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An illustrated Key to the larval stages of dipterous families in Egypt

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ABSTRACT

In Egypt order Diptera includes sixty-four families (steyskal, 1967), In addition to a new recorded family, Diopsidae (Stalked-eye flies). It is worth to mention here that, the larval stages act as an important role for determination and separation of the families and the species of order Diptera, particulary the unknown specimens of agriculture quarantine. Identification of dipterous families, within the scope of the present work, depends up on an illustrated key, for the first time, in Egypt.

Keywords: Dipterous families, larval stages, Egypt

INTRODUCTION

Generally, Order Diptera constitutes one of the largest orders of insects, and its members are abundant in individuals and species almost everywhere. The larvae (maggots) are generally abodes and wormlike.

In the primitive families (Nematocera), the head is usually well developed and the mandibles move laterally. In the higher families (Brachycera), the head is reduced and the mouth hooks move in a vertical plane. Dipterous larvae occur in many kinds of habitats, but a large proportion of them live in water, in all sorts of aquatic habitats including streams, ponds, lakes, temporary puddles, and brackish and alkaline water. The larvae described as an important stage in the life cycle of most dipterous families, many of them cause a serious damage of economic plants. The larvae that feed on plants generally live within plant tissue, as leaf miners, some being responsible for conspicuous gall formations, stem borers, or root borers (Teskey, 1976). The predaceous larvae live in many different habitats, in water, in the soil, under bark or stones, or on vegetation. Many species feed during the larval stage on decaying plants or animal matter. Some larvae live in some rather unusual habitat, as in the larvae of some species of family Ephydridae, the larvae live in pools of crude petroleum, and other ephydrids breed in the Great Salt Lake. An excellent summary of the larval feeding habits of the Muscomorphan Diptera can be found in Ferrar (1987).

The basic number of instars is 4-9 for the lower Diptera (usually four), with reduction to three for higher flies. The rate of larval development is highly variable, ranging from a few days for those maggots which are dependent on the short-term resource of a decaying carcass, to some species that live in cold, wet habitats and can take two years to complete development. Some useful publications that provide broad biological information include Clausen, (1940); Felt (1940), Seguy (1950), Hennig, (1948, 1950&1952), Oldroyd, (1964), Cole (1969), Pennak (1972), Merritt and Cummins (1984, 2003), and McAlpine, *et al*. (1981, 1987).

MATERIALS AND METHODS

The present work depends mainly on reviewing the literature, taxonomic catalogues and several keys concerning the immature stages of order Diptera.

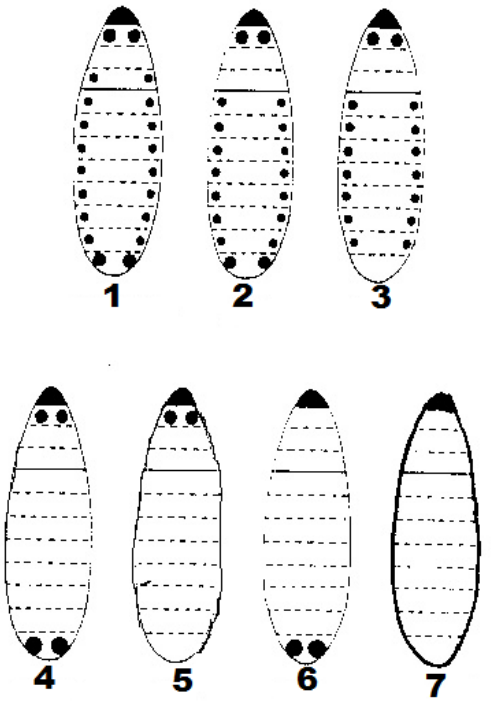
On other hand the practical part was carried out by examining many lived larvae reared by many researchers in Plant Protection Research Institute.

Others larvae investigated through collection trips, carried out by taxonomy department.

The illustrations were made directly from literature or from specimens, using USB Digital Microscope and original binuclear microscope.

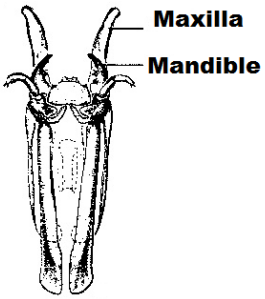
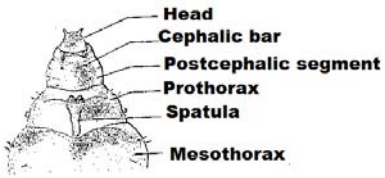
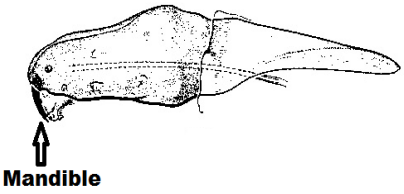
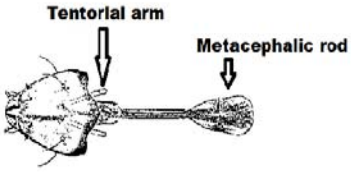
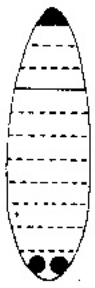
The key is constructed based on the main morphological characters that differentiate and separate the families provided with illustrations, of the larvae of dipterous families. The Design of key taken from O'Hara, (2008).

