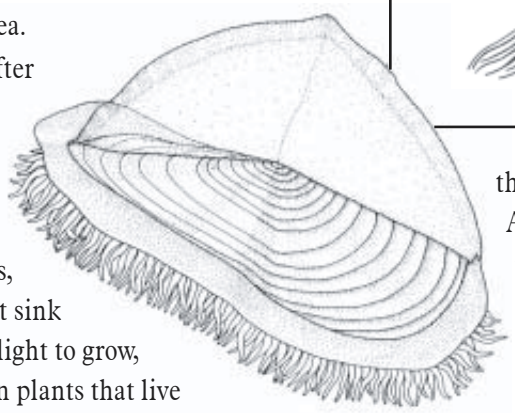
Pacific while-sided dolphins

Design a Drifter

MATERIALS

- Variety of materials including corks, toothpicks, clay, pipe cleaners, paper clips, twist-ties, rubber bands, coffee stirrers, biodegradable packaging pellets and metal washers

Use a variety of materials to create a drifter that lives at sea. Remember, your drifter must be submerged. It can't float at the surface because it'll get sunburned or be eaten by predators, and your drifter can't sink because it needs sunlight to grow, or perhaps it feeds on plants that live at the surface.



What Does a Jelly Feel Like?

MATERIALS

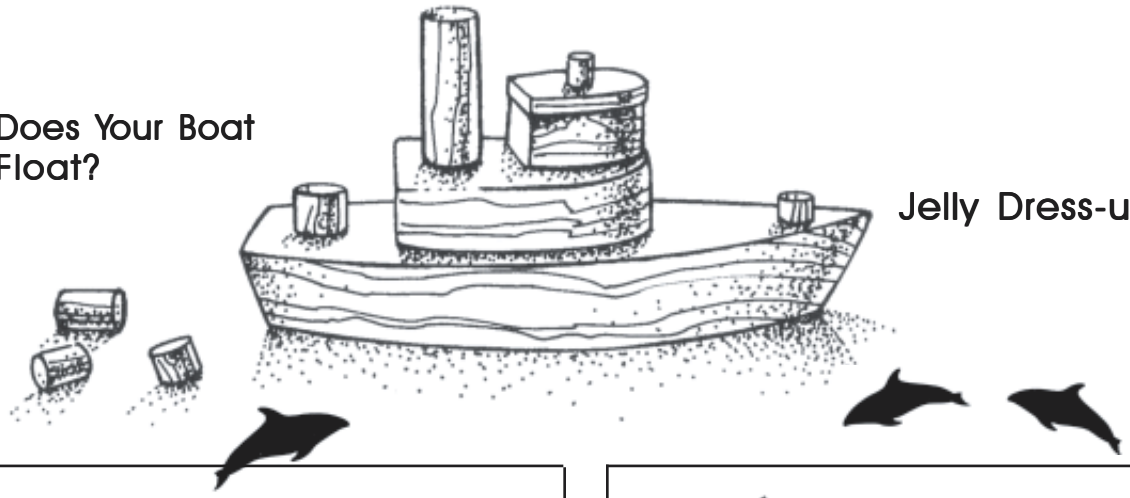
- 1 envelope of unflavored gelatin
- 1 ½ cups cold water
- Bowl
- Plastic baggie (sandwich size)

A bag full of jello feels a lot like a jelly that lives in the sea. Make a batch of jello and chill it in a bag to make your own jelly at home.

Dissolve gelatin in ¼ cup cold water, let stand for two minutes. Put the gelatin mixture in microwave on high for 30 seconds, stir the mixture thoroughly, then let it stand again for two minutes. Add 1 ¼ cups cold water and mix thoroughly. Pour mixture into a plastic baggie and chill.

Make a bag full of jello and see what a jelly feels like to the touch.

Does Your Boat Float?



MATERIALS

- Variety of boat-building materials including clay, toothpicks, string, the bottom of a plastic jug or bottle, paper scraps, fabric or other material for sail
- Metal washers or pennies for weights
- Scissors
- Glue

Design and build a boat that floats. What happens to a ball of clay if you drop it into a sink full of water? Can you shape the same ball of clay to make it float? Once you've finished your boat, experiment with different objects to see how much weight your boat can carry before it sinks. If you make a sailboat, which way do you angle the sail to make it sail straight when you blow from one side?

