Exercise 14

Aim: Study of external morphology of animals through models.

Principle: The external morphology of any organism is normally studied using either their preserved (in formalin or ethanol) or stuffed specimens. Use of models for the purpose of its study becomes very important and relevant for such animals, which are rare, endangered or even extinct.

It is needless to mention that every fine detail of the external features of an organism is depicted in the model. Not only this, a magnified image of a few otherwise smaller or minute parts are also sometimes depicted in the model. In order to have an idea of the exact size of the animal, a scale is desired to be given on the platform on which the model is mounted.

Requirement: Model of the animal to be studied, note book, pencil and eraser

Procedure

For this purpose, take a model of the animal and observe its features and note down in your practical record notebook. It is always desirable to study the models of both male and female specimens that show sexual dimorphism. Also draw a labelled diagram of the animal.

Earthworm

The external features of earthworm (*Pheretima posthuma*) are as follows:

(i) Narrow, cylindrical and elongated body measuring approximately 150mm in length and 3 to 5 mm in diameter. The anterior end of the body is pointed whereas the posterior end is slightly depressed or blunt.

(ii) The dorsal surface of the body is darker than the ventral surface. Besides this, a median dark line due to underlying dorsal blood vessel is also visible on the dorsal surface all along the length of the body.

(iii) Entire body is divisible into more than 100 segments of almost equal size. These are called **metameres** (Fig. 14.1).

(iv) Mouth is situated anteriorly in the first metamere called the **peristomium**.

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

(vi) In the adult earthworm, the skin or body wall around the segments 14th to 16th is comparatively thick, and the segmentation is not conspicuous. This thickened region is called **clitellum**.

(vii) The animal is hermaphrodite. Female and male genital apertures are present ventrally in the 14th and 18th segments respectively. The female genital aperture is situated mid ventrally, whereas the two male genital apertures are ventro-lateral in position.

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

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

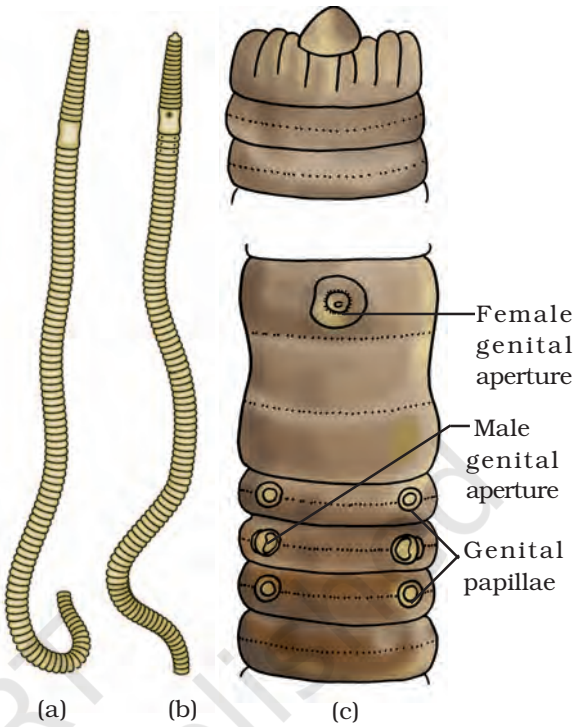

Fig. 14.1 External morphology of earthworm (a) Dorsal (b) Ventral (c) Details in magnified view

Cockroach

The following external features may be observed in the model:

(i) Body is dorsoventrally flattened, and bilaterally symmetrical. The body is covered externally by chitinous plates called **sclerites**. The dorsal sclerites are called ***tergum,*** while the ventral ones are called ***sternum***.

(ii) Body is distinctly divisible into three parts, i.e., head, thorax and abdomen (Fig. 14.2).

