Exercise 3

Aim: To study some selected animals on the basis of their external features

Principle: Diversity among animal kingdom is enormous. A systematic study of such a huge number of animals would not have been possible without a proper classification. Zoologists have identified sufficiently large number of animals varying from microscopic protozoans to the giant whale. These animals have been classified on the basis of their morphological similarities and dissimilarities as well as on their phylogenetic relationships. In the present study, emphasis has been put on morphological features. The classification given at the end indicates their systematic position.

Requirement: Representative animals (slides, museum specimens, models, photographs, charts), microscope.

Procedure

The method of observing specimens of different taxa varies from microscopic examination to gross morphological features seen with naked eye.

For identification of some microscopic specimens, place the slide of the specimen on the stage of a compound microscope. Adjust the focus using the adjustment screws of the microscope in such a way that the entire specimen is clearly visible in the focus. For identification of animals visible with the naked eye, specimens preserved in 5-10% formalin are used. Draw labelled diagrams of the specimens seen.

Note: Features marked with '*' are the the identifying features of the organism.

Observation

Amoeba

(i) The whole body is made up of a single cell (acellular organisation).

(ii) *Body shape is irregular with many blunt pseudopodia (Fig. 3.1).

(iii) A deeply stained nucleus of almost round shape is present.

(iv) *A contractile vacuole and several food vacuoles are present in the cytoplasm.

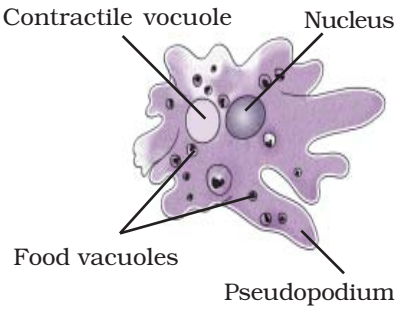


Fig. 3.1 *Amoeba*

Systematic position

Phylum – Protozoa
Class – Sarcodina

Hydra

(i) Body, called polyp is elongated and cylindrical (Fig. 3.2).

(ii) Long, slender and contractile tentacles (6-10) are present that encircle hypostome with an opening at the tip. This end is called oral end.

(iii) The opposite (aboral) end of the body is flat, which helps the animal to attach itself to the substratum. This is called basal disc.

(iv) Bud-like structures branch out from the polyp, which ultimately separate as young hydra (vegetative propagation).

(v) Sometimes, gonads may be seen as small bulges on the body.

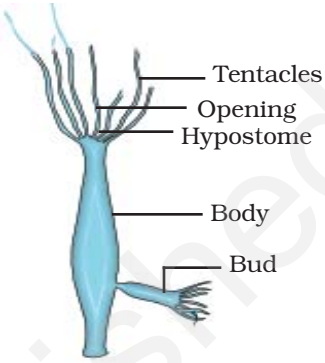


Fig. 3.2 *Hydra*

Systematic position

Phylum – Cnidaria
Class – Hydrozoa

Fasciola (Liver Fluke)

The external features are as follows:

(i) *A leaf-like dorso-ventrally flattened body (Fig. 3.3), about 20-30 mm in length, and 4 to 12 mm in width in the middle.

(ii) Anterior part of the body is broader with a conical end.

(iii) *Mouth is present at the tip of the cone, and is surrounded by a muscular oral sucker.

(iv) On the ventral surface of the body there is a muscular ventral sucker situated 3-5 mm behind (posterior) the oral sucker, and it is called acetabulum.

(v) *Slightly anterior to acetabulum on the ventral surface, there is an opening called genital aperture or gonopore.

(vi) At the tip of the posterior end, an opening called excretory pore is present.

(vii) Liver fluke is bisexual.