Jelly Dress-up

MATERIALS

- Clear umbrella
- Fabric streamers, ribbons or other materials to make tentacles
- 4 lacy ribbon
- Hat (like a beret) for the jelly's mouth
- Scissors
- Glue

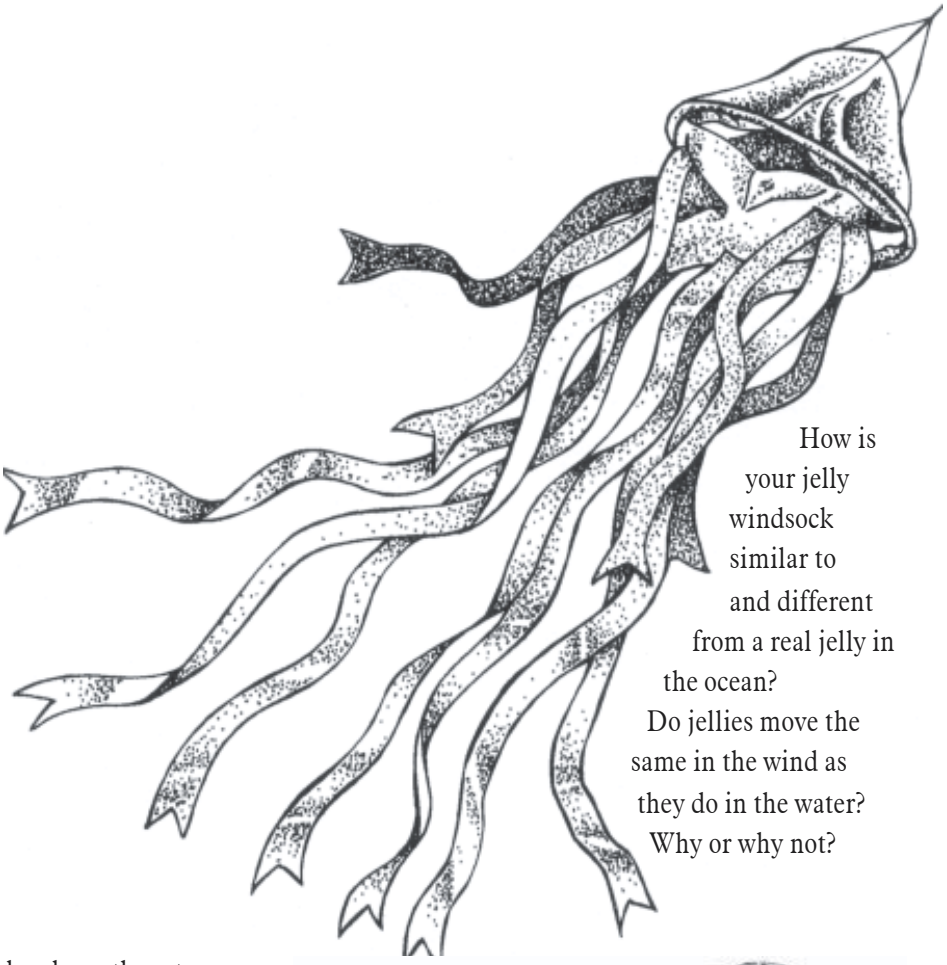
Glue strips of fabric, streamers or ribbons around the edge of the umbrella. Drape a piece of lacy ribbon around your neck of the jelly's mouth arms. A hat on your head serves as the jelly's mouth. When you get hungry, use your lacy mouth arms to carry food up ot the mouth on top of your head!

Make your own jelly costume.

Jelly Windsock

MATERIALS

- Two coat hangers
- Wire cutters
- Piece of fabric (size depends on how big you'd like to make your windsock)
- Measuring tape
- Strips of fabric, ribbons or streamers
- Scissors
- Glue
- String



How is your jelly windsock similar to and different from a real jelly in the ocean? Do jellies move the same in the wind as they do in the water? Why or why not?

Cut the two coat hangers and reshape them to make two circles of equal size. Measure the circumference of the circles, then cut a piece of fabric one inch wider than the circumference. The length of your windsock depends on how long you'd like your windsock to be. Remember to add one inch to the top and one inch to the bottom to fold over the wire hanger. Wrap the top end of your fabric around one of the wire circles, fold over about an inch of fabric and glue the fabric together, enclosing the wire hanger. Do the same at the bottom of your fabric with the other wire circle to create a cylinder. Glue strips of fabric, streamers or ribbons along the bottom edge of the cylinder to make tentacles. Fasten the string to the top wire hanger and hang your jelly!

