

Chordates

Subphylum Vertebrata (Craniata)

Evolution shaped by adaptations of:

Living endoskeleton

- Grows with body
- Cartilage, then bone

Pharynx

- Increased respiratory function supported high metabolic rates

Nervous system

- Evolution of new cell types (neural crest cells) promoted development of head and sensory organs

Paired appendages

- Pectoral and pelvic girdles and limbs
- Originated for balance in swimming

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Chordates

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Vertebrate Ancestry

- Garstang's hypothesis – tunicate larvae began to reproduce (paedomorphosis)

See Fig. 15.10 in text

- Cephalochordates (lancelets) once thought to be vertebrate ancestor – now sister group?

- Lamprey larva (ammocoete) as a model
 - Muscular pump to filter feed
 - Brain and sense organs
 - Gill filaments with lamellae

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Earliest vertebrates (Ostracoderms)

See Fig. 15.11 in text

- Jawless fishes (Agnatha)
- Late Cambrian to late Devonian
- No paired fins, but evolved later
- Head and body covered with bony plates
- Basic vertebrate head pattern evolved in this group

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Extinct jawed vertebrates (Gnathostomata)

- Presence of jaws and paired fins See Fig. 15.14 in text

Placoderms

- Bony anterior shield and tooth plates
- Many bottom feeders, but some large carnivores

Acanthodians

- Most small, weakly armored
- Had gill cover (operculum)
- Believed to give rise to modern bony fishes

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Evolution of Jaws

See Fig. 15.13 in text

Jaws = modified cartilaginous gill arches

Evidence:

- jaws and gill arches have upper and lower bars with hinge
- both arose from neural crest cells
- jaw muscles homologous with original gill support muscles

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Living fishes

See Figs. 16.1 and 16.2 in text

- Constitute half of all vertebrate species
- Found in all aquatic habitats
- Efficient respiration with gills
- Numerous sensory innovations
- Paired fins are precursors to tetrapod limbs

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Subphylum Vertebrata (Craniata)

Living Agnathans (jawless fishes)

Hagfish

See Fig. 16.3 in text

- No jaws, scales, or paired fins
- Marine scavengers with rasping plates
- Slime glands along body
- Good sense of smell and touch

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Living Agnathans (jawless fishes)

Lamprey

See Figs. 16.4 and 16.5 in text

- No jaws, scales, or paired fins
- Many parasitic, use oral disc with teeth, rasping tongue
- Long larval stage in freshwater streams
- Marine species are anadromous
- Decimated Great Lakes fisheries

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