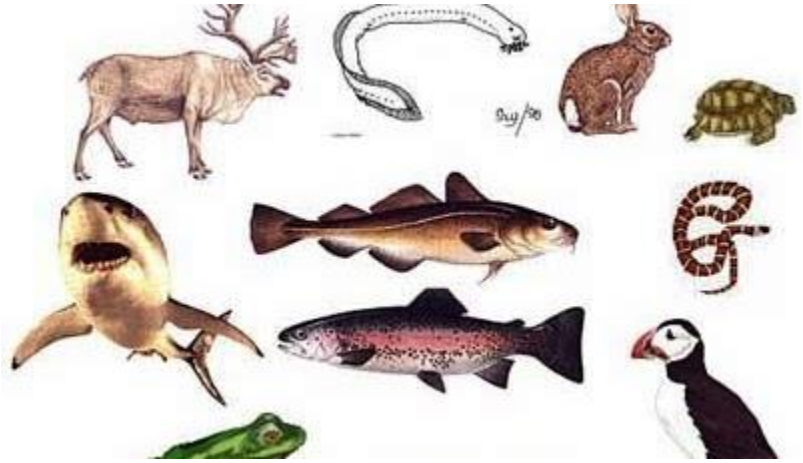
PRACTICAL MANUAL: ANIMAL DIVERSITY: CHORDATES (Zoo202)



Virtual University

Contents

Practical No: 1
Study of Protochordates

Protochordates

The organisms belonging to the Protochordata are generally known as the lower chordates. They don't form a "proper" taxonomic group and are only classified as such for convenience purposes. However, they do form a major group of Chordata. They are also known as Acraniata because they lack a true skull. They are divided into three subphyla hemichordate, Urochordata and Cephalochordata.

Characteristics of Protochordata

1. They are generally found in marine water.

2. Their body is bilaterally symmetrical, triploblastic, and coelomated.

3. At a certain stage of their lives, their body develops a long, rod-like structure for support called the notochord.

4. They exhibit organ system level of organization

Sub-Phylum Hemichordata

Hemichordates are small soft-bodied creatures, living singly or in group on sandy and muddy sea bottoms or in open water. The body and coelom are divided into three regions with paired gill-slits and nervous tissue in both dorsal and ventral epidermis.

Classification

Phylum Hemichordata is divided into 2 classes Class

1. **Enteropneusta** - burrowing animals. Ex. Balanoglossus, Saccoglossus. Ptychodera

2. **Pterobranchia** - encased body. Rbabdopleurida. Ex. Rhabdopleura, Cephalodiscida. Cephalodiscus, Atubaria.

Classification: *Balanoglos*

Subphylum	Hemichordata
Class	Enteropneusta
Genus	*Balanoglossus* (Acorn worm)
	Glossobalanus (Tongue worm)

Geographical distribution: World-wide or cosmopolitan

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

Characteristics:

1. Balanoglossus is commonly called as 'Acorn worm.' It lives in a U-shaped burrow and at one opening of burrow fecal castings may be seen. V-tube burrow at other end has opening for anterior end and also another additional opening
2. It measures 10 cm to 2.5 meters, depending on the species
3. It is bilaterally symmetrical, triploblastic deuterostome with worm-shaped body divisible into three regions-anterior proboscis or prosoma, middle collar or mesosoma and posterior trunk or metasoma
4. Proboscis is conical, collar is funnel like, while trunk is cylindrical
5. Proboscis contains heart vesicle, central sinus and buccal diverticulum. It has thick muscular body wall and its cavity or coelom opens to the exterior by the proboscis pore
6. Collar contains the mouth and collar coelom which opens by a pair of collar pores on dorsal surface
7. Trunk region contains most of the internal organs, such as pharynx, gonads or hepatic region. Pharynx and gonads constitute branchiogenital region. Posteriormost part is abdomen
8. Branchio-genital region is composed off : (i) genital wing having gonad (ii) branchial region containing paired gills and (iii) hepatic region having hepatic caecae.
9. Alimentation is complete and circulatory system usually contains contractile sac of heart
10. Sexual dimorphism. Fertilization external and development includes tornaria larva. It possesses power of regeneration

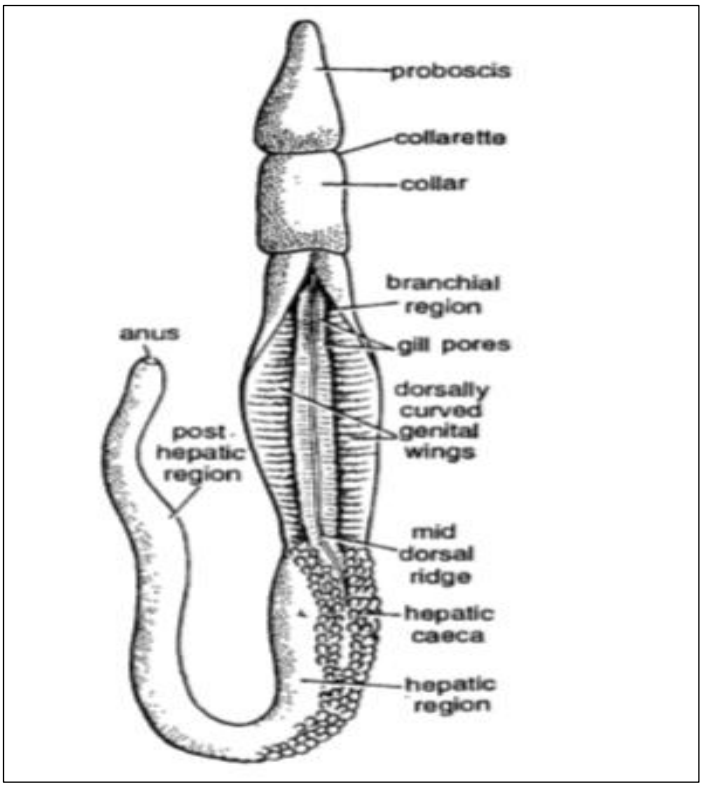


Figure: Balanoglossus (Acorn worm)

Practical No: 2
Study of Urochordates

Subphylum Urochordates

The urochordates are commonly known as sea squirts. Notochord and nerve cord present only in tadpole-like larva. Body sac-like containing thick leathery covering or test, hence called tunicates.

Aseidia

Classification

Phylum	Chordate
Sub phylum	Urochordata
Class	Ascidiacea
Order	Enterogona
Genus	*Aseidia*

Geographical distribution: Aseidia is commonly found in cold temperate regions.

