

PRACTICAL MANUAL:
Animal Diversity: Chordates
ZOO513P



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Practical No. 1

Study of Hemichordates

Learning outcomes: Students will be able to classify hemichordates and recognize their habitat, diversity of food, adaptation for protection and reproduction on this earth.

Hemichordates are marine animals. These animals are also called as Acorn Worms. They were initially grouped under [Phylum Chordata](#). But, research has proven that none of these [organisms](#) does not have a post-anal tail or even the notochord, which is a distinguishing feature of chordates. Hence, these animals have been given a separate phylum, called the Hemichordata.

They are mostly burrowers in sand or mud, or live in algae or beneath stones. Their long bodies are divided into an anterior proboscis, a short collar and a long trunk. They vary greatly in size, ranging from a few millimetres to almost one and a half meters. *Balanoglossus* a hemichordate species can be of 1.5 meters in length. These species feed on small organic particles. They can be either filter feeders or substrate eaters.

Classification of Phylum Hemichordata

Phylum Hemichordata is again divided into two classes:

- **Enteropneusta:** This class includes acorn worms. They have a vermiform body and are found on sandy beaches near seas in warm climates.
- **Pterobranchia:** They have a tube-dwelling and live in deep sea waters. They are bottom dwellers who attach to other organisms for their survival.

Classification of *Balanoglossus*

Subphylum	Hemichordata
Class	Enteropneusta
Genus	<i>Balanoglossus</i> (Acorn worm)
	<i>Glossobalanus</i> (Tongue worm)

Habit and habitat: It is a marine animal, adapted for burrowing life in the sandy bottom. The animal lives inside the V-tubes (tubicolous). Most of them live in shallow water but a few go deeper upto approximately 15,000 feet. They burrow slowly by soft proboscis.

Acorn worms are solitary, wormlike, bilaterally symmetrical animals, often brilliantly coloured. They are known as acorn worms because of the appearance of the proboscis and collar.

Characteristic Features of Acorn worm

Proboscis is short, conical projection at the worm's anterior end. A ring like collar is posterior to proboscis and an elongated trunk is third division of the body.

Mouth is located ventrally between proboscis and collar. A variable number of pharyngeal slits are positioned laterally on the trunk.

There is no central nervous system: nerve tissue is concentrated in the collar, which is linked with a [nervous system](#) in the epidermis, or outer covering. The [circulatory system](#) usually includes a contractile heart like vesicle, blood vessels, and sinuses. The pharynx may be perforated by numerous paired gill slits, or they may be absent.

Acorn worms are suspension feeders, capturing minute animals as they drift by in the water organisms on their proboscis. Many hemichordates have a larval stage in their life cycle; the larvae, called tornariae, swim using microscopic hairs called cilia.

Sexes are separate or united. Reproduction is mostly sexual reproduction. Fertilization is external. Development is mostly indirect. But a few species exhibit direct development.

The hemichordates have evolutionary links with both chordates and echinoderms (e.g., starfish, sea urchins); however, precise relationships are still being actively studied.

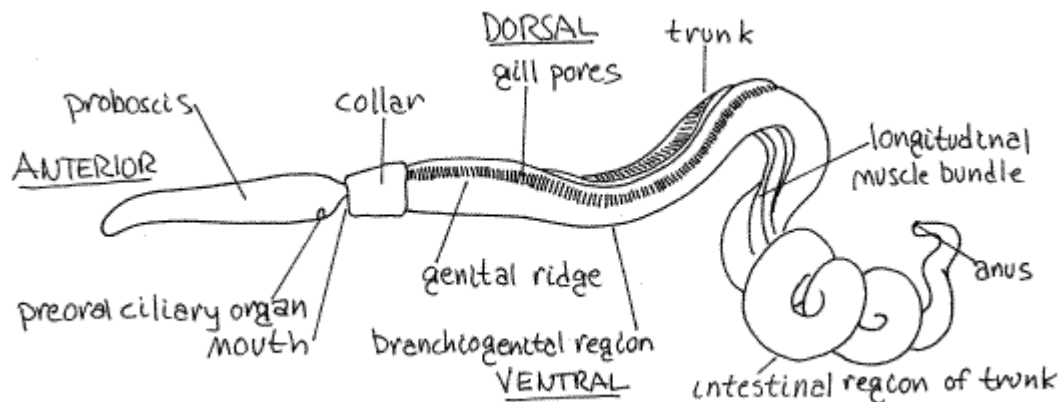


Fig: Acorn Worm (Blanoglossus)

Practical No.2

Study of Urochordates

Learning outcome: Students will understand the classification of urochordates and will learn their habitat, food availability, adaptation for protection and reproduction.

Urochordata come under the **classification of Cephalochordates**. They are a subphylum of the **Phylum Chordates** and consist only of marine filter-feeding invertebrates that are found in seawater. They feed on planktonic particles

The Urochordata, sometimes known as the Tunicates, are commonly known as "sea squirts." The body of an adult tunicate is quite simple, being essentially a sack with two siphons through which water enters and exits. Water is filtered inside the sack-shaped body. However, many tunicates have a larva that is free-swimming and exhibits all [chordate characteristics](#): it has a notochord, a dorsal nerve cord, pharyngeal slits, and a post-anal tail. This "tadpole larva" will swim for some time; it eventually attaches to a hard substrate, it loses its tail and ability to move, and its nervous system largely disintegrates.

Classification of Aseidia

Phylum	Chordate
Sub phylum	Urochordata
Class	Ascidiacea
Order	Enterogona
Genus	<i>Aseidia</i>

Distribution

Tunicates are distributed in ocean waters from the polar regions to the tropics. Free-swimming tunicates are found throughout the oceans as [plankton](#), while sessile forms grow mainly on solid surfaces such as wharf piles, ship hulls, rocks, and the shells of various sea creatures.

External feature

A solitary tunicate has two major openings, or siphons, on the surface away from the area of attachment: a branchial aperture, through which water enters the body, and an atrial aperture, through which water, wastes, and gametes leave. Water circulation is produced by ciliary activity on the animal's pharynx. The animal is covered with a thick tunic, which consists of some cells, blood vessels, and a secretion of a

variety of proteins and carbohydrates, including [cellulose](#), which, although [abundant](#) in plants, is unusual in animals.

Nervous system

When the larva metamorphoses into an adult, the original [nervous system](#) and sensory organs [degenerate](#), leaving a single ganglion between the oral and atrial openings. Nerves grow to the various organs of the body from this ganglion.

Digestion

In ascidians and thaliaceans the beating action of pharyngeal [cilia](#) creates a water current. As the water is driven from the branchial sac into the atrial cavity, a sheet of mucus, secreted by the endostyle, traps a variety of very small organisms suspended in the water current, especially small plantlike protists (phytoplankton). The mucus is rolled into a cord and then conveyed to the intestine, where it is digested and absorbed. A stomach and glands may be present. The intestine ends as an [anus](#) in the [atrium](#) below the atrial aperture. Wastes are ejected through this aperture in a stream of water. An internal mucous sheet, secreted by the endostyle, allows ascidians to utilize a variety of organisms, especially small plants (phytoplankton) as their food source. Some trap small animals.

Excretion

Metabolic wastes, such as the breakdown products of protein, are excreted at various parts of the body, including the surfaces of the gills and the intestine, and sometimes by a discrete [kidney](#). In many cases wastes are stored as solid deposits rather than being excreted from the body as they are produced.

