Chapter Fifteen: Invertebrates
Teacher Notes

Lesson One: Simple Invertebrates

- -Invertebrate Characteristics
  - -some have heads; others do not
  - -some eat foods through mouth; some absorb food through tissue
  - -none have backbones
  - -have 3 basic body plane or types of symmetry
    - -bilateral-two sides of body mirror each other
    - -radial-body organized around the center
    - -asymmetry-can't draw a straight line to divide its body into two or more equal parts
  - -Nerves
    - -allow animals to sense their environment
    - -all animals except sponges have nerves
    - -nerves also carry messages around the body to control an animal's actions.
      - -Nerve Cords-packs of nerves that carry messages along a single path.
      - -Ganglion-a mass of nerve cells
        - -each ganglion controls different parts of the body
      - -brain-organ that controls nerves throughout the body
  - -Gut-the digestive tract
    - -pouch lined with cells that release chemicals that break down food into small particles. The cells then absorb the food particles.
    - -Coelom-a body cavity that contains the internal organs
      - -contains heart and lungs
- -Sponges
  - -simplest invertebrates
  - -are asymmetrical
  - -have no tissues, gut, or nerves
  - -move only small distances if at all
  - -How do Sponges Eat?
    - -feed on tiny plants and animals
    - -sweeps water into body through its pores (tiny holes on the outside of body) water flows into a cavity in the middle of the body bringing oxygen and food. Special cells called collar cells line this cavity and will filter and digest food. Water leaves through holes at the top of the sponge
  - -Body Part Abilities
    - -if forced through strainer body parts would come back together
    - -broken off part will regenerate or grow back
    - -if broken into pieces the pieces will become new sponges
      - -some other animals can do this but only sponges use it as a form of reproduction

- -Kinds of Sponges
  - -divided into groups according to the kind of skeleton they have

-Cnidarians-invertebrates that have stinging cells
- -have complex tissues and a gut
- -have a simple network of nerves
- -move more quickly than sponges
- -can also regenerate
- -Two Body Forms
  - Medusa
    - -swim through water
  - Polyp
    - -usually attach to a surface
- -some change forms during their lifetime but some are polyps their whole life
- -Stinging Cells
  - -tentacles covered with stinging cells
    - -when an organism brushes against a tentacle it activates the stinging cells.
      - -stinging cell uses water pressure to fire a tiny, barbed spear into the organism.
        - -can be painful and paralyzing
- -Kinds of Cnidarians
  - -hydrozoans
    - -common cnidarians that live in both freshwater and marine environments.
    - -spend entire life as polyps
  - -jellyfish
    - -catch other invertebrates and fish in their tentacles
    - -spend most of their life as medusas
  - -sea anemones and corals
    - -spend most time as polyps
    - -often brightly colored
    - -corals are usually small and live in colonies
      - -colonies build huge skeletons that are made of calcium carbonate.
      - -each new generation builds on the last

-Flatworms
- -All have
  - -bilateral symmetry
  - -clearly defined head and two large eyespots
  - -knows direction that light is coming from by using sensory lobes
    - -sensory lobes are also used to detect food
- -Planarians
  - -live in freshwater lakes and streams or on land in damp places
  - -most are predators
  - -eat other animals and digest food in a gut

-use sensory lobes to find food
-have a well developed nerve system
-have a brain for processing information about their surroundings

-Flukes
-are parasites (organisms that feed of other organisms)
-most live in and reproduce inside other organisms
-eggs pass out of the host with their waste
-these eggs infect drinking water or food
-have tiny heads without eyespots or sensory lobes
-have suckers and hooks for attaching to animals

-Tapeworms
-similar to flukes
-have a small head with no eyespots or sensory lobes
-live and reproduce in other animals
-feed on these animals as parasites
-body is very specialized for environment
-don't have gut; attach to the intestine of another animal and absorb nutrients
-nutrients move directly through the tapeworm's tissues
-can infect humans

-Roundworms
-long, slim bodies and are round
-have bilateral symmetry
-have a simple nervous system
-ring of gangles forms a simple brain
-parallel nerve cords connect the two ends of their body
-most are very small
-break down tissues of plants and animals to make rich soil
-many are parasites
-can infect humans

Lesson Two: Mollusks, and Annelid Worms

-Mollusks
-examples include snails, slugs, clams, oysters, squids, and octopuses
-three classes
-gastropods-slugs and snails
-bivalves-clams and other shellfish with 2 shells
-cephalopods-squids and octopuses

-How Do Mollusks Eat?
-snails and slugs eat with a ribbonlike organ called a radula to scrape algae from rocks, chunks of tissue from seaweed, or pieces of leaves from plants
-clams and oysters attach to one place and use gills to filter tiny plants, bacteria, and other particles from the water

-octopuses and squids use tentacles to grab their food and to place it in their powerful jaws

-Ganglia and Brains

-special ganglia to control breathing, movement, and digestion

-octopuses and squids have most advanced nervous systems

-cephalopods and octopus have large brains that connect all of their ganglia

-cephalopods are thought to be the smartest invertebrates

-Pumping Blood

-Open Circulatory Systems-a circulatory system in which the circulatory fluid is not contained entirely within vessels.

