

ANSWERS

#11 A Closer Look: Identifying Coral Species (pp. 19-21)

Answers to Questions: **1.** Answers will vary. Calyces whose side walls are missing leave long grooves, giving the coral skeleton a distinctly different appearance from species whose cups are distinct. **a.** Cup features are determined genetically and therefore have different structures. **b.** Answers will vary. If you have specimens from a shoreline, use them as an example to help answer this question. If some of the features used for identification are still visible, the species can usually be determined. The shape and density of the skeleton can sometimes be used as clues to the species. **2.** The side walls are absent. **3.** After the larva settles down on a suitable substrate, it begins to secrete a skeleton. In colonial corals new polyps gradually grow around the original polyp. These new polyps continue to secrete new material, making the skeleton grow in diameter. The colony grows over the substrate in an ever-increasing encrusting mass. If the species is a branching type, a stalk starts to grow upward from somewhere in the center of the colony. New polyps and more skeleton are added to the tips of the branches, forming a bushlike shape. If the coral is an encrusting type, the colony continues to grow in diameter over the substrate. **4.** Most branching coral species are subject to breakage during a storm. Encrusting corals, because of their low profile, are less likely to break. During violent storms large chunks of coral break off the reef, and heavy wave action batters them back and forth, scouring other corals. A coral reef may take several decades to grow back to its original cover and beauty. **5a.** A principal form of the body plan of cnidarians, consisting of a bag-within-a-bag construction and a central mouth opening ringed by tentacles. Polyps attach to hard surfaces with their mouths pointing upward. **b.** Many individuals fused together in a cooperating biological unit. **c.** The edges (side walls) of a calyx extending above the surface of a coral skeleton. **d.** Radiating partitions inside the side wall of the calyx. The septa sometimes extend outside the side wall to other calyces. **6.** Most reef-building corals are colonial. That is, individual animals fuse together at their bases in vast colonies. Skeleton is produced simultaneously by all individuals in the colony, forming large coral heads. On a coral reef thousands of colonies live side by side, each contributing to the formation of the reef structure.

#18 Biological and Physical Agents of Change on a Coral Reef (pp. 30-32)

Suggested Answers for Table 2: **Forest builders:** Trees, shrubs, bushes, vines, plants; **Forest floor organisms:** Herbs, flowering annual plants, worms, snails, fungus, rabbits, deer, squirrels, birds, insects; **Passive residents:** herbs, plants, snails, rabbits; **Destructive organisms:** Deer, fungi, woodpeckers, beavers, bears, humans; **Constructive physical agent:** Rain, warm temperatures, sunlight, nutrients in soil; **Destructive physical agents:** Wind, floods, severely cold winter, heavy snow, drought, landslides. *Answers to Questions:* **1.** The structure is the

arrangement of physical features in a habitat. In a forest, it includes the number of trees and their shape, density, and sizes, along with the kinds and sizes of shrubs. In a reef, it includes the number of corals and their shapes, sizes, density, height, and depth of growth. **2.** Both supply the structure of the habitat. Corals are animals; trees are plants. The skeleton of corals is calcium carbonate; the tree's skeleton is wood. **3.** Trees fall to the forest floor and decay from the action of fungus. The chemicals of the tree return to the soil to be recycled. Coral skeletons move back and forth by the action of wave energy, gradually grinding the skeletons into sand. Some of the sand washes toward shore, forming sandy beaches; some moves down the reef face, forming deep water sand deposits. **4.** A tree begins its growth as a seed and grows bigger with time. If a branch breaks off, it dies, but the tree usually heals and continues to grow. Eventually something (fire, disease, uprooting) kills the tree.

A forest is a complicated assembly of species of trees, shrubs, bushes, herbs, and the animals that live there. The growth of the forest depends on the relative rates of growth of the organisms, primarily the trees, which grow at different rates. Often one species of tree grows faster than another species, changing the makeup of the dominant trees in a process called succession. Parts of the forest may be killed by fire, wind, or other physical forces. A single species of tree may be killed by disease. Gradually the forest changes in composition. If a major fire, landslide, or wholesale logging occurs, the forest as a unit may die, along with the individuals in all of the species, both plant and animal. Seeds of some plants may survive to grow and start the process of forest formation again.

A coral begins its growth when a larva settles on the bottom of the shallow ocean and starts to grow. If a branch is broken, it dies, but the coral usually heals and continues to grow. Eventually something (waves from a storm, pollution, fresh water) kills the coral.

