Phylum Mollusca

Chapter 16

Molluscs

True coelomate animals

Protostome – Mouth first

Trochophore larva – free swimming

All organ systems present

Gills or lungs

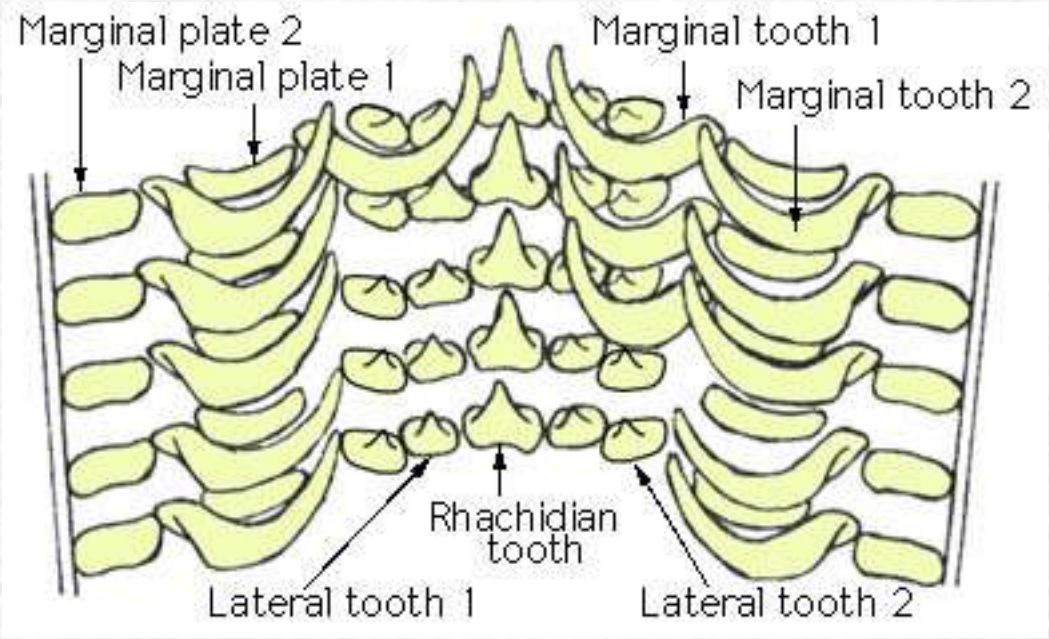
Fleshly mantle that secretes the shell
holds gills or lungs

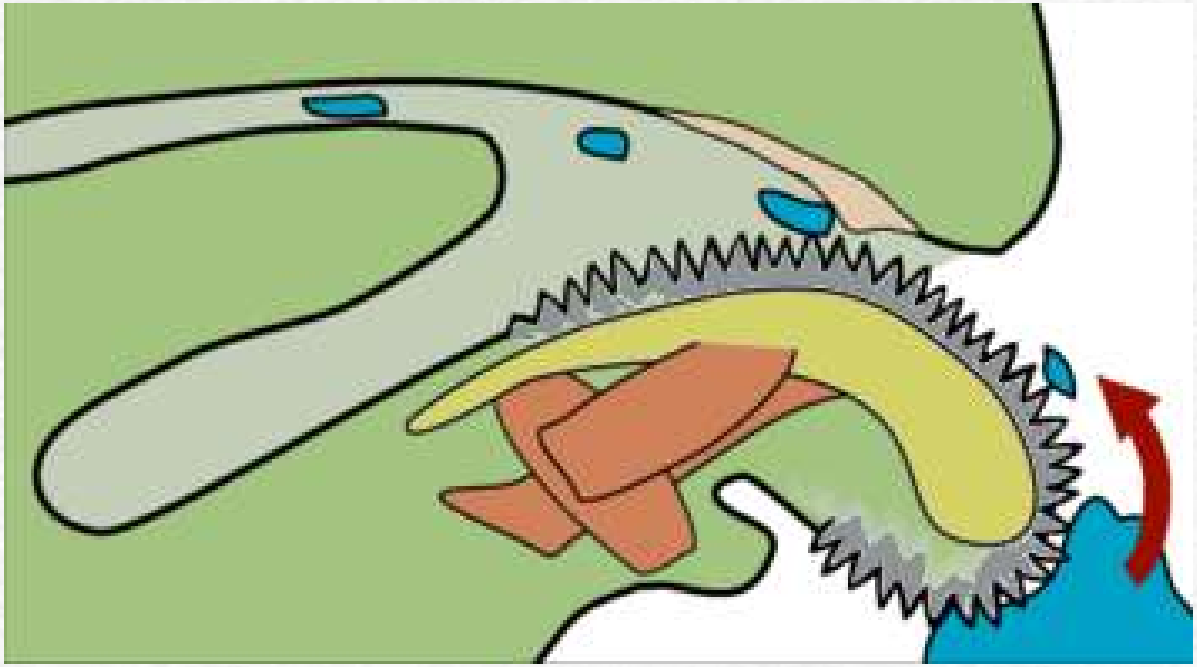
- Bilateral symetry
- Unsegmented
- Cephalization
- Open circulatory system – closed in cephalopods