Habit and habitat: Aseidia is solitary, marine and sedentary urochordate inhabiting shallow water but some occur deep upto 5500 metres

Characteristics:

1. Commonly called as sea squirts
2. Shape of body short and cylindrical with a broad base attached to rocky substratum
3. Test translucent, wrinkled and brownish in colour
4. Below test is mantle. Anteriorly body contains eight-lobed terminal branchial siphon and six-lobed sub-terminal atrial siphon having mouth and anus, respectively
5. Mouth is surrounded by 50-100 tentacles
6. Branchial siphon leads into pharynx which is perforated by stigmata. Pharynx contains endostyle
7. Dorsal tubercle separated from the nerve ganglion neural gland and membranous dorsal lamina. Alimentary canal consists of mouth pharynx, stomach, intestine, rectum and anus
8. Gonads, gonoduct and gonopore distinct
9. Monoecious. Ovary, testes in the same animal. Reproduction sexual. Oviparous. Metamorphosis retrogressive

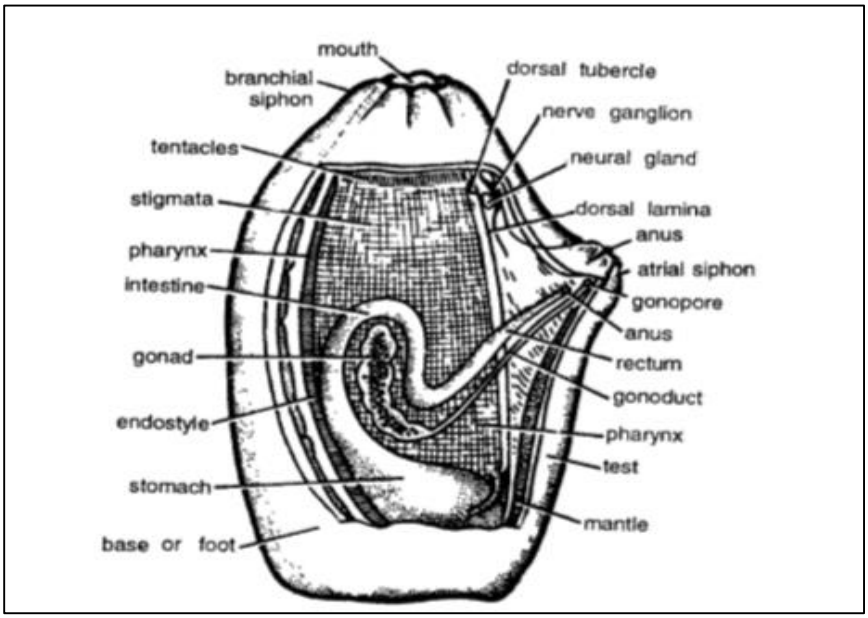


Figure : Aseidia : Partly dissected to show anatomy

Practical No: 3
Study of cephalochordates

Subphylum cephalochordate

Amphioxus, a small superficially fish-shaped chordate, constitutes subphylum Cephalochordata of the phylum Chordata. Notochord and nerve cord along entire body and persistent. Pharynx with numerous gill slits.

Amphioxus lanceolatus or Branchiostoma lanceolatum

Classification

Phylum	Chordate
Sub-pylum	Cephalochordate
Class	Leptocardii
Genus	*Amphioxus*
Specie	*lanceolatus*

Geographical distribution: Widely distributed in temperate and tropical seacoasts
Habit and habitat: *Amphioxus* burrows in clean shifting and shallow shore waters leaving only its anterior end protruded. For most of the times, it remains buried in the sand but in darkness it swims very rapidly by lashing movements of the tail. It is a ciliary feeder.

Characteristics

1. Commonly called as lancelet.
2. It was first discovered by Pallas (1778)
3. Adult is less than 5 cm long and has superficially fish-like structural make up
4. Body is elongated, flattened, non-pigmented and pointed at both ends as the name implies. Anterior end projects forwards as the rostrum
5. Dorsal, ventral and caudal fins are low and continuous. There are 2 lateral fins or metapleural folds. Dorsal fin has fin rays
6. Ventral mouth is guarded by oral hood containing oral cirri
7. Atriopore is median and ventral. Anus on left side
8. Myotomes are arranged on both sides of die body as metamerical blocks of striated muscle fibres separated by V-shaped partitions called as myosepta or myocommata
9. Notochord is an axial skeletal rod extending from anterior to posterior end. Nerve cord lies just above the notochord

10. Gonads 26 pairs, metamerically arranged on pharynx. The two sexes are separate but without sexual

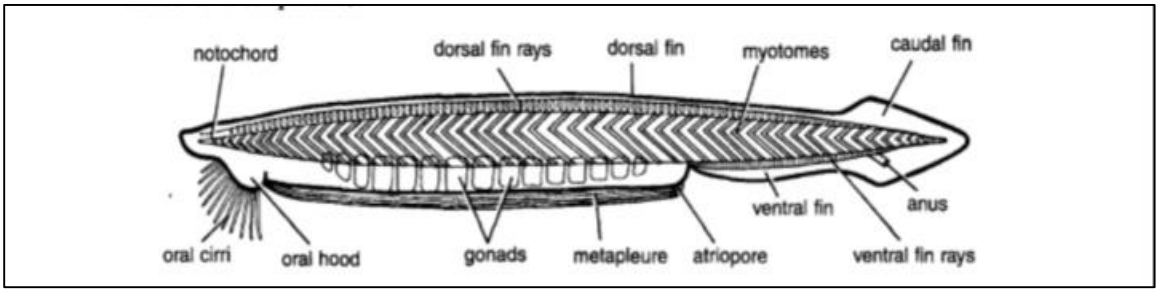


Figure: *Amphioxus*

Practical No: 4
Study of Fishes/ Pisces

1. Myxini

Classification

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

Geographical distribution: *Myxini* is distributed along seacoasts of the Atlantic and Pacific oceans in North European, North Atlantic, American and Japanese sea waters
Habit and habitat: Hagfishes or *Myxini* sometimes descend to a depth of 300 fathoms. They are purely marine, nocturnal and lie buried in the muddy bottom. They are parasitic or quasiparasitic and generally found attached to the body of fishes, especially around gill area. They bore their way into host body to eat viscera and muscles

Characteristics

1. Commonly called as hagfish or borer
2. Body is soft, without scales, worm-like, measuring about 60 cm in length and differentiated into head, trunk and tail
3. Anterior extremity contains four tentacles supported by skeletal rods
4. Mouth is terminal and surrounded by lips. Buccal funnel, and jaws are absent
5. There is a single nostril present close to the mouth. On ventrolateral sides mucous pores and distinct
6. Dorsal fin indistinct caudal tin and ventral fin confluents
7. Eyes vestigial, due to dark and bottom dwelling habit, photoreceptor organ is reduced
8. Secrete enormous mucus through mucous pores
9. 10 to 14 pairs of gills open into a branchial chamber, which opens to the exterior by a single branchial opening
10. Hermaphroditic and protandrous. Eggs are enclosed in horny shell, bearing hooks by which they attach themselves to the weeds.

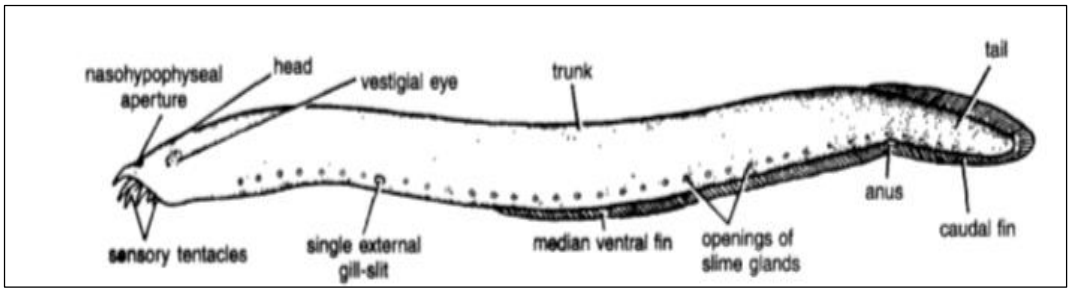


Figure: Myxini

2. Petromyzon

Classification

Phylum	Chordate
Sub-phylum	Vertebrate
Division	Agnatha
Class	Cephalaspidomorphi
Genus	*Petromyzon*
Specie	*marinus*

Geographical distribution: *Petromyzon marinus* is found in world-wide sea waters, coastal regions, streams and lakes of North America, Europe, West Africa, Australia, Chile, Japan, New Zealand, Tasmania.