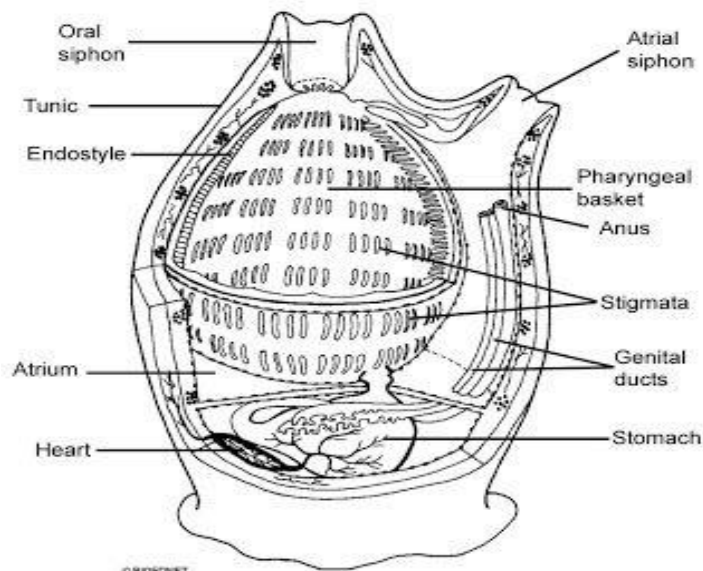


Fig: Tunicates

Practical No. 3

Study of Cephalochordates

Learning outcome: Students will be able to classify the cephalochordates and recognize their habitat, food diversity, adaptation for protection and reproduction.

Cephalochordate, also called **Acrania**, belonging to the subphylum Cephalochordata of the phylum [Chordata](#). The lancelets are also called cephalochordates (Greek: *kephale*, “head”) because the notochord extends from near the tip of the tail to well into the [anterior](#) of the body. Because they do not have the braincase, or cranium, of a [vertebrate](#), lancelets are often called acraniates. Cephalochordates are small, fishlike marine invertebrates, they probably are the closest living relatives of the vertebrates. Cephalochordates and vertebrates have a [hollow](#), dorsal nerve cord, pharyngeal gill slits, and a [notochord](#). In most vertebrates, the embryonic notochord is eventually replaced by bony vertebrae or cartilaginous tissue; among cephalochordates, the notochord is retained into adulthood and is never replaced by vertebrae.

There are two Genera are: *Branchiostoma* formerly called *Amphioxus*, the other genus is *Asymmetron*.

Classification of *Amphioxus Lanceolatus*

Phylum	Chordate
Sub-pylum	Cephalochordate
Class	Leptocardii
Genus	<i>Amphioxus</i>
Specie	<i>lanceolatus</i>

External features

Lancelets are streamlined animals. A dorsal fin extends along the upper surface of the body and continues as a caudal fin around a tail and as a ventral fin to an atrium on the lower surface. Paired fins are absent. The tip of the body projects slightly above and in front of the mouth, which is surrounded by a funnellike oral hood that bears the cirri. The anus opens well behind the atriopore, on the left side of the ventral fin. The general body surface is covered by a smooth cuticle layer.

Adult lancelets reach a length of about six to seven centimeter (2.5 inches)

The bodies of lancelets, like those of fishes and other vertebrates, are largely made up of serially repeated units (segments) that include blocks of muscles called [metameres](#) which provide more effective body coordination during locomotion.

The cephalochordate [nervous system](#) is simple. The main nerve cord, which is single and [hollow](#) as in all chordates, has a slight swelling at the front that barely qualifies as a brain.

Habit and Habitat

Lancelets are distributed throughout the world along tropical and [temperate](#) coasts. They inhabit soft bottoms ranging from sand to coarse shelly sand or gravel in shallow coastal water. Lancelets lie buried beneath this substrate, often with their mouths protruding above the surface, allowing them to take in water laden with food.

Digestion

Lancelets are suspension feeders that extract small particles suspended in the water. The mouth is covered by an oral hood, the edges of which form the buccal cirri. The cephalochordate commonly is buried in the substrate and positions its mouth above the surface of the sand. During feeding, the cirri form a kind of grid that keeps out large particles. Water is drawn into the mouth by the beating action of cilia on the gills. The [pharynx](#) is a large section of the gut just behind the mouth, extending about two-thirds the length of the body, with many narrow gill slits. The water current enters the pharynx, passes through the gill basket to the [atrium](#), and leaves the body through the atriopore. On the floor of the pharynx, between the left and right series of gill slits, an endostyle secretes a sheet of mucus that moves upward along the gills and traps food particles suspended in the water current. The mucus is rolled up and transported to the intestine, where food is digested and absorbed. There is no distinct stomach.

Gaseous exchange and excretion

The gill is largely a feeding organ, but it also serves for the exchange of gases in respiration. After the water has passed through the gill slits, it reaches the atrium and exits through the atriopore. Excretory products and eggs and sperm also exit the body through this opening.

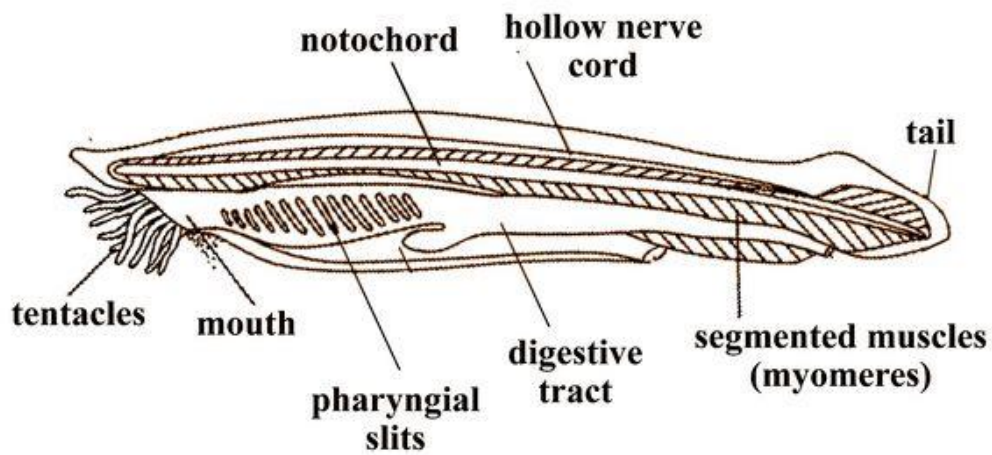
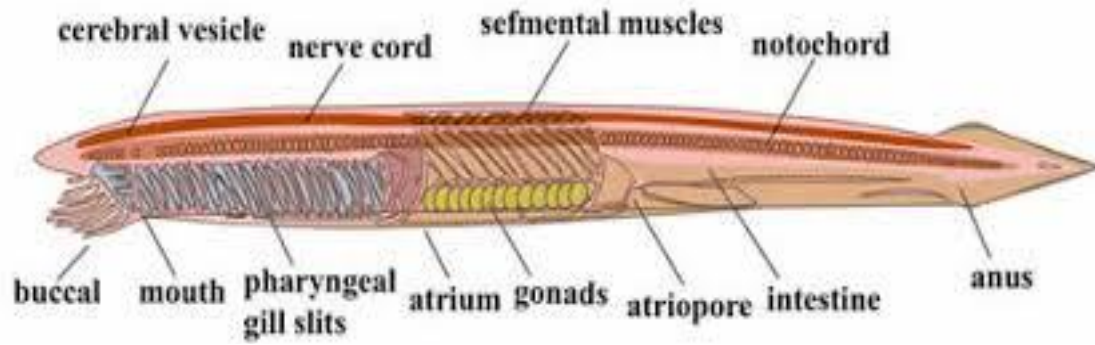


Fig: Amphioxus

Practical No.4

Study of Fishes

Learning outcome: Students will understand the mechanism of classification of fishes and their aquatic habitat, food diversity, adaptation for protection and reproduction in aquatic environment.

