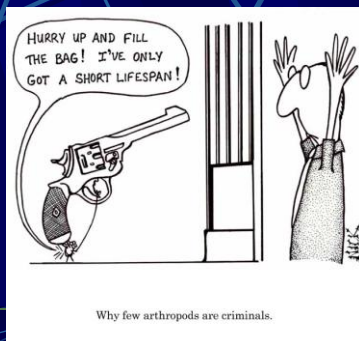


Arthropods Chapter 28

Biology II
Mrs. Michaelson



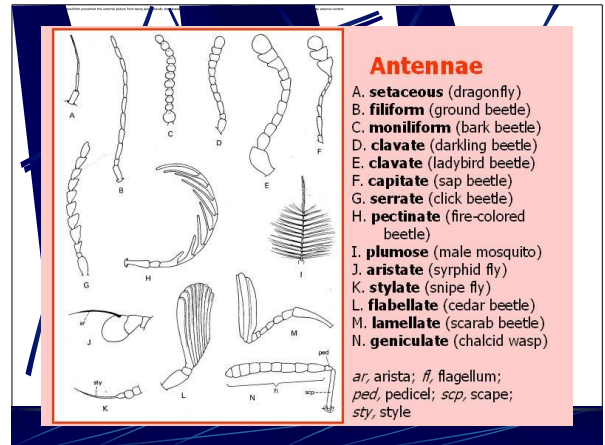
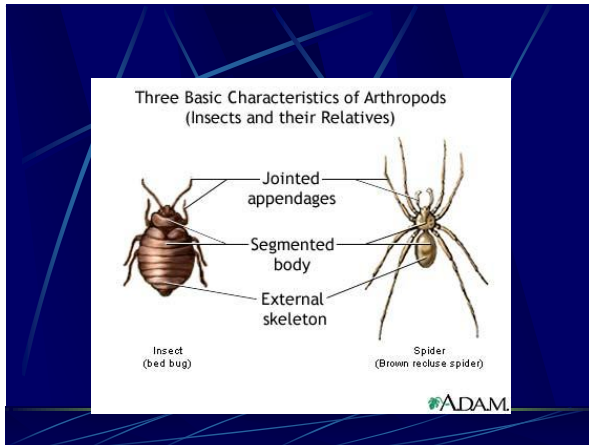
Section 28.1 Characteristics of Arthropods



Why few arthropods are criminals.

A. What is an Arthropod?

1. Segmented, coelomate invertebrate animal with bilateral symmetry, an exoskeleton, and jointed structures called appendages.
2. Appendage: Any structure, such as a leg or antenna, that grows out of the body of an animal.
 - a. Used for sensing, walking, feeding and mating.
 - b. Appendages are jointed. Allows for flexibility and powerful movements.



B. Arthropod Skeletons Provide Protection

1. **Exoskeleton:** Hard, thick, outer covering made of protein and chitin.
2. Some have continuous exoskeleton, others have plates held with hinges.
3. Exoskeleton protects and supports internal tissues and provides place for muscles to attach.
4. Can also prevent water loss.

C. Why Arthropods Must Molt

1. Exoskeletons are heavy. Some that fly need lighter ones, but doesn't protect well.
2. Exoskeletons don't grow – must molt.
 - a. **Molting:** Soft exoskeleton formed from chitin secreting cells beneath old one.
 - b. Animal contracts rear muscles and forces blood forward.
 - c. Swelling of front of body allows old skeleton to split open and animal climbs out.
 - d. Before new exoskeleton hardens animal swallows air or water to puff itself up in size.
3. Most arthropods molt 4-7 times in their lives.

Tarantula molt



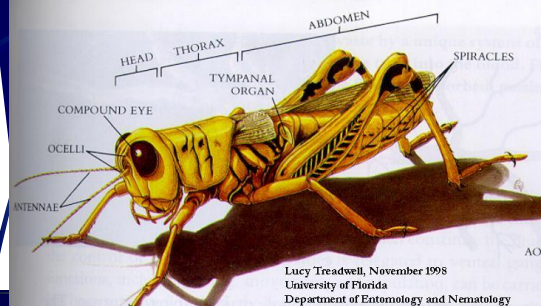
D. Segmentation in Arthropods

1. Many have head, thorax, abdomen as segments (3 segments).
2. Some have head with fused thorax and abdomen.
3. Still others have a fused head and thorax, called a *cephalothorax* and abdomen.

