
EXERCISE 15 ARTHROPODA – III (INSECTA) : OBSERVATION AND CLASSIFICATION OF SPECIMENS

Structure

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15.1 INTRODUCTION

In the previous unit (Unit – 5) you have examined the representatives of arthropoda. In this unit, you will learn about some of the representatives of insects. You have already studied that insect body is distinctly divisible into head, thorax and abdomen. The head bears mouth parts, a pair of compound eyes and a pair of antennae; the thorax is three-segmented, generally with two pairs of wings and three pairs of jointed legs (hence also the name Hexapoda for the insects); the abdomen is usually 11-segmented and is devoid of appendages.

Objectives

After performing this exercise you should be able to

- identify the insect specimens like Silverfish (*Lepisma*), Dragonfly, Locust, Mantis, *Gryllus*, *Pediculus*,
- classify the identified insects upto the level of the order, list the characters justifying their classification and mention special features, if any,
- mention the habit and geographical location of the identified insects,
- draw labelled diagrams of the identified insects,
- mention the economic importance, if any, of the identified insects.

15.2 MATERIAL REQUIRED

1. A compound microscope
2. A magnifying glass
3. Dried and preserved specimens of *Lepisma*, dragonfly, *Schistocerca gregaria*, Mantis and *Gryllus*
4. Permanent whole mounts of *Pediculus* and *Lepisma*
5. A piece of thermocol of the size of 4"X4"
6. A moderately soft pencil and an eraser.
7. Drawing sheets.

15.3 LEPISMA (Silver-fish)

Examine the specimen and note the following features:

Pasted on a small triangular piece of hard paper. (Permanent mount may also be observed under microscope).

- (i) *Lepisma* (Silver fish) is silvery white in colour, and has a "fish-like" body (pointed at both ends), hence its common name silverfish. Its peculiar colour is due to silvery white scales covering the entire body.
- (ii) The body is divisible into head, thorax, and abdomen (Fig. 15.1).
- (iii) The head bears a pair of eyes on its dorso-lateral sides, and a pair of long hair-like antennae.
- (iv) The thorax is 3-segmented, and bears a pair of jointed legs on each segment. [Do you see any wings in this insect? No, there is none, *Lepisma* is an apteron (a = without + pteron = wing) insect.]
- (v) The abdomen is 11-segmented. Look at the tip of the abdomen carefully. It bears 2 pairs of abdominal appendages, one pair of anal cerci, and a long, thread-like telson.

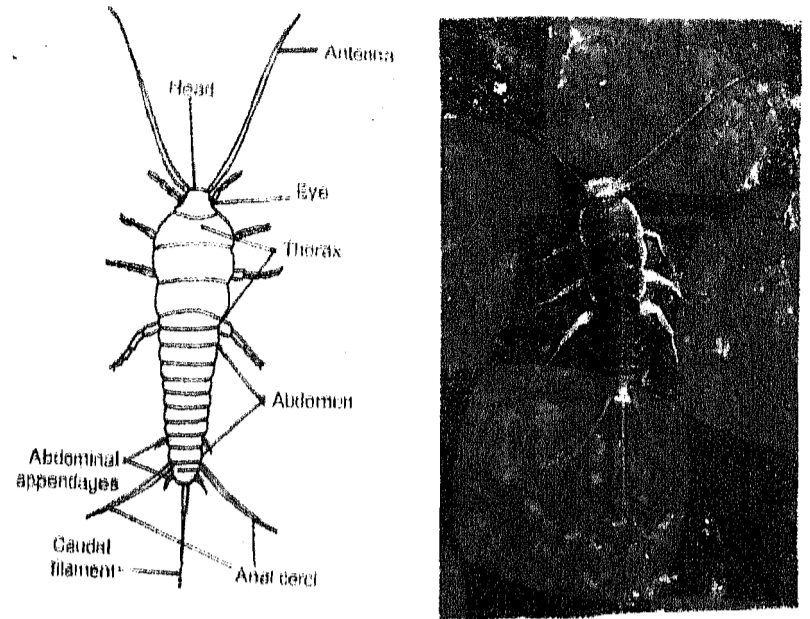


Fig. 15.1: *Lepisma*.