Fishes are members of the Chordate subphylum Vertebrata; thus, they have vertebrae that surround their spinal cord and provide the primary axial support. They also have skull that protect the brain. Fishes have been traditionally divided into superclasses based on whether they lack jaws and paired appendages (Agnathas) or possess these structures (Gnathostomes).

“Agnathans”

Class Myxini

Classification of Myxini

Phylum	Chordata
Sub-phylum	Vertebrate
Division	Agnatha
Class	Myxini
Order	Myxinoidea
Genus	Myxini

Hagfishes are members of the class Myxini. Hagfishes are worm like without scales, body differentiated into head, trunk and tail and 60 cm in length.

Hagfishes have mouth with four tentacles. 5 to 15 pairs of pharyngeal slits.

Hagfishes live buried in the sand and mud of marine environment, where they feed on soft-bodied invertebrates and scavenge dead and dying fish. When hagfishes find a suitable fish, they enter the fish through the mouth and eat the components of the body, leaving only a sack of the skin and bones.

“Gnathostomes”

Two major developments in vertebrate evolution were the appearance of jaws and paired appendages. Two classes of gnathostomes still have living members: Cartilaginous fishes (Class Chondrichthyes) and bony fishes (Class Osteichthyes).

➤ Class Osteichthyes

Members of the class Osteichthyes are characterized by having atleast some bone in their skeleton, bony operculum covering the gill opening and swim bladder.

Phylum	Chordata
Sub-phylum	Vertebrate
Division	Gnathostomata
Superclass	Pisces
Class	Osteichthyes
Genus	<i>Labeo</i>
Specie	<i>rohita</i>

Geographical distribution

Labeo rohita is widely distributed in tropical and temperate regions.

Labeo rohita is abundantly found in ponds and rivers. Carps are vegetarian and bottom feeders. They can occasionally feed on animal diet.

Characteristics

Commonly called as carp and Rohu. Body is compressed, fusiform, about 1 metre in length and weigh about 4kg. Body is divided into head, trunk and tail.

Color of the body is bluish on back and silvery white below. Body covered with large overlapping cycloid scales.

Head is depressed. It bears a subterminal fringed-lipped mouth. It also contains paired nostrils and paired eyes. A Pair of barbells arises from upper lip. Lateral line is distinct.

Dorsal, anal, caudal, paired pectoral and anal fin with soft fin rays are present. Caudal fin forked into equal lobes so called as Homocercal tail.

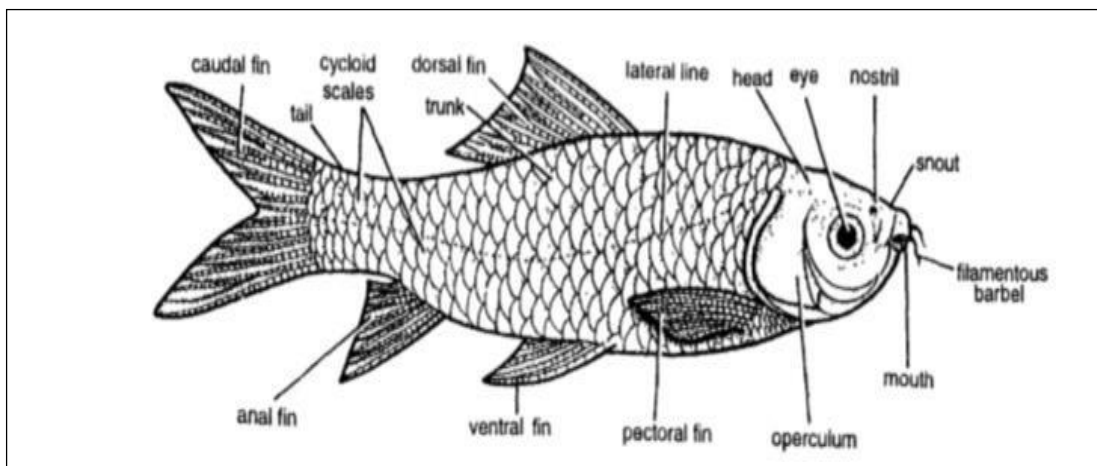


Figure: *Labeo rohita* (rohu)

➤ **Class Chondrichthyes**

Members of the class Chondrichthyes include the sharks, skates and rays. Most of the chondrichthyes are carnivores or scavengers, and most are marine. In addition to their mouthparts and paired appendages, chondichthyes possess epidermal placoid scales and a cartilaginous endoskeleton.

Scoliodon (Dogfishes)

Phylum	Chordata
Sub-phylum	Vertebrate
Division	Gnathostomata
Super-class	Pisces
Class	Chondrichthyes
Genus	<i>Scoliodon</i> (Dog fish)

Scoliodon has wide distribution. Natural home of scoliodon is the sea, but some live in Estuaries and even ascend the river. They are predacious and voracious feeders attacking their prey with powerful jaws. They are active swimmers.

Characteristics

Commonly called as dogfish. Body is spindle shaped, about 60cm long and is regionated into head, trunk and tail.

Head is dorso-ventrally compressed and flattened into snout. It contains ventrally situated slit-like mouth, obliquely situated nostrils and laterally protuberant eyes. A little behind eyes are five pairs of lateral gill-cleft.

Trunk bears paired fins. A pair of anterior pectoral fins and a pair of posterior pelvic fins. Caudal fins bifurcate into unequal lobes and form tail. So termed as Heterocercal tail.

Scoliodon exhibit sexual dimorphism. Males are easily recognized by having a pair of intromittent organs, called as Claspers. Cloaca is found between 2 pelvic fins.