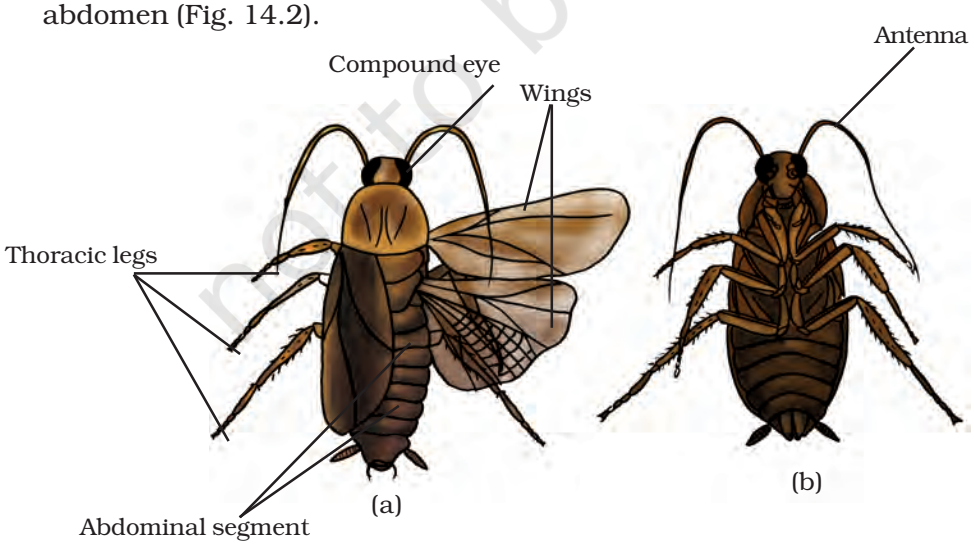

Fig. 14.2 External morphology of cockroach (a) Dorsal view (b) Ventral view

(a) Head: It is a triangular structure attached movably with the thorax, and is oriented perpendicular to the body axis. Head consists of six chitinous plates, all fused together. A pair of large compound eyes, and segmented long antennae (singular: antenna) are situated laterally on the head. The antennae are present very close to the eyes. Ventrally, an opening called mouth is present on the head that remains surrounded by the mouth parts consisting of a pair of **mandibles**, **first maxillae**, **labium or fused second maxillae, hypopharynx** and **labrum** (Fig. 14.3).

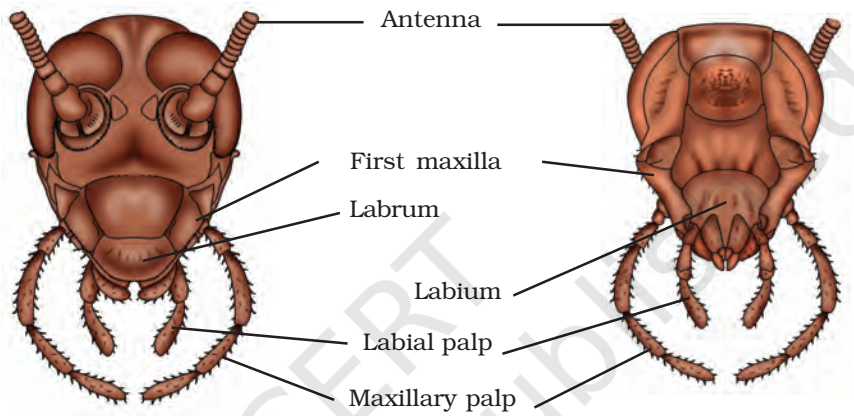

Fig. 14.3 External morphology of cockroach

(b) Thorax: It has three segments, i.e., **prothorax, mesothorax** and **metathorax.** The prothorax is larger than the rest. From each of the thoracic segment a pair of jointed legs arises ventrally. The leg segments are **coxa, trochanter, femur, tibia** and **tarsus**, which consist of five jointed tarsomeres (Fig. 14.4). Two pairs of wings are present, of which one pair is attached to the mesothoracic and the other pair to the metathoracic segments. Both pairs of the wings together cover the entire body segments starting from mesothorax. The forewing called **tegmina** is thick as well as feathery and it covers the thin and membranous hind wing while at rest.

