



Echinoderms



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Members of the phylum *Echinodermata*—called **echinoderms (eh-KY-noh-derms)**—are spiny-skinned marine animals quite familiar to beach-goers. You would know them as sea stars (starfish), sea urchins, sand dollars, brittle stars, and sea cucumbers. In addition to their spiny, bumpy external covering, adult echinoderms have *radial symmetry*, or a circular design, with five body parts. They also have an endoskeleton called a *test* made up of plates or bumps of calcium carbonate.

Echinoderms move about by forcing water along a system of tubes and canals in their bodies connected to tubed feet. By alternately contracting and expanding these tube feet, most echinoderms can slowly crawl across the ocean floor. Their tube feet also function in sensing their surroundings and in feeding.

Chordates

Chordates—animals in the phylum *Chordata*—all have these traits at some point in their development:

- (1) a notochord, a thin flexible rod to support their body;
- (2) a nerve cord running down their back; and
- (3) gill slits, which develop for respiration in **fish** and into pharyngeal arches, which aid in circulation, in **reptiles, birds, and mammals.**

These traits are *not* all apparent in all adult chordates. However, they do occur at some life stage in all chordates. For example, we do not see gill slits in humans because they are visible only in the embryo stage, before birth.

All of the *lower* chordates are marine animals. These include tunicates, which do not resemble animals at all. Tunicates are sessile-filter feeders that resemble a sponge or blob. Examples include sea porks and sea squirts.



The more advanced chordates belong to the subphyla *Vertebrata*. These animals with a backbone are commonly called *vertebrates* and are divided into five groups: fish, **amphibians**, reptiles, birds, and mammals.

Fish: Jawless, Cartilaginous, and Bony

Fish are *cold-blooded* animals that live in water and breathe through gills. Cold-blooded animals have a body temperature that changes with the temperature of their surroundings. There are three classes of fish: the *jawless fish* (lampreys), the *cartilaginous fish* (sharks and rays), and the *bony fish*. Each class of fish has distinguishing characteristics. (See Unit 15.)



Familiar cartilaginous fish include sharks and stingrays.

Lampreys are slimy, scaleless, jawless fish. They resemble a muscular tube with a mouth full of razor-sharp teeth and a strong tongue. A lamprey is parasitic and feeds on the body fluids of other living fish.

Cartilaginous fish have flexible skeletons made of cartilage: a softer version of bone. They have fine, sharp, toothlike spines covering their bodies. Familiar cartilaginous fish include sharks and stingrays.

Bony fish—all 30,000 species—include most other fish: the goldfish, mullet, flounder, and seahorse, to name just a few. Bony fish are distinguished by skeletons made of bone, and broad, flat scales covering their bodies.



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Amphibians: Living in Water and on Land

After hatching from eggs, most *amphibians* live in water and breathe through gills. After developing into adults, they live most of their lives on land, although near water, and breathe through lungs. Nearly all amphibians return to water to reproduce. Among the most familiar

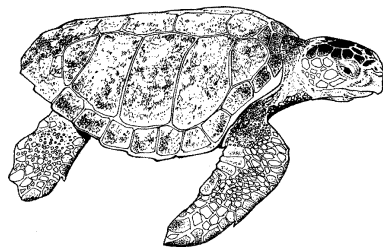


amphibians are frogs, toads, and salamanders. Most amphibians are not able to live in saltwater because their skin is too thin to protect them from the drying effect of salt.

Reptiles: Adapted to Life on Land

A group of cold-blooded, air-breathing vertebrates known as *reptiles* includes turtles, lizards, alligators, crocodiles, and snakes. Reptiles do not have to live in water because they have dry, scaly skin that protects against water loss. In addition, their eggs have a coating or shell that keeps them from drying out. Several types of reptiles, however, do live in water. Poisonous sea snakes are found in tropical waters; alligators and crocodiles are common in near-shore habitats such as swamps and marshes; and marine iguanas can be found on rocky shores, mangrove swamps, and beaches in the Galapagos Islands.