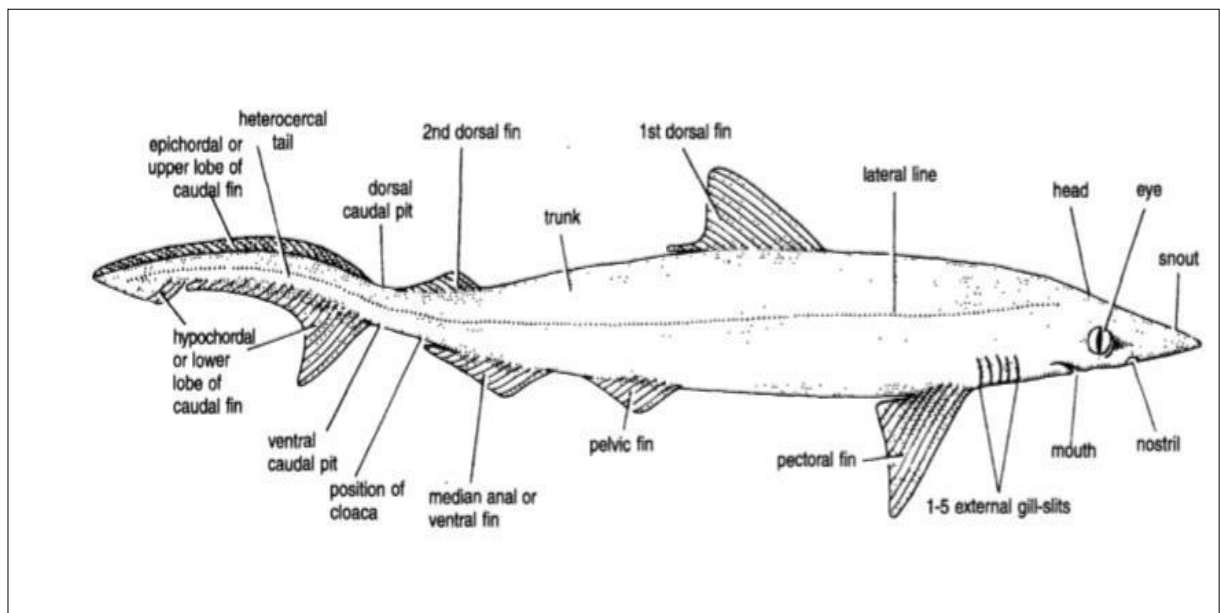


Figure: Scoliodon (Dog fish)

Practical No.5

Study of Amphibians

Learning outcome: Students will gain the ability of classification of amphibians and their aquatic and terrestrial habitat, food, adaptation for protection and reproduction in aquatic environment.

Amphibians occur on all continents except Antarctica, but they are absent from many oceanic islands. Amphibians are tetrapod that applies to all vertebrates other than fishes. Most tetrapods exhibit adaptations for life on land. Modern Amphibians belong to three orders: Caudata, the salamanders; Anura, the frog and toad; and Gymnophiona, the caecilians.

General characteristics are: Skin with mucoid secretions and lacking epidermal scales, feathers or hairs; larvae usually aquatic and undergo metamorphosis to the adult; two atrial chambers in the heart.

Their glands help to keep the skin moist to prevent drying. Chromatophores are specialized cells in the epidermis and dermis of the skin are responsible for skin color and color change.

❖ Order Caudata

Classification of Salamander

Phylum	Chordata
Sub-phylum	Vertebrate
Superclass	Tetrapoda
Class	Amphibia
Order	Caudata
Genus	<i>Salamander</i>

Members of the order Caudata are the salamanders. Salamanders is distributed in Europe, eastern Asia and North America. They possess a tail throughout life and both pairs of legs. Most terrestrial salamanders found under logs, stones, cracks and crevices of old walls.

Salamanders are lizard like. Female is longer than male. Body is divided into Head, trunk and Tail.

Forelimbs and Hind limbs are well.

Head contains mouth, prominent eyes and nostrils. Eyes are provided with movable eyelids. Large parotids glands are present behind the head.

Lungs present, gills are absent in adults.

Tail is without tailfins. Body is spotted all over.

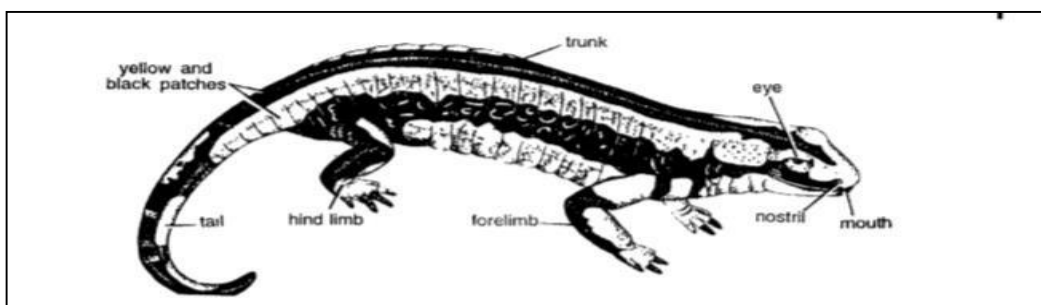


Figure: Salamender

❖ Order Anura

Classification of *Bufo*(Common toad)

Phylum	Chordate
Sub-phylum	vertebrate
Sub-class	Tetrapod
Class	Amphibia
Order	Anura
Genus	<i>Bufo</i>

Distribution

Belong to family Bufonidae and genus *bufo*. *Bufo* has worldwide distribution. They are abundantly found in India, United States. *Bufo* is terrestrial, nocturnal hiding under logs and stones and in burrows in day. They enter in water to breed.

Characteristics

Commonly called as true toad. It differs from frog in having tough, dry an warty skin with more poison glands than mucus glands.

Body is divided into Head and Trunk. Head contains mouth large eyes, nostrils and tympanum.

Behind eyes there is a pair of large parotid glands. Hind limbs contains four claws like digits and thumb pads.

Forelimbs and Hind limbs are short and poorly developed webs.

Eggs are pigmented and laid in gelatinous string. Young toads mature in many years.

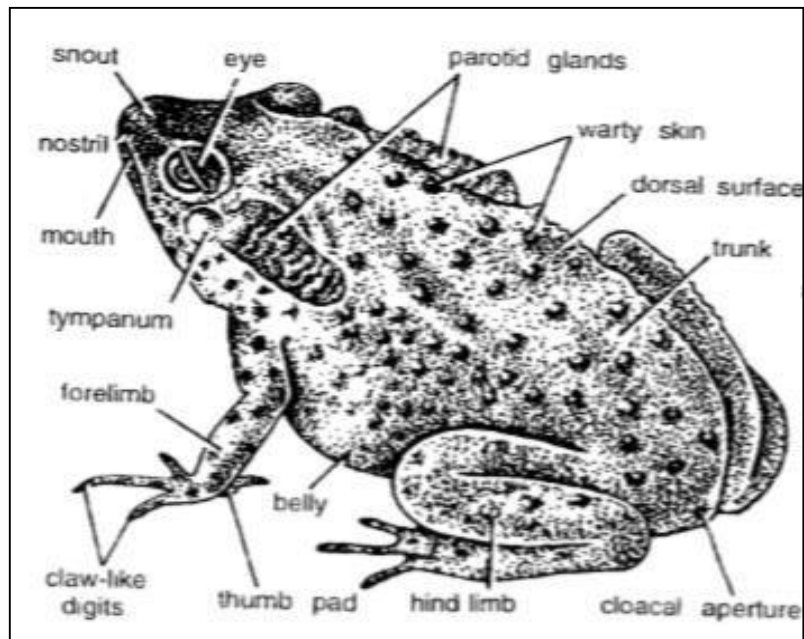


Figure: *Bufo*: common toad

Practical No.6

Study of Reptiles

Learning outcome: Students will develop the skills to classify the reptiles and learn their habitat, food, adaptation for protection and reproduction on this Earth.

Reptile, member of the class Reptilia, the group of air-breathing [vertebrates](#) that have internal [fertilization](#), amniotic [development](#), and epidermal [scales](#) covering part or all of their body. The major groups of living reptiles—the Turtles (order Testudines), [tuatara](#) (order Rhynchocephalia [Sphenodontida]), [lizards](#) and [snakes](#) (order Squamata), and [crocodiles](#) (order Crocodylia, or Crocodilia) account for over 8,700 species.