Habits and Habitat

Lepisma is a small-sized (about 4-5 mm long) insect, commonly occurring in damp places and feeding on the starch of starched clothes and the gum paste in the book binding including paper. As such it is a household pest but of a minor importance.

Geographical Distribution

Almost throughout the world.

Classification and its Justification

Kingdom	Animalia	Animals, multi-cellular organisms with cells that lack a cell wall, many capable of movement or movement of some of their body parts or capable of movement at some time of their life cycle; heterotrophic nutrition.
Phylum	Arthropoda	because it has a metamericly segmented body with jointed legs.
Class	Insecta	because its body is divisible into head, thorax and abdomen and thorax bears three pairs of legs
Sub-class	Pterygota	because wings are absent and there is no metamorphosis during development,
Order	Thysanura	because it has many-segmented cerci and a large median caudal telson.
Genus	<i>Lepisma</i>	
Common name	Silver fish	

15.4 DRAGONFLY

Fix a dried, and well-stretched preserved specimen on a thermocol sheet and observe the following features:

- (i) The body is divisible into a large head, robust thorax and long abdomen.

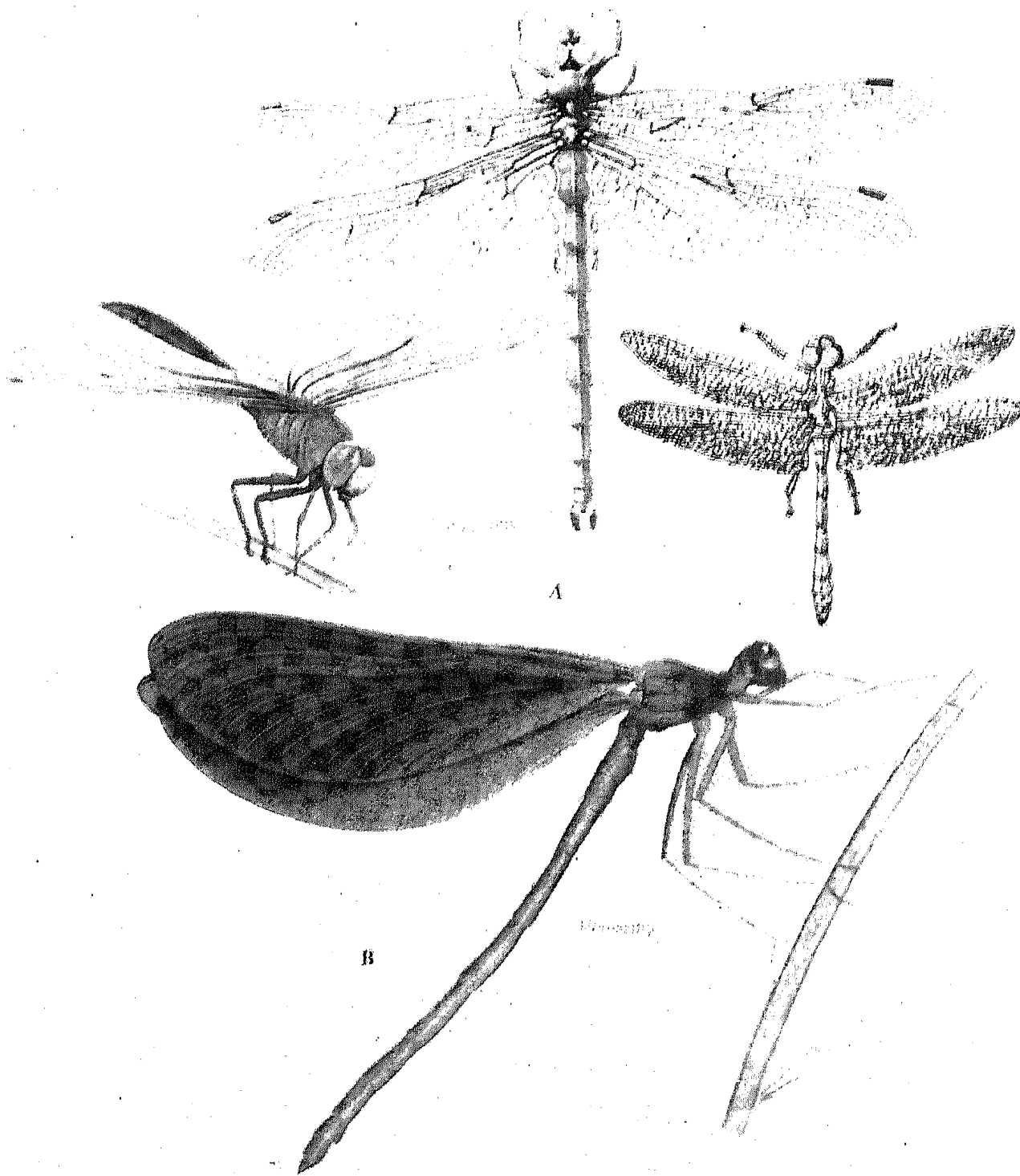


Fig. 15.2: A - Dragon flies, B - Damsel-fly.

- (ii) The head bears a pair of prominent compound eyes (each consisting of about 30,000 visual units called ommatidia), and pair of inconspicuous antennae.
- (iii) The thorax is 3-segmented.
- (iv) Each thoracic segment bears a pair of jointed legs.
- (v) Two pairs of large, membranous wings on the second and third thoracic segments. The wings are held horizontally while the insect is resting.
- (vi) Look at the apex of the anterior margin of each wing. You can very clearly see a coloured spot called as "Pterostigma" (Fig. 15.2).