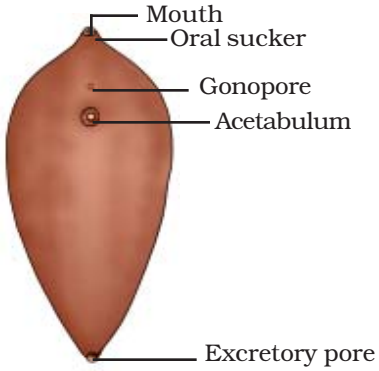


Fig. 3.3 Liver Fluke

Systematic position

Phylum – Platyhelminthes
Class – Trematoda

Note: It is a common parasite living in the liver tissue of some cattles like sheep and buffalo. It can be easily seen with the naked eye, but the details of its external features can be observed under the lower magnification of a microscope. For this purpose, the whole mount slide of the specimen may be observed under a simple dissecting microscope.

Ascaris (Round worm)

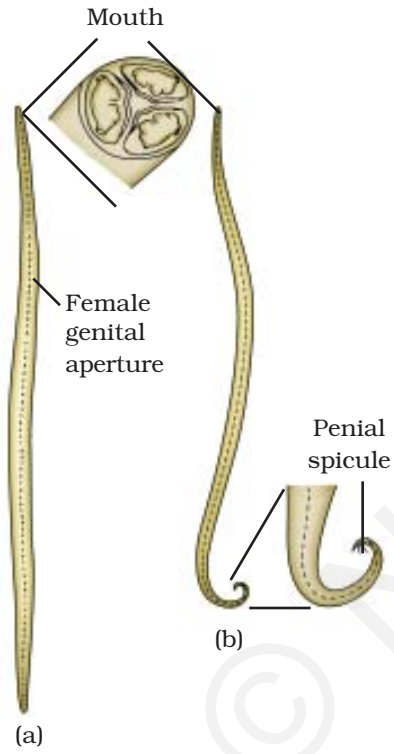


Fig. 3.4 *Ascaris* (a) Female (b) Male

The external features of round worm are as follows:

(i) *Body long (20 to 40 cm), cylindrical (5 to 6 mm diameter) with no segmentation (Fig. 3.4).

(ii) Sexes are separate; the females are longer than the males.

(iii) *Both the ends are pointed; posterior end of male is ventrally curved.

(iv) Mouth is situated at the anterior end, and is surrounded by three lips, one present mid-dorsally and rest two lips are situated ventrolaterally (for viewing these lips a magnifying lens is needed).

(v) *Single longitudinal lines are present on the dorsal, ventral and on the two lateral sides, all along the length of the body. Out of these, the lateral lines are comparatively more distinct than the other lines.

(vi) Excretory pore is present on the ventral surface slightly behind anterior end.

(vii) In addition to the ventrally curved posterior tip, the male worm has a pair of penial spicules very close to the cloacal opening.

(viii) In case of female specimen a female genital aperture is present mid ventrally at about one-third distance from the anterior end.

Systematic position

Phylum – Aschelminthes
Class – Nematoda

Note: Round worm or *Ascaris* is one of the common parasites found in the intestine of human beings.

Pheretima (Earthworm)

The external features of earthworm are as follows:

(i) *Body narrow and elongated about 150 mm in length and 3 to 5 mm in diameter (Fig. 3.5). The anterior end of the body is pointed whereas the posterior end is slightly depressed or blunt.

(ii) *Entire body is divisible into more than 100 externally distinct segments of almost equal size. These segments are called metameres.

(iii) Body surface of the living animal is slimy and moist due to the secretion of mucus from the body wall.

(iv) Dorsal and ventral surfaces of the body can be easily distinguished, as the dorsal surface is darker than the ventral one. Besides this, a mid-dorsal dark line is also visible all along the length of the body due to underlying dorsal blood vessel.

(v) Mouth is situated ventrally in the first metamere called the **peristomium**.

(vi) Anus is situated at the tip of the last metamere.