Many huge turtles also make the sea their home. Two species of sea turtles, the green and the loggerhead, grow to weigh over 400 pounds. The Atlantic Ridley and the hawksbill turtles are found in Florida waters and nest on our beaches. Female sea turtles crawl above the high-tide line on the beach to lay their eggs in nests under the sand. Then they leave their



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nests and return to the sea to feed. When the young turtles hatch, they must find their way to the sea on their own. Many are eaten by dogs or raccoons; some head towards lighted roads instead of the water, and only a very few survive to adulthood. Marine turtles are classified as *endangered*. It is illegal in the United States to kill or possess sea turtles or their eggs, harass nesting turtles, or disturb turtle nests.

Birds: Low Weight and High Power

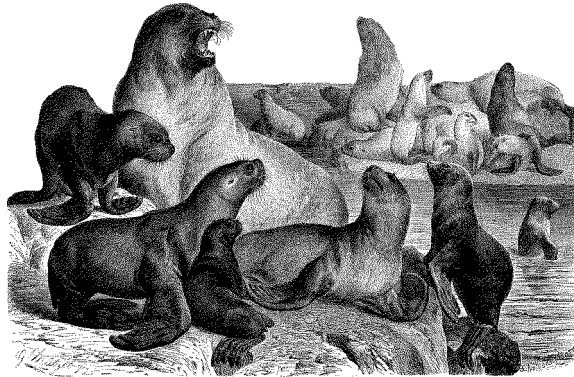
Birds are *warm-blooded* vertebrates with feathers. Warm-blooded animals have a body temperature that stays about the same temperature no matter what the temperature of the surroundings is. All birds also have wings, although some use them for purposes other than flying. Penguins, for example, use them to swim. Most birds have two traits that make them well adapted for flying. Birds have a lightweight skeleton of hollow bone that is easy to carry in flight. They also have a high metabolic rate that generates energy and power necessary for flight.



Sea birds are common in coastal habitats. Many birds rely on the ocean for food during long migrations. Common marine birds include the gulls, terns, skuas, albatross, and penguins.

Mammals: Earth's Largest Creatures

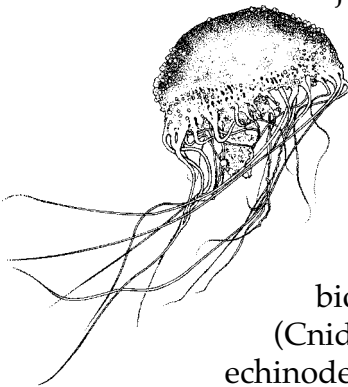
Mammals are another group of vertebrates. They have lungs, breathe air, provide milk for their young, and have hair. Mammals also maintain a regular body temperature, making them warm-blooded. The largest creature to have ever lived is a mammal—the blue whale—which may weigh in at over 150 tons and can measure 100 feet in length—about the length of two and one-half school buses. Marine mammals include the whale, porpoise, seal, sea lion, sea otter, and manatee. A separate unit is devoted to marine mammals (see Unit 16).



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Summary

Animals are classified in major groups called *phyla*. One phylum of animals—the chordates—has notochords, nerve cords, and gill slits at some point in their development. *Vertebrates*, a more developed subphylum of chordates, are animals with backbones such as fish, amphibians, reptiles, birds, and mammals. Three classes of fish, the jawless fish (lampreys), cartilaginous fish (sharks and rays), and bony fish (30,000 species), make their home in the marine environment. With the exception of amphibians, other types of vertebrates live in saltwater habitats, too. Most animals do *not* have backbones and are classified as *invertebrates*. Groups of invertebrates commonly found in the marine biome include sponges (Porifera), jellyfish (Cnidaria), worms, mollusks, arthropods, and echinoderms.





Practice

Use pages 323-333 to write the correct **animal phylum** on the line provided.