-Closed Circulatory System-a circulatory system in which the heart circulates blood through a network of blood vessels that form a closed loop.

-Mollusk Bodies

-foot, visceral mass, mantle, and shell are body parts

-foot-helps animal move

-visceral mass-gills, gut, and other organs

-mantle-layer of tissue that covers the visceral mass

-shell-protects the mollusk from predators and keeps land mollusks from drying out.

-Annelid Worms

-also known as segmented worms; all have

-bilateral symmetry

-closed circulatory system

-complex nervous system with brain

-Earthworms

-most common annelid worms

-eat soil and break down plant and animal matter in soil leaving waste called castings

-Marine Worms

-covered with bristles and are many colors

-most live in ocean

-some eat mollusks and other small animals; others filter pieces of food from water

-Leeches

-some are parasites and others are scavengers or predators

-can be used in medicine

Lesson Three: Arthropods

-Characteristics of Arthropods

-Segmented and Specialized

-some have nearly all of their segments are the same; most have some specialized segments including wings, antennae, gills, pincers, and claws.

-during development some parts grow together forming the three main body parts-thorax, head, and abdomen.

-Jointed Limbs

-jointed limbs give their name; “arthro” means joint

-“pod” means foot

-An External Skeleton

-exoskeleton-a hard, external, supporting structure.

-made of chitin

-serves as a frame, allows movement, muscles are connected to exoskeleton

-things internal skeleton doesn’t-acts like armor and keeps water inside.

-Sensing Surroundings

-some use bristles to detect motion, vibration, pressure, and chemicals.

-some have simple eyes; most have compound eyes

-Compound Eye-an eye composed of many light detectors.

-Kinds of Arthropods

-are classified by the kinds of body parts they have-see the differences by looking at the number of legs, eyes, and antennae.

-Antenna-a feeler that is on the head of an invertebrate, such as a crustacean or an insect, that senses, touch, taste, or smell.

-Centipedes and Millipedes

-one pair of antennae, hard head, one pair of mandibles

-centipedes have one pair of legs on each segment

-millipedes have two pairs of legs on each segment

-Crustaceans

-shrimp, barnacles, crabs, and lobsters

-most live in water, have gills for breathing, mandibles for eating, and two compound eyes, two pair of antennae.

-Arachnids

-Spiders, scorpions, mites, and ticks

-two main body parts-cephalothorax (head and thorax) and abdomen

-most have four pairs of legs, no antennae, clawlike mouthparts called chelicerae, and simple eyes (they have eight)

-spiders are more helpful than harmful-kill more insects than any other animal

-ticks live in forests, brushy areas, and even grassy lawns

-bodies can be a few millimeters long, segments are joined as one part, are parasites and can carry disease.

-Insects

-largest group of arthropods

-have three main body parts, six legs, and two antennae

-The World of Insects

-Insect Bodies

-bodies have three parts-head, thorax, and abdomen
-on head they have one pair of antennae, compound eyes, and mandibles.
-thorax is made of three pars each of which has one pair of legs
-some insects have no wings; others may have one or two pairs on thorax

-Complete Metamorphosis
-Metamorphosis-a phase in the life cycle of many animals during which a rapid change from the immature form of an organism to the adult form takes place.
-most insects go through complete metamorphosis
-has 4 main stages – egg, larva, pupa, adult
-Stages of metamorphosis
-an adult lays eggs
-larva hatches from egg (caterpillar stage)
-after final molt, the caterpillar makes a chrysalis and becomes a pupa
-adult body parts replace the larval body parts; adult splits the chrysalis
-adult butterfly pumps blood into its winds until they are full-sized.

-Incomplete Metamorphosis
-grasshoppers and cockroaches are insects that go through incomplete metamorphosis
-incomplete metamorphosis is less complicated
-has three main stages-egg, nymph, and adult

Lesson Four: Echinoderms

-Spiny Skinned
-echinoderm means "spiny skinned"
-spiny parts are the skeleton
-endoskeleton-an internal skeleton made of bone cartilage
-can be had an bony or stiff and flexible

-Bilateral or Radial?
-adults have radial symmetry but larvae have bilateral symmetry

-The Nervous Systems
-simple nervous system with a circle of nerves around mouth (called the nerve ring)
-at the end of each tip is an eye that senses light; the rest of body is covered with cells that sense touch and chemical signals in the water.

-Water Vascular Systems-a system of canals filled with a watery fluid that circulates throughout the body of an echinoderm.
-helps animal move, eat, breathe, and sense environment

-Kinds of Echinoderms
-are divided into five major classes

-Brittle Stars and Basket Stars
    -have long, slim arms and often smaller than sea stars
    -don't have suckers on feet
-Sea Urchins and Sand Dollars
    -are round
    -endoskeletons form solid, shell-like structure
    -have no arms but use tube feet to move
    -sea urchins feed on algae they scrape from rocks and other objects and chew with special teeth
    -sand dollars burrow into soft sand or mud eating particles of food they find there
-Sea Lilies and Feather Stars
    -have 5 to 200 feathery arms that stretch away from their body and trap small pieces of food
-Sea Cucumbers
    -have no arms; have a soft, leathery body; they are long and have a wormlike shape