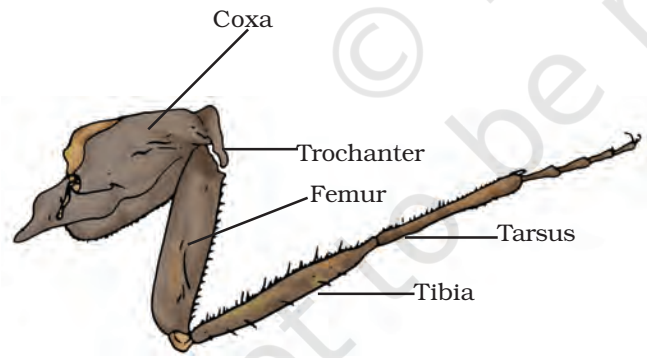

Fig. 14.4 Leg of cockroach showing different parts

(c) Abdomen: It consists of ten segments. The last four segments are slightly narrower; hence the posterior end of the abdomen looks tapering. Dimorphism of male and female is distinct in the posterior abdominal segments. In females, the seventh sclerite of abdominal segment overlaps the eighth and the ninth sclerites and together

form a boat shaped genital pouch ventrally. On the other hand in males, only the seventh segment overlaps the eighth segment. A pair of long and jointed **anal cerci** is present laterally on the tenth segment of both male and female. The males have an additional pair of filamentous **anal style,** attached ventrally to the ninth segment (Fig. 14.5).

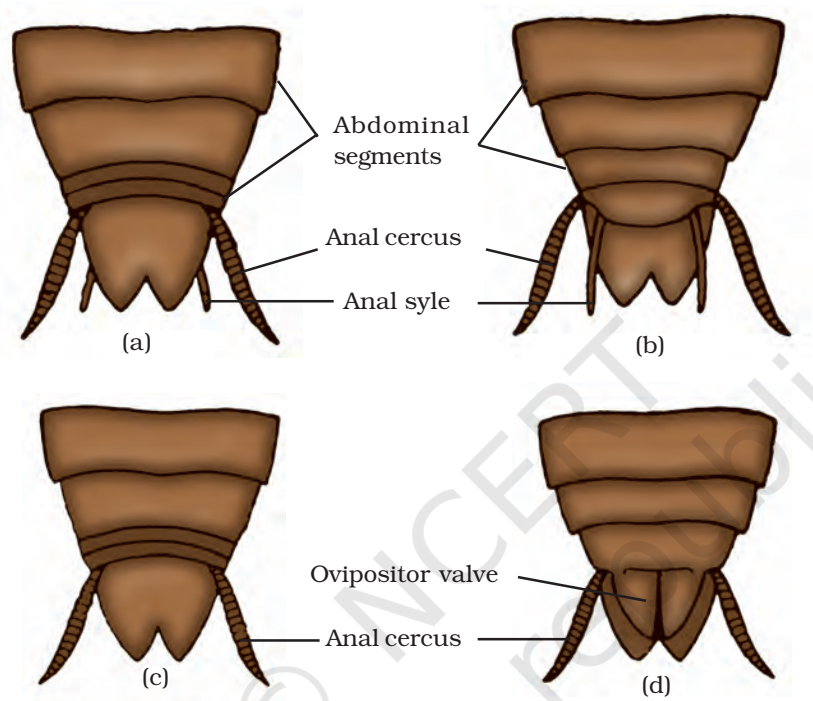

Fig. 14.5 Posterior abdominal segments of cockroach
(a) Male dorsal view (b) Male ventral view
(c) Female dorsal view (d) Female ventral view

Frog

The following external features may be observed in the model.

(i) Body is bilaterally symmetrical and streamlined (Fig. 14.6). Head is triangular in shape. On the dorso-lateral margins of head, is present a pair of bulging eyes. Nictitating membrane is present to cover the eyeball. Behind the eyes a distinct pair of circular patch of skin, called **tympanic membrane**, is present. Mouth is beset with upper and lower jaws. Mouth opens into the buccal cavity in which a posteriorly attached

