

ZOOLOGY 101 SECTION 7 LECTURE NOTES

Phylum Mollusca:

- Mollusks, snails, clams, octopi, etc.

Characteristics:

1. Body bilaterally symmetrical; unsegmented; usually with definite head
2. Ventral body wall specialized as a **muscular foot**
3. Dorsal body wall forms the **mantle**, which encloses the **mantle cavity**, is modified into **gills** or a **lung**, and secretes the **shell**
4. Surface epithelium usually ciliated and bears mucous glands and sensors
5. Coelom present
6. Complex digestive system; rasping organ called **radula** usually present; anus usually emptying into mantle cavity close to mouth
7. Open circulatory system
8. Gas exchange by gills, lung, mantle or body surface
9. One or two *metanephridia* (kidneys) present
10. Complex nervous system
11. Sensory organs of touch, smell, taste, equilibrium and vision

Ecological Relationships:

- Second most diverse group after arthropods ~ 50,000 living species
- Range in size from 5mm - 18 meters
- Found in diverse habitats; from ocean abyss to land, fresh and marine water

Economic Importance:

- Food, jewelry, destructive to wood, pests and hosts to parasites

Form and Function:

- **HAM!!!** "Hypothetical Ancestral Mollusk"
- Body plan:
 - Consists of *head-foot* and *visceral mass* portions
 - Mantle: two folds of outgrowth from dorsal body wall
 - Mantle cavity: space enclosed between mantle and body wall
 - Gills or lung housed in mantle cavity
 - Shell secreted over visceral mass by mantle
- Head-Foot
 - Mouth, cephalic sensory organs, foot, tentacles, radula
 - Radula: unique to mollusks, rasping, protrusible, tongue like organ covered in as many as 250,000 teeth
 - Foot: locomotion, creeps, secretes mucous
- Visceral Mass
 - Digestive, circulatory, respiratory and reproductive organs
 - Mantle and mantle cavity
 - Shell: three layers
 - Periostracum = outer layer made of conchiolin

- Prismatic = middle layer of dense calcium carbonate
- Nacreous = inner layer of calcium carbonate sheets and nacre

Internal Structure and Function:

- Gas exchange: body surface, mantle, gills or lung
- Open circulatory system with pumping heart
- Coelom restricted to area around heart
- Mouth > radula > stomach > intestine > anus
- Includes various digestive glands (liver)
- Metanephridia (kidneys) connect with coelom and empty into mantle cavity
- Nervous system of paired ganglia and nerve cords
- Dioecious (some are hermaphroditic)

Mollusca contains eight classes, the largest classes are:

Gastropoda

Bivalvia

Cephalopoda

Polyplacophora

Class Gastropoda: snails, limpets, slugs, whelks, conchs, periwinkles, sea slugs, sea hares, sea butterflies and others

- Largest and most diverse class ~40,000 species
- Body asymmetrical, usually in a coiled shell
- Head well developed with radula, foot large and flat
- Dioecious or monoecious
- Shell univalve, some have an operculum, a horny plate to cover shell aperture

- **Torsion** = a twisting phenomenon where the shell alters the position of the visceral organs 180 degrees, only occurs in gastropods
- **Fouling** = arrangement of anus anteriorly creates problems of wastes being washed back over gills

Class Bivalvia: (Pelecypoda) mussels, clams, scallops, oysters, and shipworms

- Bivalve, two shelled mollusks
- Body enclosed in a two lobed mantle, valves of variable form and size
- Dorsal hinge for shell valves with hinge ligament
- Head greatly reduced but mouth with labial palps, no radula, no cephalic eyes, gills plate like
- Foot usually wedge-shaped
- Sexes usually separate
- Shell:
 - Valves
 - Hinge ligament
 - Adductor muscles
 - Umbo
- Sedentary *filter-feeders*
 - Incurrent siphon > gill pores > mouth > stomach (crystalline style) > digestive gland > intestine > anus > excurrent siphon

Class Cephalopoda: squids, octopi, nautilus and cuttlefish

- Shell often reduced or absent
- Head well developed with eyes and a radula, head with arms or tentacles, foot modified into a funnel

- Nervous system of well developed ganglia centralized to form a brain
- Sexes separate with direct development
- **Pen** = in squids, most of the shell is gone leaving a thin, horny strip subdermal; shell entirely gone in octopi
- Locomotion:
 - Forcefully expel water through ventral funnel
 - Squids and cuttlefish swim by fins and jets
 - Octopods crawl about by arms and suckers

Class Polyplacophora: chitons

- Elongated, dorsoventrally flattened body with reduced head
- Bilaterally symmetrical, radula present, sexes separate
- Shell of eight dorsal plates
- Foot broad and flat
- Multiple gills along sides of body between foot and mantle
- Mantle forms girdle with *osphradia* chemoreceptors

Class Monoplacophora:

- Living specimens first found in 1952
- Many show pseudo-metamerism
- Small with low rounded shell and creeping foot

Class Scaphopoda: tusk shells or tooth shells

- Sedentary, marine, slender body covered with a tubular shell

Classes Caudofoveata and Solenogastres

- Once grouped into one class (Aplacophora)
- Both worm-like and shell less
- Reduced head and no nephridia
- Caudofoveata most primitive