Most reptiles have a [continuous](#) external covering of epidermal [scales](#). Reptile scales contain a unique type of [keratin](#) called beta keratin; the scales and interscalar skin also contain alpha keratin, which is a trait shared with other [vertebrates](#). Keratin is the main component of reptilian scales. Scales may be very small, as in the microscopic tubercular scales of dwarf [geckos](#) (*Sphaerodactylus*), or relatively large, as in the body scales of many groups of [lizards](#) and [snakes](#). The largest scales are the scutes covering the shell of a [turtle](#) or the plates of a [crocodile](#).

❖ Order Testudine

Classification of Giant Turtle

Phylum	Chordata
Subphylum	Vertebrata
Superclass	Tetrapoda
Class	Reptilia
Order	Testudines
Genus	<i>Testudo</i>

Testudo is found in fresh-water or salt water or on land. It feeds on small worms and insects. It also hibernates during winter season

They are commonly called as Giant Turtle. Body is divided into Head, Trunk and Tail.

They have leathery skin. Dorsal convex portion is called **Carapace** and the flatter internal portion is called **Plastron**. Head is mounted on retractile neck. Jaws lack teeth. Feet are stumpy. They are Uricotelic and oviparous.

They cover their eggs with soil. They have clutch size of egg in 5 to 100 Eggs. Development takes from four weeks to one year and the parents does not attend to the eggs during this time. Young are independent of the parents at hatching.

In recent years, turtle conservation program have been enacted. Slow rate of growth and long Juvenile periods make turtles vulnerable to extinction.

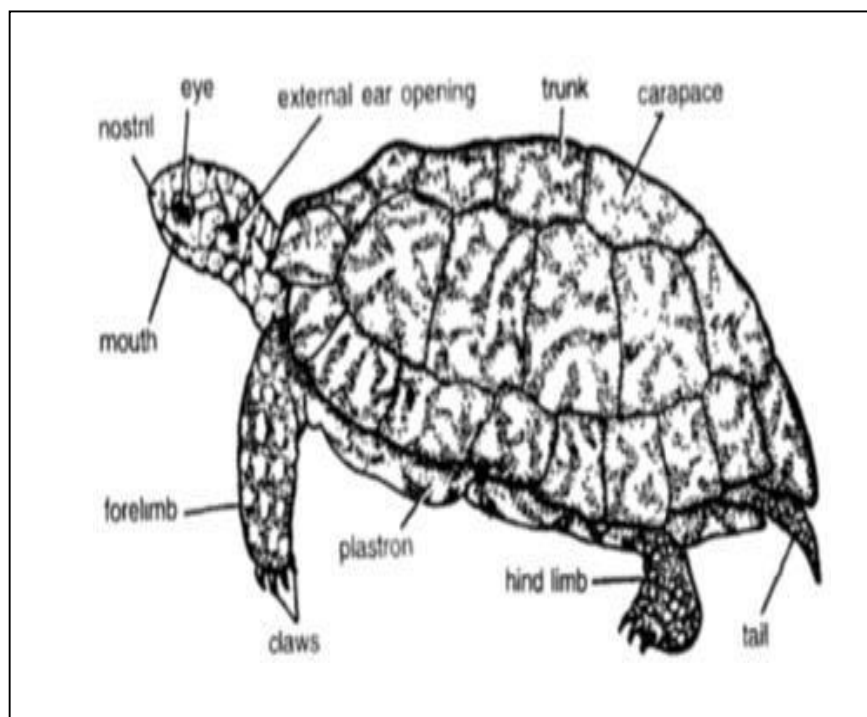


Figure: *Testudo*

❖ Order Squamata

Classification of Hemidactylus: Common house Lizard

Phylum	Chordata
Subphylum	Vertebrata
Superclass	Tetrapoda
Class	Reptilia
Order	Squamata
Genus	<i>Hemidactylus</i>

Hemidactylus has world-wide distribution and is chiefly found in India, Europe, Asia, Africa, United States of America, Sri Lanka and China. *Hemidactylus* is a common house lizard found in every home. Nocturnal in habit. During winter they hibernate under wood, logs and crevices of the walls. They are adapted to walk on walls. They feed on insects and small invertebrates.

Order Squamata is divided into three suborders. Wall lizards belong to Genus *Hemidactylus*. Lizard's usually have two pair of legs and their upper and lower jaw unite anteriorly.

Body is divided into Head, Neck, Trunk and Tail. Head is triangular shaped containing eyes, nostrils and ear openings. Eyes lack movable eyelid. Forelimbs and Hind limbs are well developed for walking.

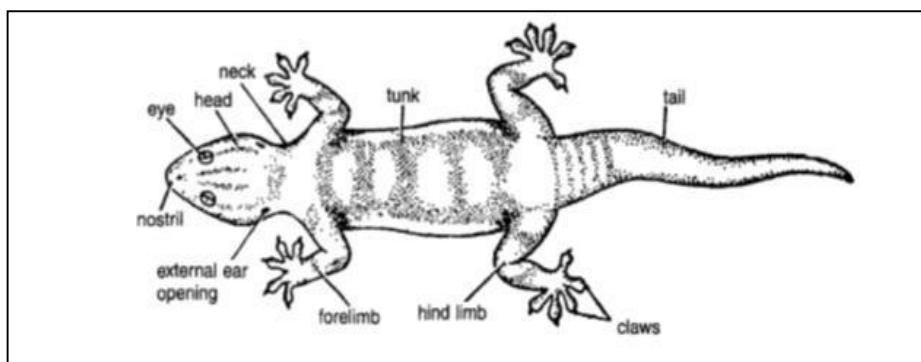


Figure: *Hemidactylus*

❖ Order Crocodilia

Classification of Crocodylus: Mugger

Phylum	Chordata
Subphylum	Vertebrata
Superclass	Tetrapoda
Class	Reptilia
Order	Crocodilia
Genus	<i>Crocodylus</i> (Magarmach)

Crocodylus is found in Southern Asia, Africa, Australia, Central America and India. It is found in rivers and lakes. The animal makes 10 to 13 meters long tunnel below the level of water. The opening of the tunnel is used as entrance and the other side is used to deposit the eggs.

The order crocodilian has 21 species. Crocodilian has not changed much over 170 million years history. The snout is elongated often used to capture food by sideways sweep of head. Nostril at the tips of the snout, so the

animal can breathe while mostly submerged. Tooth is not protrusible Crocodilians are oviparous and display parental care of hatchling.

