The term <u>pretarsus</u> refers to the terminal segment of the tarsus and any other structure attached to it, including :-

<u>Angues</u> – a pair of claws

<u>Arolium</u> – a lobe of adhesive pad between the claws

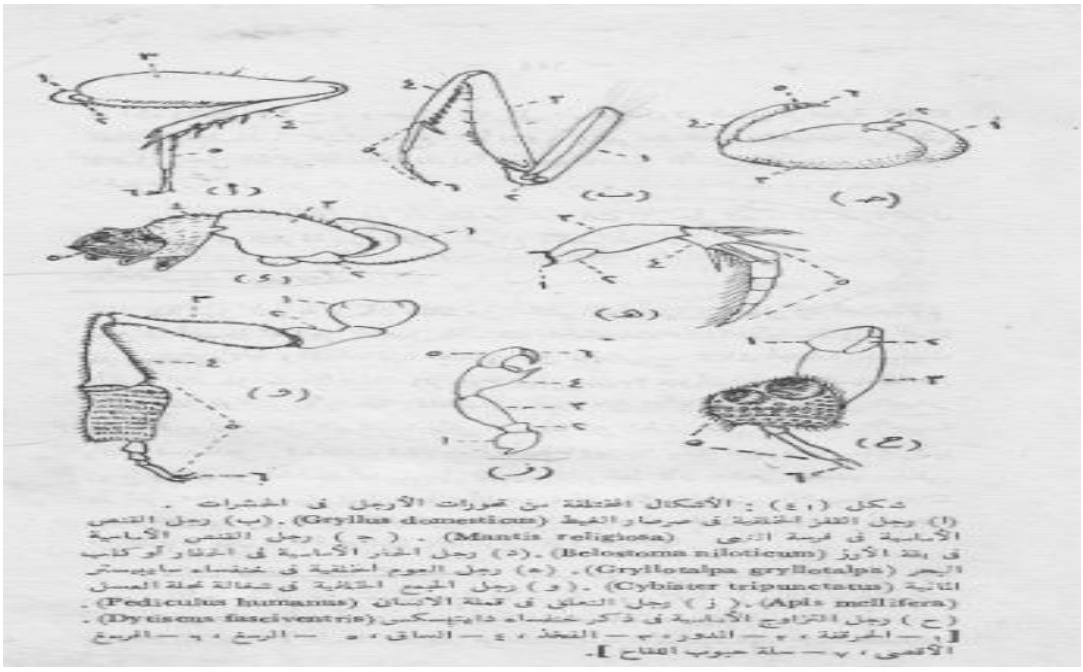
<u>Pulvilli</u> – a pair of adhesive pads under the claws .

Note:- plantulae : are the pads which situated between the tarsal segment.

"Leg modification"

The legs can be used for many purpose as:-

1- **Running leg – ground beetle .**
2- **Jumping leg – hind leg of locust .**
3- **Digging – burrowing leg – fore**
4- **leg of mole cricket .**
5- **Swimming leg – diving beetle .**
6- **Grasping leg – fore leg of mantis .**
7- **Collecting leg – hind leg of worker honey bee .**
8- **Cleaning leg- fore leg of worker honey bee.**
9- **Clinging leg – leg of the lice .**



شكل (٤١) : الأشكال المختلفة من أفخاذ الأرجل فى الحشرات .
(أ) رجل القفز الخلفية فى صرار الليل (Gryllus domesticus). (ب) رجل المشى الأمامية فى فرس النبى (Mantis religiosa) . (ج) رجل المشى الأمامية فى بقة الأرز (Belostoma niloticum). (د) رجل الحفر الأمامية فى الخنفار أو كلب الجمل (Gryllotalpa gryllotalpa). (هـ) رجل الجمع الخلفية فى خنفساء سايبستر (Cybister tripunctatus). (و) رجل الجمع الخلفية فى ضمالة نحلة العسل (Apis mellifera). (ز) رجل التعلق فى قملة الإنسان (Pediculus humanus). (ح) رجل التزاوج الأمامية فى ذكر خنفساء دايتيسكس (Dytiscus fasciventris).
[١ — الحرقفة ، ٢ — الفخذ ، ٣ — الساق ، ٤ — الرسغ ، ٥ — الأظفر ، ٦ — سلة حبوب اللقاح].

