

Class Myxini Order Myxiniformes Family Myxinidae (hagfishes)

- Lacks jaws
- Mouth not disk-like
- barbels present
- Unpaired fins as continuous fin-fold
- Branchial skeleton not well developed
- Eyes degenerate
- 70-200 slime glands
- Isoosmotic, simple kidneys, stenohaline, marine
- Four rudimentary hearts
- No true stomach
- Unpaired gonads



Class Myxini Order Myxiniformes Family Myxinidae (hagfishes)

- Knot-tying behavior
- Scavengers
- Rely heavily on cutaneous respiration
- Global, deep sea distribution
- Commercial interest – eelskin



Class Petromyzontida Order Petromyzontiiformes Family Petromyzontidae (Northern Lampreys)

- 8 genera, 34 species
- Dorsal fins continuous in adults
- Oral disc
- 7 pairs of gill openings
- Single nostril
- Pineal body opening
- No bone
- No scales
- No paired fins
- No jaws

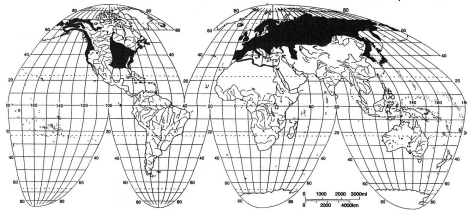


Class Petromyzontida Order Petromyzontiformes Family Petromyzontidae
(Northern Lampreys)

- Anadromous and freshwater
 - Non-parasitic forms often freshwater
 - Parasitic forms often anadromous
- Life history



Petromyzontidae



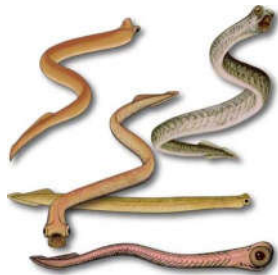
Class Petromyzontida Order Petromyzontiformes Family Petromyzontidae
(Northern Lampreys)

- Ammocoete
- Parasitic forms:
- Non-parasitic:



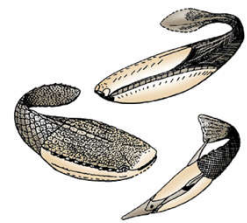
Class Conodonta, Conodonts

- Extinct, late Triassic
- First "teeth"
- Cranium and teeth
- No jaws
- Small, thought to be of pedomorphic origin



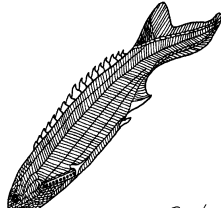
Class Pteraspidiomorphi

- Extinct
- One of the earliest known vertebrates
- No jaws
- Dermal skeleton
- Little known, an extinct monophyletic lineage.



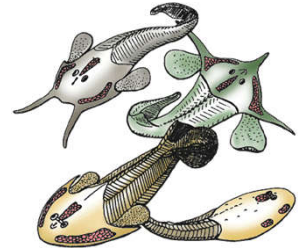
Class Anapsid

- Extinct, Silurian period
- 6-15 external branchial openings
- Reduced or lost anal fin
- Short paired fins
- Series of large dorsal scutes
- Hypocercal tail
- No jaws
- No massive head shield



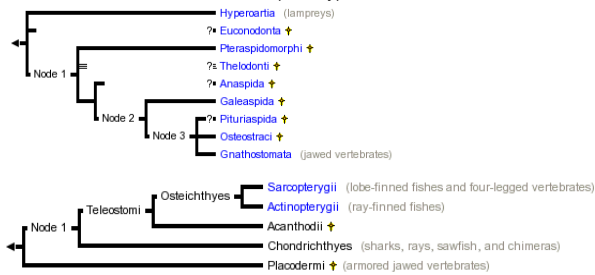
Class Cephalaspidomorphi, osteostraci

- Extinct, early Silurian
- No jaws
- 10 pairs external gill openings
- Dorsal eyes
- Pectoral fins (homology to gnathostome pectoral fins not known)
- Dorsal scutes reduced or lost



Gnathostomata

- Monophyletic (including tetrapods)
 - Jaws derived from modified gill arches
 - Three semicircular canals in inner ear
 - Paired fins (usually)
 - Gill openings through slits (in fishes)
 - Dermal exoskeleton absent (usually)