Habit and habitat: Petromyzon is found both in salt and fresh-water. They lead an ectoparasitic life on other fishes, attaching to the body of host by buccal funnel and secreting an anticoagulant for continuous flow of blood. They are also anadromous i.e., ascending river for spawning. Carnivous and predators.

Characteristics

1. Commonly called as lamprey
2. Body is eel-like, measuring about 90 cm, and differentiated into head, trunk and tail. First dorsal fin, second dorsal fin and caudal fin confluent
3. Skin is without scales, slimy, green, brown and with strong metallic lusture
4. Head contains mouth but no jaws. Mouth is surrounded by a large, ventral, suctorial funnel with numerous horny teeth. The 'tongue' is toothed and piston-like
5. Dorsal nasal sac and mouth are unconnected. Paired eyes are present behind nasal-aperture
6. Gill-slits are 7 pairs and branchial basket is well developed
7. Sexes are separate. Female with large anal fin. Male with urinogenital or copulatory papilla. The development includes ammocoete larva which is very important phylogenetic ally as it is regarded a connecting link between Amphioxus and cyclostomes

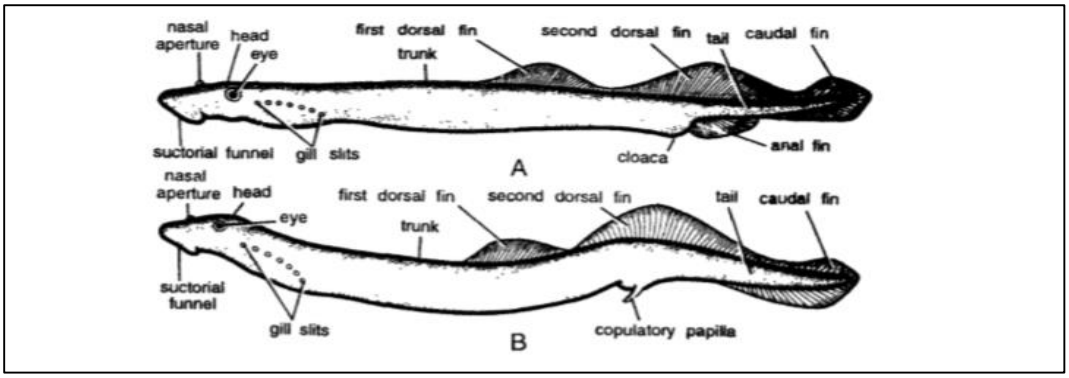


Figure: *Petromyzon* a) Female b) Male

Practical No: 5
Study of Gnathostomes

1. *Scoliodon*: Dog Fish

Classification

Phylum	Chordata
Sub-phylum	Vertebrate
Division	Gnathostomata
Super-class	Pisces
Class	Chondrichthyes
Genus	*Scoliodon* (Dog fish)

Geographical distribution: *Scoliodon* has wide distribution. About 4 species are found all along the Indian sea coast. Its presence has been reported from Zanzibar, Srilanka to Malay Archipelago, East Indies, Philippine Islands, Mexico to Panama, Cuba, West Indies and South America. Lower Carboniferous to Recent.

Habit and Habitat: The natural home of *Scoliodon* is the sea, but some live in estuaries and even ascend the rivers. They are predacious and voracious feeders attacking their prey with powerful jaws. They are active swimmers.

Characteristics:

1. Commonly called dogfish or dogshark
2. Spindle-shaped body, about 60 cm long, is regionated into head, trunk and tail
3. Dorsal and lateral sides of body are pigmented dark grey or slaty grey, while the ventral side is white
4. Head is dorso-ventrally compressed and flattened into snout. It contains ventrally situated slit-like mouth, obliquely situated nostrils and laterally situated protuberant eyes. A little behind eyes there are five pairs of lateral gill-clefts
5. Trunk bears paired fins. A pair of anterior pectoral tins and a pair of posterior pelvic tins.
6. Heterocercal tail turned upwards and caudal tin
7. A pair of pigmented lateral lines extends from head to tail
8. Scoliodon exhibits sexual dimorphism. Males are easily recognized by having a pair of intromittent organs, called as claspers. Cloaca is found between 2 pelvic fins.

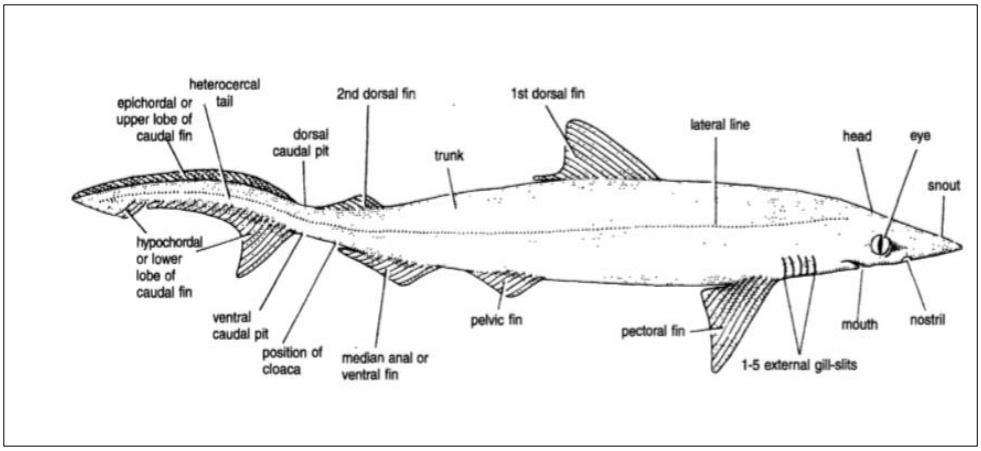


Figure: *Scoliodon* (Dog fish)

2. *Labeo rohita*: rohu

Classification

Phylum	Chordata
Sub-phylum	Vertebrate
Division	Gnathostomata
Superclass	Pisces
Class	Osteichthyes
Genus	*Labeo*
Specie	*rohita*

Geographical distribution: *Labeo rohita* is widely distributed in tropical and temperate regions specially found in India (Punjab, Assam) and Myanmar Eocene to Recent

Habit and habitat: Labeo rohita is abundantly found in ponds and rivers. Carps are vegetarian and bottom feeders. They can occasionally feed on animal diet. Because of its feeding habit, it is cultivated with two other carps, *Catla catla* and *Cirrhina mrigala*. Rohu breeds only in the rivers and bund type of tanks but not in confined waters.

Characteristics:

1. Commonly known as carp and Rohu in Hindi
2. Body compressed, fusiform, about 1 metre in length and weighing about 4 kg
3. Colour of the body is bluish or brownish on back and silvery white below. Body covered with large overlapping cycloid scales. Scales are of taxonomic importance
4. Body is regionated into head, trunk and tail
5. Head is depressed and is produced into a short, obtuse and blunt snout. It bears a subterminal fringe-lipped mouth bounded by fleshy upper and lower lips. It also contains paired nostrils and paired eyes

6. A pair of filamentous barbels arises from upper lip. Small tubercles cover the snout, which is oblong, depressed, swollen and projecting beyond the jaws
7. Large operculum hangs on either side enclosing gills and branchial chamber.
8. Lateral line is distinct. Scales overlying the lateral line are perforated by tubes of the lateral line system. Scales are of taxonomic value. Scales are flat, bony with rounded edges and are called as cycloid scales. These overlap and form a complete covering
9. Dorsal, anal, caudal, paired pectoral and anal fin with soft fin rays present. Caudal fin forked into equal lobes
10. Weberian apparatus present between bladder and inner ear. Kidneys are mesonephric.