"The wings "

Insects are the only invertebrate that can fly .

Their wings develop as evagination of the exoskeleton during morphogenesis , but they are fully function at only during the adult stage .

In most cases , a characteristic network of veins rum throughout the wing tissues .

These veins are extensions of the body circuolatory system . they are filled with hemolymph. The wings contain a tracheal tubes and nerves.

"The advantages of the wings"

The wings serve not only as organs of flight but also may adapted as :

1- **Protective covers (coleopteron)**
2- **Thermal collectors (Lepidoptera)**
3- **Gyroscopic stabilizer (Diptera)**
4- **Sound producers (Orthoptera)**
5- **Visual contact (Lepidoptera)**

"Wing venation"

The archedictyon is the name given to a hypothetical scheme of wing venation proposed for the very first winged insects . these veins (and there branches) are named according to a system devised by john Comstock and George needhum (Comstock- needhum system)

1- Costa (C) :- the anterior edge of the wing .

2- Subcosta (Sc) :- the second longitudinal vein typically unbranched .

3- Radius (R) :- third longitudinal vein 1-5 branches reach the wing margin .

4- Media (M):- 4th longitudinal vein 1-4 branches .

5- Cubitus (Cu) :- 5th longitudinal vein 1-3 branches .

6- Anal veins (1A , 2A, 3A) unbranched veins .