- (vii) Observe the posterior margin at the base of hind wings. It is produced backward in the form of a lobe-like structure. Presence of this lobe is a characteristic feature of dragon-flies, and helps in distinguishing them from their close relatives – the damsel flies, which do not show this projection.
- (viii) The abdomen is very long and cylindrical, with male copulating organ located on the second and third sternite.

Habits and Habitat

Commonly found flying in the air in the vicinity of water (ponds, etc). Predatory in habit, being strong hunters.

Geographical Distribution

It has a cosmopolitan distribution, especially found in India, Sri Lanka, Myanmar, Malaysia, Asia, USA and Europe.

Classification and its Justification

Kingdom	Animalia	Animals, multi-cellular organisms with cells that lack a cell wall, many capable of movement or movement of some of their body parts or capable of movement at some time of their life cycle; lieterotrophic nutrition.
Phylum	Arthropoda	because it has a metamericly segmented body with jointed legs.
Class	Insecta	because its body is divisible into head, thorax and abdomen and thorax bears three pairs of legs
Sub-class	Pterygota	because wings are present and there is metamorphosis during development,
Order	Odonata	because mouth parts are of biting type, wings membranous and held horizontally, nymphs are aquatic with rectal gills.

Common name **Dragon fly**

15.5 LOCUST

Fix a dried, preserved and well-stretched specimen of Locust (*Schistocerca gregaria*) on a thermocol sheet and observe the following features:

- (i) The body is robust with head broadly joined with the thorax.
- (ii) The head bears a pair of short antennae, and a pair of well-developed compound eyes (Fig. 15.3).
- (iii) The forewings are leathery to form tegmina black spots, while the hind wings are large and membranous. The hind legs are Long and stout and are meant for jumping.
- (iv) The abdomen consists of ten segments with a vestigial eleventh segment.

