

## 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***

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- 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).

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**Mollusks and Annelids *continued***

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- **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.

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**Mollusks and Annelids *continued***

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- 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.