



Forest of the Sea

Grade: 1

Subject Areas:

Life science, Language Arts,
Physical Science

Skills: acting, coloring,
describing, modeling,
observing, matching

Duration: 1 hour

Connections:

food chains, oceanography,
photosynthesis, wildlife, art

Vocabulary

consumers

protists

photosynthesis

producers

algae

seaweed

kelp

phytoplankton

Objective:

Students will make a hanging model of a kelp forest and will explore the importance of algae in aquatic food chains.

Materials

- a large paper or cardboard
- one or more samples of algae in containers that can be easily seen by students
- a poster of an aquatic food web
- picture or short video of a kelp forest
- coloring pictures of animals of the kelp forest
- long strips of material in shades of green and brown
- coat hangers and string
- paper plates and crepe paper (for jelly fish)
- small paper bowls (for abalone)
- iridescent paper and brown tissue paper (for abalone)
- paper clasps
- single hole punch or stronger punch
- crayons, glitter, glue, etc.
- scissors and tape

Standards

Strands: Excellence in Environmental Education Guidelines

Strand 1 — Questioning and Analysis: F) Working with Models and Simulations: Learners understand that relationships, patterns, and processes can be represented by models.

Strand 2 — Knowledge of Environmental Processes and Systems

Strand 2.2 The Living Environment: B) Heredity and Evolution: Learners understand that plants and animals have different characteristics and that many of the characteristics are inherited. **C) Systems and connections:** Learners understand basic ways in which organisms are related to their environments and to other organisms. **D) Flow of matter and energy:** Learners know that living things need some source of energy to live and grow.

Life Science (LS) 2a: Students know different plants and animals inhabit different kinds of environments and have external features that help them thrive in different kinds of places.

LS 2b: Students know both plants and animals need water, animals need food, and plants need light.

LS 2c: Students know animals eat plants or other animals for food and may also use plants or even other animals for shelter and nesting.

Background

Eating Sunshine

Every living organism needs a way of utilizing energy in order to stay alive. A source of energy is necessary for metabolic processes such as growth, repair, communication and maintenance. Energy from food is processed in special organelles that both plants and animals have called mitochondria. Organelles are specialized structures that perform certain functions within cells. One main difference between animals and plants is how they acquire energy.

Animals gain energy by breaking down molecules they get through eating or consumption. Animals have adapted all sorts of ways to eat things. Animals are classified as **consumers**. Plants and some protists, on the other hand, are able to convert sunlight into energy. **Protists** are a miscellaneous group of life that include algae and protozoans. This very ancient process, called **photosynthesis**, occurs in organelles that only plants and protists have called chloroplasts. Inside chloroplasts, are active pigments called chlorophyll which are green. Here food is produced in the form of sugars. The sugars are made with the help of carbon dioxide and water. Organisms that produce energy in the form of sugars through photosynthesis are classified as **producers**.

Photosynthesis is the basis for most life. Once energy collected from the sun combines water and carbon dioxide, oxygen is produced. Therefore, without producers, life could not have become what it is today. Oxygen allows cells to gain energy faster and more efficiently in

a process called aerobic respiration. This is different than the inhaling and exhaling oxygen through a respiratory system. Cellular respiration is a process all higher forms of life need to survive whether they are animal, plant or protist.

Small and Tasty

The earliest producers on our planet were cyanobacteria, otherwise known as blue-green algae. Over billions of years these simple organisms

slowly transformed Earth's atmosphere towards one high in oxygen. These single celled organisms are not true forms of algae, however. They are photosynthetic forms of bacteria. These along with true forms of algae produce huge sums of oxygen today. **Algae** comes in a variety of forms and all algae is closely tied to water. Algae are primitive plants and differ from true plants because they don't have what is called a vascular system. A vascular system includes roots, stems and leaves. Most true plants have adapted to live on land whereas algae never left the water. Both plants and

Local Connection

Kelp Forest of California

The California coast is home to two species of giant kelp. Giant Kelp (*Macrocystis pyrifera*) which grows mostly in the southern reaches of the state and Bull Kelp (*Nereocystis leutkeana*) which grows along the Northern Coast of California stretching up to British Columbia. These particular species form what are called kelp forest and some can gain heights of 170 feet tall!

Both species of kelp belong to the group called Brown Algae or Phaeophyta. Like many other forms of algae they hold onto the bottom of the sea by a holdfast. The Giant Kelp has gas filled button-like features called floats or pneumatocysts. These allow the steam-like stipes to stand upright in water. Along the spires of stipes are have many leaf-like blades that together form an extensive underwater forest.

The importance of kelp forests is becoming more clear as we learn about their role in the marine ecosystem. Both species are referred to as keystone species. They form beautiful biologically diverse communities that provide food and shelter for many different forms of life. Many organisms blend in extremely well and depend on this camouflage to ward off predators. Others, like the sea otter get much of their diet from the animals that live in this unique ecosystem.

algae are producers and mark the beginning of most food webs. Because of this, they are vital.

Always Nearby

The world of algae is vast and complex. Basically, algae will grow just about anywhere there is exposed untreated water. It lives in the oceans, lakes, rivers and ponds. In fact, people have to treat surface water like ponds and pools to prevent algae from growing there. Due to their abundance, they should be easy to collect for this lesson. Note: There are local toxic species, so pay attention to posted warnings.