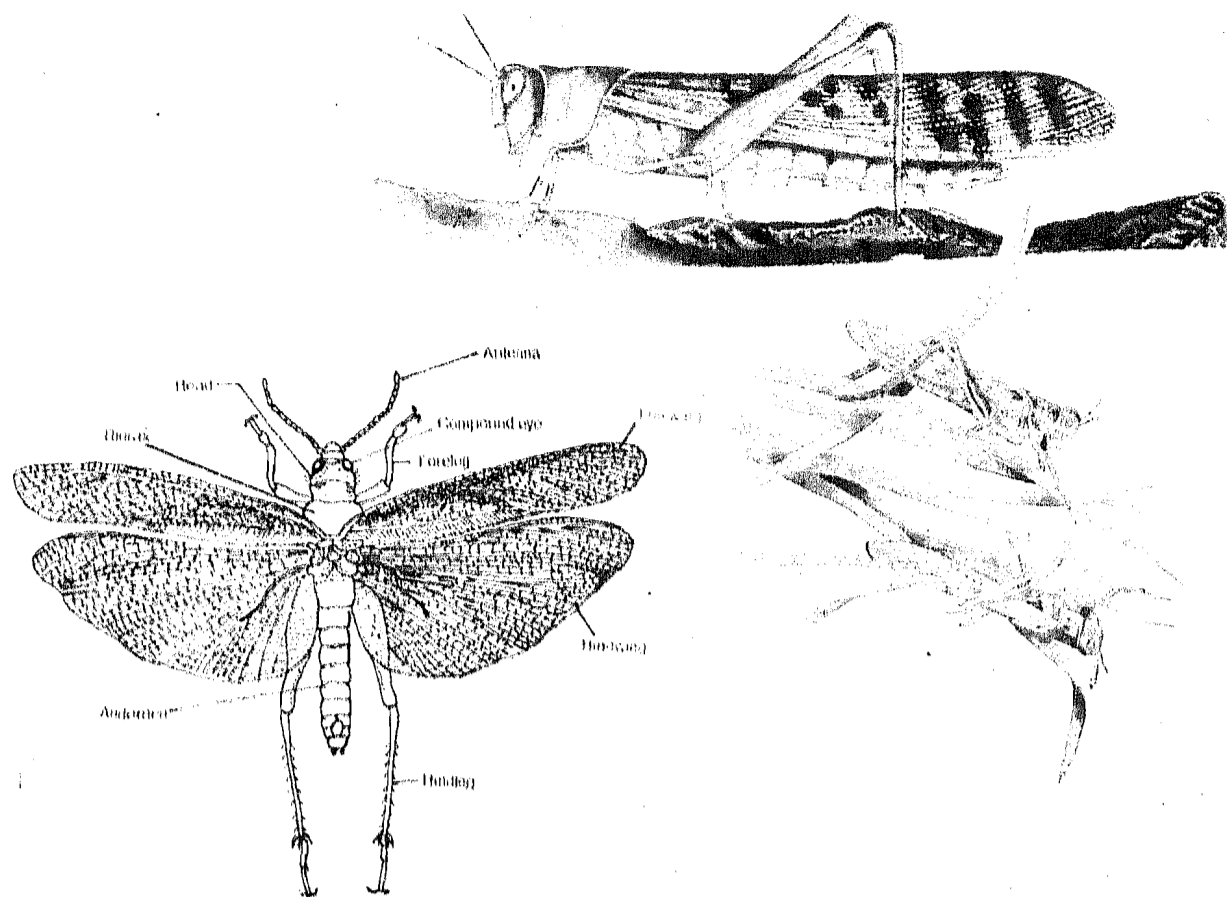


Fig. 15.3: Locust-*Schistocerca gregaria*

Habits and Habitat

Locusts are found in the deserts in the tropical regions of the world; they are herbivores and gregarious migrating (swarming) in great numbers.

Locusts are agricultural pests of great importance and are the worst destroyer of standing crops and orchards.

Geographical Distribution

Locusts are found in the deserts of Africa, Arabia, Iran, Afganistan, Pakistan and North-West India.

Classification and its Justification

Kingdom	Animalia	Animals, multi-cellular organisms with cells that lack a cell wall, many capable of movement or movement of some of their body parts or capable of movement at some time of their life cycle; heterotrophic nutrition.
Phylum	Arthropoda	because it has a metamerically segmented body with jointed legs.
Class	Insecta	because its body is divisible into head, thorax and abdomen and thorax bears three pairs of legs
Sub-class	Pterygota	because wings are present and there is metamorphosis during development,

15.6 MANTIS – Praying Mantis

Fix a dried, preserved and well-stretched specimen of Praying mantis (*Mantis religiosa*) on a thermocol sheet and observe the following characters:

- (i) The elongated body is of green colour and is divisible into head, thorax and abdomen.
- (ii) Head is small and triangular, bears large compound eyes and three simple eyes called Ocelli.
- (iii) The antennae are long and filiform.
- (iv) Mouth parts are of biting and chewing type.

