Department of biology

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((Entomolog I))

Stage (Two)

LEC- ((SEVEN))

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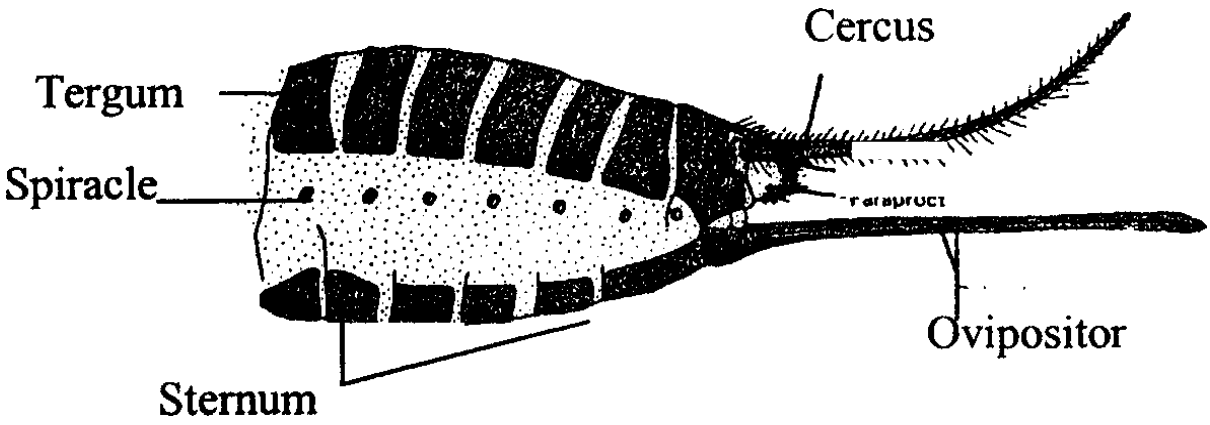
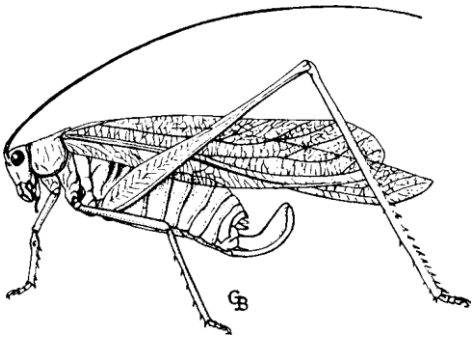
Insect abdomen: structure and its modifications

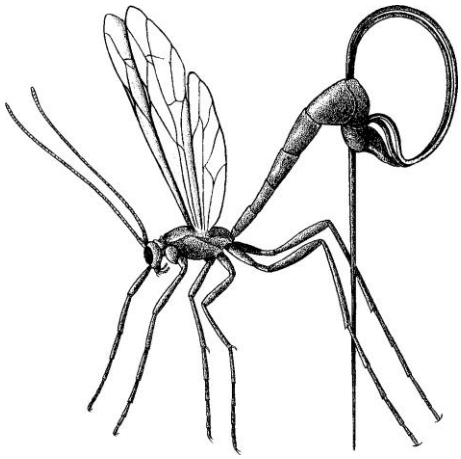
ABDOMEN

The dorsal and ventral abdominal segments are termed terga (singular tergum) and sterna (singular sternum), respectively. Spiracles usually can be found in the conjunctive tissue between the terga and sterna of abdominal segments 1-8. Reproductive structures are located on the 9th segment in males (including the aedeagus, or penis, and often a pair of claspers) and on the 8th and 9th abdominal segments in females (female external genitalia copulatory openings and ovipositor).

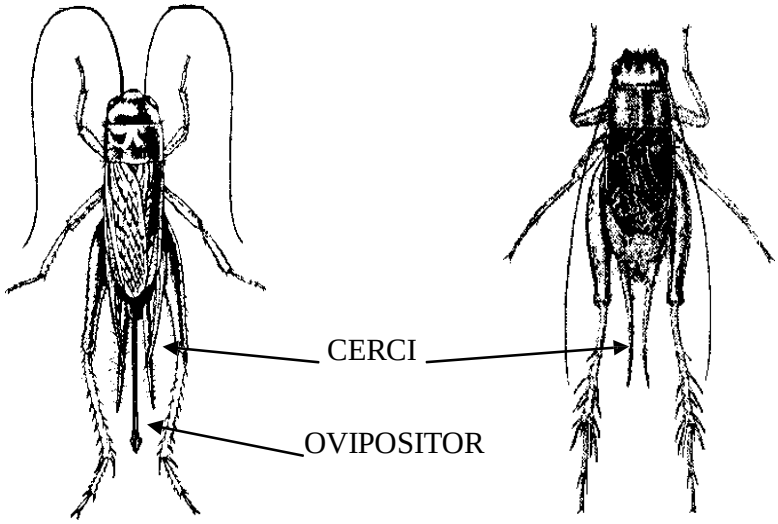


MODIFICATIONS OF THE OVIPOSITOR





SEXUAL DIMORPHISM



Female (note the long ovipositor Between the cerci)

Male (two cerci at the end of the abdomen)

Abdominal structures in insects

Basic structures

Segmentation is more evident in abdomen. The basic number of abdominal segments in insect is eleven plus a telson which bears anus. Abdominal segments are called uromeres. On eighth and nineth segment of female and nineth segment of male, the appendages are modified as external organs of reproduction or genitalia. These segments are known as genital segments. Usually eight pairs of small lateral openings (spiracles) are present on the first eight abdominal segments. In grasshoppers, a pair of tympanum is

found one on either side of the first abdominal segment. It is an auditory organ. It is obliquely placed and connected to the metathoracic ganglia through auditory nerve.