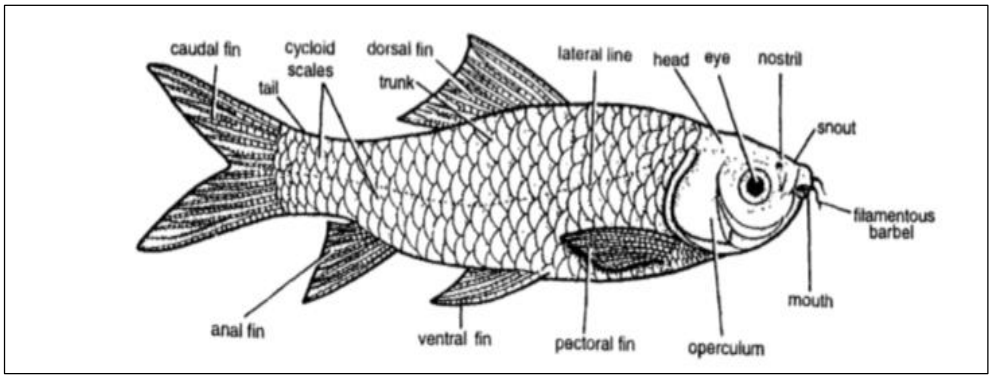


Figure: *Labeo rohita* (rohu)

Practical No: 6
Study of Amphibians (Caudates)

Salamender

Classification

Phylum	Chordata
Sub-phylum	Vertebrate
Superclass	Tetrapoda
Class	Amphibia
Order	Caudata
Genus	*Salamander*

Geographical distribution: *Salamander* is distributed in Europe, Eastern Asia and North America. Eocene to Recent

Habit and habitat: Terrestrial *Salamander* commonly found under logs, stones, cracks and crevices of the old walls

Characteristics

1. Commonly known as fire salamander
2. Animal lizard like. Males measuring 12 to 15 cm in length. Females longer than males. Body divisible into head, trunk and tail
3. Body coloured brilliantly black with irregular patches of yellow on back and limbs.
4. Forelimbs and hind limbs well developed and lift the body well above ground
5. Head contains mouth prominent eyes and nostrils. Eyes are provided with movable eyelids. The large paratoid glands are present behind the head
6. Tooth-bearing extensions of prevomers along parasphenoids present
7. Lungs present. Gills and gill clefts are absent in adults
8. Vertebrae opisthocoelus. Inter-auricular septum perforated
9. Tail is without tail fin. Body is spotted all over

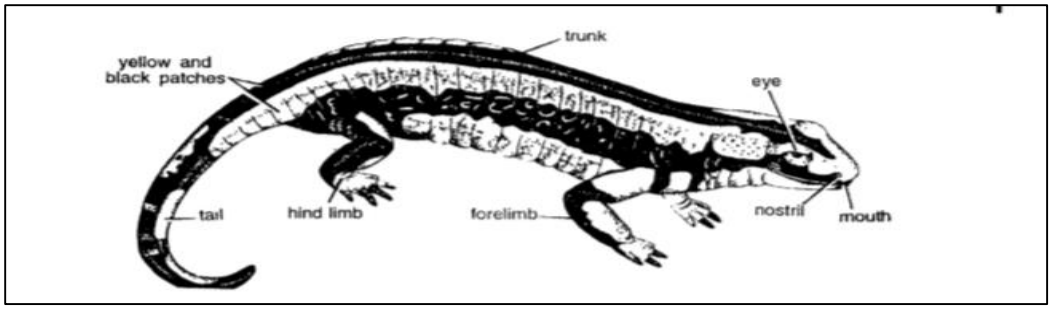


Figure: *Salamender*

Practical No: 7
Study of Amphibians (Anurans)

Bufo: Common Toad

Classification

Phylum	Chordate
Sub-phylum	vertebrate
Sub-class	Tetrapod
Class	Amphibia
Order	Anura
Genus	*Bufo*

Geographical distribution: *Bufo* has world-wide distribution. They are abundantly found in India, United States and Pacific State of Alaska. Miocene

Habit and habitat: Bufo is terrestrial, nocturnal, hiding under logs and stones or in burrows in day. It enters water only to breed and spawn

Characteristics:

1. Commonly called as true toad
2. It differs from frog in having rough, dry and warty skin with more poison glands than mucous glands. The skin is more or less of protective nature than respiratory
3. Body divided into head and trunk. Head contains mouth large eyes, nostrils and tympanum
4. Behind eyes there is a pair of large parotid poison glands
5. Hind limbs contain 4 claw like digits and thumb pads or adhesive pads
6. Forelimbs and Hind limbs are short. Toes provided with horny tips and poorly developed webs
7. Maxilliary teeth, sternum absent and ventral parts of pectoral girdle overlap (arciferous). Sacral vertebra has dilated transverse processes. Vertebrae procoelus. Urostyle with double condyle
8. Liver is bilobed. Glands of swammerdams absent
9. Eggs are pigmented and laid in gelatinous string. Young toads mature in many years

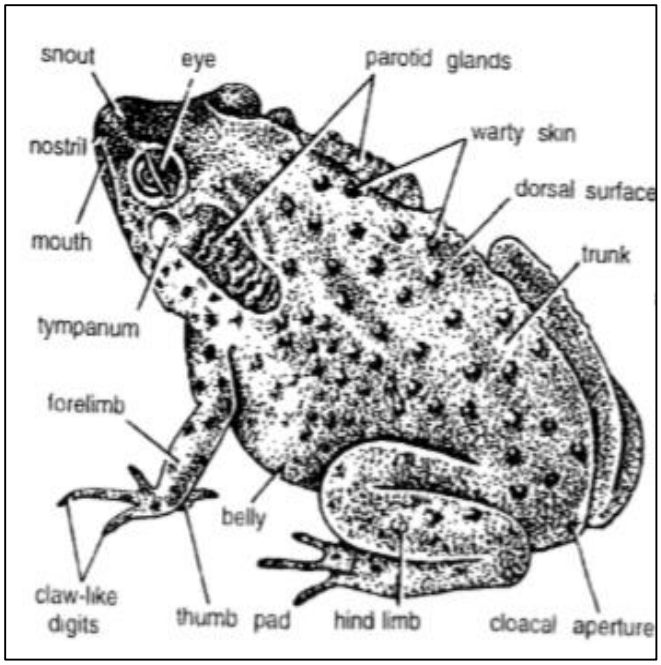


Figure: *Bufo*: common toad

Hyla Tree Frog

Classification

Phylum	Chordate
Sub-phylum	vertebrate
Sub-class	Tetrapod
Class	Amphibia
Order	Anura
Genus	Hyla

Geographical distribution: *Hyla* is commonly distributed in India, China, United States, Africa and Canada. Miocene.