1. sponge _____
2. jellyfish _____
3. crab _____
4. squid _____
5. shark _____
6. sea anemone _____
7. shrimp _____
8. bird _____
9. sea star _____
10. oyster _____
11. round segmented worm _____



Practice

Use the list above each section to complete the statement in that section.

chordates	echinoderms	phyla
Cnidaria	invertebrates	zoologist
crustaceans	mammals	

1. A scientist who studies animals is called a _____ .
2. Scientists classify animals that share major traits into major groups called _____ .
3. Animals that have a nerve cord at some time in their development are called _____ .
4. Most animals do *not* have backbones and are classified as _____ .
5. _____ such as the whale and manatee have hair, nurse their young, and are warm-blooded.
6. Most marine arthropods belong to a subgroup called _____ .
7. The phylum of animals with stinging cells is called _____ .
8. _____ include sea star (starfish), sea urchins, and sand dollars.



amphibians
birds
bony

cartilaginous
exoskeleton
hydrostatic

jawless
reptiles
turtles

9. _____ are cold-blooded vertebrates with dry, scaly skin that lay eggs.
10. The three classes of fish are the _____ fish , the _____ fish, and the _____ fish.
11. Frogs and toads are classified as _____ .
12. The Atlantic Ridley and the hawksbill _____ are found in Florida waters.
13. Common sea _____ include gulls, terns, and penguins.
14. Arthropods have a hard outer shell called a _____ .
15. An animal with a _____ skeleton is built like a bag of muscles.



Practice

Use pages 323-333 and other resources as needed to complete the chart below.

Classifying Marine Animal					
Phyla	Examples	Symmetry	Skeleton	Segmentation	Features/Characteristics
Porifera					
Cnidaria					
Annelida					
Mollusca					
Arthropoda					
Echinodermata					



Lab Activity 1: Phyla Identification



Investigate:

- Compare different phyla of invertebrates.

Materials:

- charts below
- preserved specimen or pictures of different invertebrates
- reference books (textbooks, encyclopedias, field guides, etc.)

Procedure:

1. For each specimen, complete one of the charts below.
2. Draw a picture of your specimen in the space provided.
3. Use reference materials to identify the scientific name and phylum.

Analysis:

Lab Specimen

phylum: _____

specimen drawing

scientific name: _____

common name: _____

skeleton: _____

body shape: _____

segmentation: _____

other characteristics: _____



Lab Specimen

phylum: _____

specimen drawing

scientific name: _____

common name: _____

skeleton: _____

body shape: _____

segmentation: _____

other characteristics: _____

Lab Specimen

phylum: _____

specimen drawing

scientific name: _____

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body shape: _____

segmentation: _____

other characteristics: _____



Lab Activity 2: Crab Observation



Investigate:

- Observe the behaviors and adaptations of a living arthropod.

Materials:

- living blue crab (may substitute live crayfish, shrimp, or lobster)
- tray or small aquarium
- saltwater (fresh or prepared from mix)

Procedure:

Obtain a blue crab, and place it in a small tray or aquarium of saltwater to cover its gill cavity. **Be careful of the pincers.**

Analysis:

1. What phylum does the blue crab belong to? _____
2. Draw the shape of the exoskeleton, the body of the crab, and describe the color.



- Carefully turn the crab over; diagram the shape of its abdomen, and describe the color.

- How does this coloration help the crab? _____

- Describe how the crab moves. _____

- How many pairs of legs does the crab have attached to its exoskeleton? _____

- Are all legs the same? _____

Are any legs missing? _____



8. Draw an example of each type of leg in the space below and describe its function.

9. What does the crab use the pair of legs near its head for? (List two purposes.) _____

10. What does the crab use the next three pairs of legs for? _____

11. What does the crab use the last pair of legs for? _____

12. Gently touch the eye of the crab with a pencil eraser. Describe the crab's reaction. _____