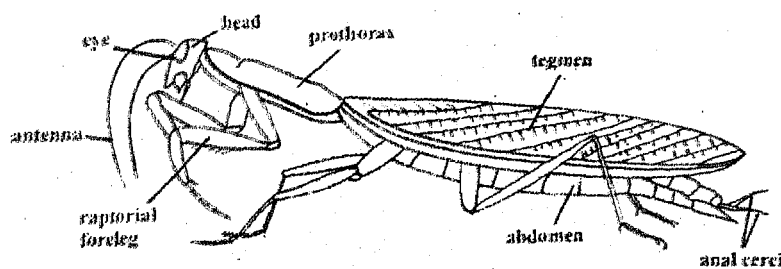


Fig. 15.4: *Praying Mantis*

- (v) Prothorax is much elongated with the raptorial forelegs modified for grasping and holding the prey (fore legs are usually held folded facing forward, and hence the popular adjectival name "praying").
- (vi) Wings are membranous, folded and overlap the sides of the body.
- (vii) Abdomen is 10-segmented.

Habits and Habitat

Mantis is found in grassy fields and areas of plantation. It is a voracious carnivore devouring living insects. It lies in wait for the prey, the forelegs are raised in an attitude of "prayer", hence the name praying mantis.

Geographical Distribution

Various species of mantis are found in USA, Africa, Southern Europe and Western Asia.

Classification and its Justification

Kingdom	Animalia	Animals, multi-cellular organisms with cells that lack a cell wall, many capable of movement or movement of some of their body parts or capable of movement at some time of their life cycle; heterotrophic nutrition.
Phylum	Arthropoda	because it has a metameric segmented body with jointed legs.
Class	Insecta	because its body is divisible into head, thorax and abdomen and thorax bears three pairs of legs
Sub-class	Pterygota	because wings are present and there is no metamorphosis during development,
Order	Orthoptera	because it has biting and chewing type of mouthparts; the forewings are leathery, while hind wings are membranous.
Genus	<i>Mantis</i>	
Species	<i>religiosa</i>	
Common name	Praying mantis	

15.7 GRYLLUS

Fix a dried, preserved and well-stretched specimen of *Gryllus* (Cricket) on a small thermocol sheet and observe the following features:

- (i) The body is divisible into head, thorax and abdomen.
- (ii) Head bears a pair of compound eyes, and a pair of simple eyes known as ocelli.
- (iii) A pair of long filiform antennae.
- (iv) Mouth parts are well-developed and are of biting and chewing type.
- (v) Forewings are hard and are called as tegmina, while the hindwings are membranous.
- (vi) The tibia of the forelegs bear tympanic (sound perceiving) organs.
- (vii) Hind legs are long and stout and are adapted for jumping (Fig. 15.6)
- (viii) The female possesses a well-developed ovipositor for depositing the eggs in crevices and holes.
- (ix) It has a stridulating (sound producing) organ, consisting of a file at the base of the forewing and a scraper at the edge of the forewing. The scraper rubs the file and produces sounds specially during night time.