Purple-striped jellies

Snazzy Squid Costume

MATERIALS

- Foam (check the Yellow Pages for local foam or mattress stores): 54" x 76" sheet (double bed size) of 1" -thick foam for a child's costume
- 12" of 36' -wide butcher paper
- 2' of 3/4" Velcro
- 2/3 yard of (2' x4' square) of black chiffon fabric
- Clear quart-size plastic bag
- 2' of string
- Spray or craft paint - 1 can each of black and silver
- Contact cement or spray adhesive
- Highlighter pen
- Scissors
- Rubber gloves
- Balloon

To make your Snazzy Squid suit

It'll help if you read all the directions and study the illustrations before constructing your squid suit. Find a comfortable, well-ventilated place to work and have clean-up materials handy. Read and follow the health warnings on the glue and paint containers. Plan on spending about three hours making this costume.

1. On the butcher paper or newsprint, draw a grid with six-inch squares (an enlarged version of the grid on page 85). Enlarge the pattern pieces onto your grid, drawing one square at a time. Cut out the pieces, lay them on the foam and outline them with the highlighter pen. Cut out the foam body parts.

2. Mantle: glue the scratchy side of three 4-inch pieces of Velcro along one side of the mantle at point A. Glue the three matching fuzzy pieces along the mantle's other side. Glue the scratchy side of a 4-inch piece of Velcro to the inside of the mantle at the neck at point B. Cut out the arm holes.

3. Siphon: glue the sides of the siphon (D) together to form a tube. (You can use rubber bands to hold the tube closed while it dries.) Glue the fuzzy side of the 4-inch piece of Velcro to the outside of the siphon at point E.

4. Headband-of-arms: glue the narrow ends of the feeding tentacles (G) to the inside center of the headband-of-arms at point G. (The round ends should point upward in the same direction as the pointed ends of the arms.) Glue a 4-inch piece of Velcro to each end of the headband at point H.

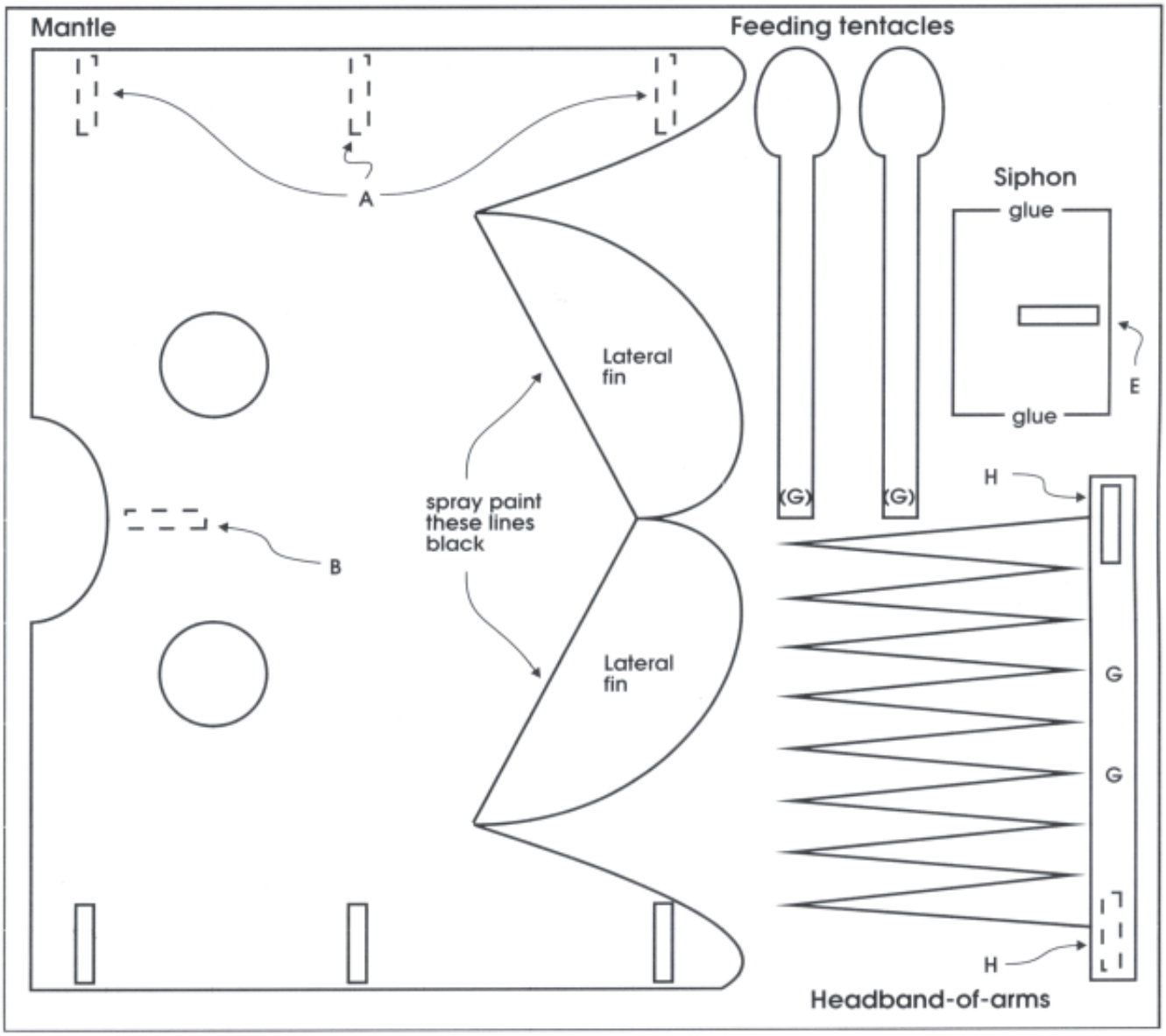
5. Paint a black line to separate the mantle from the lateral fins. Decorate the mantle and lateral fins with 2-inch diameter silver and black circles. Paint the arms and the round ends of the feeding tentacles with 2-inch diameter black circles to represent suction cups.

