

# LESSON PLAN

## Step 1

### SETTING LIMITS

#### Objectives

- Identify environmental conditions of the rocky coast of Maine and the coral reefs of the Caribbean.
- Interpret the relations among latitude, temperature, and sunlight within the two ecosystems.
- Predict the location of marine ecosystems with similar environmental conditions.

#### Materials

- Copies of Take-Home Pages, pages 6–9.
- Globe or large world map.

#### Subjects

- Science, social studies

#### Procedure

1. Have students imagine they are going on a trip to the coast (to a famous resort or less visited spot) or designing a travel poster for a beach vacation. Ask them to think of words that characterize this location (e.g., *beach, sand, surf, or waves*) and have them describe the weather conditions they would expect to find there.

2. Using a globe or world map, ask students to locate the places that the class has mentioned. Then ask them to find the coast of Maine and the islands of the Caribbean, two locations that they will later compare in detail. Review the concept of latitude, measured in imaginary lines that circle the globe parallel to the equator. (*Latitude increases as one travels north or south toward the poles and away from the equator, which is located at zero degrees latitude.*) Have students estimate the latitude of each location they found on the map or globe. (*Maine and the islands of the Caribbean are located at about forty-five and twenty-five degrees north latitude, respectively.*) Ask students which location is closer to the equator and has

a warmer, sunnier climate (the Caribbean); which probably has a cold winter (Maine); and which has the same warm temperatures all year long (the Caribbean).

3. Ask students to name an instrument that measures temperature (thermometer) and have them discuss briefly how temperature affects their daily lives (e.g., in deciding how to dress according to the weather). Ask your students if they know the names of the two most common temperature scales (Fahrenheit and Celsius). Then ask them how winter temperatures in Maine might be different from those in the Caribbean. (Maine has colder winter temperatures.) Would they expect to see the same plants and animals in each place? (No: Some animals live better in cold places, and others in warm.) Tell your students that temperatures limit the kinds of organisms that can live in a given location. Stress that close-in currents, which act like rivers flowing within the oceans, also influence a coastal region's temperature. Currents that begin near the equator, like the Northern Equatorial or the Gulf Stream, are warm. Currents that begin in Greenland or Labrador (show these locations on a globe) begin closer to the North Pole and are cold. (For more information

on currents, oceans, and weather, see *Art to Zoo*, September/October 1995, *Tomorrow's Forecast: Oceans and Weather.*)

4. Hand out copies of the Take-Home pages. After students have completed the exercises individually, review the correct answers. Ask your students to predict which of the two locations has the greater average amount of sunlight. (*Be sure to remind students that the equator has a latitude of zero degrees and that lower latitudes generally have warmer climates and more hours of direct sunlight.*) Tell your students that sunlight is the source of energy that fuels each living community or ecosystem. Plants use the Sun's energy, nutrients in the water, and carbon dioxide to produce sugars that animals then eat. To conclude the lesson, ask students to predict the temperature conditions of other locations along the Atlantic coast as shown on the map. Students will conclude that coral reefs are located close to the equator and that rocky, temperate coasts are further north.

# TAKE-HOME PAGE

## Setting Limits

### To the teacher

- Duplicate this page for students.
- Use with Lesson Plan Step 1.