A coral reef is a complicated assembly of species of corals, algae, crabs, octopus, and the fish that live there. The growth of the coral reef depends on the relative rates of growth of the organisms, primarily the corals. Different corals grow at different rates. Often one species of coral grows faster than another species, changing the makeup of the dominant corals on the reef in a process called succession. Parts of the reef may be killed by wave action, sediments, or other physical forces. Gradually the coral reef changes in composition. If a major storm, pollution, or dragging of anchors by ships occurs, the coral reef as a unit may die, along with all individuals in all of the species, both plant and animal. Larvae of some corals may move into the region with water currents and settle on the bottom to grow and start the process of reef formation again. **5.** Wind directly damages a forest. Wind causes ocean waves that damage the coral. Fresh water in the form of a flood could damage a forest. Fresh water damages a coral reef because corals cannot live in fresh water. Air pollution (such as acid rain) might kill many trees in a forest. Water pollution and sediments might kill many corals on a reef.

6. Most reef-building corals have symbiotic algae growing in their tissues. The rate of coral growth depends on the amount of sunlight the algae receive. Therefore corals do not grow in deep water or under ledges or in caves.

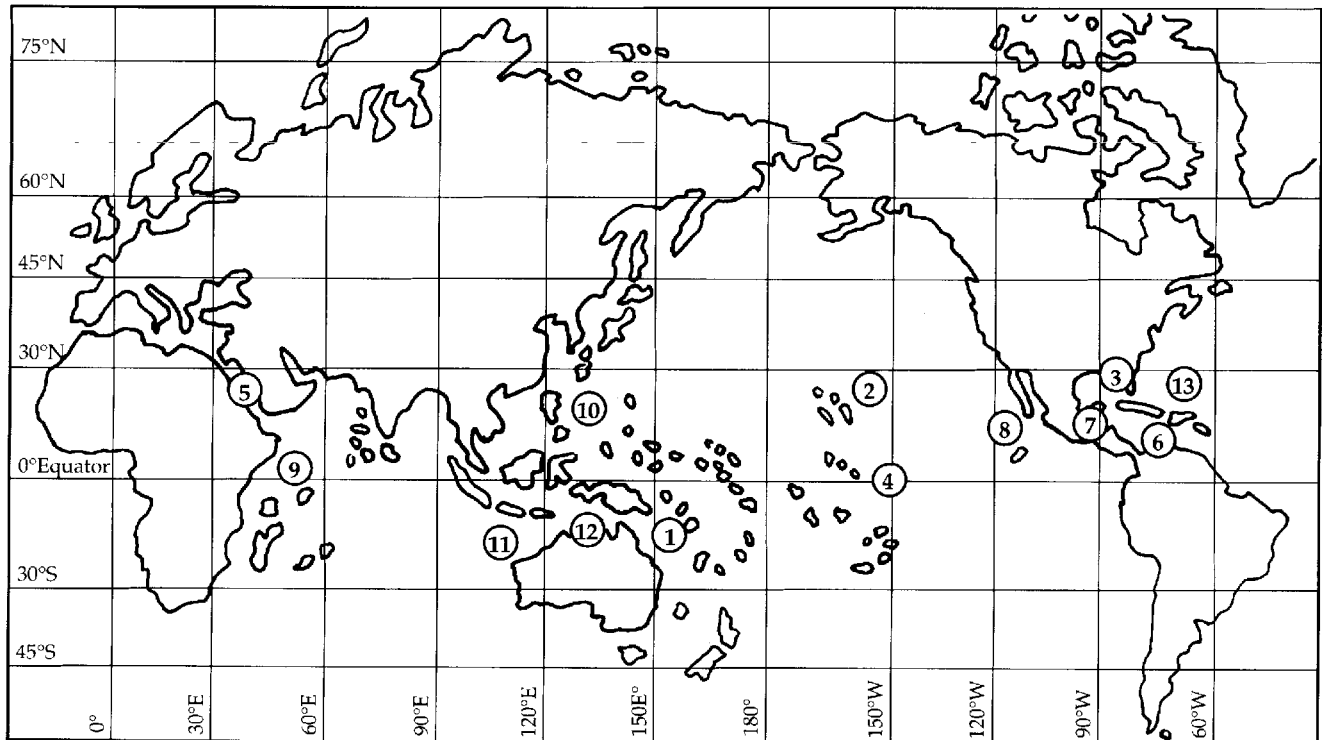
The upper surfaces of the tallest trees receive most of the sunlight, shading the smaller plants lower down. Plants on the forest floor must be shade-tolerant to survive.

#21 Where Do Coral Reefs Grow? (pp. 35-36)

1. no; Brazil, all of Central Africa on west coast, all of tropical South America on the west coast; 2. arrows are counter clockwise in northern hemisphere and clockwise in southern hemisphere; 3. eastern coastlines; western coastlines; coral reefs grow only in warm water; 4. Brazil; Sediment loaded fresh water flows from Amazon River into the Atlantic Ocean.

