

Phylum Mollusca

- * Snails, slugs, oysters, clams, octopuses, and squids
- * Most are marine
- * Soft-bodied animals, but most are protected by a hard shell
- * Three similar structures: muscular foot, visceral mass, mantle
- * Separate sexes with gonads in the visceral mass

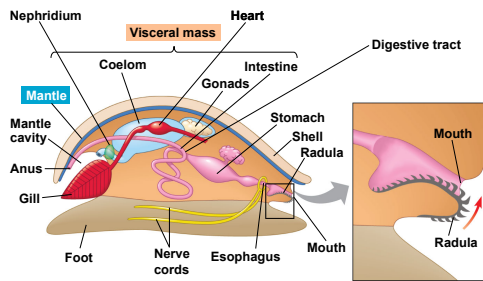
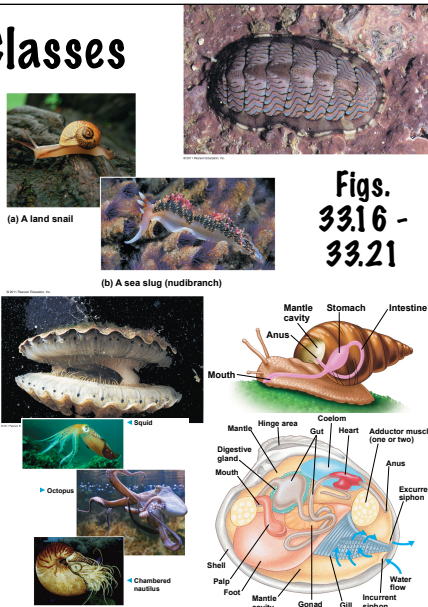


Fig. 33.16

1

Phylum Mollusca Classes

- * Class Polyplacophora - oval-shaped marine animals encased in an armor of eight dorsal plates
- * Class Gastropoda - snails (shells), slugs (lack shell or very small shell)
- * Both marine and freshwater
- * Torsion - anus and mantle above head
- * Class Bivalvia - clams, oysters, mussels, and scallops (shell divided in two halves)
- * Have gills used for feeding as well as gas exchange
- * Class Cephalopoda - squids, octopuses
- * Beak-like jaws surrounded by tentacles of modified foot



Figs. 33.16 - 33.21

2

Molluscs: Silent Extinction

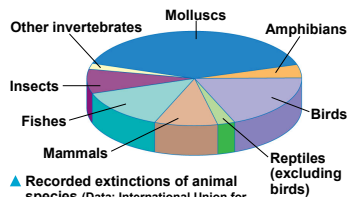
- * Group with the largest number of recent extinctions
- * Most threatened groups are freshwater bivalves and terrestrial gastropods
- * Threatened by habitat loss, pollution, and non-native species



▲ An endangered Pacific island land snail, *Partula suturalis*



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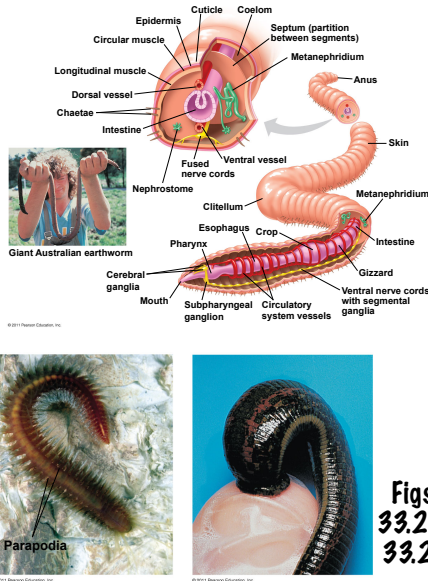
▲ Recorded extinctions of animal species (Data: International Union for Conservation of Nature, 2008)

Fig. 33.22

3

Phylum Annelida

- * Segmented worms (bodies composed of fused rings)
- * Class Oligochaeta - contain chaetae (bristles made of chitin)
- * Earthworms eat their way through soil extracting nutrients as the soil moves through the canal
- * Class Polychaeta - possess paddlelike parapodia that function as gills and aid in locomotion
- * Class Hirudinea - blood-sucking parasites (ex. leaches)

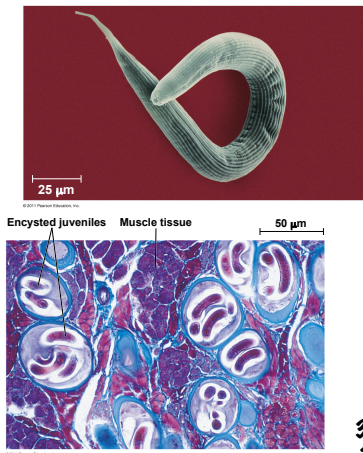


Figs.
33.23-
33.25

4

Phylum Nematoda

- * Nonsegmented
- * Among the most widespread of animals
- * Found in aquatic habitats, in the soil, in tissues of plants, and in the body fluids and tissues of animals
- * Bodies are covered in a tough cuticle
- * Parasites of plants and animals