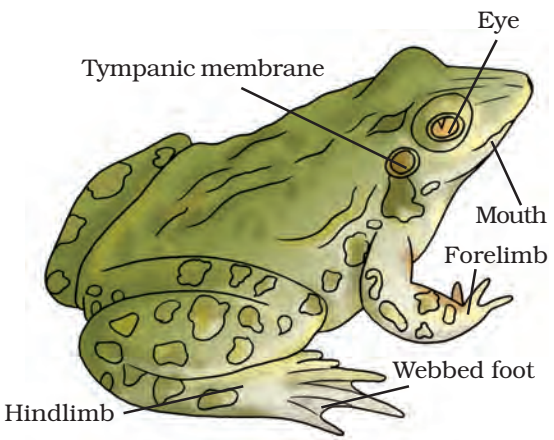

Fig. 14.6 External morphology of frog

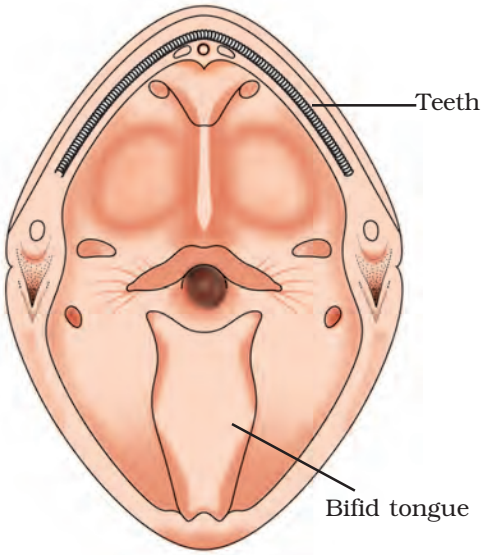

Fig. 14.7 Buccal cavity of frog

bifid and highly muscular tongue is present. Upper jaw contains rows of pointed teeth. Lower jaw is toothless. Dorsally on the snout, a pair of nostrils are present (Fig. 14.7).

(ii) Behind the head, a wide and long trunk is present. Neck is absent. At the posterior end of the trunk a **cloacal** aperture is present. There is no tail. Trunk is provided with two pairs of limbs i.e. the forelimb and the hindlimb. The forelimbs are smaller in length than the hind limbs. Forelimb is differentiated into upper arm, forearm, and a hand with four small digits without claws. The hindlimb consists of a thigh, shank and a foot with five long and webbed digits (Fig. 14.8).

(iii) 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 the forelimb becomes thick and pad like during breeding season only. This is called **nuptial pad** (Fig. 14.8), which helps in holding the females during mating. Males also have a pair of prominent vocal sacs on the ventral surface of lower jaw to produce croaking sound.

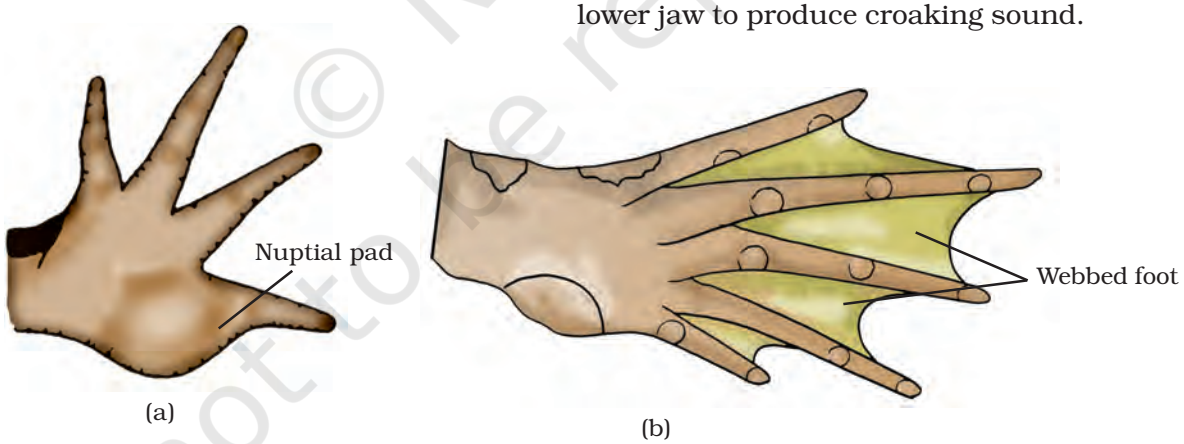

Fig. 14.8 Digits of the limbs of frog (a) Nuptial pad of fore limb (b) Webbed foot of hind limb

Questions

1. What are important significances of study of an organism through its model?