Unique to phylum are the radula

Muscular foot

Direct eye from skin not brain


Marginal plate 2
Marginal plate 1
Marginal tooth 1
Marginal tooth 2
Rhachidian tooth
Lateral tooth 1
Lateral tooth 2



- 50,000 living species
- 35,000 fossil species
- Mollusca means soft body
- Chitons, snails, slugs, nudibranchs, clams, mussels, oysters, squid, octopuses
- Microscopic to the Architeuthis 18m to 450 Kg

- Found in habitats from the tropics to the polar seas
- Originated in the oceans
- Most evolution happened near shores
- Only bivalves and gastropods moved to brackish and freshwater habitats

Form and function

Head – foot

Active area

Feeding

Sensory organs

Locomotion

Radula- locomotion

Visceral mass

Digestive

Circulatory

Reproductive

Ciliary tracts

Radula

- Rasping, protruding tonguelike organ
- Found in all molluscs but bivalves
- Ribbonlike membrane covered in tiny teeth
- Complex muscles move the radula in and out
- Few teeth to 250,000

- Tear off food
- Conveyer belt for carrying to digestive system
- New rows are continuously replaced
- Pattern and number of teeth are unique to each species

Foot

Locomotion

Attachment

Combinations of these

Ventral solelike structure

Waves of muscular contractions

modifications

- Attachment disc in limpets
- Laterally compressed hatchet foot in bivlaves
- Siphon for jet propulsion in the squid
- Secreted mucus is an aid to adhesion or gliding

Snails and bivalves can extend the foot hydraulically by engorgement with blood

Can extend in mud or sand and use as an anchor

In free swimming (pelagic)+

forms is modified to winglike or thin fin structures

Visceral Mass/Mantle/Mantle Cavity

- Mantle – sheath of skin that hangs down on each side of body
- Protects soft parts and creates mantle cavity between it and visceral mass
- Outer surface of mantle secretes the shell

Mantle Cavity

- Houses respiratory organs
- Products from digestive, excretory and reproductive systems deposit in cavity
- Water currents connect cavity to outside environment
- Jet propulsion for locomotion

- Sensory receptors to sense outside environment
- Head can be withdrawn into cavity for protection

Shell

Secreted by the mantle continuously

Increases in thickness as animal ages

3 layers thick

Periostracum, prismatic, nacreous

Protein, calcium carbonate and crystalline calcium carbonate

Shell

- The first shell appears during larval period then grows as animal ages
- Protection/support
- Calcium comes from food/soil/water
- Mother of pearl/nautilus/conch etc.
- Many ornate varieties