Habit and habitat: *Hyla* is arboreal in habit, living on trees and rocks

Characteristics:

1. Commonly known as tree frog
2. Body measuring 3 to 8 cm in size and divided into head and trunk
3. Head contains eyes and nostrils

4. Forelimbs and hind limbs adapted for arboreal life. Terminal base of each digit is claw shaped and toes contain expanded adhesive discs or cushions which are used to climb trees
5. Eyes well developed with horizontal pupil. Tympanum distinct. Voice often loud
6. Skin of belly contains hygroscopic glands which help in adhering the frog with leaf, twigs or stem
7. Upper jaw toothed, lower jaw without teeth (edentulus)
8. Transverse processes of sacral vertebra are dilated
9. Fertilization external. Eggs are laid in water. Development includes tadpole larva

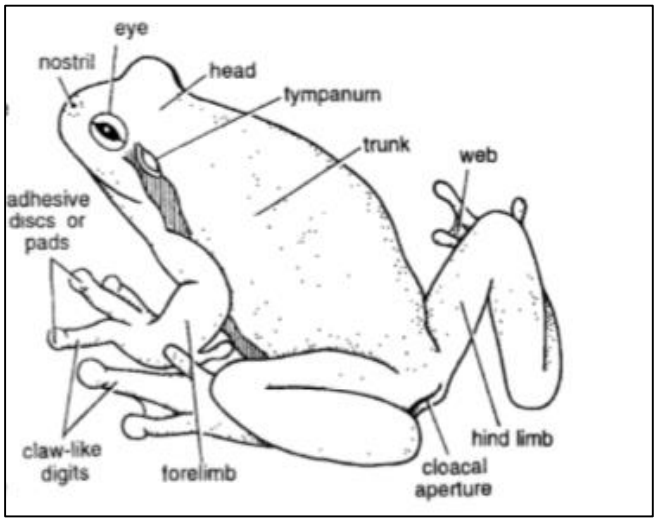


Figure: *Hyla*

Practical No: 8
Study of reptiles (Testudineans)

Testudo Giant turtle tuturtle

Classification

Phylum	Chordata
Subphylum	Vertebrata
Superclass	Tetrapoda
Class	Reptilia
Order	Testudines
Genus	*Testudo*

Geographical distribution: *Testudo* is widely distributed in Galapagos Islands, Africa, Europe, India and Sri Lanka. Jurassic to Recent

Habit and habitat: *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

Characteristics:

1. Commonly known as Giant turtle
2. Body divided into head, neck, trunk and tail. Body is encased in an oval shell consisting of closely sutured plate-like bones in definite manner. Over the shell is a layer of leathery skin or cornified scutes also in definite pattern. Dorsal convex portion or carapace and the flatter ventral portion or plastron are joined on sides by skin
3. Head, mounted on retractile neck, tail, and limbs protrude between two parts of the shell and in most species can be withdrawn completely within the margins of the shell. Head contains mouth, nostril and eyes. Behind eye is external ear opening
4. Jaws lack teeth but bear stout cornified sheaths to crush their food. Quadrate immovable
5. Thoracic vertebrae and ribs consolidated with bony carapace
6. Feet are stumpy. Toes end in horny claws that are useful in crawling and digging
7. They are uricotelic
8. Male has an erectile penis on the ventral wall of the cloaca
9. Oviparous

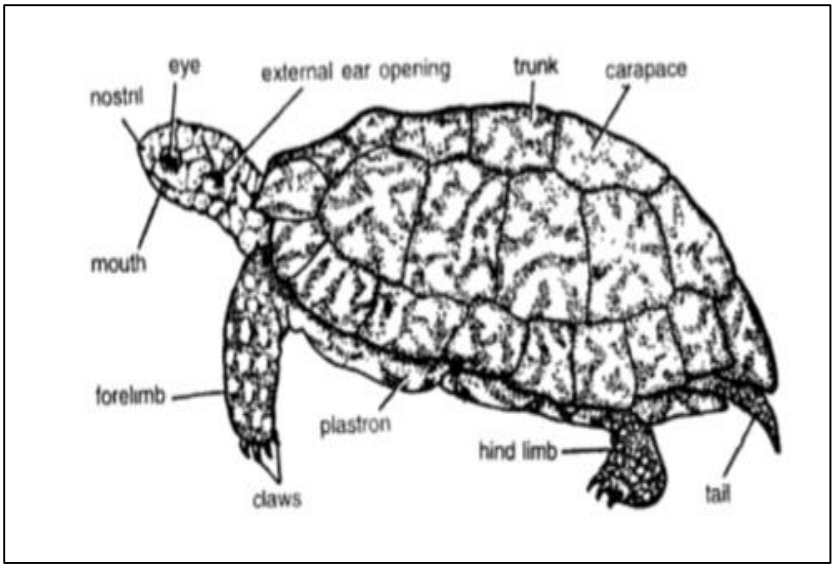


Figure: *Testudo*

Practical No: 9
Study of Reptiles (Rhynchocephalians)

Sphenodon punctatum

Classification

Phylum	Chordata
Subphylum	Vertebrata
Superclass	Tetrapoda
Class	Reptilia
Order	Rhynchocephalia
Genus	*Sphenodon*
Specie	*punctatum*

Geographical distribution : *Sphenodon* is found in New Zealand and specially in the islets of Bay of Plenty. Pennian to Eocene and Recent

Habit and habitat: Sphenodon lives in burrows, leads semiaquatic life. It is nocturnal and eats insects, molluscs or small invertebrates. It also produces frog-like croak. Breeding season November to February

Characteristics:

1. Commonly called as tuatara
2. Animal is lizard-like having dull olive-green colour with white and yellow spots and measuring about 75 cm. Body divided into head, neck, trunk and tail. Head contains eye, nostril and mouth
3. contains scaly skin and long tail
4. Forelimbs and hind limbs adapted for walking having clawed digits
5. Several backwardly directed hook or crest like spines extend all along mid-dorsal line.
6. Skull contains two complete fossae, quadrate is fixed, post frontals are separate (only in Sphenodon) and upper jaw has beaks. Teeth acrodont. Mandibles joined by ligament. Between skull and atlas is proatlas. Sternum present and vertebrae amphicoelous. Caudal vertebrae have chevron bones
7. Eye is photosensitive
8. Opening transverse. Male without copulatory organ. About 10 eggs with hard white shell are laid in holes in the ground. Eggs require 13 months to hatch

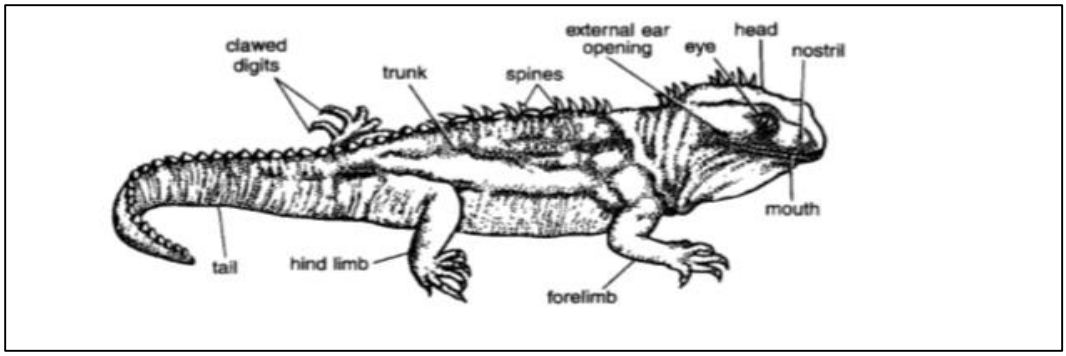


Figure: Sphenodon

Practical No: 10
Study of Reptiles (Squamata)

Hemidactylus: Common House Lizard

Classification:

Phylum	Chordata
Subphylum	Vertebrata
Superclass	Tetrapoda
Class	Reptilia
Order	Squamata
Genus	*Hemidactylus*

Geographical distribution: Hemidactylus has world-wide distribution and is chiefly found in India, Europe, Asia, Africa, United States of America, Sri Lanka and China

Habit and habitat: 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. It is a fast runner diapsid.

Characteristics

1. Commonly known as wall lizard
2. Body measuring approximately 25 cm in length is slender, covered with minute small scales and divided into head, neck, trunk and tail
3. They are ugly looking. Some members contain black and dark grey patches on dorsal surface while others have dark grey dorsal surface. Abdomen is yellowish white
4. Head is triangular containing eyes, nostrils and external ear opening. Eyes lack movable eyelids. Tongue protrusible
5. Forelimbs and hind limbs well developed. Toes are provided with rounded adhesive pads for climbing
6. Many wall lizards produce sound
7. Quadrate bone movable. Only supratemporal arch present
8. Vertebrae amphicoelous. Egg shells calcified.