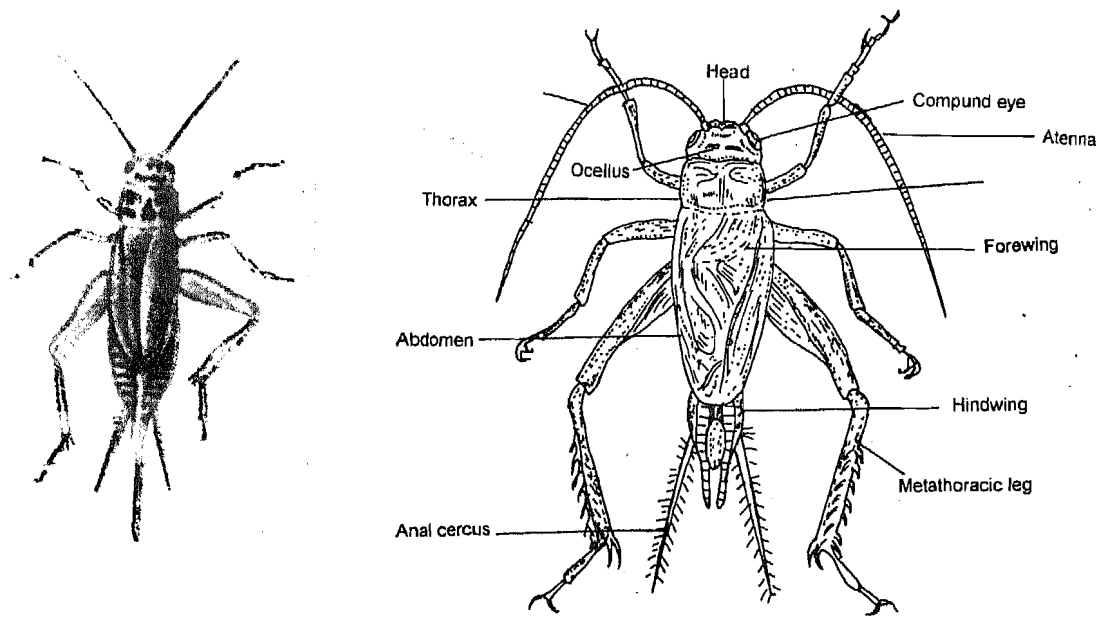


Fig. 15.5 *Gryllus* (cricket)

Habits and Habitat

Gryllus is a common household insect. It is found in damp, warm places like under logs, boxes, stones and in the kitchen. It comes out only during night (such insects are known as nocturnal), and are omnivorous. They are very destructive, damaging the household belonging, like clothes, books, food, etc.

Geographical distribution

Gryllus is found in India, Sri Lanka, Myanmar, USA, Canada and Europe.

Classification and its Justification

Kingdom	Animalia	Animals, multi-cellular organisms with cells that lack a cell wall, many capable of movement or movement of some of their body parts or capable of movement at some time of their life cycle; heterotrophic nutrition.
Phylum	Arthropoda	because it has a metamerically segmented body with jointed legs.
Class	Insecta	because its body is divisible into head, thorax and abdomen and thorax bears three pairs of legs
Sub-class	Pterygota	because wings are present and there is metamorphosis during development,
Order	Orthoptera	because it has biting and chewing type of mouthparts; the forewings are leathery, while hind wings are membranous.
Genus	<i>Gryllus</i>	
Common name	Cricket	

15.8 PEDICULUS

Put a prepared (permanent) slide of *Pediculus* (Head louse) under the microscope and observe the following features:

- (i) It is a small-sized, dorso-ventrally flattened insect of pale brown colour with dark markings along the sides. (Its dorso-ventrally flattened body makes this insect to fit into the narrow spaces between the hairs of the host).
- (ii) The body is divisible into head, thorax and abdomen.
- (iii) The head is small, bears a pair of compound eyes, and a pair of 5-segmented antennae.
- (iv) The mouth parts are of piercing and sucking type.

[Do you see any wings on this insect? No, there are none, Wings are secondarily lost. Loss of the wings in *Pediculus* is a parasitic adaptation].

- (v) It has three pairs of legs. Each leg bears a large curved claw adapted for clinging to the hairs of the host (humans).
- (vi) Abdomen is 9-segmented.

