

Chapter Outline

Chapter 28 Mollusks and Annelids

Section 1: Mollusks

KEY IDEAS

- > What are the key characteristics of mollusks?
- > What are the three parts of the mollusk body plan?
- > What are the similarities of and differences between gastropods, bivalves, and cephalopods?

CHARACTERISTICS OF MOLLUSKS

- > What are the key characteristics of mollusks?
- > Mollusks are soft-bodied coelomates that have a three-part body plan. Mollusks also have bilateral symmetry, and most mollusks have a shell.
 - Members of the phylum Mollusca are called *mollusks*. Snails, oysters, clams, octopuses, and squids are examples of mollusks.
 - The body cavity in mollusks is a true coelom.
 - In animals that have a coelom, the gut and other internal organs are suspended from the body wall and are cushioned by the fluid within the coelom.

MOLLUSK BODY PLAN AND ORGAN SYSTEMS

- > What are the three parts of the mollusk body plan?
- > The three parts that make up the basic mollusk body plan are the visceral mass, the mantle, and the foot.
 - The visceral mass is the central section of the mollusk's body that contains the mollusk's organs.
 - Outside of the visceral mass is a heavy fold of tissue called the *mantle* that forms the outer layer of the body and that secretes the mollusk's shell.
 - Every mollusk has a muscular region called a *foot*, which is used primarily for locomotion.
 - Feeding and Digestion
 - All mollusks except bivalves have a radula, a tonguelike organ covered with thousands of pointed curving teeth used for feeding.
 - Food is digested in the stomach and intestine of the one-way digestive tract. Wastes are passed out of the anus.

Mollusks and Annelids *continued*

- Excretion
 - A mollusk’s coelom is a collecting place for waste-laden body fluids.
 - The beating of cilia pulls the fluid from the coelom into tiny tubular structures called *nephridia*, which recover useful materials such as sugars and salts from the fluid.
 - The remaining waste leaves the mollusk’s body through a pore that opens into the mantle cavity.
- Circulation
 - Most mollusks have a three-chambered heart and an open circulatory system.
 - The blood in an open circulatory system does not stay completely within vessels but instead fills spaces around the body organs.
 - Octopuses and their relatives are exceptions because they have closed circulatory systems, in which blood remains entirely inside of the vessels.
- Respiration
 - Most mollusks respire with gills, which are located in the mantle cavity. The mantle cavity is a space between the mantle and the visceral mass.
 - Mollusk gills extract 50% or more of the dissolved oxygen from the water that passes over them.
 - Most terrestrial snails have no gills. Instead, the thin membrane that lines the snail’s empty mantle cavity works like a primitive lung.
- Reproduction
 - Most mollusks have distinct male and female individuals, although some snails and slugs are hermaphrodites.
 - Fertilization of eggs occurs externally in most aquatic mollusks and internally in terrestrial mollusks and in octopuses and their relatives.
 - The fertilized eggs of most mollusks develop into a type of larva called a *trochophore*.

MOLLUSK DIVERSITY

- > What are the similarities of and differences between gastropods, bivalves, and cephalopods?
- > Gastropods, cephalopods, and bivalves share the same basic organ systems and tissue layers, but they have different feeding strategies and body plans.
 - Mollusks are abundant in almost all marine, freshwater, and terrestrial habitats.
 - The three major classes of mollusks are Gastropoda (snails and slugs), Cephalopoda (octopuses and squids), and Bivalvia (clams, oysters, and scallops).

