

CHARACTERISTICS OF VERTEBRATE GROUPS

Dr Poonam Kumari
Professor
Dept of Zoology
Maharaja College, Ara
PG SEMESTER 1{Paper 2}

Vertebrates are members of the larger phylum Chordata, and show all of the major chordate features at some point in their life cycles: notochord, dorsal hollow nerve cord, pharyngeal slits, and a post-anal tail. But what makes a vertebrate a vertebrate, is the presence of the vertebral column, or backbone, which surrounds and protects the main nerve cord. Vertebrates belong to the phylum chordate. Vertebrates are the most complex and successful life forms on earth.

During the embryonic development of all chordates, they pass through a stage called the pharyngula, having these features:

1. A dorsal, tubular nerve cord, running from anterior to posterior. At its anterior end, it becomes enlarged to form the brain.
2. A flexible, rodlike notochord that runs dorsal to the digestive tract and provides internal support. In vertebrate chordates, it is replaced by a vertebral column or backbone long before maturity.
3. Pairs of gill pouches. These lateral outpocketings of the pharynx are matched on the exterior by paired grooves. In aquatic chordates, one or more pairs of gill pouches break through to the exterior grooves, forming gill slits. These provide an exit for water taken in through the mouth and passed over the gills.
4. A tail that extends behind the anus.

Five classes of vertebrates are recognized:

1. **Fishes**

2. **Amphibians**
3. **Reptiles**
4. **Birds**
5. **Mammals**

1. Class Pisces

- a) Class Agnatha: These are jawless, fish-like animals with poorly developed fins. Lampreys and hagfishes are the only jawless vertebrates to survive today. They both have a round mouth and for this reason are often referred to as cyclostomes. They are the most primitive of the vertebrates. Besides lacking jaws, their notochord persists for life, never being completely replaced by a backbone even in the lampreys. They have no scales.
 - b) Class Chondrichthyes: This comprises 800 living species of sharks, rays, skates and rat fishes, all of which have a cartilaginous skeleton, true jaws, and a number of other distinctive characters. They got their names from the fact that their skeletons are made of cartilage, not bone. With their gills exposed to sea water, all marine fishes are faced with the problem of conserving body water in a strongly hypertonic environment. Sea water is about 3.5% salt, over 3 times that of vertebrate blood. The cartilaginous fishes solve the problem by maintaining such a high concentration of urea in their blood (2.5% — far higher than the 0.02% of other vertebrates).
 - c) Class Osteichthyes: includes some 20,000 species of true fishes, with a bony skeleton, a sutured skull, teeth fused to the jaws, lobed or rayed fins, and a number of other distinguishing features. Bony Fishes (Osteichthyes). They have paired fins. As their name indicates, the skeleton in this group is made of bone. The group is subdivided into the ray-finned fishes (Actinopterygii) and lobe-finned fishes (Sarcopterygii).
- ## 2. Class Amphibia: This includes some 3,500 living species of frogs, toads, salamanders, newts, and caecilians, all of which have four limbs (making them tetrapods), a moist glandular skin, external

fertilization, and a complex life cycle. Some have poison glands. Amphibians are vertebrates that spend part of their lives under water (breathing with gills) and the remainder on land (breathing with lungs). Amphibians are cold-blooded; their body temperature depends on the temperature of their environment. All amphibians have moist skin (their skin must be moist to absorb oxygen, even though they breathe with their lungs). Most amphibians lay shell-less, jelly-covered eggs, usually in the water. There are 3 groups (orders) of living amphibians: frogs and toads (Anurans); newts and salamanders (Urodeles); caecilians (the worm-like Gymnophiones).

3. Class Reptilia: These are four-legged, tailed animals, with dermal scales, internal fertilization and direct development. Living reptiles include about 6,200 species of crocodiles, turtles, lizards, snakes, and tuataras. Important extinct groups of reptiles include the dinosaurs, hadrosaurs, ichthyosaurs, pterosaurs and plesiosaurs. Reptiles (meaning "to creep") are a group of animals that have (or modified scales), they breathe through lungs and usually lay eggs. They are cold-blooded vertebrates. They all have scales (or plates, in the case of turtles) that prevent them from losing moisture through their skin and protects against injury. Scales are made up of keratin, the same material found in fingernails. Most lay eggs. There are four main groups of reptiles: turtles and tortoises; lizards and snakes; crocodiles and alligators; and lastly tuatara.
4. Class Aves: the birds: Birds are animals that have wings, feathers, a beak, strong hollow bones and powerful flight muscles. They are warm-blooded (or homoiothermic) tetrapods whose forelimbs are specialized for flight (although some species are secondarily flightless or even flightless). Birds have a characteristic covering of feathers and reproduce by laying eggs. Not all flying animals are birds; and not all birds can fly. The ability to fly has developed independently many times throughout the history of the Earth. Bats (flying mammals), pterosaurs (flying reptiles from the time of the

dinosaurs), and flying insects are not birds. The fastest running bird is the ostrich, but it cannot fly. The ostrich is also the fastest two-legged runner of all the animals on Earth. The ostrich is the largest bird. Bird is quite varied; most can fly, some can run very well, some swim, and some do combinations of these. They all have feathers. All birds hatch from eggs, and most birds build nests for the eggs. Some birds deposit their eggs in other birds' nests (like the cowbird). Bird bones are mostly hollow, thus very light (yet strong). Flightless birds include kiwi, ostrich and emu. The only bird that can fly backwards is the humming bird.

5. Class Mammalia: This includes more than 4,000 species of homoiothermic tetrapods, with epidermal hair and female mammary glands for suckling the young. All give birth to young, although a very few, primitive species reproduce by laying eggs.

Characteristics

- They possess mammary glands – produce milk to feed young
- They have sweat glands – only mammals perspire (in order to maintain body temperature)
- They are warm-blooded/homoiothermic (use food energy to maintain certain temperature)
- They have two pairs of limbs
- All have hair at some time in their life, and most have an outer hair (or fur) covering, though some are practically hairless (whale, elephant).
- Breathing is by lungs, diaphragm assists with this (mammals are the only animal that have diaphragm)
- They have well developed brains.
- As with most animal groups, there are more herbivores (plant-eaters) than there are carnivores (meat-eaters).
- Vertebrates are highly cephalized and have well developed organs. They have endoskeleton and a closed circulatory system. And they have the ability to regulate their body temperature.

- Of the five class of vertebrates birds and mammals are endothermic in nature and the others like fish, amphibians, and reptiles are ectothermic in nature.
- They have bony endoskeleton which consists of cranium, limb girdles, visceral arches and two pairs of appendages.
- Muscles attached to the endoskeleton helps in locomotion and they have ventral hearts with 2 to 4 chambers.
- Have a large digestive system with liver, digestive glands and pancreas. Also have well developed body cavity.
- The bloods of the vertebrates contains red blood and white blood corpuscles. They have paired kidneys.
- The general body plan of the vertebrates consists of head, trunk, appendages and post anal tail.