The cross veins :- **reaches between two longitudinal vein (small letters)**

Wing cell :- **small spaces between the veins**

a- Opened b- closed

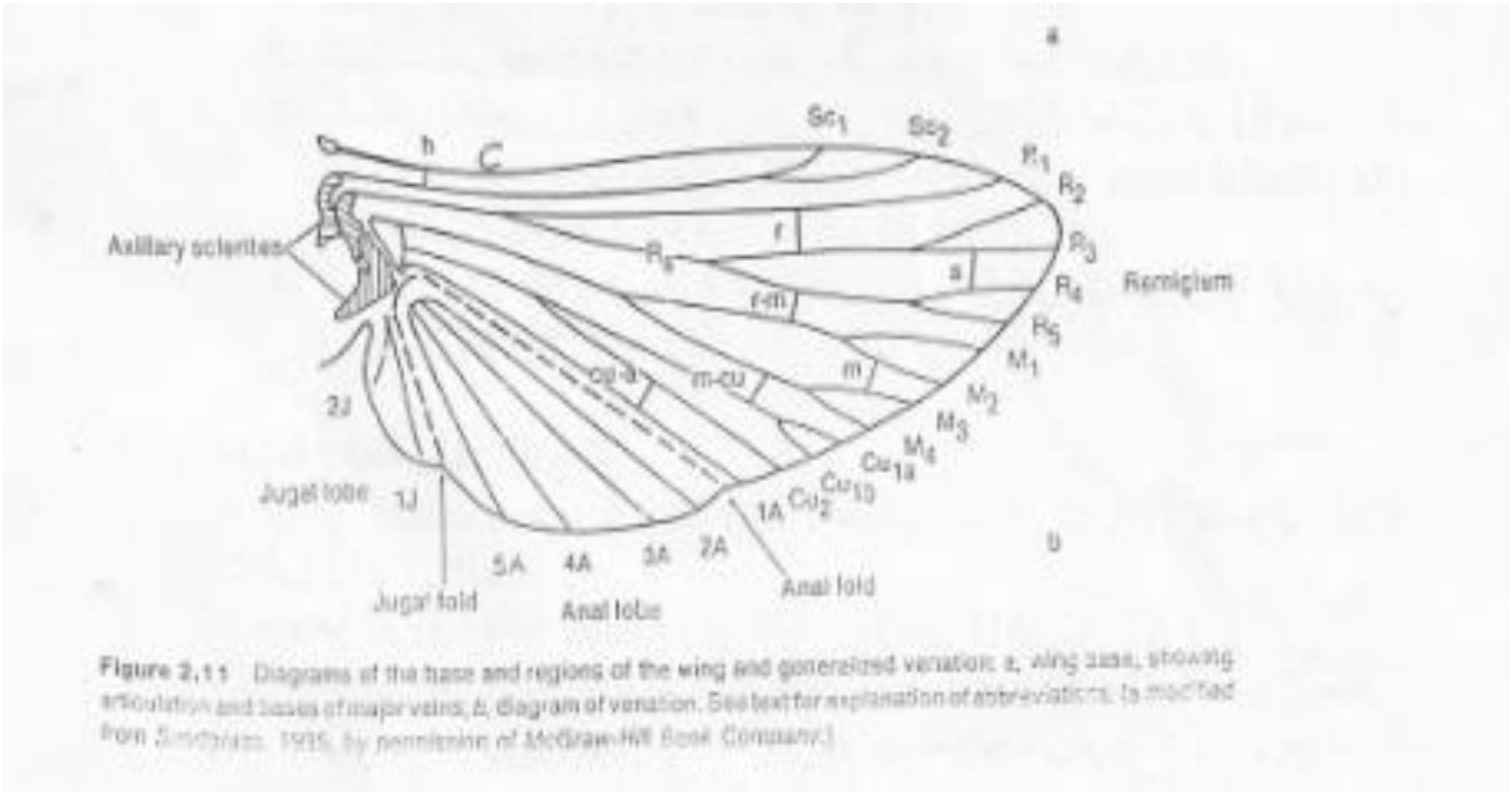


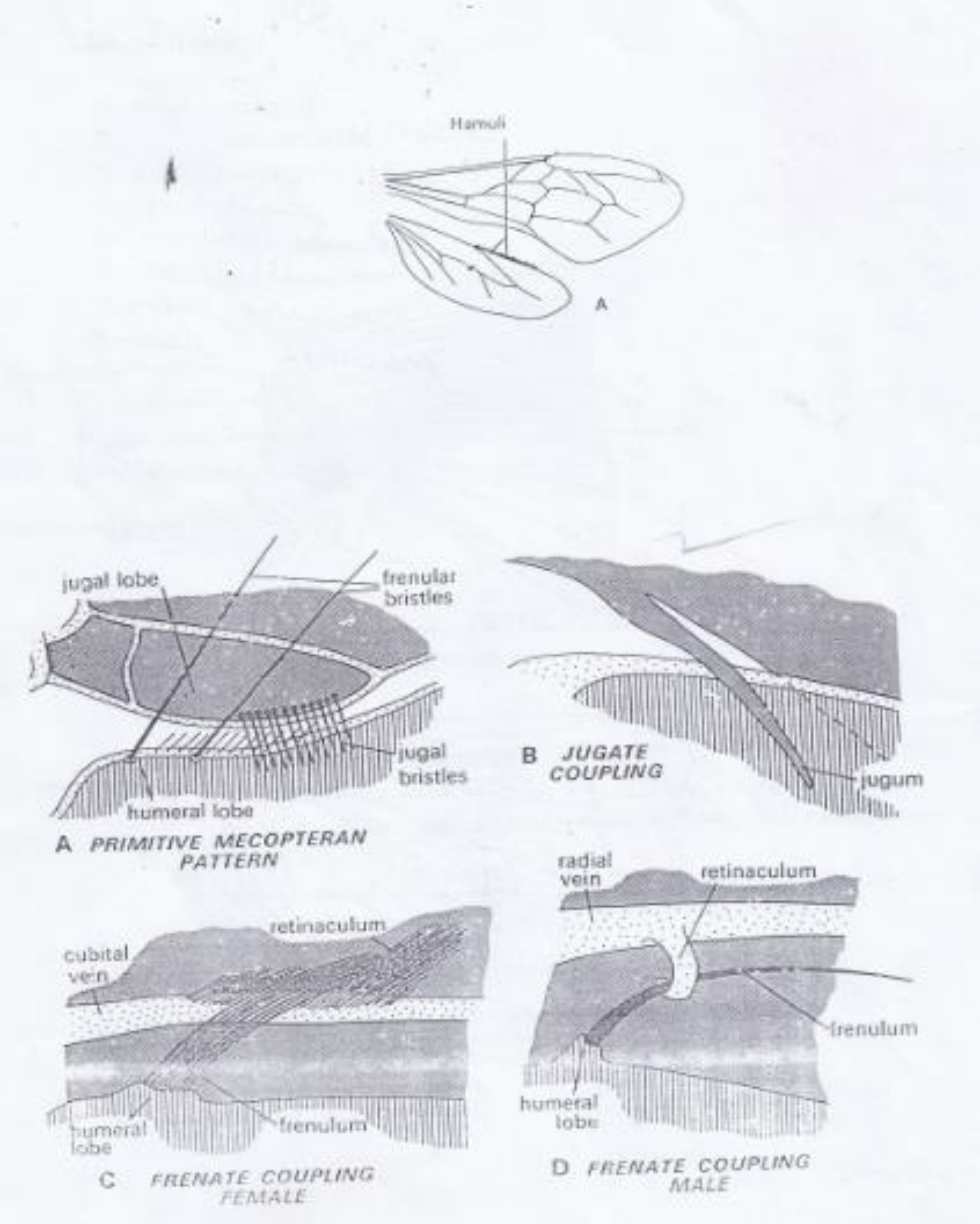
Figure 2.11 Diagrams of the base and regions of the wing and generalized venation: a, wing base, showing articulation and bases of major veins; b, diagram of venation. See text for explanation of abbreviations. (a modified from Snodgrass, 1935, by permission of McGraw-Hill Book Company.)