(vii) *In the adult earthworm, the skin or body wall around the segments 14th to 16th is comparatively thick, and it is called **clitellum.**

(viii) Female and male genital apertures are present ventrally in the14th and the 18th segments respectively. The female genital aperture is situated mid-ventrally, whereas the male genital apertures are ventro-lateral in position.

(ix) A pair of genital papillae is also present ventrolaterally in the 17th and the 19th segment just above and below the male genital apertures.

(x) On the ventral surface, four pairs of openings of spermathecae are situated ventrolaterally in the grooves between 5/6, 6/7, 7/8 and 8/9 segments.

Fig. 3.5 Earthworm (a) Dorsal view (b) Ventral view

Systematic position

Phylum – Annelida

Class – Oligochaeta

Hirudinaria (Leech)

The following external features can be easily observed in the specimen:

(i) *The body is elongated with convex dorsal surface, and flat ventral surface (Fig. 3.6).

(ii) The dorsal surface is dark green, and the ventral surface is yellowish brown.

(iii) Size varies from 6 to 10 cm in length. However, leeches may contract or elongate their body much beyond the limits mentioned.

(iv) Body surface always remains moist due to secretion of mucus from the body wall.

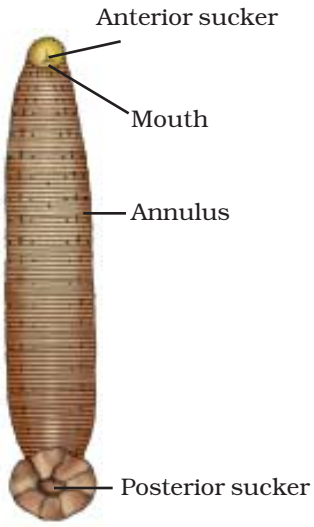


Fig. 3.6 Leech

(v) *At the anterior end on the ventral surface a cup-shaped anterior sucker is present. Mouth is present in the centre of the anterior sucker. A ventral sucker is also present at the posterior end of the body.

(vi) Anus is present on the dorsal side at the junction of the last metamere and the posterior sucker.

(vii) Hundred or more very closely arranged grooves or annuli are present on the body surface. There are 33 body segments each with five superficially marked annuli except the few anterior and posterior ones.

(viii) Each of the five anterior metameres bears a pair of eyes on the dorsal margin. Each eye looks like a dark spot.

(ix) There are 17 pairs of ventro-laterally arranged nephridiopores in the metameres starting from 6th to 22nd.

(x) The male and female genital apertures are present on the ventral side in the middle of the 10th and 11th metameres.

Systematic position

Phylum – Annelida

Class – Hirudinea

Note: It is a blood-sucking (sanguivorous) ectoparasite on cattle and human.

Palaemon (Prawn)

Following are the external features of prawn:

(i) Size of the animal is variable. Usually, it measures between 20 and 30 cm in length (Fig. 3.7).

(ii) Usually orange-red in colour, however, the colour is variable.

(iii) A bit laterally compressed body is elongated, bilateral and symmetrical.

(iv) *Body is apparently divided into anterior **cephalothorax** (fused head and thorax) and posterior **abdomen**.

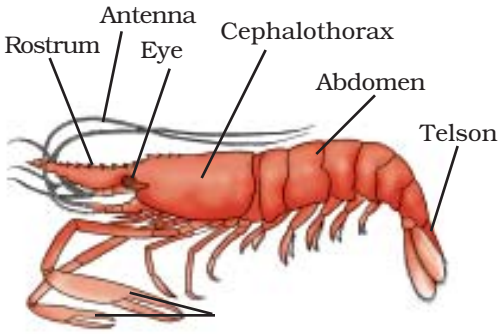


Fig. 3.7 Prawn

(v) *The cephalothorax can be identified by a thick and hard shield- like cover, called the **carapace**. Anteriorly the carapace is extended as a serrated and pointed **rostrum**.

(vi) *A pair of stalked compound eyes are present at the anterior end of cephalothorax.