6. Ink sac: stuff the piece of black chiffon into the quart-size plastic bag. Tie the opening closed with the string.

Squid notes

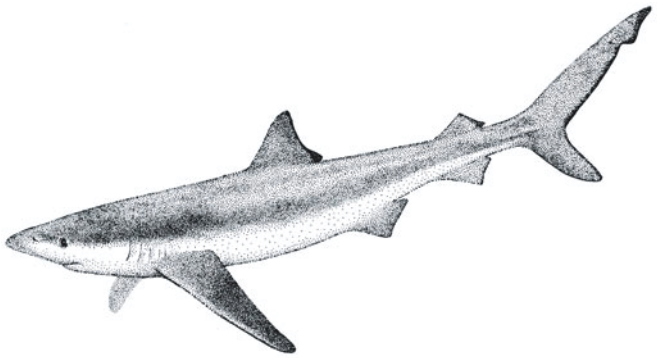
A squid swims through the ocean, sometimes darting with quick bursts of speed, other times slowly cruising along. It hunts for small fishes and shrimp, which it suddenly snatches with its longest tentacles. When danger threatens, it can release a squirt of ink, stored in a sac inside its body, to cloud a predator's view. Or it can jet away with a quick burst of speed by contracting its muscular mantle to force water out through its narrow siphon.

(To show how a squid jets away, help your child blow up a balloon. Then let the balloon go without tying a knot. Air forced through the balloon's narrow opening is similar to water forced through the squid's siphon. A squid can control its direction by pointing its siphon forward to go backward and vice versa.)



Velcro strips indicated with a dotted line go on the **back** of the foam parts

Critter Cards - Open Sea

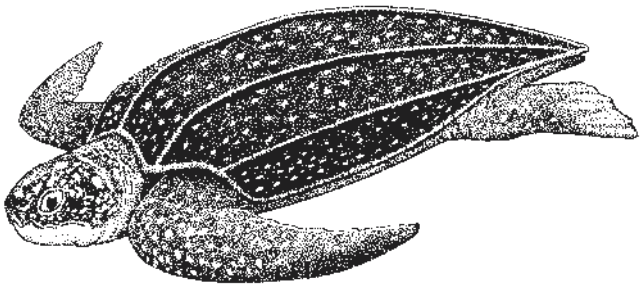


Blue shark

Blue shark
Prionace glauca [size: to 13.5 ft. (4 m)]

Blue sharks usually live offshore but visit the nearshore waters of Monterey Bay in late summer and fall. They make seasonal migrations of thousands of miles. Sleek and graceful, they use their front fins for gliding, a swimming method that is especially efficient at low speeds.