"Wing adapthtions and modification"

1- **Membranous (bees)**
2- **Leathery (Tegmen) (grass hopper)**
3- **Elytra (Coeoptra)**
4- **Hemelyrta (Bugs)**
5- **Halters (House fly)**
6- **Hairy wing (Thrips)**
7- **Scaly wings (Butter fly)**
8- **Lace wing (Chrysopidae)**

"Coupling mechanism in insect wings "

1- **<u>Jugate type</u>:- (jugum) a lobe at the base of the fore wings**
2- **<u>Frenate type</u> :- a spine or spines at the base of the hind wing .**
3- **<u>Hamulate type</u> :- with tiny hooks on hind wings that hold front and hind wings together.**

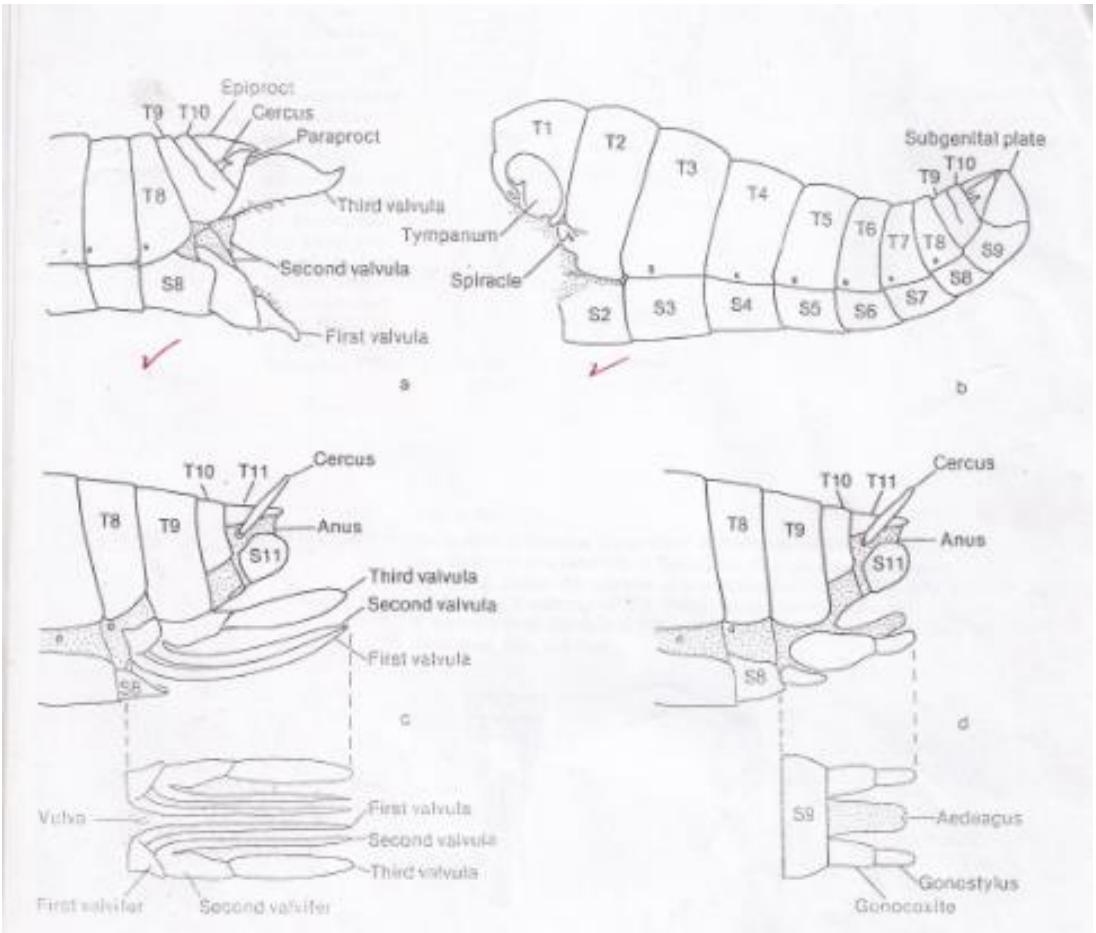

Hamuli
A
jugal lobe
frenular bristles
jugal bristles
humeral lobe
A PRIMITIVE MECOPTERAN PATTERN
B JUGATE COUPLING
jugum
radial vein
retinaculum
frenulum
humeral lobe
D FRENATE COUPLING MALE
cubital vein
retinaculum
humeral lobe
frenulum
C FRENATE COUPLING FEMALE

"The Abdomen"

It is the third functional region of insect body and contain 11 segment , subdivided into three parts :-

1- **<u>Pregenital segments</u> :- include the first seven segment in female .**
2- **<u>Genital segments :-</u> include the 9th abdominal segment in male and 8, 9th segments in the female and paired appendage, fit together to form the ovipositor.**
3- **<u>Postgenital segments</u> : include the 10 , 11 segment , carrying the two appendages and cerci .**

<u>Usually</u> there is no appendages on the abdominal segments (subclass Pterygota).



The abdomen

"The Abdominal Appendages "

1- ***Anal cerci :-*** **a pair of 10th abdominal segment**
   Appendage:-
   a- Simple not- jointed (Orthoptera)
   b- Sclerotized , porceps like cerci (Dermapetra)
   c- Long filamentous cerci (Thysanura)
2- **Styles :-** **can be seen in ♂ cockroach , it is regarded as vestige of walking limbs .**
3- **Median caudal filament :-** **a thread like projection arising from center of the last abdominal segment between the cerci (Thysanura) .**
4- **Abdominal prolegs :-** **can be seen in Lepidoptera larvae .**
5- **Abdominal gills :-** **respiratory organs found in may fly naiad .**
6- **Cornicles :-** **located dorsally on the abdomen of the aphids as paired secretory structure .**
7- **Female external genitalia** **:- the ovipositors , it is formed by the modification of 8 and 9 abdominal segments (Orthoptera)**

the ovipositors is some times modificated into a poison injecting sting (wasps and bees)

8- **Male external genitalia** **:- modification of 9th abdominal segment of the male making the copulatory organ of male , which is consist of aedeagus and claspers to grasp and hold the abdomen of the female during mating .**

Modifications of the terminal abdominal segments. A. Posterior portion of earwig abdomen with forcepslike cerci. B. Stonefly nymph with feelerlike cerci. C. Posterior portion of damselfly abdomen with gill-bearing epi- and paraprocts. (A redrawn from Hebard, 1934; B redrawn from Ross, 1962a; C redrawn from Snodgrass, 1954.)