(vii) Abdomen consists of six segments each with its own set of biramous appendage.

(viii) At the end of the last abdominal segment, a terminally pointed structure, **telson**, is present.

(ix) *There are 19 pairs of jointed appendages, i.e., one pair in each segment. In the cephalothoracic region, there are 13 pairs of appendages of which antennules, antenna, chelate legs, and nonchelate legs are the prominent ones. The appendages of the five anterior abdominal segments are called the **pleopods** or swimming legs. The appendages of the last abdominal segment are broader and called **uropod**.

Systematic position

Phylum – Annelida

Class – Crustacea

Note: It is a common fresh water arthropod found in rivers, ponds, lakes, streams, etc.

Bombyx mori (Silkmoth)

The external features of mulberry silkworm is given below:

(i) Body colour is creamy white and measures approximately 25 mm in length (Fig. 3.8).

(ii) *Heavy and stout body is divisible into head, thorax and abdomen.

(iii) Head is comparatively small. Thorax is provided with three pairs of jointed legs and two pairs of wings. Abdominal segments are continuous with thoracic segments.

(iv) *The entire body as well as wings are covered with microscopic scales.

(v) A pair of compound eyes and an antenna are present on the head.

(vi) *In sitting posture, the wings remain outstretched (like the wings of an aeroplane).

(vii) They are nocturnal.

Fig. 3.8 Silkmoth

Systematic position

Phylum – Arthropoda

Class – Insecta

Note: Silkworms are a group of insects (moths), which are species-specific to their host plants. Silk threads are obtained from the cocoon which is a protective covering around the pupa of these worms. Following are the different varieties of silkworm:

Mulberry Silkworm: *Bombyx mori* (Its host plant is mulberry.)

Tasar Silkworm: (a) Tropical Tasar Silkworm *Antheraea mylita* (Its host plant is *Terminalia arjuna*)

(b) Temperate Tasar Silkworm; (i) *A.proyeli (ii) A. papha.* (Its host plants are Sal, Oak, Fig.etc.)

Muga Silkworm: *Antheraea assemiensis* (Its host plant is Machilus.)

Eri Silkworm: *Philosamia ricinii* (Its host plant is castor, *Ricinus communis*.)

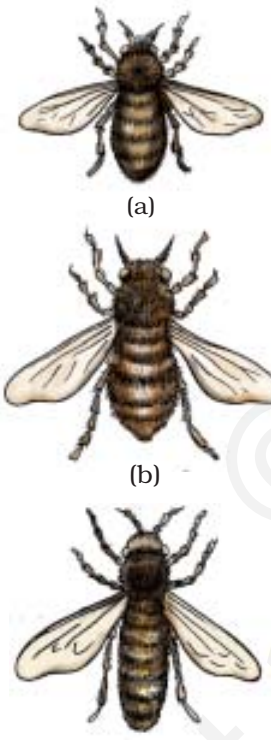
Each and every species of silkworm has its own specific size as well as features. However, the following features are common for all silkworms:

(i) Four stages in life cycle viz., egg, larva, pupa encased in cocoon, and silkmoth.

(ii) The moth is a non-feeding stage. Male moth mates with female, which lays 300-500 eggs. Both parents die 2-3 days after mating and egg laying.

(iii) Silk fiber is obtained by boiling cocoons in water, and then by reeling out the threads.

APIS INDICA (HONEYBEE)



(a)

(b)

(c)

Fig. 3.9 Honeybee
(a) Worker
(b) Queen
(c) Drone

Honeybee is a social insect, and three distinct morphological forms (members) can be identified in a colony of bees. These are queen, workers, and drones. All the three morphological forms of bees have the features of an insect (Fig. 3.9).

Following common features are present in all the members of the colony:

(i) *Body is divided into three distinct regions: head, thorax and abdomen.