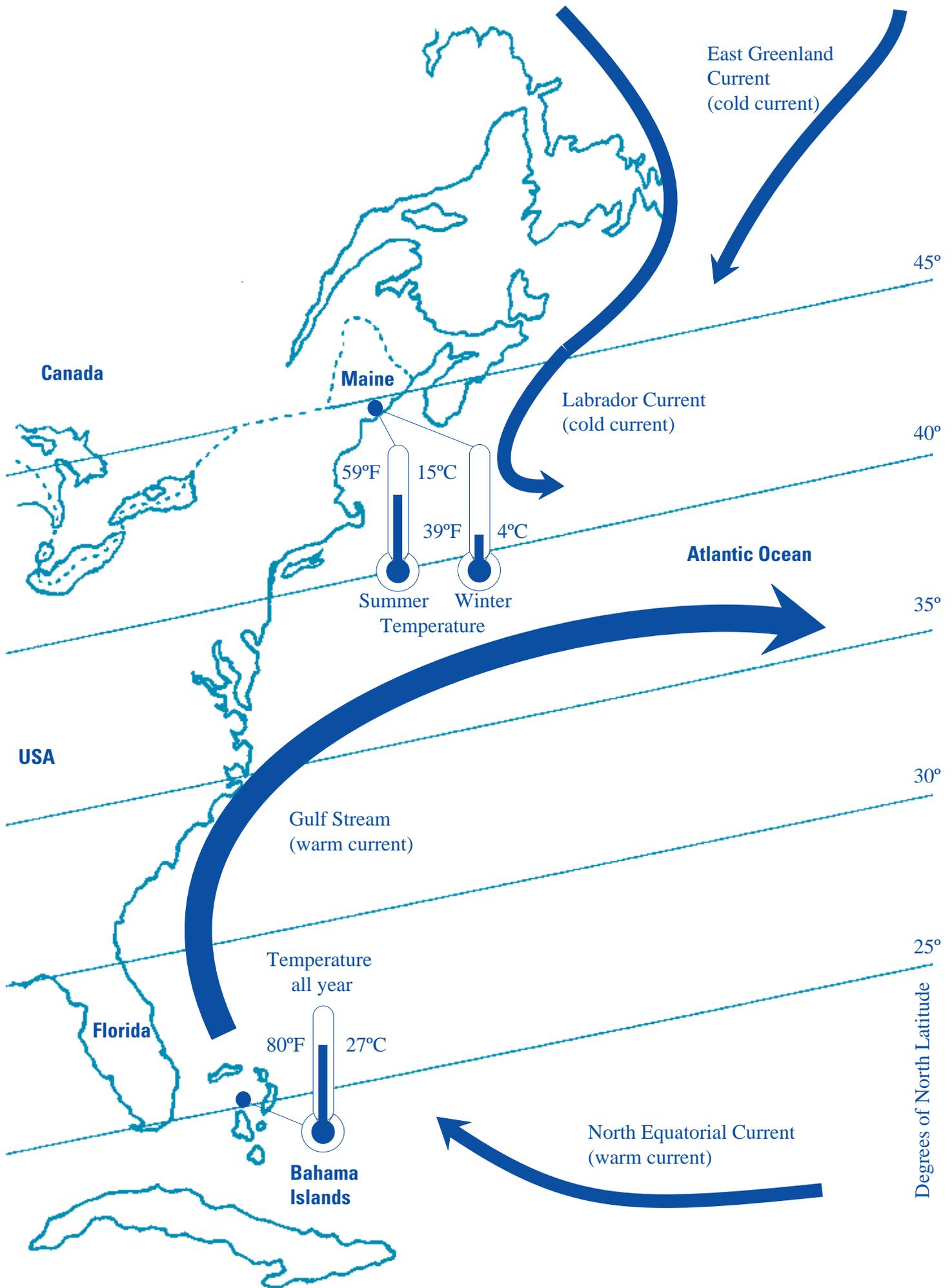
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**Directions:** Although the coast of Maine and the islands of the Bahamas are both in the Atlantic Ocean, each receives a different amount of sunlight and has a different water temperature. These conditions limit the kinds of plants and animals that can live in each ecosystem. Use the map on page 7 to complete the chart below.

CONDITION	ECOSYSTEM	
	Caribbean coral reef	Rocky coast of Maine
Latitude		
Temperature ( <i>summer and winter</i> )		
Two nearby ocean currents		

### Answer these questions

1. Which location has greater temperature differences between winter and summer? Why?
2. Which location has a greater amount of sunlight? Why?
3. Find the latitude where you live and mark it on the map. How do the conditions where you live compare with those of the Maine coast and the islands of the Caribbean?



# TRABAJO PARA HACER EN LA CASA

## Fijando Límites

### Al maestro (a)

- Copie esta página para los alumnos.
- Usela con el tercer paso del plan de la lección.