Some forms of freshwater algae love warm shallow water. In this environment it can grow into large mats often called scum. These large mats can begin to crowd out other organisms competing for space, light and oxygen. On the other hand, algae that dots ponds and streams and other freshwater sources, like lakes, are eaten by a host of small animals. These animals include clams, snails, insect larva, tadpoles, and even some types of fish. Algae can be a crucial first link for many aquatic food chains.

In the ocean, visible forms of algae grow in the tidal zones and are called **seaweed**. Seaweed can come in a host of colors including brown, orange, purple, red, yellow and green. Along the shores of Northern California, lives one of the largest species of algae in the world called Bull Kelp. Sometimes these tall spires of **kelp** are referred to as the “forests of the sea” because so many things live within it and depend on it for survival, including a much sought commodity—abalone. These forest can grow as high as 150 feet in some places. Here, animals don’t only eat the algae they use it for shelter as well (see local connection).

Along the surface of the ocean live microscopic forms of algae called phytoplankton. These are vital to marine food webs but some can be toxic. In the King Range National Conservation Area, monitoring of marine algae is an ongoing task. During certain times of the year toxic algal blooms can develop which can kill wildlife and can make shell food dangerous to eat. There is a lot we still don’t know about algae, and these toxic blooms are one of them.

People eat algae too. Sushi, pudding, and ice cream are partly made of algae. The ingredient carrageenan comes from algae. Because algae is so easy to grow, many people are looking towards algae as a new energy source.

Algae is both primitive and important. It plays a vital role in the stability of our atmosphere and the health of our ocean. Most aquatic ecosystems begin by the energy produced by this amazing plant-like organism.

Activity 1: A-L-G-A-E

Procedure

1. Gather the students in a common area and begin asking them questions about energy. Only allow one child to respond to complex questions to save time. Explain to the students that everything alive has to get energy from somewhere. Animals get their energy from eating things and are called consumers. Plants and plant-like things called algae get their energy from the sun and are called producers. (hold up the model sun) Producers make oxygen. Everything is connected to the sun to live because of what they eat. Tell them that they are going to learn about “early plants” live in both fresh and saltwater called algae. Show them the samples of algae. Ask them to come up with words to describe the samples. Write these words down and repeat them together as a class. Begin by saying: “Algae is _____.”

2. Next, sing a song about algae. (see attached song)

Hold up the poster of an aquatic food web. Explain the importance of algae as food. Next, have the students act as kelp. Hold up the sun and have them stretch their arms over their heads as they sway like they live in water. Have them yell: “I live in the ocean” “I get my energy from the sun.” “I make oxygen.” “Many things eat me.” “Animals use me to hide in.” Have the students take a break before the next activity.

Materials

- a large paper or cardboard sun
- one or more samples of algae in containers that can be easily seen by students
- a poster of an aquatic food web
- a poster of the Algae Song lyrics

- *Where do you get your energy from?*
- *Do you get your energy directly from the sun?*
- *Do you get your energy from food?*
- *Do you like to eat? What does a fish like to eat?*
- *What does a _____ like to eat?*
- *How about a plant—what do plants eat?*

Activity 2: Making a Seaweed Forest

Preparation

Adhere the long cloth streamers to a few coat hangers. These will be strung up in the classroom to form the basis of the seaweed forest. You may want to punch holes in the paper bowls and plates ahead of time as well. Cut out animal pictures ahead of time to prevent a mess and to save time.

Procedure

1. Show a picture of a kelp forest and point out some of the animals that live there. Different organisms will live at various levels in this complex community. Explain to the students that they are going to make a model of a kelp forest. To do this, they will color animals and tape them at different levels within the streamers of paper kelp. Hold up the long streamers of “kelp”. If appropriate, break the students up by ability level. The older students can make a model of an abalone or jelly fish using the paper bowls and plates, while the younger students can color a few of the kelp forest organisms. To make a jellyfish, invert a paper plate and attached strips of crepe

- *Where does algae live?*
- *Can algae live in the sea or in a river?*
- *How does algae get its energy?*
- *What colors does algae come in?*
- *Why is a kelp forest important?*
- *What types of animals eat algae?*
- *What is tall algae called (our forest)? I gave Rachel a copy of how the kelp forest would look.*

Materials

- picture of a kelp forest
- coloring pictures of animals of the kelp forest
- long strips of material in shades of green and brown
- coat hangers and string
- paper plates and crepe paper (for jelly fish)
- small paper bowls (for abalone)
- iridescent paper and brown tissue paper (for abalone)
- paper clasps
- single hole punch or stronger punch
- crayons, glitter, glue, etc.
- scissors and tape

paper around the edge so they hang down like tentacles. Punch a hole through the top to attach a clasp.

2. To make an abalone, have the students color the inside of a paper plate and add glitter, or have them line the inside with iridescent paper to it to make it shiny. On the outside of the bowl, tape or glue brown and green tissue paper.

3. Most of the students will color an assortment of cut out animals that live in a kelp forest. First have them match two pictures together, so features like eyes and gills are visible from both sides. It is optional to add animals that live on the surface of sea water like birds. (These may be difficult to

place in the classroom). As the students complete their animals, tape them at different levels within the kelp forest. If time remains, have the students sit within the kelp forest and discuss with them what they have learned about algae especially kelp.