Modifications:

Reduction in number of abdominal segments has taken place in many insects. In spring tail only six segments are present. In house fly only segments 2 to 5 are visible and segments 6 to 9 are telescoped within others. In ants, bees and wasps, the first abdominal segment is fused with the metathorax and is called propodeum. Often the second segment forms a narrow petiole. The rest of the abdomen is called gaster. In queen termite after mating the abdomen becomes gradually swollen due to the enlargement of ovaries. The abdomen becomes bloated and as a result sclerites are eventually isolated as small islands. Obesity of abdomen of queen termite is called physogastry.

Abdominal appendages

i . Pregenital abdominal appendages in wingless insects:

1) **Styli** : (Stylus : Singular) Varying number of paired tube like outgrowths are found on the ventral side of the abdomen of silverfish. These are reduced abdominal legs which help in locomotion.

2). **Collophore or ventral tube or glue peg**: It is located on the ventral side of the first abdominal segment of spring tail. It is cylindrical. It is protruded out by the hydrostatic pressure of haemolymph. It might serve as an organ of adhesion. It aids in water absorption from the substratum and also in respiration.

3). **Retinaculum or tenaculum or catch**: It is present on the ventral side of the third abdominal segment. It is useful to hold the springing organ when not in use.

4). **Furcula or Furca**: This is a 'Y' shaped organ. It is present on the venter of fourth abdominal segment. When it is released from the catch, it exerts a force against the substratum and the insect is propelled in the air.

ii) **Abdominal appendages in immature insects**:

1) **Tracheal gills**: Gills are lateral outgrowths of body wall which are richly supplied with tracheae to obtain oxygen from water in naiads (aquatic immature stages of hemimetabolous insects). Seven pairs of filamentous gills are present in the first seven abdominal segments of naiads of may flyand are called as lateral gills. Three or two leaf like gills (lamellate) are found at the end of adbomen of naiad of damselfly and are called as caudal gills. In dragonfly the gills are retained within the abdomen in a pouch like rectum and are called as rectal gills.

2) **Anal papillae**: A group of four papillae surrounds the anus in mosquito larvae. These papillae are concerned with salt regulation.

3) **Dolichasters**: These structures are found on the abdomen of antlion grub. Each dolichaster is a segmental protuberance fringed with setae.

4) **Proloegs**: These are present in the larvae of moth, butterfly and sawfly. Two to five pairs are normally present. They are unsegmented, thick and fleshy. The tip of the proleg

is called planta upon which are borne heavily sclerotised hooks called crochets. They aid in crawling and clinging to surface.

iii) **Abdominal appendages in winged adults** :

1) **Cornicles**: Aphids have a pair of short tubes known as cornicles or siphonculi projecting from dorsum of fifth or sixth abdominal segment. They permit the escape of waxy fluid which perhaps serves for protection against predators.

2) **Caudal breathing tube**: It consists of two grooved filaments closely applied to each other forming a hollow tube at the apex of abdomen. e.g. water scorpion.

3) **Cerci** : (Cercus - Singular) They are the most conspicuous appendages associated normally with the eleventh abdominal segment. They are sensory in function. They exhibit wide diversity and form.

Long and many segmented :- e.g. Mayfly Long and

unsegmented :- e.g. Cricket

Short and many segmented :- e.g. Cockroach Short and

unsegmented :- e.g. Grasshopper

Sclerotised and forceps like : e.g. Earwig. Cerci are useful in defense, prey capture, unfolding wings and courtship.

Asymmetrical cerci :- Male embiid. Left cercus is longer than right and functions as clasping organ during copulation.

1) **Median caudal filament**: In mayfly (and also in a wingless insect silverfish) the epiproct is elongated into cercus like median caudal filament.
2) **Pygostyles**: A pair of unsegmented cerci like structures are found in the last abdominal segment of scoliid wasp.
3) **Anal styli**: A pair of short unsegmented structure found at the end of the abdomen of male cockroach. They are used to hold the female during copulation.
4) **Ovipositor**: The egg laying organ found in female insect is called ovipositor. It is suited to lay eggs in precise microhabitats. It exhibits wide diversity and form. Short and horny : e.g. Short horned grasshopper

   Long and sword like : e.g. Katydid, long horned grasshopper

   Needle like : e.g. Cricket

   Ovipositor modified into sting : e.g. Worker honey bee.

Pseudovipositor: An appendicular ovipositor is lacking in fruit flies and house flies. In fruit flies, the elongated abdomen terminates into a sharp point with which the fly pierces the rind of the fruit before depositing the eggs. In the house fly the terminal abdominal segments are telescopic and these telescopic segments aid in oviposition. The ovipositor of house fly is called pseudovipositor or ovitubus or oviscapt.

Male genitalia: External sexual organs of male insects are confined to ninth abdominal segment. In damselfly, the functional copulatory organ is present on the venter of second abdominal segment

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