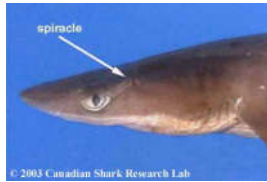
Class Placodermi

- Extinct
- Jaws, no teeth
- Head and trunk shield
- Braincase without nasal capsules
- Jaw muscle not external to mandibular arch
- Head and shoulder with dermal plates



Class Chondrichthyes – cartilagenous fishes

- Dermal skeleton
- Endoskeleton mostly cartilage
- Jaws
 - Upper jaw –
 - Lower jaw –
 - teeth
- No lung or swim bladder
- Urea retention
- Spiral valve
- Pectoral fins with keratin based spine
- Paired nares
- Spiracle
- Reproduction
 - Internal fertilization –
 - gestation period
 - No parental care
 - Large egg cases, no larval stage



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Class Chondrichthyes, subclass Elasmobranchii, Order Lamniformes, mackerel sharks

- Seven families, 10 genera, 15 species
- 2 dorsal fins
- Five gill slits
- No nictitating membrane
- No barbels
- Spracle behind eye
- Examples



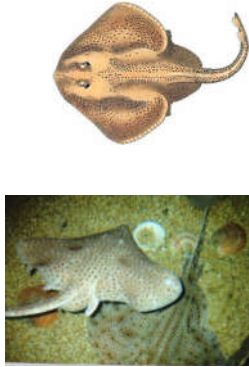
Class Chondrichthyes, subclass Elasmobranchii, Order Carchariniiformes, ground sharks

- Eight families, 49 genera, 270+ species
- 2 dorsal fins, no spines
- Five gill slits, last 1-3 over pectoral fin
- No gill rakers
- Nictitating membrane
- May have barbels or labial furrows
- Spracle usually absent
- Mouth extends beyond eye
- Oviparous, ovoviviparous or viviparous
- Examples



Class Chondrichthyes, subclass Elasmobranchii, Order Rajiformes, skates

- Three families, >25 genera, >275 species
- Snout pointed
- Pectoral disc usually rhomboid
- Thorns along midline of back
- Caudal fin moderately well developed, without barb, may have two dorsal fins
- Some electrogenic organs in tails
- Males with enlarged spines near eyes
- Oviparous



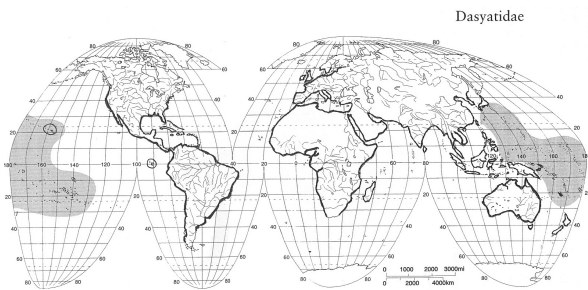
Class Chondrichthyes, subclass Elasmobranchii, Order Myliobatiformes, stingrays

- 33 genera, 178 species
- 4-5 pairs of gill slits
- Caudal fin and single dorsal fin reduced or absent
- Sting from modified dermal denticle sheathed in venomous tissue
- Pectoral disc rounded, oval or triangular
- No thorns along midline
- Ovoviviparous



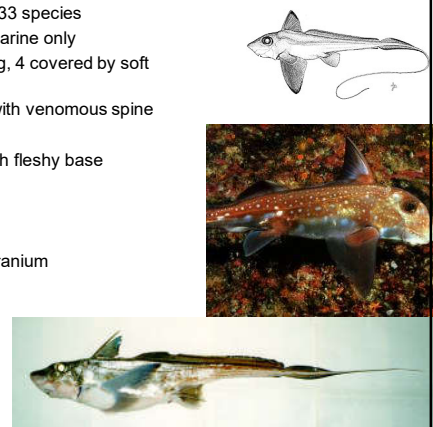
Class Chondrichthyes, subclass Elasmobranchii, Order Myliobatiformes, stingrays

- Taxonomy recently revised, skates and rays were previously grouped together
- Freshwater or marine



Class Chondrichthyes, subclass Holocephali, Family Chimeridae

- 3 families, 6 genera, 33 species
- Global distribution, marine only
- 1 external gill opening, 4 covered by soft operculum
- two dorsal fins, first with venomous spine
- teeth
- large pectoral fins with fleshy base
- elongate tail
- Oviparous,
- Upper jaw fused to cranium



Class Acanthodi – “spiny sharks”

- Extinct, Silurian, Devonian
- Earliest jawed fishes in the fossil record
- Evolution:
- Probably active mid-water and surface feeders
- Freshwater and Marine