(ii) Head is somewhat triangular. A pair of large compound eyes is present dorso-laterally on it. Three small ocelli are present on the dorsal surface between the two compound eyes. Mouthparts are present ventrally on the head.

(iii) Thorax consists of three segments, i.e., prothorax, mesothorax and metathorax. One pair of jointed legs is present ventrally in each of the thoracic segment. There are two pairs of membranous wings present dorsally in the mesothorax and the metathorax.

(iv) Abdomen: A six-segmented abdomen is present behind the metathorax. A very narrow region in between the abdomen and thorax.

Apart from these common features, the workers, queen and drones can be identified by their own specific features:

(a) Workers

(i) Workers (unfertile female) are smallest in size (Fig. 3.9a).

(ii) Abdominal segments bear wax glands, which are present ventrally on the four posterior abdominal segments.

(iii) *A sting is present at the end of the last abdominal segment.

(iv) Pollen - collecting baskets are present in the thoracic legs.

(b) Queen

(i) Queen (fertile female) is largest in size (15-20 mm) in a colony of bees. Every colony has a single queen bee (Fig. 3.9b).

(ii) *The abdomen is long and tapering.

(iii) Wings and legs are small.

(iv) Eyes are small.

(v) Wax gland is absent in the abdominal segment.

(c) Drones

(i) Drones (males) are larger than workers but smaller than queen in size (Fig. 3.9c).

(ii) *Eyes are very large (i.e., even larger than those of workers).

(iii) Wax glands are absent in the abdominal segments.

The common Indian species of bees are: *Apis dorsata*, *Apis indica* and *Apis florae*. Among these species *Apis dorsata* is largest in size and *Apis florae* is smallest.

Systematic position

Phylum – Arthropoda

Class – Insecta

Order – Hymenoptera

Pila globosa (Apple Snail)

The external features are as follows:

(i) *Body of the animal remains lodged within a hard and one-piece spirally coiled calcareous shell (Fig. 3.10).

(ii) There is a wide opening at the end of the last whorl of the shell, which remains closed by another calcareous plate called operculum.

(iii) The body consists of four regions: head, foot, visceral mass and mantle.

(iv) It inhabits shallow freshwater (paddy fields, ponds) and moves with its foot.

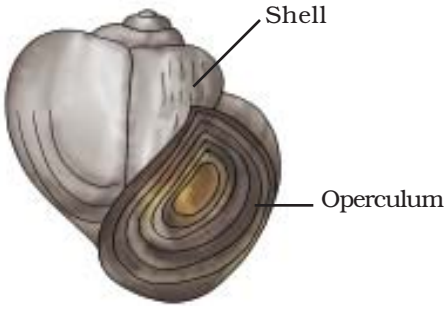


Fig. 3.10 *Pila*

Systematic position

Phylum – Mollusca

Class – Gastropoda

Note: *Pila* or apple snail is one of the common molluscs seen during the rainy season. It is a sluggish organism.

Asterias (Star Fish)

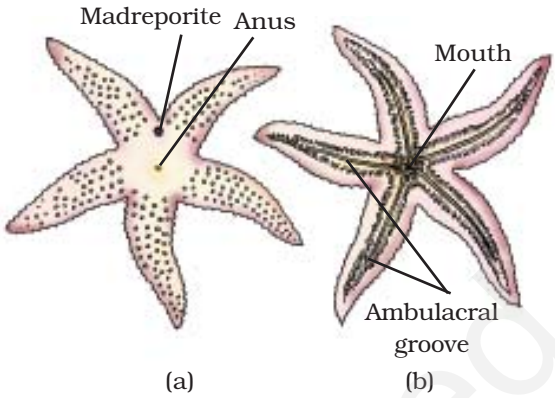


Fig. 3.11 Star fish (a) Aboral view (b) Oral view

The external features are as follows

(i) *Starfish is an unique marine organism, which can be identified by its star-shaped pentamerous structure (Fig. 3.11).