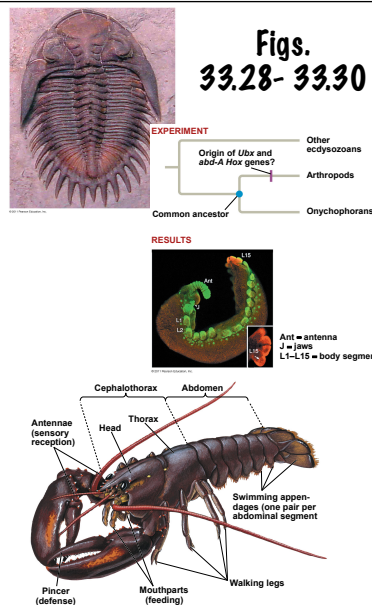


Figs.
33.26-
33.27

5

Phylum Arthropoda

- * Two out of every three known species of animals are arthropods
- * Early arthropods (trilobites) show variation from segment to segment
- * Segmented coelomates that have an exoskeleton made of chitin and jointed appendages
- * As they evolved the segments fused and the appendages became more specialized
- * Have an open circulatory system
- * Fluid called hemolymph is circulated into the spaces surrounding tissues and organs



Figs.
33.28- 33.30

6

Phylum Arthropodia

* Four Subphyla

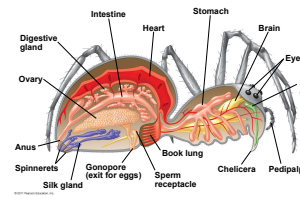
- * Cheliceriforms - clawlike feeding appendages (chelicerae) (ex. spiders, ticks, mites, scorpions, and horseshoe crabs)

- * Arachnids have an abdomen and a cephalothorax with six pairs of appendages

- * Myriapoda - millipedes (two pairs of legs per segment) and centipedes (one pair of legs per segment)



Figs.
33.31
-33.34



▲ Scorpion



▲ Dust mite



(a) Millipede



(b) Centipede



▲ Web-building spider

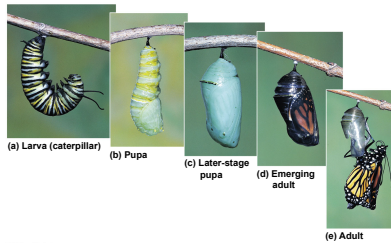
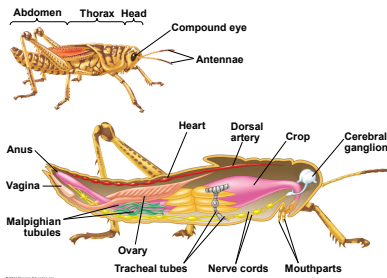
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Phylum Arthropodia

* Four Subphyla

* Hexapoda - insects

- * More species-rich than all other forms of life combined
- * Flight key to evolutionary success
- * Many undergo metamorphosis
 - * Incomplete metamorphosis - the young (nymphs) look like adults but go through a series of molts
 - * Complete metamorphosis - larval stages specialized for eating and entirely different from adult stage (maggot, grub, or caterpillar)



Figs. 33.35-33.37

8

Phylum Arthropodia

* Four Subphyla

- * Crustacea - have biramous, branched, appendages that are extensively specialized for feeding and locomotion
- * Decapods are large crustaceans (lobsters, crabs, crayfish, and shrimp)
- * Planktonic crustaceans include many species of copepods (may be the most numerous of all animals)
- * Barnacles - sessile crustaceans whose cuticle is hardened into a shell



(a) Ghost crab



(b) Krill



(c) Barnacles

Fig. 33.39

9

Phylum Echinodermata



- * Share characteristics of deuterostomes with chordates (even though they are invertebrates)

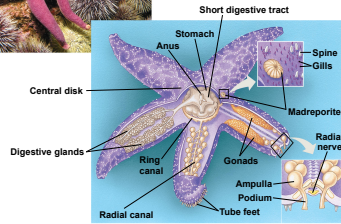
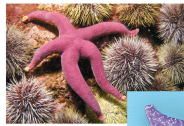


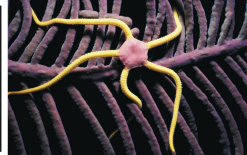
Fig. 33.40

- * Radial cleavage
- * Development of the coelom from the archenteron
- * Formation of the mouth at the end of the embryo opposite the blastopore
- * Most echinoderms are slow-moving or sessile marine animals
- * Have a thin, bumpy or spiny skin that covers an endoskeleton of hard calcareous plates
- * Have a water vascular system which is a network of branching hydraulic canals into tube feet that function in locomotion, feeding, and gas exchange

10

Phylum Echinodermata

- * Radial symmetry of many echinoderms evolved from bilateral ancestors
- * Sea stars (Class Asteroidea) - undersurfaces of arms have tube feet
- * Brittle stars (Class Ophiuroidea)
- * Sea urchins and sand dollars (Class Echinoidea) - have no arms, but they have five rows of tube feet
- * Feather stars (Class Crinoidea)
- * Sea cucumbers (Class Holothuroidea) - endoskeleton is reduced
- * Sea daisies (Class Concentricycloidea)