#22 The Reef Region (p. 37)

See map below. 1. Great Barrier Reef; 2. Maui, Hawaii; 3. Key West, Florida; 4. French Polynesia; 5. Red Sea; 6. Jamaica; 7. Belize; 8. Cabo San Lucas; 9. Seychelles Islands; 10. Philippines Islands; 11. Java; 12. Celebes Islands; 13. Bahama Islands



#23 Mapping the Reefs (pp. 38-41)

Answers to Geography Clues: 1. Bahama Islands; 2. Belize; 3. Caribbean; 4. Madagascar; 5. Pacific; 6. Great Barrier Reef; 7. Jamaica; 8. Panama; 9. Florida; 10. Hawaii; 11. Philippines; 12. Red Sea; 13. Marshall Islands

#27 What's My Name? (pp. 46-49)

Coral Reef Animal Key: A. Atlantic thorny oyster; B. swimming crab; C. fire worm; D. club urchin; E. brittle star; F. finger coral; G. trumpet triton; H. corkscrew anemone; I. Spanish crab; J. elkhorn coral; K. club urchin; L. comb jelly; M. moon jelly; N. soft sea cucumber; O. Frons oyster; P. pillar coral; Q. comet star; R. long-spined urchin; S. polyclad flatworm; T. brain coral; U. rock lobster; V. spiny lobster; W. sun anemone

#28 Classification of Reef Fish (pp. 50-53)

Classification of Butterflyfish (decision points in sequence): A. *C. miliaris* (1-4-6-7-8-10-11-12-13); B. *C. citrinellus* (1-4-6-7-8-10-11-12-13); C. *C. unimaculatus* (1-4-6-7-8-10-11-12-14); D. *C. tinkeri* (1-4-6-7-8-10-11); E. *C. fremblii* (1-4-6); F. *C. quadrimaculatus* (1-2); G. *C. lunula* (1-4-6-7-8-10-11-12-14); H. *C. auriga* (1-4-5); I. *C. reticulatus* (1-2-3); J. *C. ornatissimus* (1-4-6-7-8-9); K. *C. multiscintus* (1-4-6-7); L. *C. trifasciatus* (1-4-6-7-8-9); M. *C. kleini* (1-2-3); N. *C. lineolatus* (1-4-6-7-8-10); O. *C. ephippium* (1-4-5);

Answers to Questions: 4. Features that do not vary within a group (species) but differ from other groups (species). Whenever possible, the features should be easy to see.

5. Use characteristics other than color to construct the key.
6. Some color patterns change as the animal grows or ages. Patterns and colors often differ with the sex of the animal. Patterns or colors sometimes change suddenly when the animal becomes aggressive or fearful. Some color patterns fade rapidly when the animal dies; other colors persist long after it dies.

#29 Partner Wanted (pp. 54-55)

Box 1 (sea anemone) and **Box 4** (clownfish); **Box 2** (hermit crab) and **Box 6** (sea anemone); **Box 3** (cleaner fish) and **Box 7** (grouper); **Box 5** (pistol shrimp) and **Box 8** (goby)

#30 Animals that Bite and Sting (p. 56)

- 1. D/box jellyfish; 2. L/*Diadema* sp.; 3. G/stingray;
- 4. P/stinging hydroid; 5. B/lion fish; 6. N/Conus shell;
- 7. I/fire coral; 8. O/Crown-of-thorns; 9. C/rabbit fish;
- 10. K/blue-ring octopus; 11. H/surgeon fish; 12. M/stone fish;
- 13. A/fire worm; 14. J/bluebottle; 15. F/moray eel;
- 16. E/Stomatopod

#36 Who Eats Who? (pp. 65-66)

See figure below.

#39 Feeding Frenzy (p. 77)

- 1. crustaceans; 2. crustaceans and molluscs;
- 3. availability of prey, size of predator population

#41 Reef Homes: Zonation of a Coral Reef (pp. 79-80)

2. *Hypothesis:* Halo is caused by grazers moving between patch reef where they hide and the grass bed where they feed.

#44 Threats to the Coral Reef (p. 85)

- 1. N; 2. H; 3. H; 4. N; 5. H; 6. H; 7. N; 8. H; 9. H; 10. N; 11. H. The activities of people are the major cause of destruction to coral reefs.

#47 Fishy Problems (p. 90)

- 1a. 3 million; b. 4; c. 50; 2. 22,500; 3. 12,000; 4 a. 48; b. 37.5 kg.; c. 3969 lbs.; d. 496 lbs.; 5a. 3279 ft.; b.\$3,660 /ft.; 6. \$62 million; 7a. between 20 to 35 metric tons; b. 44,092.5 to 77,161.8 lbs.; 8a. 429,730 metric tons; b. 3 million people eat 0 lbs. of fish, 6 million people eat 58.42 lbs./person