Mollusks and Annelids *continued*

- **Gastropods**
 - Gastropods—snails and slugs—are primarily a marine group that also has members in freshwater and terrestrial habitats.
 - Most gastropods have a pair of tentacles on their head that have eyes located at the tips.
 - Most gastropods also have a single shell. Slugs and nudibranchs have no shell.
 - The foot of gastropods is adapted for locomotion. Terrestrial species secrete mucus from the base of the foot, which forms a slimy path that they can glide along.
 - Many gastropods are herbivores, while others are active predators.
- **Cephalopods**
 - Squid, octopus, cuttlefish, and nautilus are all cephalopods.
 - Most of a cephalopod's body mass is made up of a large head attached to tentacles (a foot divided into numerous parts).
 - The tentacles are equipped with either suction cups or hooks for seizing prey.
 - Although cephalopods evolved from shelled ancestors, most modern cephalopods lack an external shell.
 - All cephalopods are active predators.
 - Cephalopods are the most intelligent of all invertebrates. They have a complex nervous system that includes a well-developed brain.
 - Like many other aquatic mollusks, cephalopods draw water into their mantle cavity and expel it through a hollow tube called a *siphon*.
 - In squids and octopuses, this system functions as a means of jet propulsion.
- **Bivalves**
 - Bivalves such as clams, oysters, and scallops have a two-part, hinged shell, which is secreted by the mantle.
 - Bivalves do not have a distinct head region or a radula.
 - Most bivalves are marine filter feeders with gills that are used for feeding as well as for respiration.
 - Many species of bivalves produce pearls.

Mollusks and Annelids *continued***Section 2: Annelids****KEY IDEAS**

- > What are the key characteristics of annelids?
- > Which characteristics are used to classify annelids?

CHARACTERISTICS OF ANNELIDS

- > What are the key characteristics of annelids?
- > In addition to segmentation, annelids are coelomates with highly specialized organ systems. Most annelids have external bristles called *setae* (singular, *seta*).
 - Earthworms are coelomates that belong to the ancient phylum Annelida. Most annelid species are terrestrial earthworms.
 - Annelids are easily recognized by their segments, which are visible as a series of ringlike structures along the length of their body.
 - Annelids were the first organisms to have a body plan based on repeated body segments.
 - Annelids have internal body walls called *septa*, which separate the segments.
 - Each segment of an annelid has its own fluid-filled cavity, which contains a part of the animal's coelom. The cavity houses digestive, excretory, and circulatory organs, as well as organs involved in movement.
 - Segmentation of the annelid body allows for greater freedom of movement and greater complexity of body organization.
 - Well-developed cerebral ganglia form a primitive brain, which is located in the head region.
 - Annelids reproduce sexually.
 - Like mollusks, annelids have a trochophore larval form. However, the development of this larval form is different in annelids than it is in mollusks.

ANNELID DIVERSITY

- > Which characteristics are used to classify annelids?
- > Annelids are grouped into different classes based on the number of *setae* (bristles) that they have and the presence or absence of *parapodia*, which are flap-shaped appendages used for gas exchange and locomotion.
 - Marine worms, earthworms, and leeches are examples of annelids.

Mollusks and Annelids *continued*

- Marine Worms
 - Marine segmented worms are members of the class Polychaeta, the largest group of annelids.
 - Almost all polychaetes live in ocean habitats.
 - Polychaetes have a pair of paddlelike parapodia on most of their segments. The parapodia, which usually have setae, allow the worm to swim, burrow, or crawl.
 - Polychaetes often have unusual forms and iridescent colors.
 - Polychaetes usually have a well-developed head with eyes and other sensory structures.
- Earthworms
 - Earthworms and some related freshwater worms are members of the class Oligochaeta.
 - Oligochaetes have no parapodia and only a few setae on each segment.
 - Earthworms lack the distinctive head region of polychaetes and have no eyes.
 - Earthworms are scavengers that consume soil that contains organic matter.
 - The ingested soil moves into a storage chamber called the *crop*, then to an area called the *gizzard*, where grinding action breaks down the soil particles. Undigested material passes out the anus in a form called *castings*, which are prized as soil fertilizer.
- Leeches
 - Most leeches live in calm bodies of fresh water, but some species live among moist vegetation on land.
 - A leech has suckers at both ends of its body.
 - Unlike other annelids, its segments are not separated internally.
 - Leeches lack both setae and parapodia.
 - Most leeches are predators or scavengers. Only a small minority are parasites.
 - Parasitic leeches secrete chemicals called *anticoagulants* into the host's blood. These chemicals keep the blood from clotting.
 - Leeches also secrete an anesthetic that prevents the host from feeling their presence.
 - The strongest anticoagulant the leeches produce is called *hirudin*. Hirudin is now being produced through genetic engineering.