Extensions

- Do puddle science! Measure puddles, watch them evaporate, see what lives in them and more.
- Have students observe life in a fish tank. Students can take turns feeding the fish algae.
- Find books relating to life that lives in water.
- Have the students lay out decorated blocks in the shape of a triangle to model a food chain.
- Follow the stages of a frog or fish from egg to adult.
- Grow bean plants and measure their height using attachable blocks.
- Visit a shoreline or go tidepooling

References

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Chloroplasts, http://www.biology4kids.com/files/cell_chloroplast.html

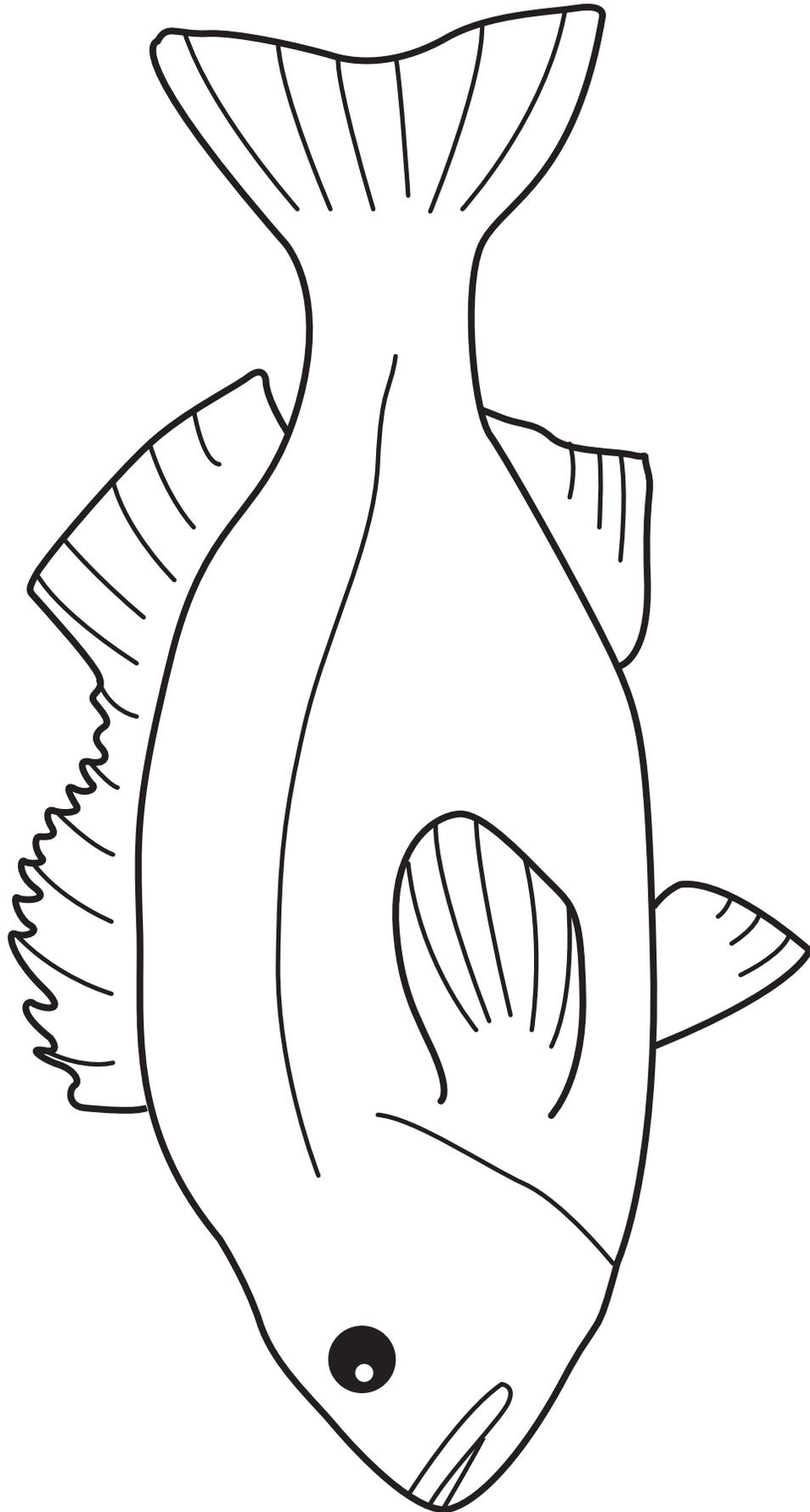
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Kelp Forests of California: <http://www.suite101.com/content/kelp-forests-of-california-a71405>