Figs. 33.41-33.45

11

Vertebrates

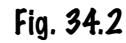
- * 540 million years ago the first vertebrates began to evolve
- * One lineage of vertebrates colonized land 365 million years ago
- * 52,000 species of vertebrates which include the largest organisms ever to live on Earth



Fig. 34.1

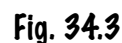
12

- * **Vertebrates are a subphylum of the phylum Chordata**
- * **Have a notochord and a dorsal, hollow nerve cord**
- * **Bilaterian animals that belong to a clade known as Deuterostomia**
- * **Two groups of invertebrate deuterostomes are the urochordates and cephalochordates are more closely related to vertebrates than to invertebrates**



Chrodates

- * All have a set of shared derived characters (some only express them during embryonic development)
- * Notochord - longitudinal, flexible rod located between the digestive tube and the nerve cord
- * Provides skeletal support throughout most of the length of a chordate
- * In most vertebrates a complex, jointed skeleton develops
- * Nerve cord - develops from a plate of ectoderm that rolls into a tube dorsal to the notochord
- * Develops into the central nervous system



Chordates

- * Most have grooves in the pharynx called pharyngeal clefts that develop into slits that open to the outside of the body
- * Function as suspension-feeding structures
- * Modified for gas exchange in aquatic vertebrates
- * Develop into parts of the ear, head, and neck in terrestrial vertebrates
- * Chordates have a tail extending posterior to the anus (many lose it during embryonic development)

15

- * Subphylum Urochordata (tunicates) - deepest-branching lineage of chordates and are marine suspension feeders (sea squirts)

- * Most closely resemble chordates during larval stage

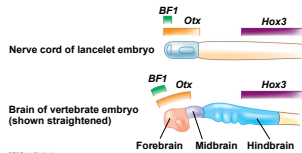
- * Draws water through a siphon to filter out food particles

- * Subphylum Cephalochordata (lancelets) - named for blade-like shape

- * Marine suspension feeders

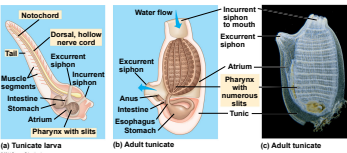
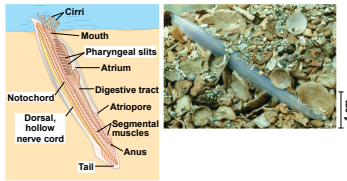
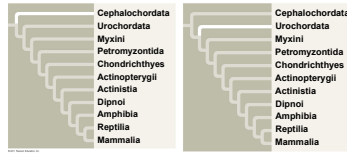
- * Retain chordate body plan as adults

- * Gene expression in lancelets holds clues for the evolution of the vertebrate form



Chordata

Figs.
34.4-34.6



16

Craniates

- * Chordates with a head
- * Evolved 530 million years ago (Cambrian Explosion)
- * Head allows a new way of feeding and active predation
- * Share common characteristics: skull, brain, eyes, and other sensory organs
- * Neural crest - collection of cells that appears near the dorsal margins of the closing neural tube in an embryo
- * Cells give rise to a variety of structures including some bones and cartilage in the skull
- * Class Myxini (hagfish) - least derived lineage that still survives
- * Jawless marine animals that have a cartilaginous skull and an axial rod of cartilage derived from the notochord that lack vertebrae

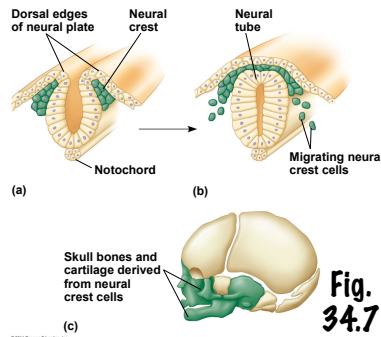


Fig.
34.7



Fig.
34.9

17

Vertebrates

- * Craniates that evolved a backbone
- * Shared characteristics: vertebrae enclosing a spinal cord, an elaborate skull, and fin rays (in aquatic forms)
- * Class Cephalaspidomorphi (Lampreys)
- * Oldest living lineage of vertebrates
- * Have cartilaginous segments surrounding the notochord and arching partly over the nerve cord
- * Conodonts and Ostracoderms are ancient vertebrates where mineralized skeletons first appeared

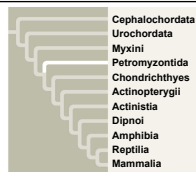
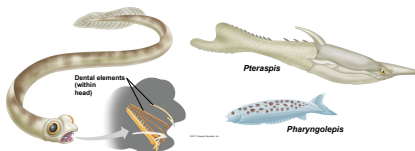
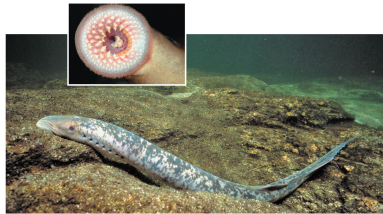


Fig.
34.10-
34.12



18