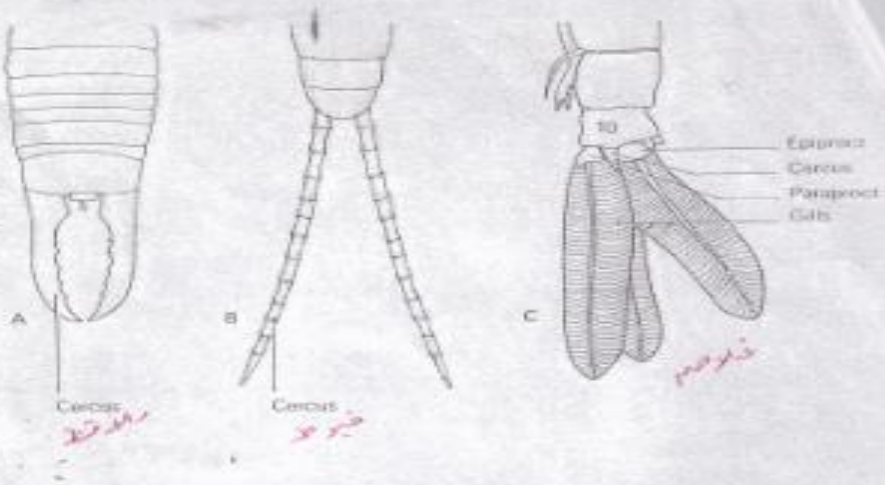
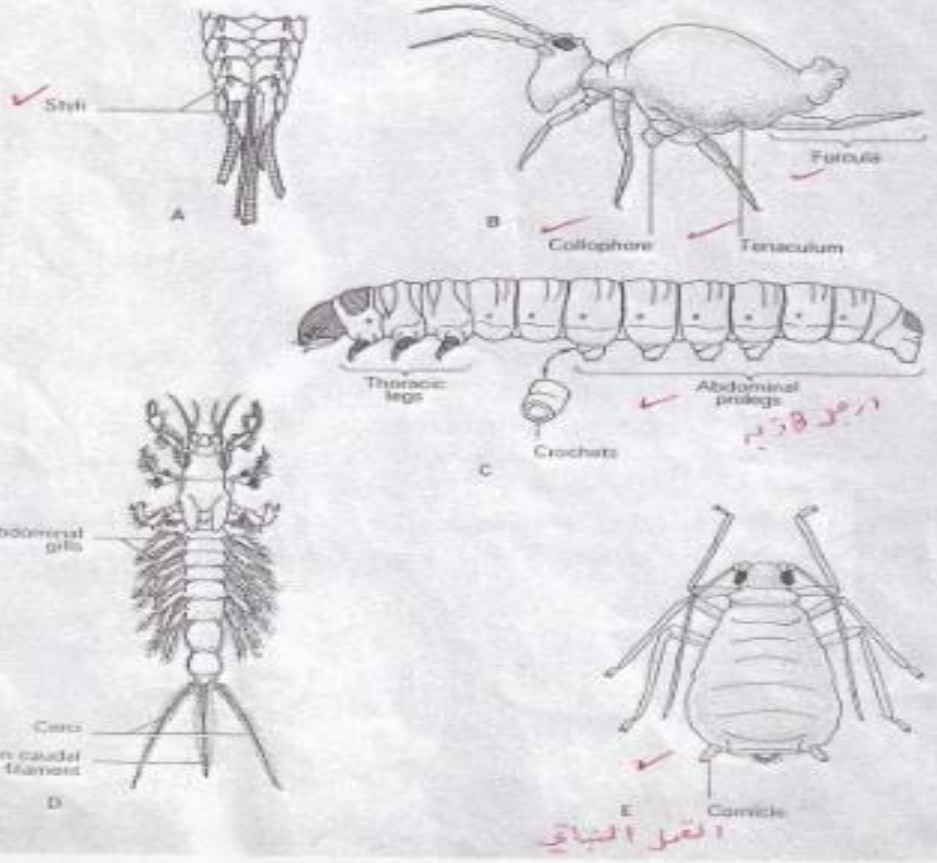


Fig. 2-42
Nongenital abdominal appendages. A Venter of posterior portion of the abdomen of a silverfish. B. Springtail. C. Caterpillar. D. Mayfly nymph. E. Aphid. (A redrawn with modifications from Essig, 1942, after Oudemans; B courtesy of U.S. Public Health Service (redrawn); C redrawn from Snodgrass, 1961; D and E redrawn from CCM General Biological, Inc., key card.)



"Internal Anatomy"

The Internal Anatomy include the organs and systems (digestive , circulatory , respiratory , nervous and reproductive) system , these organs are protected by the body wall .