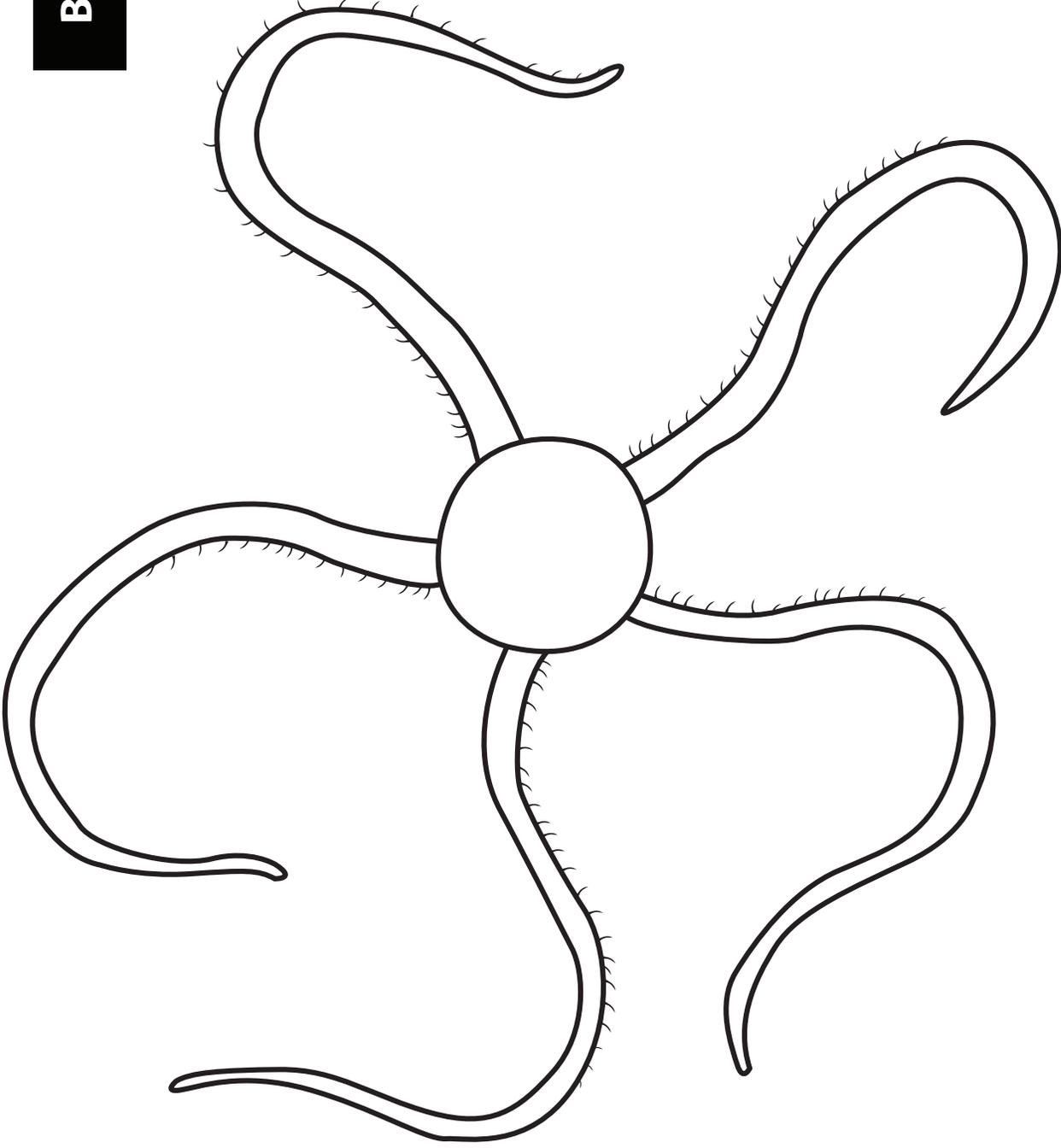
The Kelp Forest, Sea Searcher's Handbook, Monterey Bay Aquarium, pgs. 62-71