Head long and triangular and narrows towards snout which is not differentiated from the rest of the skull. Jaws long, powerful, rimmed with numerous bluntly conical and unequal teeth, dental formula 16-19/14-15. The first tooth fits into a pit and fifth mandibular tooth into a notch on the outer side of upper jaw

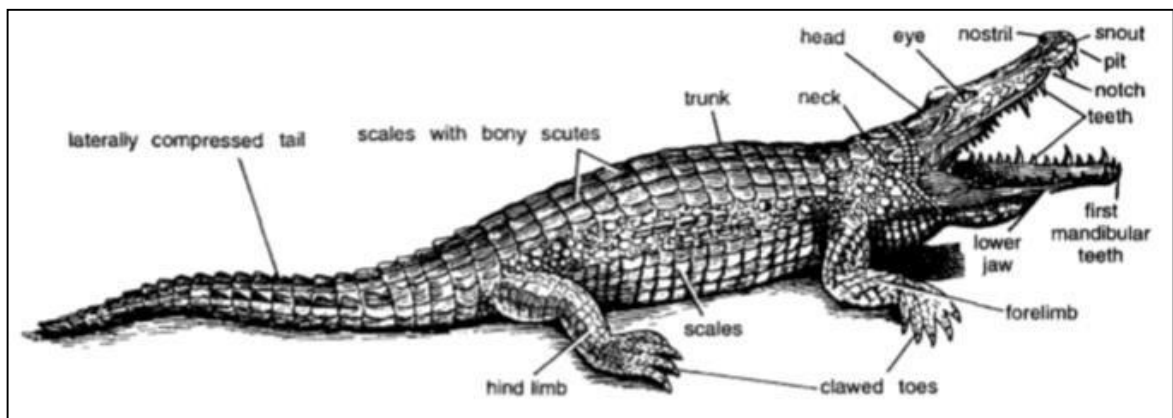


Figure: *Crocodylus*

Practical No.7

Study of Birds

Learning outcome: Students will be able to understand the mechanism of classification of birds and their aerial habitat, food, specific adaptation for flying and reproduction on this Earth.

All the birds are included in this class. Birds are unique among vertebrates because they have feathers on their bodies. Birds are considered to be evolved from the reptilian ancestors due to the presence of scales on legs and claws which are reptilian characters. The major characteristics of this class are adaptations for flight, including appendages modified wings, feathers, endothermy, a high metabolic rate, a vertebral column modified for flight and bones lightened by numerous air spaces. In addition, modern birds possess a horny bill and lack teeth.

They are warm blooded animals because they can maintain their body temperature. Their body is covered by different colored feathers. The body is streamlined which allows them to move better in air. The forelimbs are modified into wings for flight. Digestive system has a gizzard to grind the food and a crop to store it. The heart is four chambered with two auricles and two ventricles.

Birds have reduced number of skull bones and keratinized sheath called a bill replaces the teeth. Birds have light bones to support their flight mechanism. Forelimbs are modified into wings. Feet are covered with epidermal scutes formed by the fusion of several reptilian epidermal scales. Hind limbs are modified for bipedal locomotion. Tarsus usually shorter than toes. Wing feathers, tail feathers present.

Classification of *Columba livia*(Pigeon)

Phylum	Chordata
Sub-phylum	Vertebrata
Superclass	Tetrapoda
Class	Aves
Order	Columbiformes
Genus	<i>Columba</i>
Specie	<i>livia</i>

Habit and habitat: *Columba livia* is the most common and familiar bird around man, nesting in buildings, old houses, warehouses, sheds and railway stations. Their flight is swift and strong. Breeding continues throughout the year.

Characteristics:

1. Commonly called as blue-rock pigeon and Kabutar in Hindi

2. Body is divisible into head, neck, back and breast and abdomen
3. Plumage is grey with glistening metallic green and purple on breast and neck
4. Head contains large eyes and slit-like nostrils. It is produced into a short and slender bill or beak. Upper and lower beaks are covered by the horny sheath, called rhamphotheca. At the base of the upper beaks there is a patch of skin called cere
5. Beak adapted for seed-eating
6. Eyes are large, rounded, with a well-developed nictitating membrane and a rounded pupil
7. Forelimbs are modified into wings which contain besides skeleton flight feathers called as remiges. Feet are covered with epidermal scutes formed by the fusion of several reptilian epidermal scales
8. Hind limbs are modified for bipedal locomotion. Tarsus usually shorter than toes. Wing feathers, tail feathers present. Other structures seen are neck, breast, abdomen and black bars on wings
9. Eggs white and unmarked

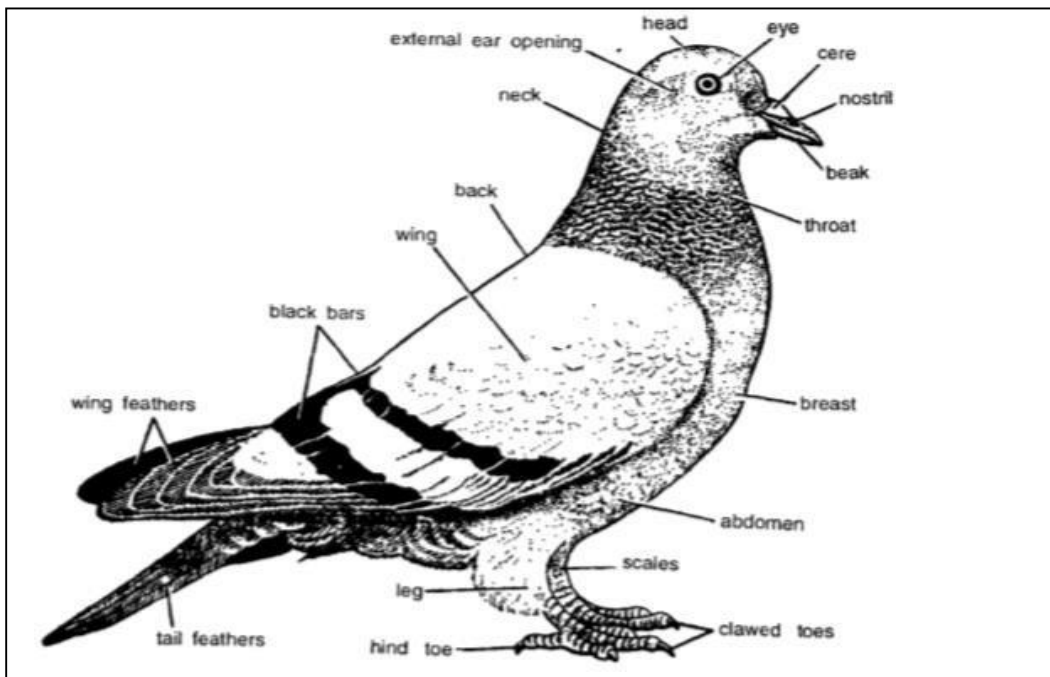


Figure: *Columba livia*

Classification of (*Psittacula euparis*) Parrot

Phylum	Chordata
Sub-phylum	Vertebrata
Superclass	Tetrapoda
Class	Aves
Order	Psittaciformes
Genus	<i>Psittacula</i>
Species	<i>euparis</i>

Geographical distribution: *Psittacula euparis* is found in India, Pakistan, Myanmar, Sri Lanka and the United States. Eocene to Recent

Habit and habitat: It is found on tall trees in flocks in city as well as in villages. It is also commonly found in the fruit trees, ripe crops and in jungles. Gregarious with loud voices. Feeds on fruits and crops.

Characteristics:

Commonly called as Indian parakeet or parrot. Its Hindi name is Hiranmaya. It has brilliant blue-green plumage with massive, deeply-hooked red bill and a distinct maroon patch on each shoulder

Body is divisible into head, neck, back, breast and abdomen. Head contains eye, nostril and horny beaks

Beak stout, narrow, sharp edged and hooked at the tip and adapted for fruit eating.

Upper mandible movable on frontal bone of skull. It is so articulated that its lowering automatically raises the upper beak, which is curved at the tip

Feet adapted for grasping, holding and climbing. Foot zygodactylous in which I and IV digits are directed backwards and II and III forward to provide a firm grip on the branch of the tree

Tail feathers elongated. Maroon patches on wing feathers.