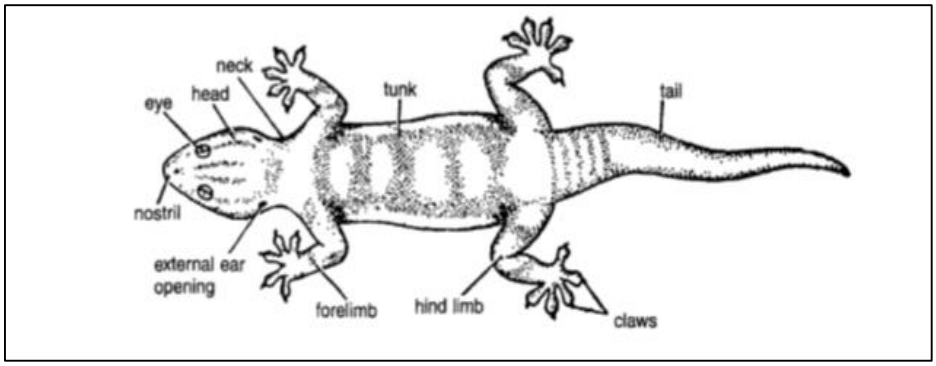


Figure: *Hemidactylus*

Python: Ajgar

Classification

Phylum	Chordata
Subphylum	Vertebrata
Superclass	Tetrapoda
Class	Reptilia
Order	Squamata
Genus	*Python*

Geographical distribution: Python has world-wide distribution except New Zealand

Habit and habitat: They are found mostly on ground, in trees of tropical jungle, in dry, rocky or sandy places. They kill birds, goats, sheep, deer, cows, dogs, horses and even tigers. They can also swim in water. Oviparous

Characteristics

1. Commonly known as Ajgar, is a favourite snake in a serpentarium
2. Animal is huge, massive, voluminous, measuring about 10 metres in length, and weighing nearly 110 kilograms
3. Body is covered with small scales in 60-75 rows. Body divided into head, neck, trunk and tail. Head contains mouth, nostril and eyes
4. Dorsal side has brown pigmentation with dark grey rhomboid edged spots while ventral side is greyish with yellow brown spots
5. Head is distinct from the neck and covered with symmetrical shields or small scales. Eyes are free and functional with vertical pupil.

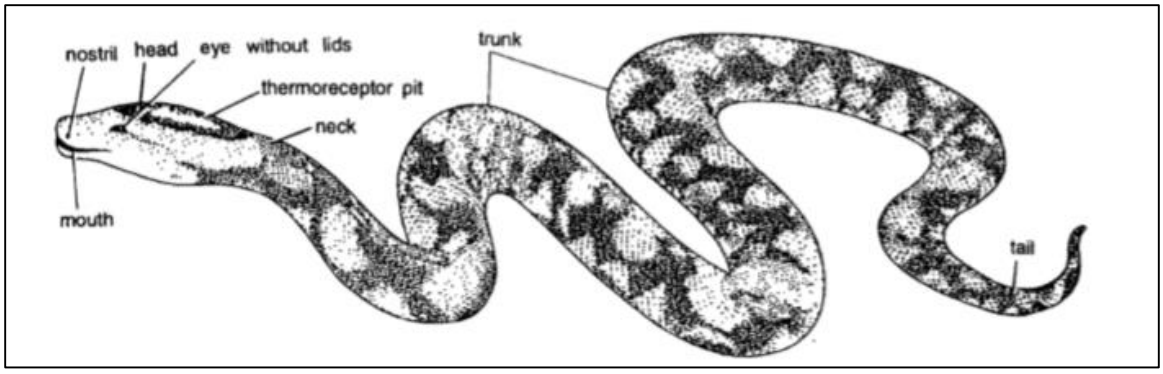


Figure: *Python* : Ajgar

Practical No: 11
Study of Reptiles (Crocodilia)

Crocodylus: Mugger

Classification

Phylum	Chordata
Subphylum	Vertebrata
Superclass	Tetrapoda
Class	Reptilia
Order	Crocodilia
Genus	*Crocodylus* (Magarmach)

Geographical distribution: *Crocodylus* is found in Southern Asia, Africa, Australia, Central America and India. Triassic to Recent

Habit and habitat: 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.

Characteristics:

1. Commonly known as Mugger
2. Body is stout, elongated, 4 to 6 meters in length and divided into head, neck, trunk and tail
3. Surface covered by leathery armour of osteoscutes bony scutes arranged in transverse rows
4. Upper part of the body is dark olive brown with black spots or bends
5. 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
6. Ear opening small and protected by a small flap of skin
7. Tongue not protrusible
8. Tail long, heavy and laterally compressed
9. Forelimbs and hind limbs short and pentadactyle, with 5 fingers and 4 toes, ending in claws and with webs
10. Heart 4-chambered with separate ventricles. Bladder absent

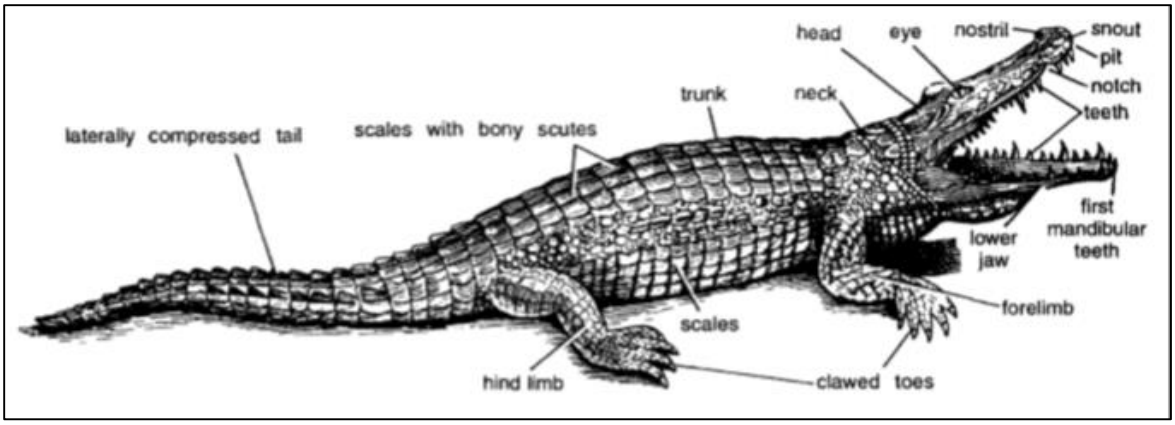


Figure: *Crocodylus*

Practical No: 12
Study of Birds (Pigeon)

Columba livia : Pigeon

Classification

Phylum	Chordata
Sub-phylum	Vertebrata
Superclass	Tetrapoda
Class	Aves
Order	Columbiformes
Genus	*Columba*
Specie	*livia*

Geographical distribution: Columba is commonly found in India, forested zone of the Pacific coast and United States. Eocene to Recent

