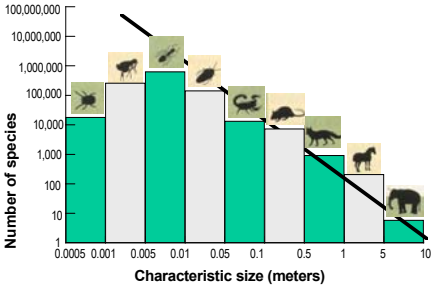
Marine Animals

Invertebrates



Robert May in SCIENTIFIC AMERICAN, October 1992.

- Invertebrates are the heterotrophs or animals that lack the vertebral column.
- **Zooplanktons,** the microscopic to submicroscopic and unicellular marine Protozoans like calcareus foraminferans and siliceous radiolarians, are the ocean's primary consumers.
- **Simple Marine Invertebrates:**

(a) PROTOZOA (unicellular, often parasitic: foraminifera, radiolaria, amoebas), **(b) PORIFERA** (porous, attached, most primitive of the animals: sponges) and **(c) CNIDARIA or COELENTERATA** (carnivorous and mostly marine stinging animals, e.g., jellyfish, sea anemones, corals).

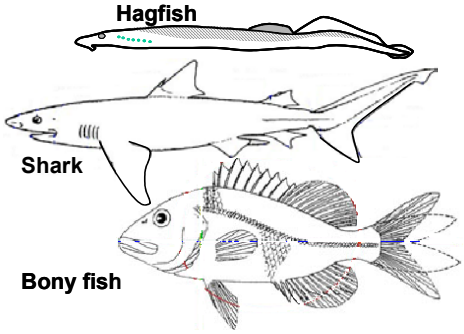
Worms: (a) PLATYHELMINTHES (flatworms, flukes, tapeworms), **(b) NEMATODA** (roundworm, with a flow-through digestive tract: mostly free-living or nonparasitic microscopic burrowers) and **(c) ANNELIDA** (ringworms).

Advanced Invertebrates: (a) MOLLUSCA (soft-bodied and hard-shelled mollusks like clams, snails and squids), **(b) ANTHROPODA** (footed animals like lobsters, shrimp, crab, krill) and **(c) CORDATA** (i.e., with spinal chord): Amphioxus, a transitional species.

Marine Vertebrates

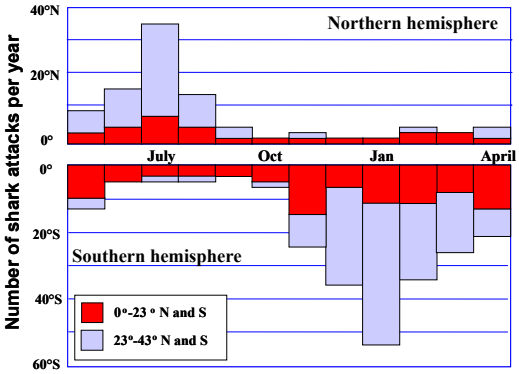
Vertebrates have vertebral column and are grouped into the following seven classes:

- **Fish:**
  - Class **Agnatha** or the "Jawless" Fish are primitive vertebrates with cartilaginous skeleton, no jaws and no scales and evolved ~500 Ma ago (Lamprey and hagfish are their living examples).



  - Class **Chondrichthyes** or the "Boneless" Fish, like sharks (largest living vertebrates after whales), skates, rays etc., with cartilaginous skeletons (but no true bones), jaws and teeth, paired fins, evolved 350-400 Ma (sharks) to ~180 Ma (rays) ago.
  - Class **Osteichthyes** are the bony fishes with cycloid scales and covered grill openings (e.g., tuna, halibut, sea horse) that first evolved ~300 Ma ago but radiated ~100 Ma ago.
- **Class Amphibia:** Frogs, toads, salamanders. Asian mud flat frogs are the only amphibians accustomed to seawater. First appeared 350-400 Ma ago. These cold blooded vertebrates use grills in the early stages but lungs as adults.
- **Class Reptilia:** Snakes, turtles, lizards and alligators, the first two of which are the major marine groups, evolved from the amphibians ~300 Ma ago.
- **Class Aves:** Birds; mainly live on and in the ocean but must return to land to breed. Tubenoses (e.g., albatross), pelicans, gulls and penguins are common marine birds. Evolved ~135 Ma ago.
- **Class Mammalia:** Warm blooded; hair, mammary glands; bear live young. Marine representatives found in the orders Sirenia (sea cows), Cetacea (whales) and Carnivora (sea otters, seals, walruses).

Shark attacks



These incidences of shark attacks suggest that the sharks prefer temperate latitudes.