E. Arthropods Have Efficient Gas Exchange

1. Quick active animals.
2. Efficient respiration. High oxygen demands.
3. Use three types of respiratory structures:
 - a. Gills: Extract oxygen from the water. (crayfish)
 - b. Tracheal tubes: Branching networks of hollow air passages that carry air throughout the body. Muscles help with this. (grasshoppers)
 - i. Air enters and leaves through openings on the thorax and abdomen called spiracles.
 - c. Book lungs: Air-filled chambers that contain leaflike plates. (spiders)

Class Insecta: External Morphology and Adaptations



F. Arthropods Have Acute Senses

1. Antennae help with detecting changes in their environment.
 - a. Used for communication with pheromones: chemical odor signals given off.
2. Accurate vision is also important.
 - a. Most have one pair of large compound eyes and from three to eight simple eyes.
 - b. *Simple eye*: Only one lens used for light detection.
 - c. *Compound eye*: Many lenses. Allows them to analyze fast changing landscape and detect colors.

Grasshopper Eye



G. Arthropod Nervous Systems Are Well Developed

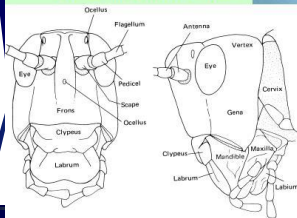
1. Double ventral nerve cord, anterior brain, and several ganglia.
2. Ganglia are fused and act as control centers for body section.

H. Arthropods Have Other Complex Body Systems

1. One or more hearts in *open* circulatory system.
2. Have complete digestive system with a mouth, stomach, intestine, and anus. Also have various glands that produce digestive enzymes.
3. Mandible: Jaws that are adapted for holding, chewing, sucking, or biting food.
4. Excrete wastes through Malpighian tubules. Located in abdomen and empty into intestine.
5. Muscular system well developed. Attached to inner surface of exoskeleton.

chewing mouthparts

Grasshopper (order Orthoptera, Acrididae): mouthparts directed downward and specialized for processing plant materials

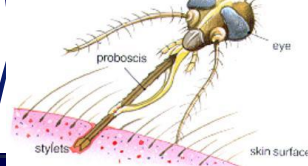


K.B. Sandved & M.G. Emsley ©1978 Viking Penguin

piercing-sucking . . .

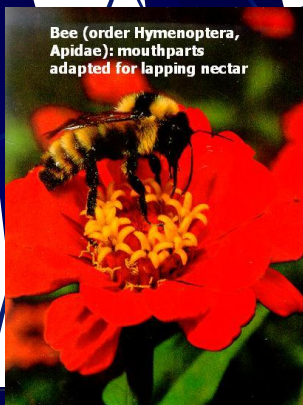
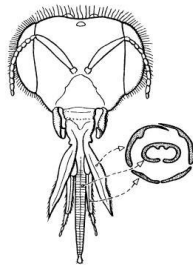


The mouthparts of a mosquito

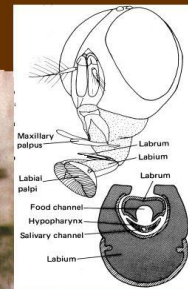


Bee (order Hymenoptera, Apidae): mouthparts adapted for lapping nectar

lapping mouthparts



sponging mouthparts



I. Arthropods Reproduce Sexually

1. Most have separate sexes.
2. Fertilization is usually internal on land and external in water.
3. Bees, ants, and wasps exhibit parthenogenesis: a form of asexual reproduction in which a new individual develops from an unfertilized egg.

Section 28.2 – Diversity of Arthropods



African Wolf Spider



Lobster



Butterfly

I. Arachnids

- A. Two species in North America to be careful of.

1. Brown recluse and black widow.



Brown Recluse



Black Widow



Brown Recluse Bite Symptoms



- Rarely any pain when bitten.
- Bite site becomes reddened.
- Painful ulceration develops.
- Skin and muscle tissue dies, leaving a deep, infected wound that enlarges, fails to heal or heals quite slowly.

● Black Widow DO NOT WRITE DOWN

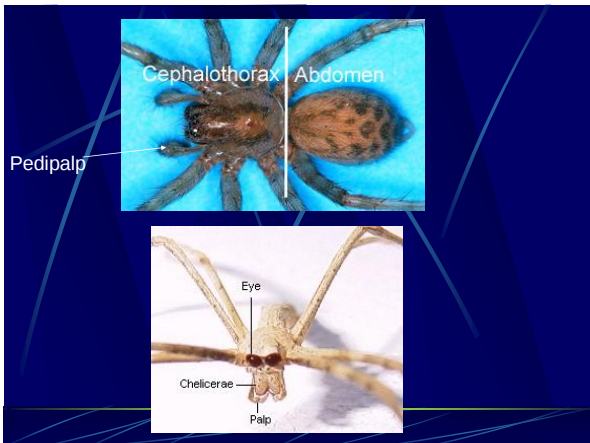
- Only females are venomous.
- Hourglass shape on underside of abdomen.
- The poison of the black widow spider affects nervous system function. The bite causes severe pain in the vicinity of the bite, accompanied later by dizziness, nausea, blurred vision and breathing difficulty. A physician should be contacted immediately following a suspected bite. When this happens, fatalities are rare and recovery is usually quick and complete.