Under the Sea, http://www.eduplace.com/rdg/gen_act/fishy/under.html

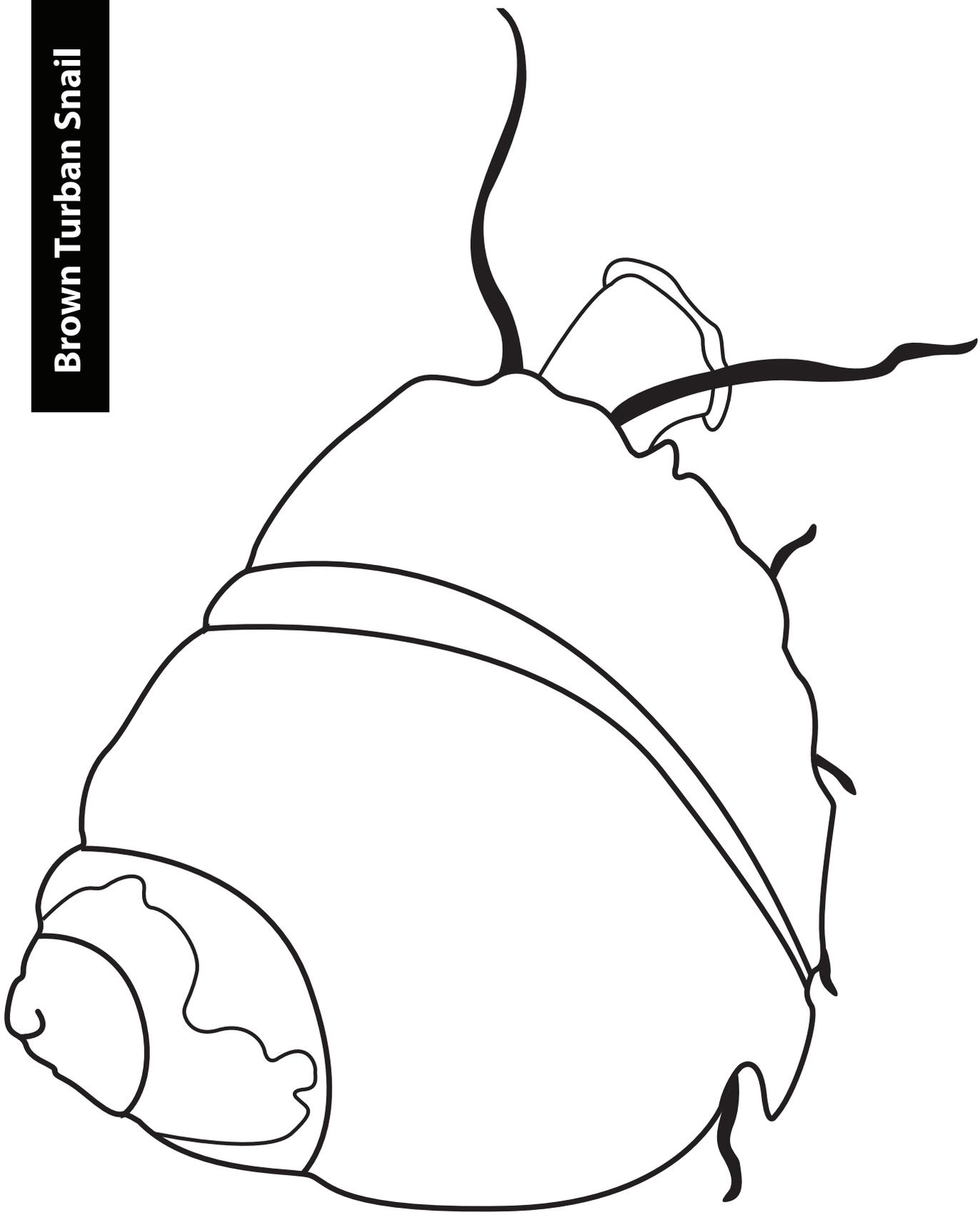
Blue Rockfish



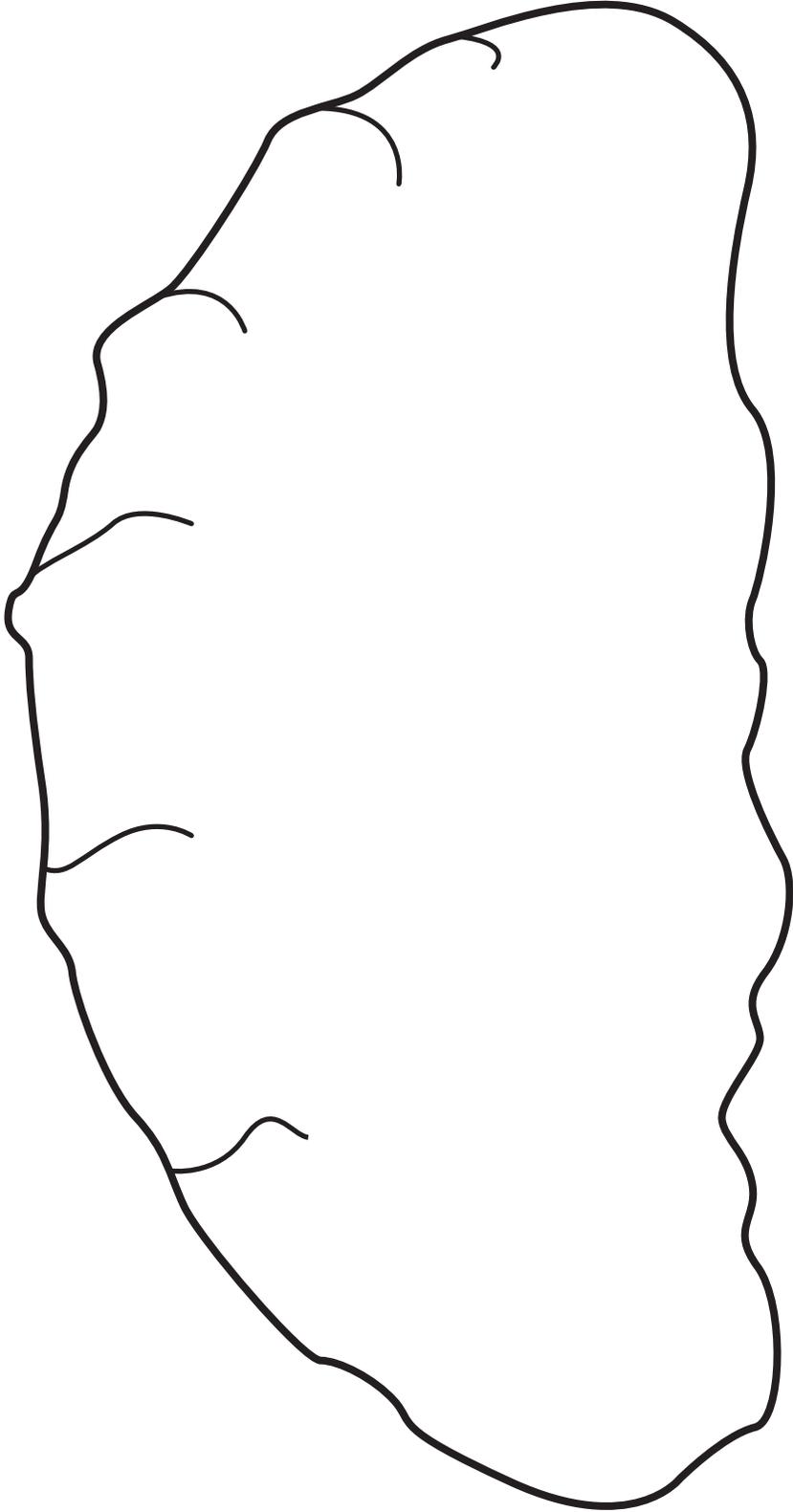
Brittle Star



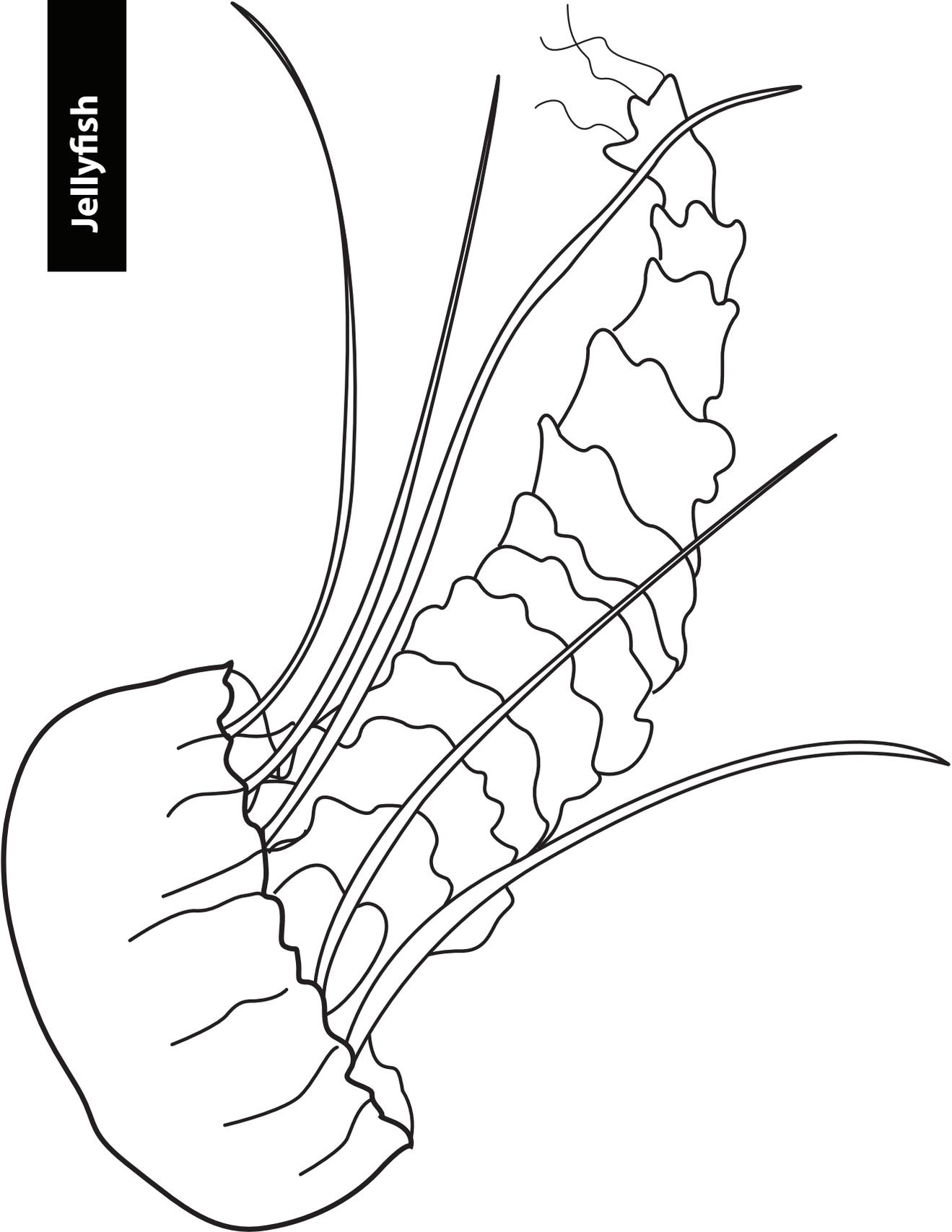
Brown Turban Snail