Flight is graceful and voice powerful. Female is green all over, but the male has a rose pink and black neck collar ring

Nesting season December to April.

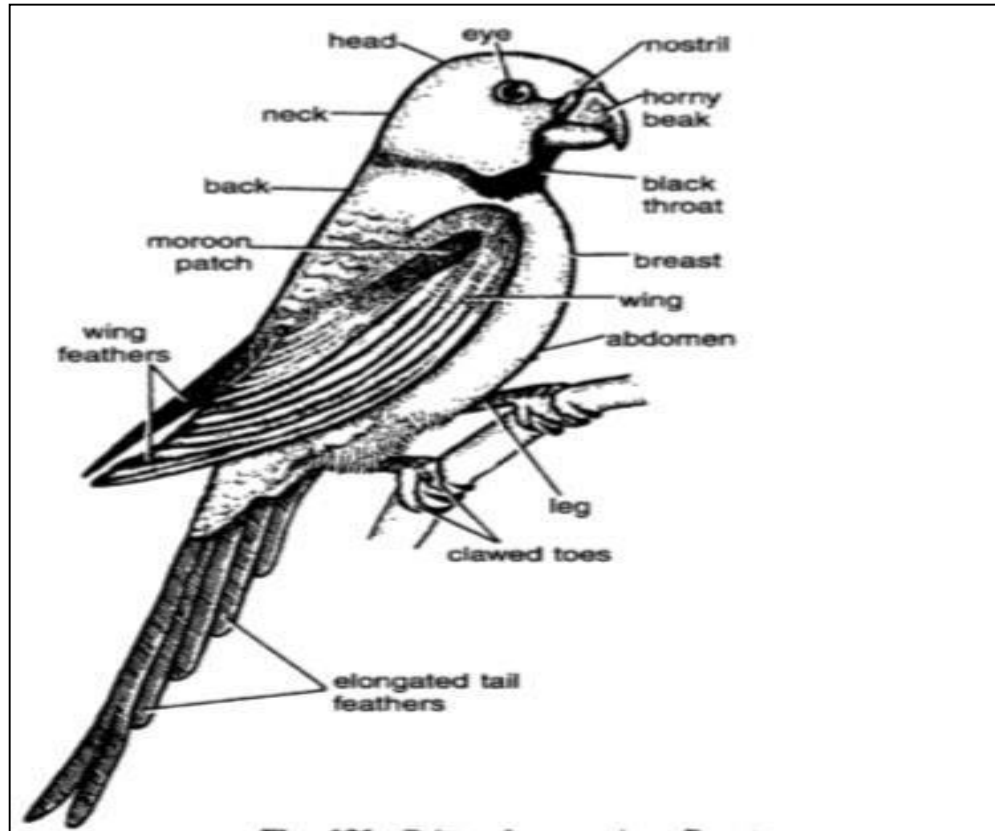


Figure: *Psittacula euparia* : Parrot

Classification of House Sparrow

Phylum	Chordata
Sub-phylum	Vertebrata
Superclass	Tetrapoda
Class	Aves
Order	Passeriformes
Genus	<i>Passer</i>
Specie	<i>domesticus</i>

Geographical distribution: *Passer domesticus* is abundantly found in Sri Lanka, Myanmar, Pakistan and India, and has been introduced to North America, South America, Australia and New Zealand

Habit and habitat: Most familiar companion bird freely moving and nesting in the houses. They act as commensal to man. In winter they feed on cultivated areas in flocks. They are gregarious.

Characteristics

1. It is the common house sparrow
2. It is a small bird measuring 10 to 16 cm in length. Body divisible into head, neck, back, breast and abdomen. Head contains eyes and beak
3. Sexual dimorphism is distinct. Female is ash white, while male is earthy brown with blackish throat and breast and white abdomen
4. Eyes small and the beak is short and conical. Beak adapted for seed eating
5. Breast and abdomen bulging
6. Wing and wing feathers folded over body. Tail feathers elongated
7. Feet adapted for perching. Toes 3 in front and 1 behind
8. Nesting practically throughout the year. Some make elaborate nests; lay 3-8 eggs
9. Young naked and blind at hatching, require feeding and care by parents before becoming independent
10. Very familiar household bird

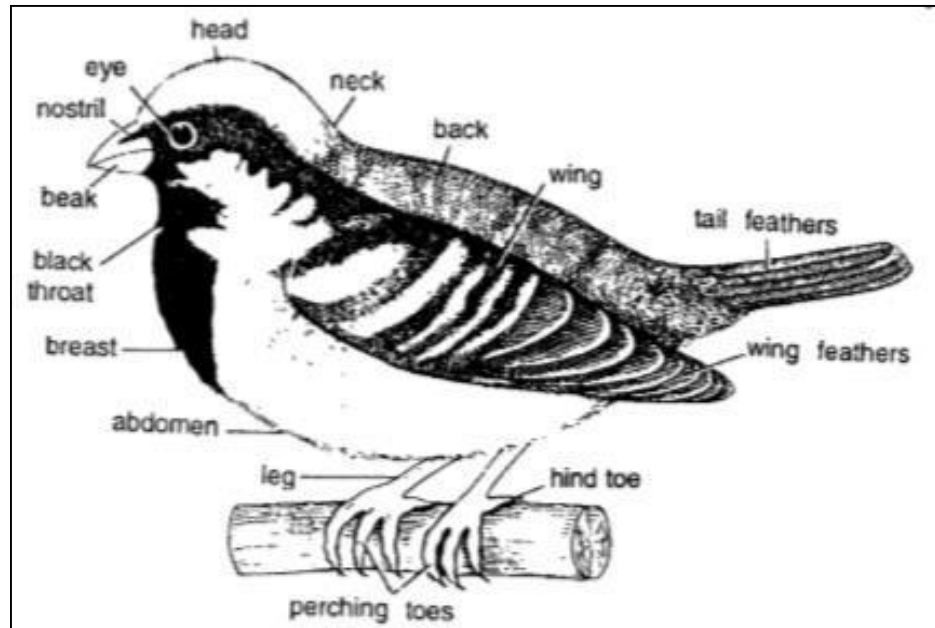


Figure: *Passer domesticus* (Sparrow).

Practical No.8

Study of Mammals

Learning outcome: Students will develop comprehensive knowledge about classification of mammals and their diverse habitats, diversity of food, specific adaptation and reproduction on this Earth.

The beginning of the tertiary period about 70 million years ago, was the start of the “age of mammals”. Mammalian characteristics evolved gradually over a period of 200 million years.

Mammary glands, glands, diaphragm, three middle-ear ossicles, heterodont dentition, seat, sebaceous and scent glands, four chambered heart, large cerebral cortex are general characteristics of mammals.

Mammals are divided into **two Subclasses: Prototheria** and **Theria**.

Prototheria include **Monotremes** or Egg laying mammals.

Theria is divided into two infra classes: **Metatheria** or **Marcupilas** and **Eutheria** or **placental** mammals.

➤ **Monotremes**

Duck bill platypus is one of the examples. These are Egg laying mammals. They are native in Australia and Tasmania. They feed on Invertebrates. Body is divided into Head, Trunk and tail. Body has soft hairs. Adult has no teeth. Upper jaw produced to form flattened beak.