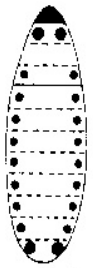
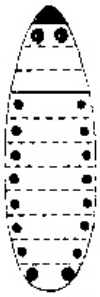
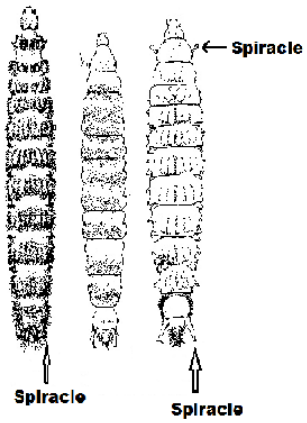
The numbers and position of spiracles are important features for separation of dipterous families.The spiracular arrangement is indicated in the following figures.

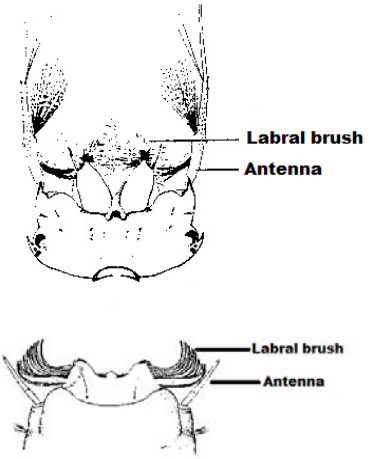
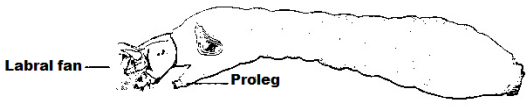
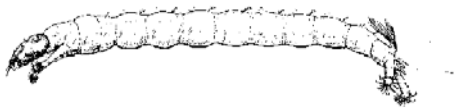


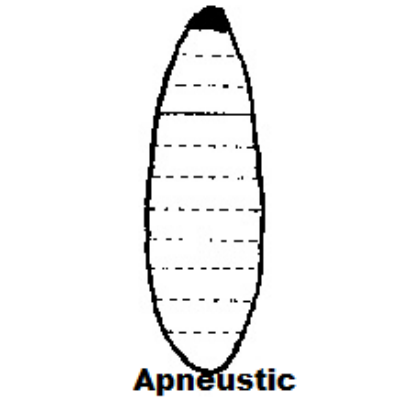
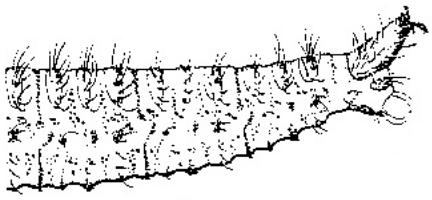
1. Holopneustic
2. Peripneustic
3. Hemipneustic
4. amphipneustic
5. Propneustic
6. metapneustic
7. Apneustic

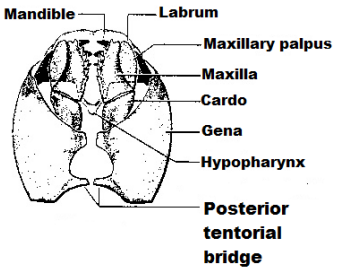
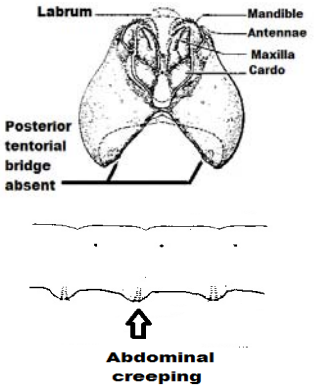
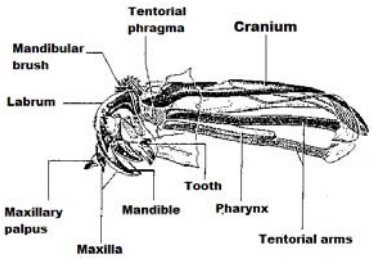
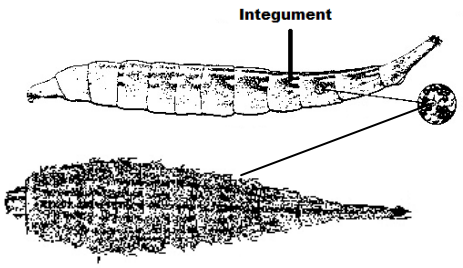
KEY TO FAMILIES OF LARVAE