(ii) Body with apparent radial symmetry with diameter ranging between 15-20 cm.

(iii) Body has a central disc from which five tapering arms radiate.

(iv) The entire body surface bears numerous small-sized blunt protuberances.

(v) The lower surface is called the oral surface, as mouth is situated centrally on this side (Fig. 3.11a).

(vi) *Radiating from the mouth there are five grooves, the ambulacral grooves, which continue in the five arms on the oral side.

(vii) *Special organs, called tube feet, are present in these ambulacral grooves.

(viii) The upper surface is called aboral surface, where anus is present (Fig. 3.11b).

(ix) At the margin of the central disc on the aboral surface is a circular sieve like structure called madreporite situated near the junction of two arms.

Systematic position

Phylum – Echinodermata

Class – Asteroidea

Scoliodon (Shark)

The external features of *Scoliodon* are as follows:

(i) *It is a marine fish having elongated, streamlined, dorsoventrally flattened body at anterior end and laterally compressed at posterior end (Fig. 3.12).

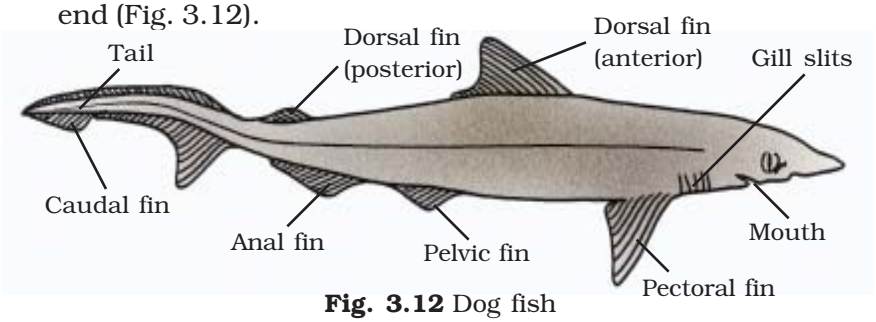


Fig. 3.12 Dog fish

(ii) Body measures upto 60 cm in length.

(iii) Body is covered with minute placoid scales that can be felt when skin is rubbed from tail to snout.

(iv) Body is divided into head, trunk and tail.

(v) A crescentic mouth is present on the ventral surface of the head behind the tip. Mouth has several rows of sharp and backwardly pointed teeth on both upper and lower jaws.

(vi) *Tail is elongated with heterocercal caudal fin (the upper and lower halves of unequal size).

(vii) *Body bears a number of unpaired and paired fins. The unpaired fins have two dorsals, a lobed caudal and a median ventral fin. Pectoral and pelvic fins are in pairs.

(viii) *Five pairs of gill slits are present laterally between mouth and pectoral fins.

(ix) A median groove-like cloacal aperture is situated ventrally between the two pelvic fins.

(x) Sexual dimorphism is visible as males have midventrally situated copulatory organ.

Systematic position

Phylum – Chordata

Subphylum – Vertebrata

Superclass – Pisces

Class – Chondrichthyes

Labeo Rohita (Rohu)

The external features are as follows:

(i) Streamlined and laterally compressed body, which is grey or black on the dorsal side; and silvery on the ventral surface. Size may reach up to 1m in length (Fig. 3.13).