" Digestive system"

***The* Digestive system involve the alimentary canal and the various glands connected with it either directly or indirectly .**

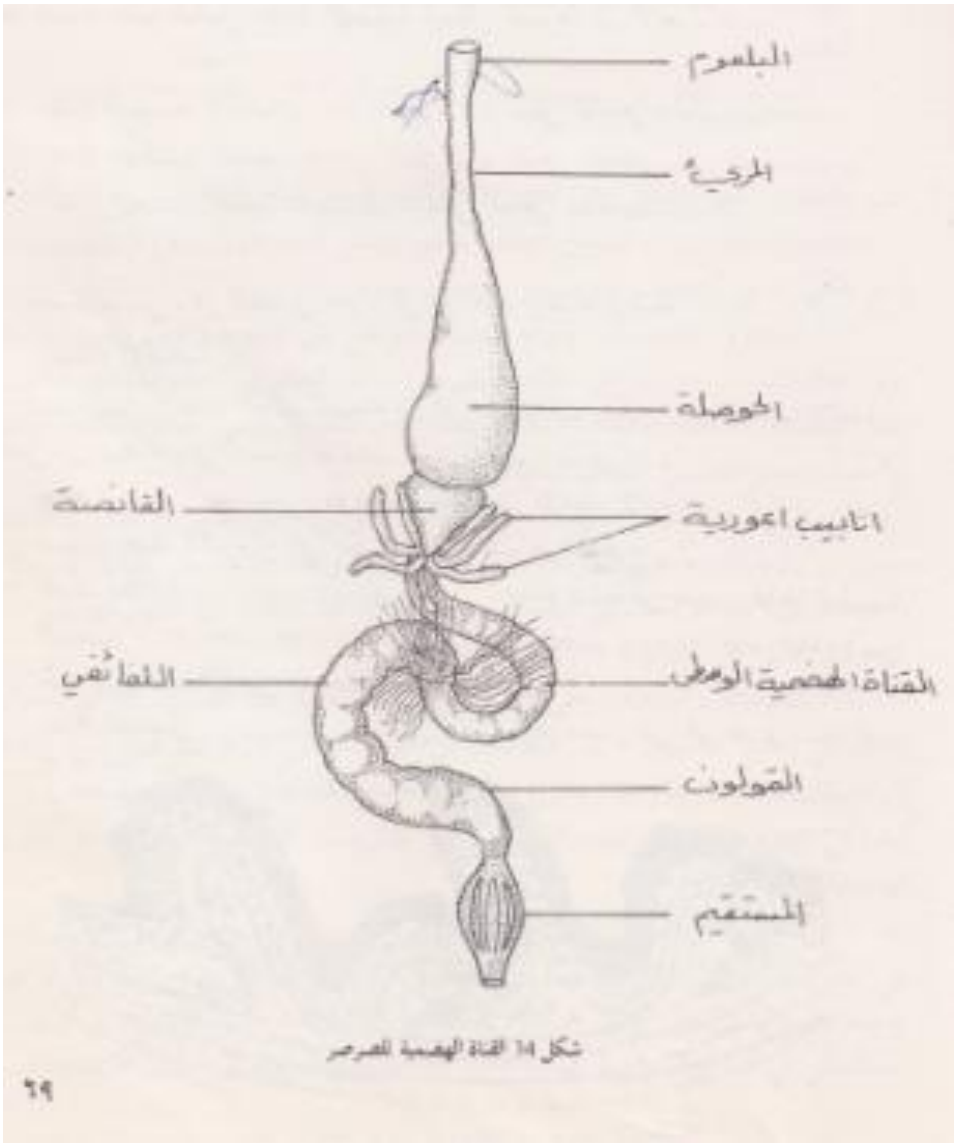
***Typically these include the salivary gland , gastric caeca and Malpighian* tubules .**

The process of ingestion , digestion , absorption and egestion are all associated with this system .

Most of the food is ingested in the form of macromolecules and other complex substance like protein ,polysaccharides, fats and so on .

These macromolecules must be broken down by catabolic reactions into smaller molecules like amino acids and simple sugar before being used by cells of the body for energy , growth or reproduction .

Alimentary canal* :- *is a tube passing through the central part of the body ; its anterior opening is the mouth at the base of the preoral cavity and its posterior opening, the anus is on the posterior body segment.



شكل ١٩ القناة الهضمية للصرصر

٦٩