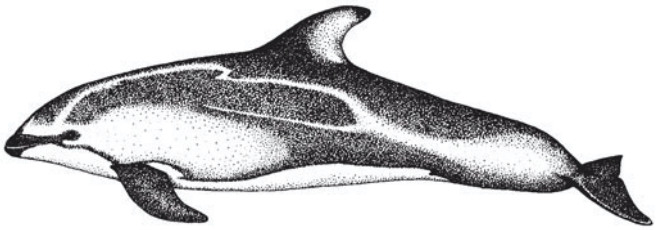
Blue sharks feed mostly on fishes and squid.



Leatherback sea turtle

Leatherback sea turtle
Dermochelys coriacea coriacea
[size: to 6 ft. (1.8 m)]

Sea turtles eat jellies. When plastic bags and balloons get in the ocean, they look like jellies. Sometimes turtles eat the plastic by mistake, then they choke and starve.



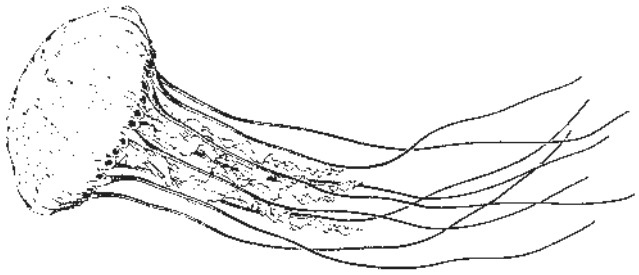
Pacific white-sided dolphin

Pacific white-sided dolphin
Lagenorhynchus obliquidens [size: to 7 ft. (2.1 m)]

Resident pods of hundreds of white-sided dolphins streak through Monterey Bay. They swim in formation with other dolphins and sea lions, sometimes leaping from the water in spirited somersaults.

Each dolphin is unique, from the patterns on its body to the noises it makes. High-pitched squeaks, clicks and whistles help it communicate with its family pod.

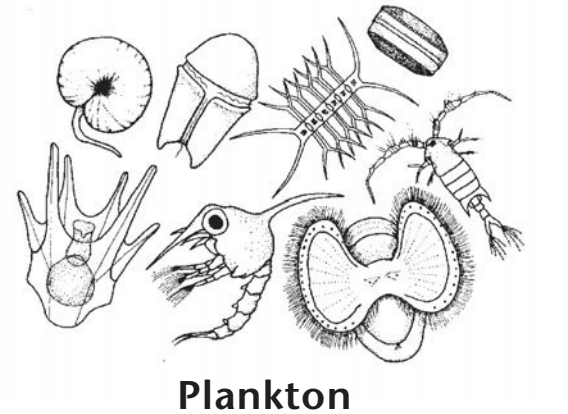
Critter Cards - Open Sea



Purple-striped jelly

Purple-striped jelly
Chrysaora colorata
[size: to 2.5 ft. diameter of bell (80 cm)]

In certain seasons, when the currents run just right, purple-striped jellies mysteriously appear near the shores of Monterey Bay, California. When the jellies arrive, it's wise to keep your distance (their sting isn't fatal, but it can be painful). Since divers have seen ocean sunfish eating these jellies, we know some fishes must be immune to the sting.



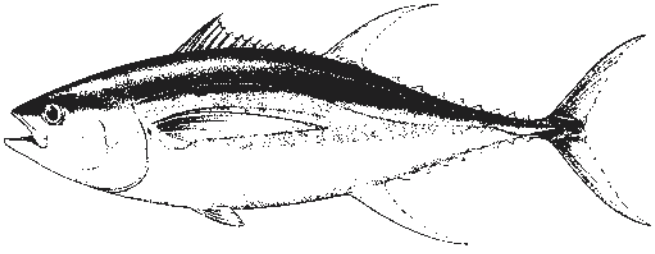
Plankton

(Plant plankton, top row from left: two dinoflagellates, chain diatom, diatom. Animal plankton, bottom row: sea urchin larva, crab larva, snail larva, copepod.)

Plankton

Plankton are plants and animals that drift on ocean currents instead of swimming. Most are tiny; these pictures are many times larger than the actual organisms.

Plant plankton form the first link in many of the ocean's food chains. Animal plankton eat these tiny plants. Filter-feeders like clams and sand crabs eat both kinds of plankton.



Yellowfin tuna

Yellowfin tuna
Thunnus albacares [size: to 6.5 feet (2 m)]

Sleek, streamlined and fast, yellowfin tuna travel the Indian, Pacific and Atlantic oceans. Local laws can't protect these international travelers from overfishing. This makes the problem of tuna conservation a global one—which means we need to find global solutions.