Internal structure and function

Gas exchange – body surface (mantle) gills and lungs

Open circulatory system

Pair of kidneys- metanephridia

Also can serve do discharge eggs and sperm

- Nervous system consists of several pairs of ganglia with connecting nerve cords
- Cephalization

Reproduction and history

- Some hermaphroditic but most are dioecious (separate male and female)
- Free swimming larva that emerges from egg is called the trochophore
- Veliger – 2nd free swimming stage found in some bivalves and gastropods – has beginning of a foot, shell and mantle

In some cases the trochophore is passed in the egg then the veliger emerges

In cephalopods, some marine and fresh water snails and some freshwater bivalves there is no trochophore stage the juvenile hatches from an egg

Classes of Molluscs

8 classes

Caudofoveata–wormlike/marine

Solenogastres-wormlike/marine

Monplacophora-small rounded shell

Polyplacophora-chitons/flattened

Scaphopoda-tooth shells

Gastropoda-snails/slugs/conchs

Bivalvia-clams/mussels

Cephalopoda-squids/nautiluses/octopuses

Caudofoveata

Wormlike

Marine

2-140mm

Burrowers

Terminal and mantle cavity at entrance of burrow

Microorganisms and detritus

No shell but covered in calcareous scales

Has radula

70 species or less

Closer to common ancestor

solenogastres

Marine

Wormlike

Use to be in same class as caudofoveata

No shell but covered in calcareous scales

No radula

No gills

Hermaphroditic

Free swimming

Feed on cnidarians

250 species

Monoplacophora

Extinct until 1952

At least 12 species now known

Small with low rounded shell

Look like limpets

Some serial repetition of internal organs

Many internal organs are paired

- Ladderlike nervous system
- Mouth contains the radula

Polyplacophora

Chitons

Diverse moluscan group

Flattened dorsally and ventrally

8 articulating limy plates

Many plate bearers

Head and sensory organs reduced

Photosensitive structures called Esthetes

2- 5 cm

Rocky surfaces in intertidal areas

Stay near living area

Have radula

- Mantle forms girdle around margin of plates
- Extened along side of foot
- Gills suspended from roof of mantle cavity
- Mantle margins can be held open for air breathing

Osphradia – sense organs for sampling water are found in the mantle grooves

Scaphopoda

Tusk shells

Tooth shells

Benthic marine molluscs

Subtidal zone to 6000 m

Slender body

Covered by mantle and tubular shell

- Mantle wraps around visceral mass to form a tube
- 2.5 to 5 cm long
- Foot is used to burrow
- Gills are absent
- Food is detritus and protozoa

Long tentacles extend from the head

Captacula – brings food to radula

No eyes, tentacles, osphradia

Sexes separate

Trochophore larva

Bivalvia

Pelecypoda

Hatchet footed

Mussels, clams, scallops, oysters etc.

1mm – 1m (giant south pacific clam)

Filter feeder – ciliary currents by gills

No radula

Little cephalization

Marine, brackish, fresh

Two shells

Adductor muscles

Umbo – oldest part of the shell

Pearl – results from foreign object between the mantle and shell

Locomotion occurs by extending slender foot between valves. Blood swells foot and acts as an anchor

Some swim by clapping shells

gills

Separate sexes

Fertilization is both external and internal

Trochophore, veliger

Cephalopoda

Head-foot

Squids, octopuses, nautiluses

Modified foot at head region

Funnel for expelling water from the mantle cavity

2-3 cm – 30 cm

Cambrian times

- Internal shells or no shells
- Swim by expelling water from the mantle cavity through a funnel or siphon
- Most have one pair of gills
- Closed circulatory

Separate sexes

Internal fertilization

No free swimming larva

Gastropoda

Largest and most diverse

40,000 living

Snails, slugs, sea hares etc.

Marine to air-breathing

Bilateral symmetry

Microscopic to giant

Stomach foot

Feeding is varied but does include a radula

Torsion – moves mantle to the front of the body

Fertilization is internal