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

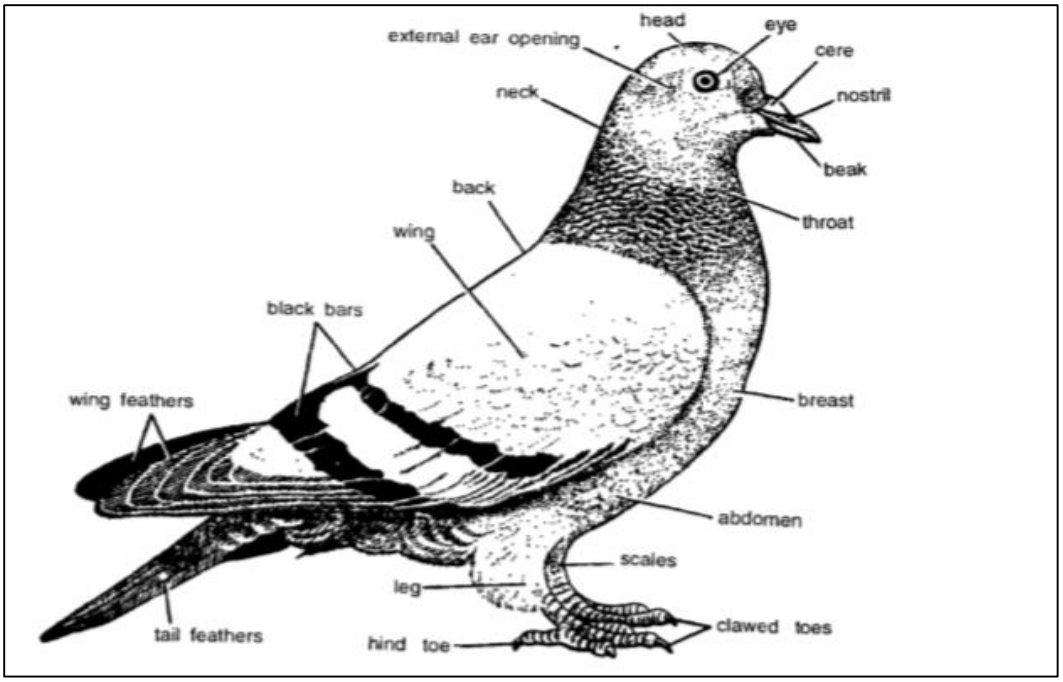


Figure: *Columba livia*

Practical No: 13
Study of Birds (Parrot)

Psittacula euparia: Parrot

Classification

Phylum	Chordata
Sub-phylum	Vertebrata
Superclass	Tetrapoda
Class	Aves
Order	Psittacifonnes
Genus	*Psittacula*
Specie	*euparia*

Geographical distribution: *Psittacula euparia* 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:

1. Commonly called as Indian parakeet or parrot. Its Hindi name is Hiraman tota
2. It has brilliant blue-green plumage with massive, deeply-hooked red bill and a distinct maroon patch on each shoulder
3. Body is divisible into head, neck, back, breast and abdomen. Head contains eye, nostril and horny beaks
4. Beak stout, narrow, sharp edged and hooked at the tip and adapted for fruit eating
5. 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
6. Feet adapted for grasping, holding and climbing. Foot zygodactylous in which I and IV digits are directed backwards and II and ill forward to provide a firm grip on the branch of the tree
7. Tail feathers elongated. Maroon patches on wing feathers
8. Flight is graceful and voice powerful
9. Female is green all over, but the male has a rose pink and black neck collar ring
10. Nesting season December to April

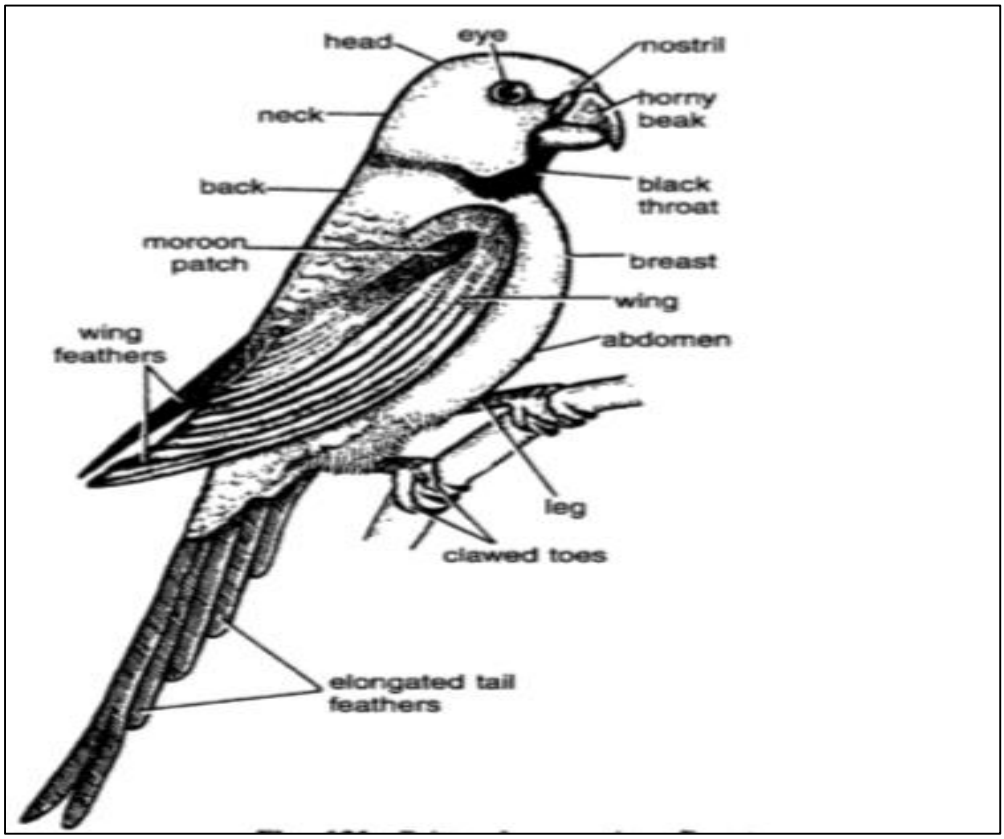


Figure: *Psittacula euparia* : Parrot

Practical No: 14
Study of Birds (Sparrow)

Passer domesticus: Sparrow

Classification

Phylum	Chordata
Sub-phylum	Vertebrata
Superclass	Tetrapoda
Class	Aves
Order	Passeriformes
Genus	*Passer*
Specie	*domesticus*

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 bulding
6. Wing and wing feathers folded over body. Tail feathers elongated
7. Feet adapted for perching. Toes 3 in front and I 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 house hold bird

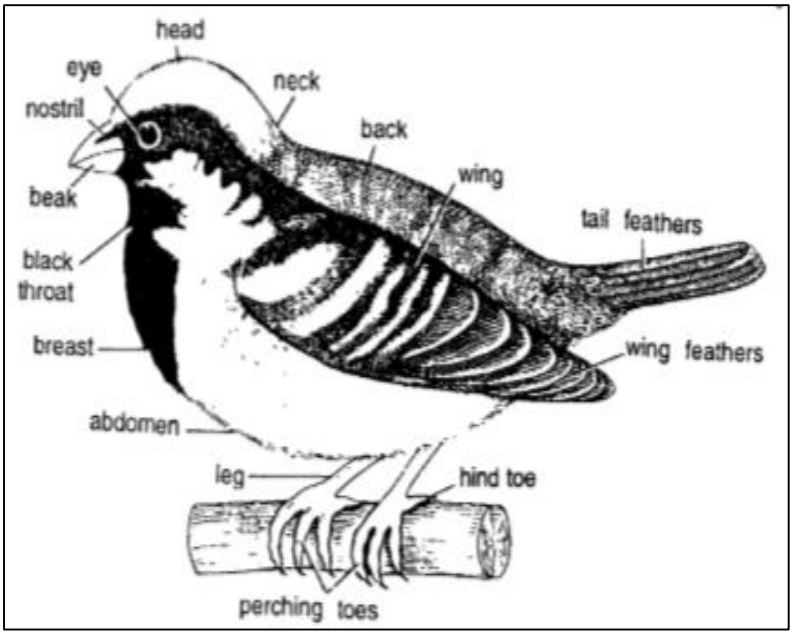


Figure: *Passer domesticus* (Sparrow). Male

Practical No: 15
Study of mammals (Monotremes)