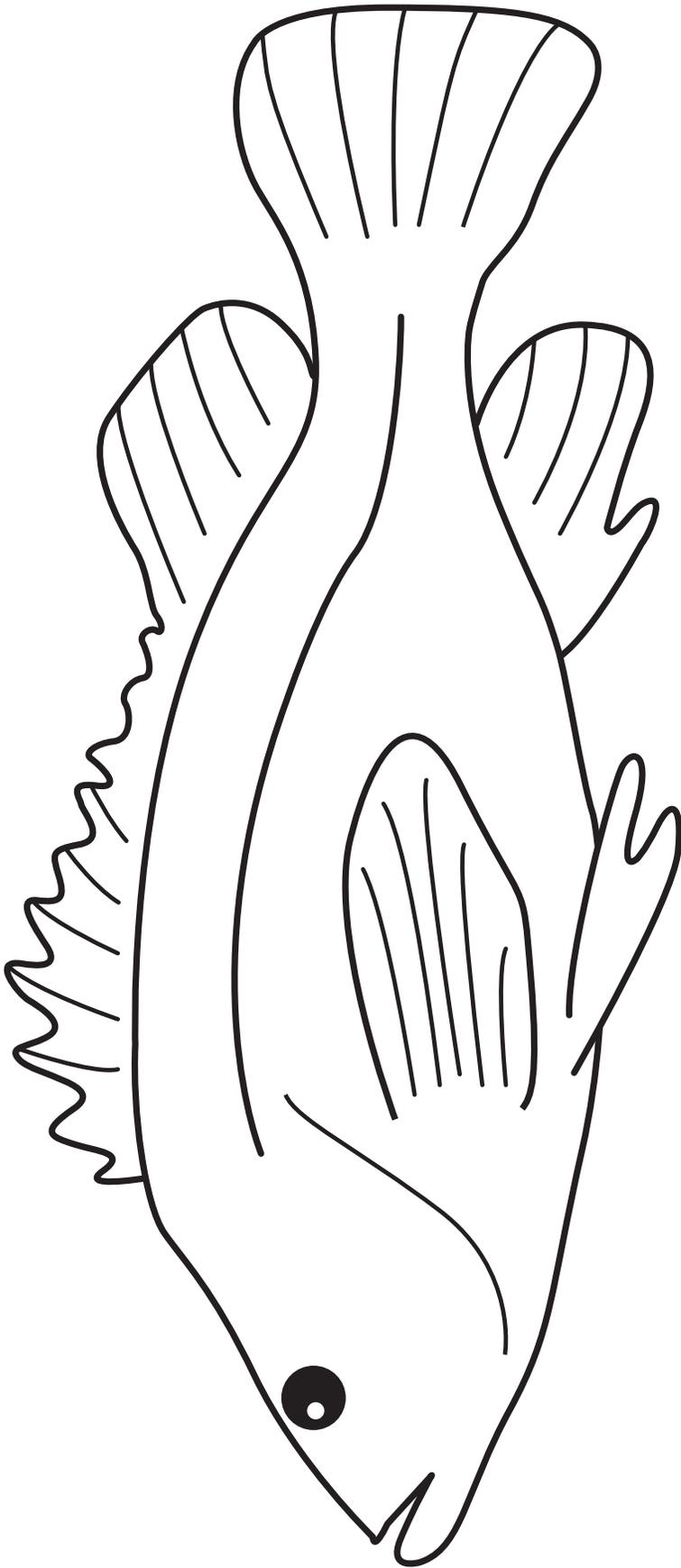
Giant Chiton



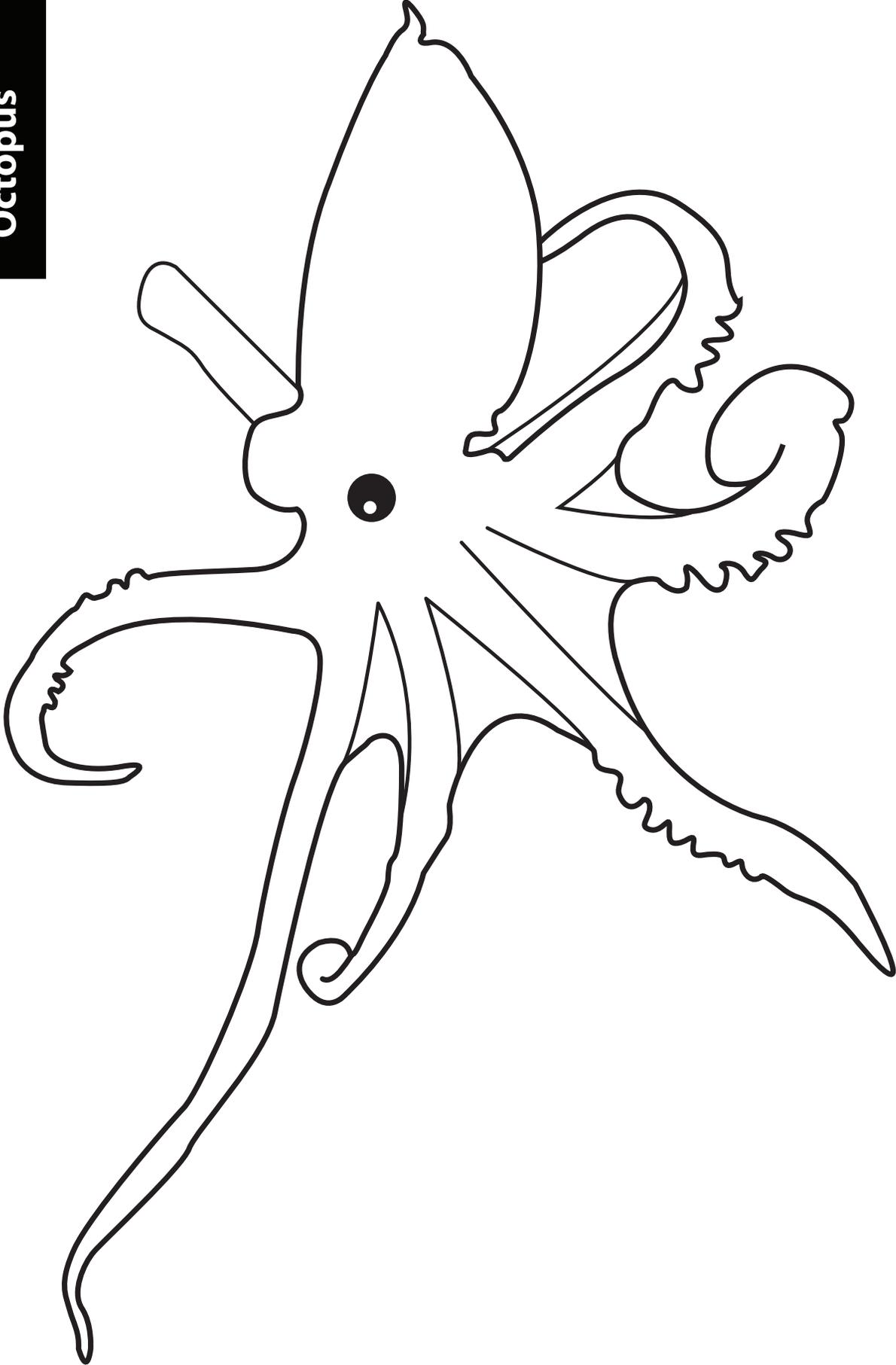
Jellyfish



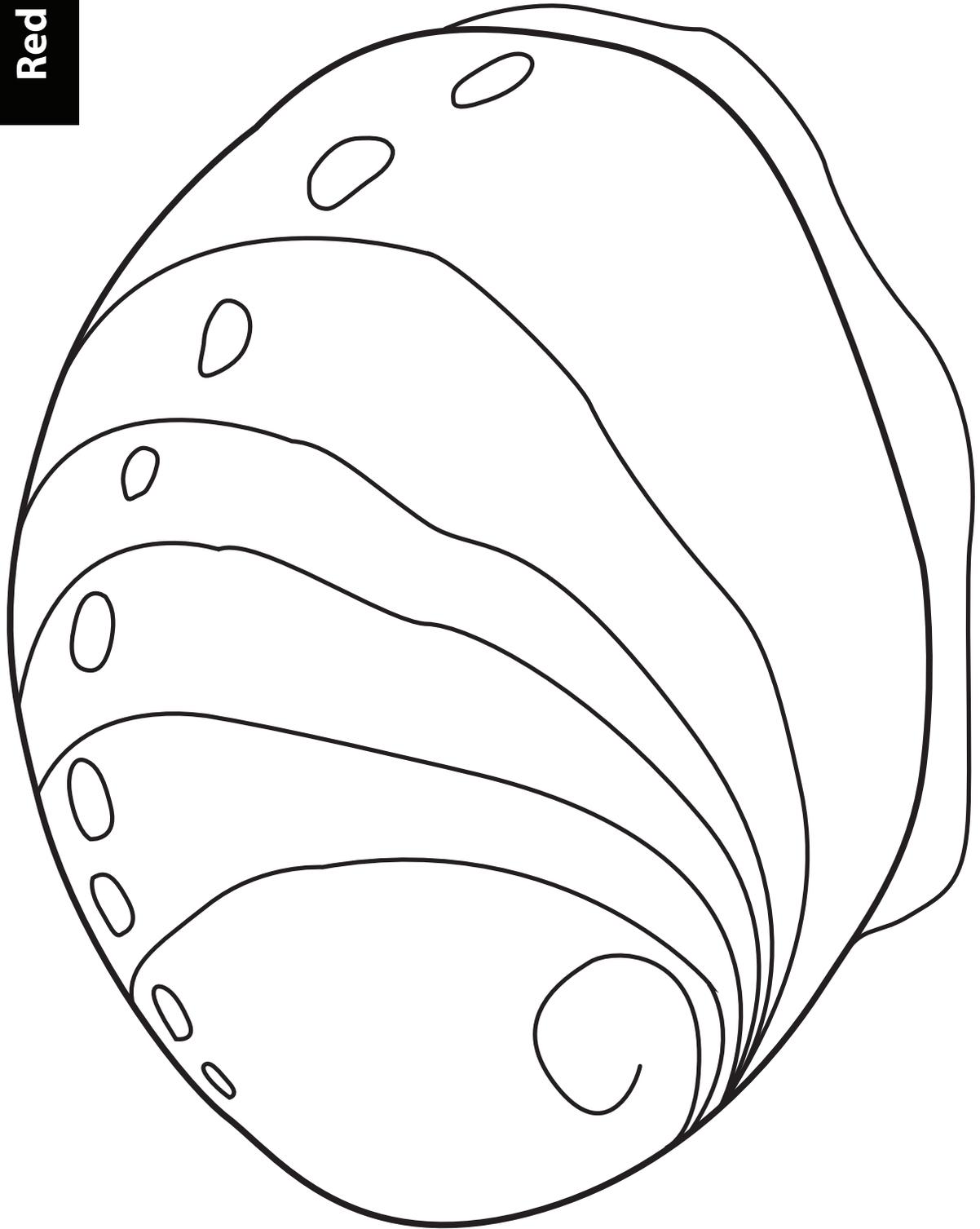
Kelp Rockfish



Octopus



Red Albalone



Sea Otter



A-L-G-A-E SONG (to the tune of B-I-N-G-O)

by Melinda Bailey

There is a plant that is very old
And algae is its name oh!

Chorus:

A-L-G-A-E, A-L-G-A-E, A-L-G-A-E
And algae is its name oh!

It gets its food from the sun
And algae is its name oh!

(repeat chorus)

It lives in the river and the sea
And algae is its name oh!

(repeat chorus)

It comes in red, brown and green
And algae is its name oh!

(repeat chorus)

In it animals like to eat and hide
And algae is its name oh!

(repeat chorus)

It gives off gas I need to breath
And algae is its name oh!

(repeat chorus)

FOOD WEB

in the kelp forest