Classification of *Ornithorhynchus* (Duck-bill)

Phylum	Chordate
Sub-phylum	Vertebrata
Superclass	Tetrapoda
Class	Mammalia
Order	Monotremata
Genus	<i>Ornithorhynchus</i> (Duck-bill)

Geographical distribution: Found in South Eastern Australia and Tasmania. Triassic to Recent

Habit and habitat: It is a native of rivers, pools and creeks. It burrows to 12 to 15 meters along the river banks. It feeds on fresh-water invertebrates, carried in cheek pouches.

Characteristics:

1. Commonly called as duck-billed-platypus
2. It measures about 50 cm in length having fine short fur, dark brown colour and combines

the characters of a duck with a mammal

3. Body is divided into head, thick trunk and tail. Body and tail contain soft hairs
4. Head distinct. Upper jaw produced to form a flattened beak which is covered with a smooth, hairless skin that forms a free fold at the base of the beak. Head contains nostril mouth and external ear opening
5. Adult has no teeth. Jaws covered with horny plates. Pinnae absent
6. Forelimbs and hind limbs have 5 digits, web and clawed toes. Hind limb has horny spur. Tail is flattened and adapted for swimming
7. Coracoid and precoracoid present. T-shaped interclavicle
8. Eyes small having nictitating membrane. Mammary glands without nipples
9. Cloaca present. Ureters open in dorsal wall of urinogenital passage. Testes abdominal, penis conducts only sperms. Oviducts distinct, uterus or vagina absent
10. Female makes nest of roots and leaves during spring in burrows, lays 1-3 eggs. About 0.5 cm long young one is hatched. It nurses by lapping up milk secreted by scattered mammary glands on the abdomen of female.

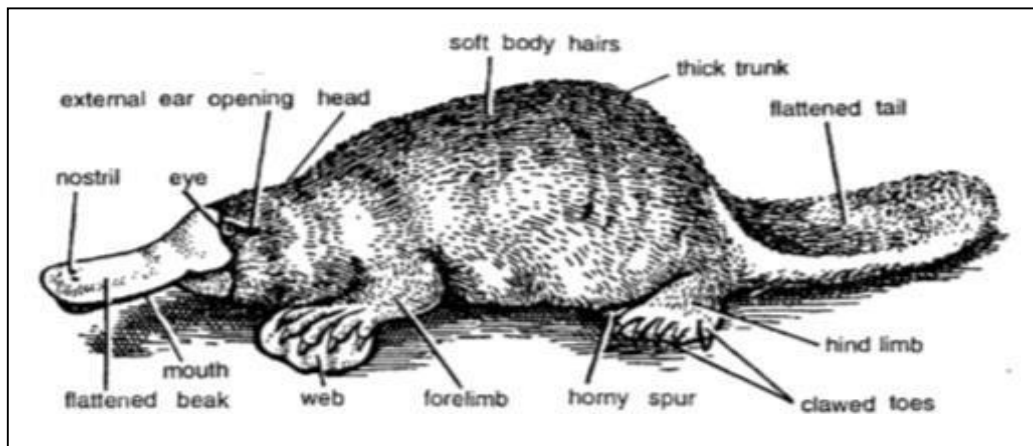


Figure: *Ornithorhynchus*: Duck-bill

➤ Metatheria

Marsupial's common example is Kangaroo. They are warm blooded animals. Kangaroo has long Hind limbs and short fore limbs These are pouched mammals. In these animals placenta is not formed therefore, babies come out of the body earlier in immature form. Teats of the mammary glands are present in the pouch from which babies suckle milk. After birth mother feeds them with milk produced from mammary glands with well-developed teats. Sexes are separate and fertilization is internal. These are viviparous.

Classification of *Macropus*

Phylum	Chordate
Sub-phylum	Vertebrata
Superclass	Tetrapoda
Class	Mammalia
Infraclass	Metatheria
Order	Marsupialia
Genus	<i>Macropus</i>

Geographical distribution: Kangaroos are found in Australia, Tasmania and New Zealand

Habit and habitat: Terrestrial, gregarious, herbivorous, browsing and leaping animals.

Characteristics:

Commonly called as Kangaroo

Macropus is largest Kangaroo. Males standing a maximum height of 2 meters. and weighing about 80-100 kg. Females 1.5 meters tall and 35-40 kg in weight

Body divisible into head, neck, back, abdomen and tail. Head is small with large ears and eyes

Hind legs and feet very long and powerful, used for leaping. Forelimbs smaller

Hallux absent, 2nd and 3rd toes united (Syndactylus). Middle or 4th toe enormously enlarged and armed with a powerful claw. Called as toilet claw

Animal nearly sits on its tail during rest. The baby kangaroo is seen protruding from the marsupium on abdomen. Young one feeds on milk through teats in marsupium

Tail non-prehensile and powerful

Other kangaroos are red kangaroo and gray kangaroo

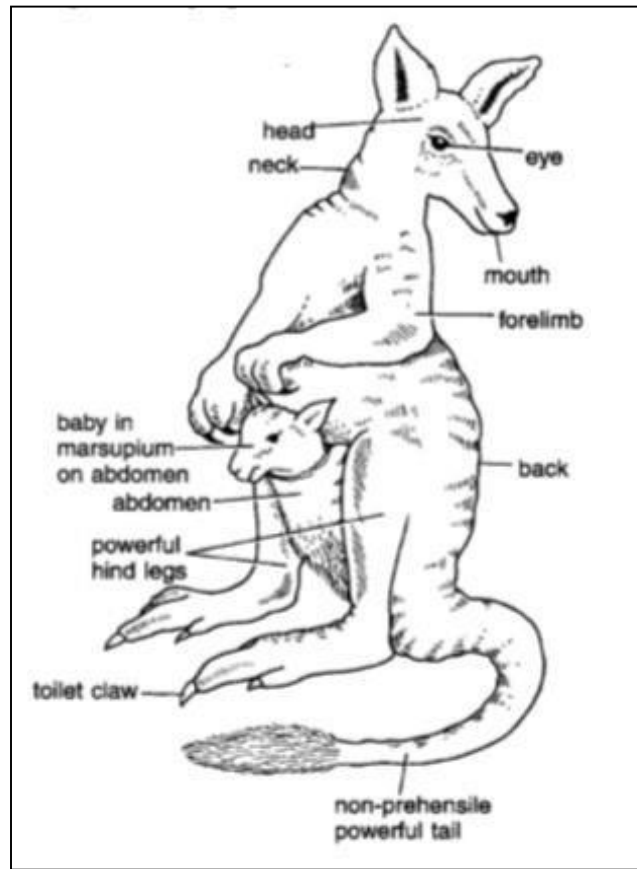


Figure: Macropus: Kangaroo

➤ **Eutheria**

They are warm blooded animals. Tetrapod are mostly terrestrial. The body is covered with hairs which insulate the body and help in maintaining temperature.

They have two pairs of pentadactyle limbs which are adapted for walking, running and climbing.

Brain is well developed with two large cerebral hemispheres and 12 pairs of cranial nerves. Eyes are protected by movable eyelids.

Embryo is kept inside the body of females for development and the process is known as gestation. To absorb nutrition from the body of mother, a glandular tissue develops between fetus and uterine wall of the mother called placenta.