PHYLUM ANTHOZOA

PHYLUM MOLLUSCA

PHYLUM ANNELIDA

SUPER PHYLUM LOPHOPHORATA
Phylogeny

• Page 32 Figure 2.3 (A)
• Originally placed with Cnidarians
• Originally thought to be Deuterostomes
• Now placed with Protostomes
• Still lots of controversy
• Final Answer?

Lophophorate Phylogeny

Phylum Phoronida
Phylum Bryozoa
Phylum Brachiopoda

Lophophorate Phyla

• General characteristics
• Common character: Lophophore
  - U-shaped food gathering structure
  - 1-2 rows, hollow, ciliated tentacles
The Lophophore

(b)

Physical Characteristics of Lophophorates

- Trimeric
  - Prosome
  - Mesosome
  - Metasome
- Body cavities
  - Protocoel
  - Mesocoel
  - Metacoel

• Protostomes
  - Schizocoely
    - Peritoneum
      - Distinct from enterocoely - Deuterostomes
  - Sessile suspension feeders
    - Reduced cephalization
    - U-Shaped gut
    - Nervous system
- Previously classified as Deuterostomes
  - Radial determinate cleavage
  - Enterocoelous coelom formation
- Molecular Phylogeny
  - Doesn’t fit
- Haeckel’s Maxim
  - 3 major phyla

Phylum Phoronida

- The Phoronids
- Worm-like tube dwellers
- Two Genera
  - Phoronis
  - Phoronopsis
- 12 species
- Intertidally to 400+m
  - Common at 70m
- 0.5 – 50cm long
- Fossil Record Absent

General Characteristics
Reproduction

- Asexual
  - Transverse fission
- Gonochoristic or Hermaphroditic
- Sexual structures
  - Form in lophophoral organs
  - Near lophophore
  - Form nidamental glands in females
  - Spermatophoral glands in males

- Internal fertilization in *P. harmeri*
  - Spermatophores released
  - Captured on female lophophores
  - Amoeboid sperm
    - To lophophore coelom
  - Travel through mesocoel and metacoel to eggs
  - Fertilization occurs
Phylogeny and Systematics

- Widespread
- Earliest possible fossil from the Jurassic/Upper Cretaceous
  - 202mya/145mya
  - Suspect
  - Trace Fossil
    - Borings
      - Talpina ramosa
      - Conchorema

Phoronid a la Carte

Predators of Phoronids

- Some species of Fish
- Gastropods
- Nematodes
Phylum Brachiopoda

- The Lamp shells
- Resemble bivalves
- Highly modified lophophore
- Excellent fossil record

General Characteristics
Reproduction

- No Asexual
- Most species Gonochoristic
- Fertilization external
  - Eggs and sperm shed
  - Some species brood embryos
    - Requires Internal fertilization

Early Development

- Strong resemblance to deuterostomes
- Larvae metamorphose in Articulates
  - Not in Inarticulates
- Mantle lobes fold up to enclose visceral mass

Phylogeny and Systematics

- Widespread and speciose
- Arose in Devonian
  - 400 mya
- Crash in Permian Triassic extinction
  - 250 mya
Class Inarticulata
- Without calcified valves
- Order Lingulida – the Lamp Shells
  - Lingula
  - Oldest genus on planet
  - Virtually identical to specimens 400 myr
- Order Acrotrilida
  - Crania
  - Limpet like in form

Class Articulata
- With calcified valves
- Order Rhynconellida
  - permanently attached to solid substrates
  - often with complete gut

Class Articulata
- Order Terebratulida
  - often found in fossil assemblages
  - Composita, Anthracospirifer, Cleiothyridina
  - Occasionally with movable peduncle, often large
  - Terebratella
Brachiopods on the half shell

• Echinoderms
• Crustaceans
• Gastropods
• Cephalopods
• Some species of Fish

Research

• International Brachiopod Congress
  – http://paleopolis.rediris.es/BrachNet/index.htm

Phylum Bryozoa

• Moss animals, Polyzoa, Ectoprocts
• Mostly sessile, modular
  – Zooids – No larger than 1mm
  – Colony – mm to m in size
• Retractable tentacles
• Excellent fossil record
  – Example of punctuated evolution
• 5000 known extant species
• 16000 known extinct species
• Class Gymnolaemata
• Class Stenolaemata
• Class Phylactolaemata

Sessile?

General Characteristics
Physiology

Autozooids

Heterozoids

Avicularia

Vibracula and Spines
Reproduction

- Hermaphroditic or Gonochoristic
- Asexual
  - Budding
- Sexual
  - Eggs and Sperm

Early Development

- Free swimming larvae
- Ancestrula
- Colony Development
Phylogeny and Systematics

- Widespread
- First arose Ordovician – 500mya
- Cambrian? – 570mya
- Permian/Triassic extinction – 250mya
- Identification Problematic

Class Gymnolaemata

- Marine
- Circular Lophophore
- Colonies leathery – Some Calcification
- Box like or cylindrical zooids
- 650 genera
- Early Ordovician

Order Ctenostomata
- Zooids cylindrical to flat
- No Ooecia
- No Avicularia
- Paleozoic to Recent

Order Cheilostomata
- Zooids flat box
- Ooecia (brood chambers)
- Avicularia
- Mesozoic to Recent
Class Stenolaemata

- Marine
- Tube shaped zooids
- Circular lophophore
- Some calcification
- Mostly Aborescent and Fenestrate
- 550 Genera

Class Phylactolaemata

- Fresh Water
- Zooids cylindrical
- Epistome present
- Lophophore
  - Horseshoe shape
  - Large
- Non-Calcareous
  - chitinous or gelatenuous
- Statoblasts
- 12 Genera
- Mesozoic - Recent

5 Orders
- 4 Extinct
  - E. Ordovician
- Order Cyclostomata
  - Zooids cylindrical
  - Special reproductive zooids
  - No Epistome
  - Paleozoic - Present
Bryozoa Under Glass

Predators of Bryozoans

- Nudibranchs
- Gastropods, Chitons
- Sea Spiders
- Sea Urchins
- Flounder, Angel Fish and Puffers

Research

- Bryostatin 1
- Myxozoan Parasites – PKD in Salmon
- International Bryozoology Association
  – http://www.nhm.ac.uk/hosted_sites/iba/

The Lophophorates

- Circular or U-shaped Lophophore
  – Suspension or Filter feeders
- Reproduction strategies
- Don’t need Sunlight to Survive
Life Styles

Marine Environment

References and Photo Credits

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