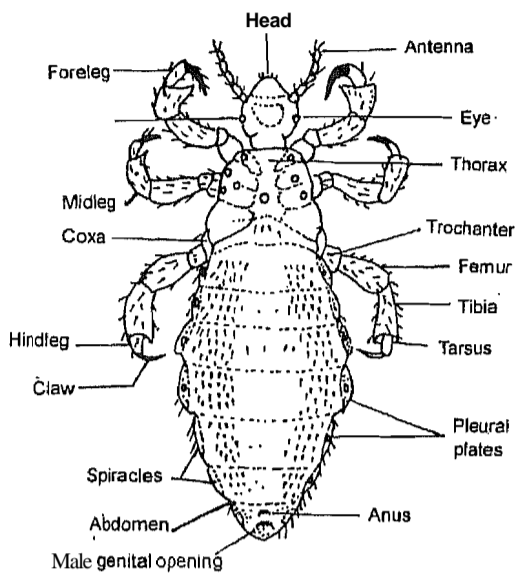
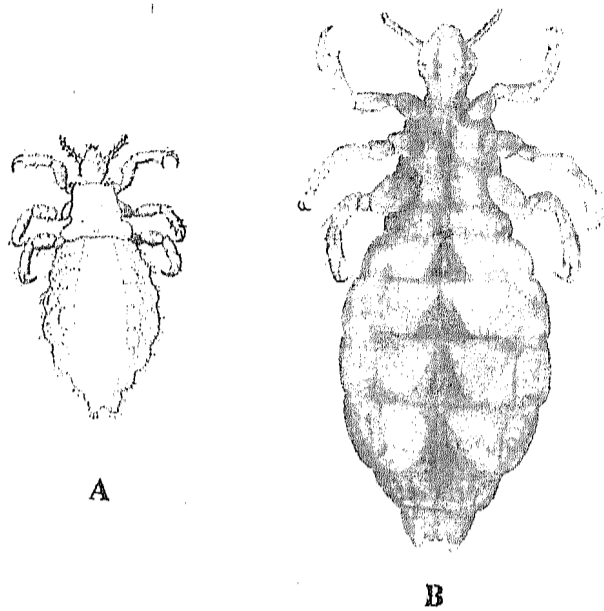


Fig. 15.6: *Pediculus humanus* A - Body louse, B - Head louse

Habit and Habitat

Pediculus humanus is an ectoparasite of humans. It occurs in two varieties viz. *Pediculus humanus capitis* (the head louse) that occurs clinging to the hairs of the head, and *Pediculus humanus corporis* (the body louse that harbours, the trunk region mostly clinging to undergarments) (Fig. 15.6). Head and body lice act as vectors of various human diseases like relapsing fever, trench fever, and the dreaded epidemic form of typhus fever.

Geographical Distribution

Pediculus humanus is found all over the world,

Classification and its Justification

Kingdom	Animalia	Animals, multi-cellular organisms with cells that lack a cell wall, many capable of movement or movement of some of their body parts or capable of movement at some time of their life cycle; heterotrophic nutrition.
Phylum	Arthropoda	because it has a metameric segmented body with jointed legs.

Class	Insecta	because its body is divisible into head , thorax and abdomen and thorax bears three pairs of legs
Sub-class	Pterygota	because wings are absent and there is no metamorphosis during development,
Order	Anoplura	Wings are secondarily absent; mouth parts are of piercing and sucking type; legs with claws for clinging to the hairs of the host.
Genus	<i>Pediculus</i>	
Species	<i>humanus</i>	
Common name	Head louse/Body louse	

15.9 TERMINAL QUESTIONS

1. Match the insects (given in column I) with their respective orders (given in column II).

I (Insect)	II (Order)
i) <i>Lepisma</i>	a) Orthoptera
ii) <i>Pediculus</i>	b) Odonata
iii) <i>Gryllus</i>	c) Anoplura
iv) <i>Dragonfly</i>	d) Thysanura

2. Give two salient features of each of the following insects:

- i) *Mantis*:
- ii) *Lepisma*:
- iii) *Gryllus*:
- iv) *Dragonfly*:
- v) *Pediculus*:

3. State briefly how the following characters are advantageous to the insects which possess them:

- i) Biting and chewing type of mouth parts of Locusts
- ii) Raptorial fore legs of *Mantis*
- iii) Total loss of wings in *Pediculus*