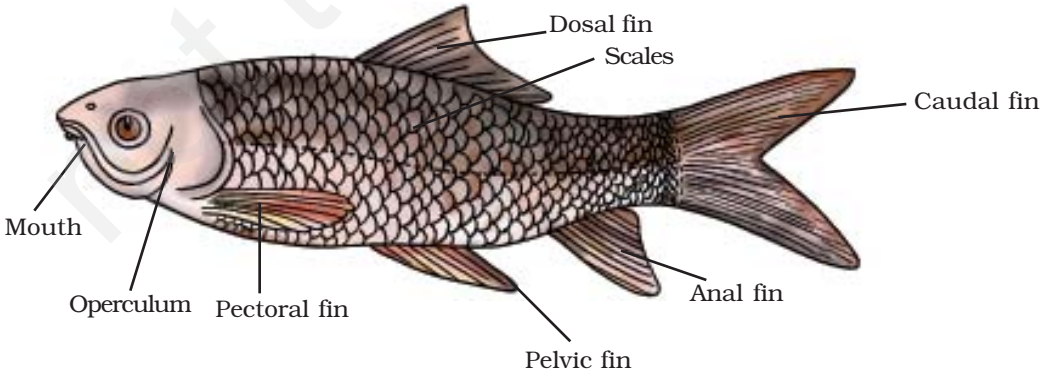


Fig. 3.13 Rohu fish

(ii) *Body is divisible into head, trunk and a tail with homocercal (dorsal and ventral lobes are of equal size) caudal fin.

(iii) Head is extended between the snout and the posterior end of the operculum (i.e., gill cover). Snout is depressed and obtuse. The operculum is free and open along the posterior and ventral margins. Mouth is a transverse opening near the tip of the snout, which has fleshy lips.

(iv) *The margin of the lower lip is fimbriated.

(v) The whole body is covered with overlapping cycloid dermal scales.

(vi) Both unpaired and paired fins are present on its body. The unpaired fins are a dorsal fin, a caudal fin and an anal fin. Pectoral and pelvic fins are paired.

Systematic position

Phylum	-	Chordata
Subphylum	-	Vertebrata
Super Class	-	Pisces
Class	–	Osteichthyes

Note: *Labeo rohita* or Rohu is one of the major freshwater carps having bony endoskeleton found in rivers and ponds in the Indian subcontinent.

Rana tigrina (Frog)

The following features can be observed: (Fig. 3.14)

(i) *The body consists of head and trunk, neck is absent.

(ii) Highly placed external nasal opening, eyes are bulging and covered by a nictitating membrane. The outer boundary of middle ear is covered by a membrane, called *tympanic membrane*.

(iii) *Skin is naked, (that is without any type of scales) and slimy (secretion of mucous glands present in the skin).

(iv) Mouth is terminal, having protrosible bifid tongue. Upper jaw is beset with several rows of spiny teeth, lower jaw has no teeth.

(v) *Forelimbs are smaller than the hindlimbs. The forelimbs have four, and hindlimbs have 5 clawless digits. An interdigital web-like membrane is present in the hind-limbs, which is used for swimming.

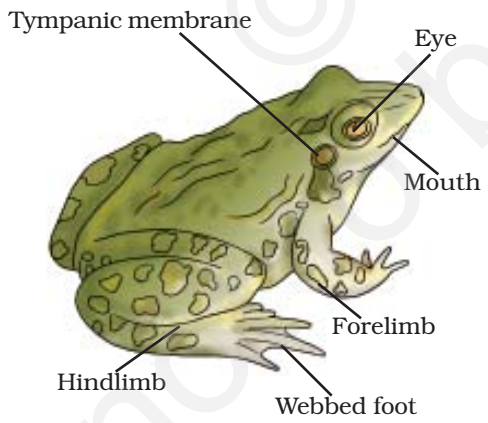


Fig. 3.14 Frog

Note: There is a distinct sexual dimorphism between male and female frog. Males are comparatively smaller in size and the base of the first digit of forelimb becomes thick and pad-like. This is called nuptial pad, which helps in holding the females during mating. On the ventral surface of the lower jaw, two vocal sacs are present for making nuptial calls during breeding season.

Systematic position

Phylum – Chordata
Subphylum – Vertebrata
Class – Amphibia

Calotes (Garden Lizard)

It has the following external features: (Fig. 3.15)

(i) *Body is divided into head, neck, trunk and elongated tail.

(ii) *Body is covered with rough epidermal scales.