Female with egg sac.

B. What is an Arachnid?

1. Spiders, scorpions, mites, and ticks – Class Arachnida.
2. Spiders are largest group.
3. Have two body regions – cephalothorax and abdomen.
4. Six pairs of jointed appendages.
 - a. First pair – chelicerae: Near mouth and modified as pincers or fangs.
 - i. Spiders do not have mandibles – digests outside and sucks up liquefied.
 - b. Second pair of appendages – Pedipalps: Adapted to handle food and sensing.
 - i. Male spiders use to carry sperm.
 - c. Four remaining appendages are legs.



5. All spiders spin silk, not all make webs.
 - a. Silk secreted by silk glands on abdomen.
 - b. Spun into thread by spinnerets, at rear.



Spinnerets

C. Ticks, Mites, and Scorpions: Spider Relatives

1. One body section: Head, thorax, abdomen all fused.
2. Ticks spread disease.
3. Mites small: Chiggers when camping.
4. Scorpions: Poison stingers to capture prey.



Deer Tick

Chigger and Bites



II. Crustaceans

- A. Crabs, lobsters, shrimps, crayfishes, barnacles, water fleas, pill bugs.
- B. Most aquatic and have gills.
- C. Have two pair antennae for sensing.
- D. Mandibles, two compound eyes, usually on stalks.
 1. Mandible closes side-to-side.
- E. Five pairs of walking legs also for seizing prey, and cleaning other appendages.
 1. First pair modified as claws.

Crayfish



III. Centipedes and Millipedes

- A. Centipedes (Class Chilopoda), Millipedes (Class Diplopoda)
- B. Centipedes are carnivorous.
- C. Bite is painful to humans.
- D. Both have malpighian tubules and tracheal tubes.
- E. Millipedes eat plants and dead material.
- F. Can spray obnoxious-smelling fluids from stink glands.

centipede



millipede

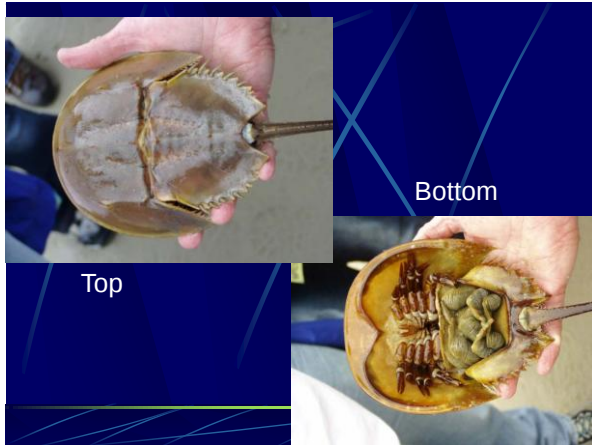


IV. Horseshoe Crabs: Living Fossils

- A. Class Merostomata.
- B. Have remained unchanged since Cambrian period (500 million years ago).
- C. Similar to trilobites.
- D. Forage on sandy or muddy ocean bottoms for seaweed, worms, and mollusks.

Trilobite





V. Insects

- A. Flies, grasshoppers, lice, butterflies, bees, and beetles.
- B. Largest group.
- C. Three body divisions.
- D. Six legs attached to thorax.
- E. Most adults have wings.
- F. See pages 776-779 Focus on Insects.

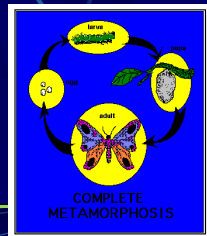
G. Insect Reproduction

1. Mate only once or a few times in their life.
2. Eggs fertilized internally.
3. Most lay large numbers.
4. Females equipped with appendage to pierce ground or wood and lays eggs in hole.

H. Metamorphosis: Change in Body Shape and Form

1. Many species go through metamorphosis: Series of changes, controlled by chemical substances.
2. Usually four stages (Complete Metamorphosis): egg, larva, pupa, adult.
 - a. 90% of insects go through this.
 - b. Butterfly, ants, beetles, flies, wasps.

3. After eggs are laid, insect embryo develops and the eggs hatch.
4. Larva: Free-living wormlike stage – often called a caterpillar.
5. Pupa: Tissues are broken down and replaced by adult tissues. Usually does not move or feed.
6. Adult emerges from pupa.



7. Incomplete Metamorphosis:

- a. **Egg** - A female insect lays eggs.
- b. **Nymph** - The eggs hatch into nymphs. Nymphs look like small adults, but usually don't have wings.
- c. **Adult** - The insects stop molting when they reach their adult size. By this time, they have also grown wings.

