

Chapter 12 Invertebrates

The study of animals is called **zoology**.

What is an animal?

Eukaryotic, multicelled, have tissues, consumer, eat their food, reproduce sexually (although some asexually)

Animals can be divided into 2 large groups: vertebrates and invertebrates.

Vertebrate animals have a backbone (vertebrae column), made of bone.

Invertebrate animals do not have a backbone. They do have structures that provide support for their bodies – internal or external. They are made of various materials – limestone, glass, protein or water.

Invertebrate - Phylum Examples:

1. Phylum Porifera - Sponges
2. Phylum Cnidaria – Jellyfish, hydra
3. Phylum Platyhelminthes - Flatworms
4. Phylum Nematoda - Roundworms
5. Phylum Annelida - Segmented worms
6. Phylum Mollusca - Mollusks and Echinoderms
 - A. Snails and slugs
 - B. Squids, octopuses
 - C. Clams, oysters, mussels, scallops
7. Phylum Arthropoda
 - A. Insects
 - B. Crustaceans – Crayfish, lobsters, shrimp, crabs, pill bugs
 - C. Centipedes
 - D. Millipedes
 - E. Arachnids – spiders, scorpions, ticks, mites

1. **Sponges:** Phylum Porifera – “pore-bearer” **Pores** are holes in the body through which seawater with nutrients and food particles pass through.

Adult sponges are **sessile** – unable to move from place to place. Embryo stage can swim.

- have skeletons made of **spongin** (Protein) or **spicules** (calcium carbonate).
- are **filter feeders** – using flagella to move and trap water, oxygen and food through its pores

2. Jellyfish: Phylum Cnidaria

- Stinging cells on tentacles around the mouth
- Jellyfish bodies have **radial symmetry** – can be divided into equal halves by any plane along the length of the organism.

- 2 shapes **Medusa** – shape umbrella-like

Polyp – shaped like a tube topped with radiating finger-like structures

Gastrovascular cavity is where food is digested. Mouth is where food enters and wastes are discarded.

Digestive enzymes breakdown food externally, outside the body but in the cavity.

No brain, just a network of nerves that respond to outside stimuli.

Nematocysts – painful stingers with triggers that can inject poison to enemies or food.

To swim, jellyfish use their muscles around their rim to contract and propel up or down.

3. Worms: Flatworms, Roundworms and Segmented Worms

Worms – Long, soft-bodied organism with bilateral symmetry (two equal sides)

Flatworms –

Planarian - Free-living – not dependent on other organisms for survival

 Most flatworms are **parasites**, living and surviving on another organism called a host

 Nervous system – simple brain, called a ganglion, a network of nerve cells in the head.

Longitudinal nerves – 2 running down the length of the body

Transverse nerves – connect the longitudinal nerves giving it a ladder-like shape

 Purpose of the nervous system – coordinates its response to stimuli

Stimulus is something that causes a reaction in an organism – move toward food, move away from light

Digestive System: Energy source: Mouth – pharynx – intestines

Respiratory System: Body cells need gas exchange. This happens directly through thin covering of body.

Excretory System: Removing liquid and solid wastes happen through tubes that end with excretory pores.

Reproductive System: Hermaphroditic organism has male and female reproductive organs on the same body. Can also reproduce asexually through **regeneration**.

Roundworms – Nematodes – can be serious parasites to humans, animals and plants.

Ascaris – parasite to animals and humans: Adults lay eggs in intestines to exit first host body in feces. Eggs swallowed by second host – larvae burrow into intestine wall – enter bloodstream – reach lungs – throat – reswallowed and become adult worms in intestines – cycle repeats.

4. Segmented Worms – Earthworms, leeches

Phylum Annelida – Segments divide body

Body Structure –

 Epidermis, skin, is thin thru which gasses are exchanged (Oxygen and Carbon Dioxide)

Epidermis must also stay moist.

The cuticle is a thin film that covers the epidermis for protection.

Muscles – one arranged in circles around body. When contract body becomes long and thin

Other one along length of body. When contracts body becomes short and wide.

Setae are bristles along each segment that aid in movement.

Nervous System – Sensory receptors

Receptors- sense stimuli in environment

Travels to 2 large ganglia (brain)

Ganglia coordinates impulses to muscles for movement/ reaction

Digestive System – eats soil containing small organisms and plant matter.

Mouth – pharynx – esophagus – crop – gizzard – intestines

Blood vessels along intestines capture nutrients and carry them throughout body.

Circulatory system – closed – stays within blood vessels

Dorsal blood vessel acts as the heart pumping blood to the 5 aortic arches.

Aortic arches help control blood pressure.

Ventral blood vessel carries the blood from the aortic arches to the rest of the body.

Capillaries are the tiny blood vessels where gasses, nutrients and wastes are exchanged on the cellular level

Reproductive system – hermaphroditic – both male and female organs on same individual

5. **Mollusks** Phylum Mollusca

3 groups – Univalves, Bivalves and Cephalopods

Univalves – Snails and slugs – coiled protective shell, some without shell

Bivalves - Clams, oysters, mussels and scallops – 2 part hinged protective shell

Muscular foot plunges into sand then acts as an anchor as it pulls the clam underground

Filter feeders that use their siphons to draw water containing food through body

Cephalopods – Octopus, squid and nautilus – most without protective shell

8 arms with tentacles with suction disks underside.

Regeneration – arm can grow back if severed

Siphon – a muscular tube that propels the octopus quickly through water

Smoke-screen – inky black fluid released to evade predators

Skin pigments allow octopus to camouflage itself for protection

6. **Echinoderms** – star fish, sea urchins, sand dollars and sea cucumbers

Spiny shells for protection

Tiny tube feet allow them to move along sea floor

Radial symmetry – symmetric in every direction if cut in half through the center

Eats clams – uses feet to pull apart bivalves then inserts stomach into clam to digest

7. **Arthropods** – Phylum Arthropoda – largest phylum, jointed legs, exoskeleton

5 groups – Insects, crustaceans (crayfish, crabs, lobsters shrimp), centipedes, millipedes, arachnids (Spiders, scorpions, ticks, mites)

Table 12-2 on page 266 in text shows differences between the classes of arthropods

Insects – 3 part body – head, thorax, abdomen

3 pairs of legs

Many have 2 pairs of wings

Compound eyes – many lenses in each eye

Open circulatory system – blood flows from heart to body cells then into body cavity where it returns to heart

Tracheae – tiny tubes where oxygen and carbon dioxide pass in and out

Metamorphosis – 2 types – Complete and incomplete

Complete metamorphosis – (4 stages) egg – larva – pupa – adult (butterfly is an example)

Larva is caterpillar, consumer of lots of food for growth

Pupa – between stage where transformation occurs during a rest period

Adult – disperses, mates and lays eggs

Incomplete metamorphosis – starts as egg then goes through series of molts in which insect grows larger through nymph stage (immature). Then enters into adult stage where reproduction occurs. Nymph looks like a smaller version of the adult. Grasshopper is an example.