(iii) Head is triangular with a cone-shaped snout having a wide mouth. A pair of nostrils and eyes present on the head. Eyes are dorso-lateral in position on head.

(iv) *Two pairs of pentadactyl (five digits) limbs; the digits are clawed.

(v) The skin provides the animal with protective colouration in its environment.

Fig. 3.15 Garden lizard

Systematic position

Phylum – Chordata
Subphylum – Vertebrata
Class – Reptilia

Note: Garden lizard is an arboreal (tree dweller) reptile commonly found among the bushes, shrubs and trees.

Columba livea (Pigeon)

Pigeon is one of the most common birds showing flight adaptations and having cosmopolitan distribution. The external features are as follows (Fig. 3.16):

(i) *Body covered with feathers.

(ii) Streamlined body divisible into head, neck and trunk.

(iii) *A small and round head, having beak without teeth. In addition the head bears a pair of nostrils, large eyes and opening of the ears (covered with feathers).

(iv) Eyes are provided with movable eyelids and nictitating membrane.

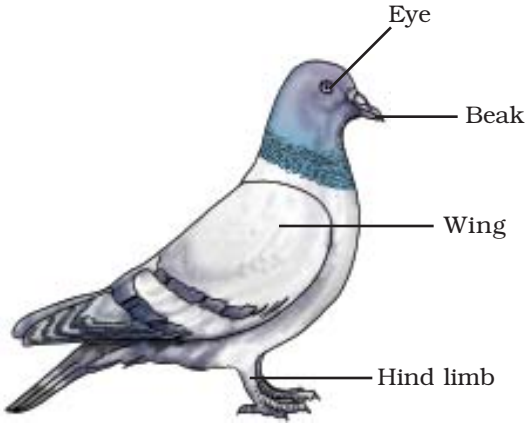


Fig. 3.16 Pigeon

(v) Cylindrical neck is very flexible to facilitate mobility of the head.

(vi) Forelimbs are modified into two wings for flying. The hindlimbs have four-clawed digits of which the first one is backwardly directed and the remaining three are forwardly directed. It helps in perching and bears the weight of the body while standing.

(vii) Cloacal aperture is situated at the posterior end of the trunk.

Systematic position

Phylum	-	Chordata
Subphylum	-	Vertebrata
Class	-	Aves

Oryctolagus lagomorpha (Rabbit)

Rabbit is a fossorial (burrowing) mammal. However, it can lead a terrestrial life in the thick vegetation.

The external features include (Fig. 3.17)

Fig. 3.17 Rabbit

(i) A medium sized animal, about 40 cm in length when adult.

(ii) Body is covered with hair, and is divisible into head, neck, trunk and a small tail.

(iii) *Head is pear-shaped with a blunt snout. Anteriorly it bears a mouth and a pair of external ears, the pinna. The upper lip has a median cleft through which the incisor teeth get exposed. Few prominent and stiff hairs are present laterally on the upper lip. These are touch- sensitive (tactile) and called vibrissae or whiskers.

(iv) A short but highly flexible neck is present between the head and the trunk.

(v) *Males have a small, cylindrical and muscular penis, a pair of scrotal sacs in which a pair of testes are lodged. Females have slit-like vulva. Females also have four to five pairs of mammary glands, which open ventrally as teats or nipples along the thorax and abdomen. Animal is viviparous.

(vi) Tail is short, upwardly directed and furry.

Systematic position

Phylum – Chordata
Subphylum – Vertebrata
Class – Mammalia

Questions

1. Match the characters given in Column A with the name of animals given in Column B.

Column A	**Column B**
(a) Hypostome	(i) Amoeba
(b) Cephalothorax	(ii) Hydra
(c) Ambulacral Groove	(iii) Earthworm
(d) Pseudopodia	(iv) Prawn
	(v) Star fish

2. What are the important differences of workers, queen and drones in honey bee?
3. Mention two main differences between male and female *Ascaris*.