Ornithorhynchus Duck-bill

Classification

Phylum	Chordate
Sub-phylum	Vertebrata
Superclass	Tetrapoda
Class	Mammalia
Order	Monotremata
Genus	*Ornithorhynchus* (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

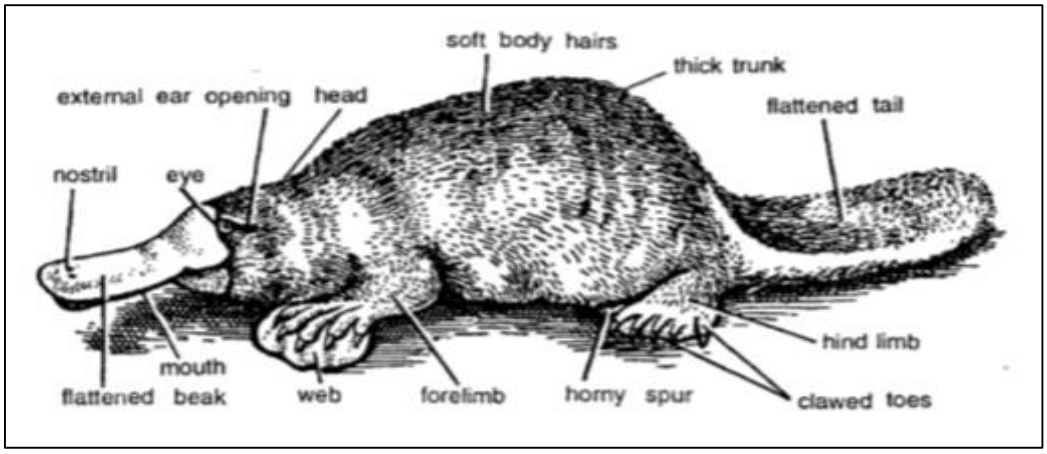


Figure: *Omithorhynchus*: Duck-bill

Practical No: 16
Study of mammals (Marsupial)

Macropus: Kangaroo

Classification

Phylum	Chordate
Sub-phylum	Vertebrata
Superclass	Tetrapoda
Class	Mammalia
Infraclass	Metatheria
Order	Marsupialia
Genus	*Macropus*

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

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

Characteristics:

1. Commonly called as Kangaroo
2. 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
3. Body divisible into head, neck, back, abdomen and tail. Head is small with large ears and eyes
4. Hind legs and feet very long and powerful, used for leaping. Forelimbs smaller
5. Hallux absent, 2nd and 3rd toes united (Syndactylus). Middle or 4th toe enormously enlarged and armed with a powerful claw. Called as toilet claw
6. 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
7. Tail non-prehensile and powerful
8. Other kangaroos are red kangaroo and gray kangaroo

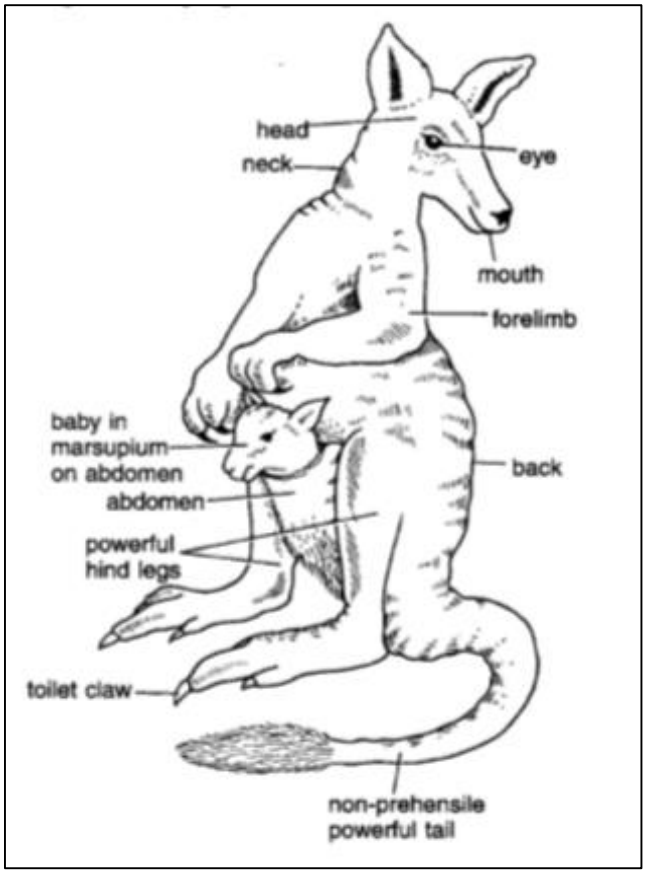


Figure: Macropus: Kangaroo

Practical No: 17
Study of mammals (Prototherians)

Erinaceus Hedgehog

Classification

Phylum	Chordate
Sub-phylum	Vertebrata
Superclass	Tetrapoda
Class	Mammalia
Subclass	Prototheria
Superclass	Tetrapod
Order	Insectivora
Genus	*Erinaceus* (Hedgehog)

Geographical distribution: Erinaceus is found in Cretaceous to Recent.

Habit and habitat: It inhabits holes and bushes during day and it comes out during night to feed. It is omnivorous, feeding on fruits, roots, insects, worms, slugs and other small animals. Hedgehog hibernates during winter. When alarmed or disturbed, it has the habit of rolling its body like a spiny rounded ball.

Characteristics

1. Commonly called as hedgehog
2. Animal characterized by the presence of sharp backwardly directed spines on dorsal side, while ventral side has soft fur. Body elevated above ground and divided into head, neck, back and abdomen
3. Head conical and produced into a small snout bearing nostrils at the tip
4. Mouth small bearing 36 sharp pointed teeth
5. Eyes small. Pinnae and legs short. No marsupial bone or pouch. Number of ribs 14-15
6. Hind and forelimbs short
7. A muscle band is found over neck and sides to move spines
8. Vagina single, foetus develops within uterus of female, attached by a placenta

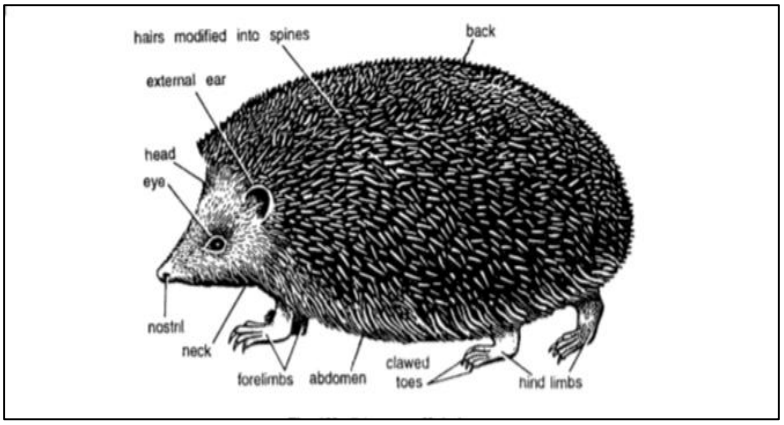


Figure: *Erinaceus*: Hedgehog

Practical No: 18
Field trip to study animal diversity in an ecosystem