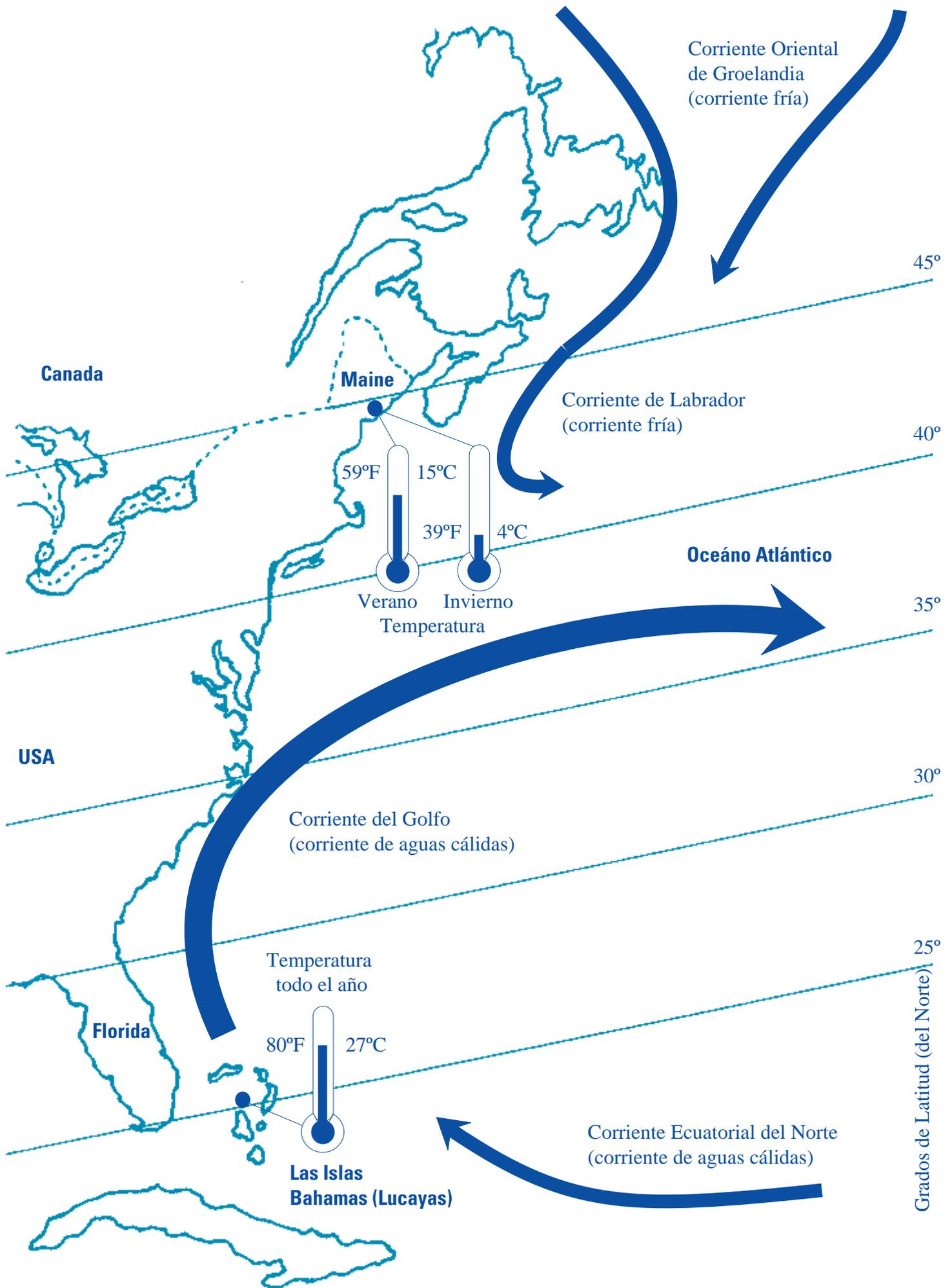
Esta publicación ha sido posible gracias al generoso aporte de la Pacific Mutual Foundation.

**Instrucciones:** Aunque las aguas de Maine y quedan en el Océano Atlántico, cada cual recibe una cantidad diferente de luz solar y tiene, por lo tanto, una temperatura diferente. Estas condiciones limitan las clases de animales y plantas que viven en estos ecosistemas. Usa el mapa en la página 9 para completar el cuadro.

CONDICIÓN	ECOSISTEMAS	
	Arecife en el Caribe	Costa Rocosa de Maine
Latitud		
Temperatura ( <i>verano e invierno</i> )		
Dos corrientes oceánicas cercanas		

### Contesta estas preguntas

1. ¿Qué lugar tiene las mayores diferencias de temperatura de invierno a verano? ¿Por qué?
2. ¿Qué lugar recibe una mayor cantidad de luz solar? ¿Por qué?
3. Encuentra la latitud donde vives y márcala en el mapa. ¿Cómo se comparan las condiciones donde vives con esas que se encuentran en la costa de Maine y las islas del Caribe?



# GLOSSARY AND ANSWER KEYS

## GLOSSARY

**Algae** A large group of simple plants that are mostly aquatic and lack true stems, leaves, and roots. This group includes the microscopic zooxanthellae that live in the tissues of coral and the twenty-foot-tall kelp that thrive in colder water habitats.

**Ecosystem** Communities of plants, animals, and microbes interacting with each other and their environment. The term ecosystem describes both the living and nonliving components of an area that interact with one another.

**Food chain** The transfer of energy, in the form of food, through a chain of organisms, starting with producers and ending with consumers. Every time an organism in the chain is eaten, some of its energy is transferred to the organism that has eaten it.

**Food web** A series of interconnected, interlocking food chains. Food chains become interconnected because most organisms eat more than one kind of food and therefore are involved in more than one food chain.

**Habitat** The place where an organism lives.

**Invertebrate** An animal without a backbone.

**Plankton** The small floating or weakly swimming plants (phytoplankton) and animals (zooplankton) that are carried by the currents and serve as a food source.

**Vertebrate** An animal with a backbone.

**Zooxanthellae** The tiny, single-celled algae that live symbiotically with corals.

**Splash zone** Portion of rocky shoreline above the high-tide mark that is splashed by waves rather than submerged underwater.

**Intertidal zone** Portion of rocky shoreline that is submerged during high tide and exposed during low tide.

**Subtidal zone** Portion of rocky shoreline that is always underwater.

**Lagoon** Area of shallow water between a coral reef and shore.

**Exoskeleton** Hard outer covering of an animal without a backbone, such as a crab.

## ANSWER KEY TO TAKE-HOME PAGE

### *Latitude*

Coral reef: twenty-five degrees north latitude; Maine coast: forty-five degrees north latitude.

### *Temperature*

Coral reef: about twenty-seven degrees C (eighty degrees F) all year. Temperatures of twenty-four to thirty degrees C (seventy-five to eighty-five degrees F) are best for coral reefs worldwide. Maine: fifteen degrees C (fifty-nine degrees F) in summer and four degrees C (39 degrees F) in winter.

### *Ocean currents*

The Gulf Stream and the North Equatorial Current help keep coral reefs warm. The surrounding cool Labrador and East Greenland Currents as well as Maine's high latitude make the coast of this state relatively cold.

### *Questions*

1. Maine, because it has a higher latitude and winter is severe.
2. The Caribbean Islands, because they are closer to the equator. This location makes for a climate that does not differ from winter to summer, so there is a lot of sunlight all year.
3. If your school's latitude is shown on the map, help students locate it. If not, provide a suitable map so students may learn their latitude. Briefly discuss climate in your region.

## ANSWER KEY TO ACTIVITY PAGE 2

1. brain
2. reef crest
3. algae
4. parrotfish
5. food
6. oxygen
7. sea fan
8. barracuda
9. outer
10. lagoon
11. grass shrimp
12. French grunt
13. pink-tipped anemone

## ANSWER KEY TO ACTIVITY PAGE 3

1. low
2. rough periwinkles
3. green crab
4. shell, sun, water
5. intertidal
6. kelp
7. sea star, subtidal
8. lobster