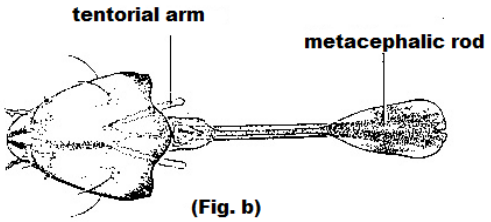
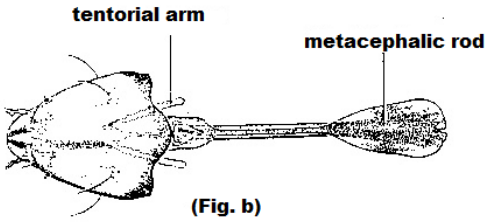
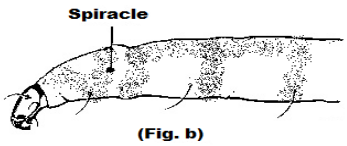
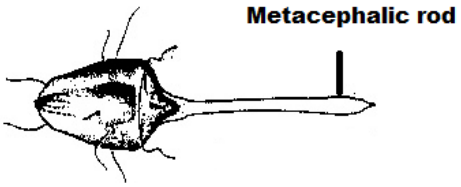
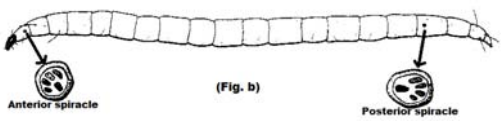
Either:	Or:
1a. Mandibles normally opposed, moving against one another in horizontal or oblique plane, and usually with 2 or truer apical teeth, rarely hook-like or sickle-shaped. Head capsule usually complete and permanently excreted (eucephalic), but if partially retracted within thorax and incomplete as result of excisions in capsule posterior, then tentorial arms lacking.   **atocera** **o to (2)**	**1a`.** Mandibles moving parallel to one another in vertical plane, usually hook-like or sickle-shaped, with or without secondary apical teeth. Head capsule usually reduced posteriorly and partially or almost entirely retracted into thorax (hemicephalic) or replaced by internal cephalopharyngeal skeleton; if appearing complete and permanently exserted, then with slender, metacephalic rod extending into prothorax.   **rachycera** **Go to (11)**
Either:	**Or:**
2a. Respiratory system usually metapneustic. Larvae occurring mostly in wet earth or decaying wood, occasionally in streams.   **Metapneustic** **Tipulidae**	**2a`.** Respiratory system usually not metapneustic. **Go to (3)**

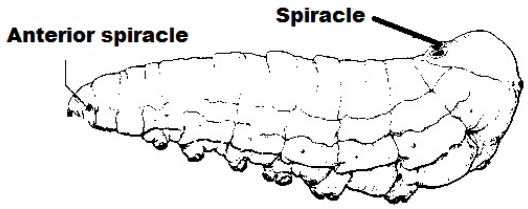
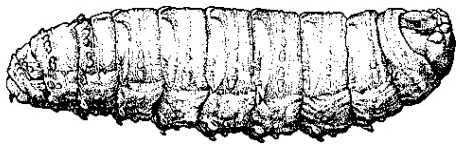
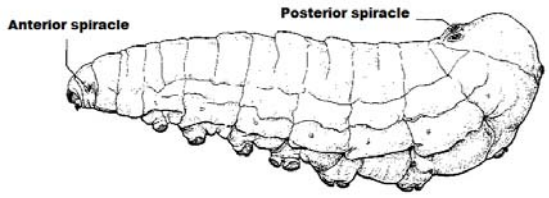
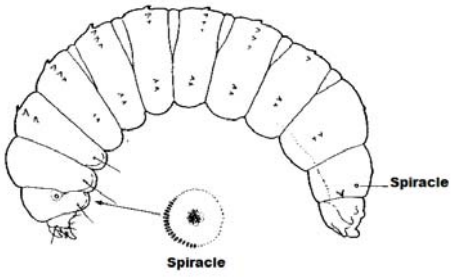
Either:	**Or:**
3a. Respiratory system holopneustic. All segments usually bearing tuberculous or spinous. Larvae associated with plant roots and decaying organic matters in soil.  **Holopneustic**  **Bibionidae**	**3a`.** Respiratory system peripneustic. Only caudal abdominal segments sometimes with broad tumid swellings associated with creeping welts.  **Preipneustic** **Go to (4)**
Either:	**Or:**
4a. Mandibles moving in oblique downward direction; labrum slender and somewhat laterally compressed, with dense brush of short setae on ventral apex and epipharyngeal surface. Caudal abdominal segment with pair of dorsally sclerotized lobes or broad, sclerotized shelf behind anus and ventral to posteriorly directed spiracles. Posterior spiracles either sessile or at apices of sclerotized tubular processes. Larvae occur in feces and decaying organic matter.  **Scatopsidae**	**4a`** Mandibles moving horizontally; labrum broad, with sparse setae especially toward apex. Caudal abdominal segment without sclerotized areas. Posterior spiracles sessile. Situated laterally on penultimate abdominal segment or associated with spinous processes dorsally on terminal abdominal segment. Larvae occur in decaying wood. **Go to (5)**

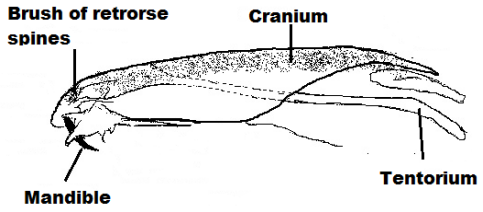
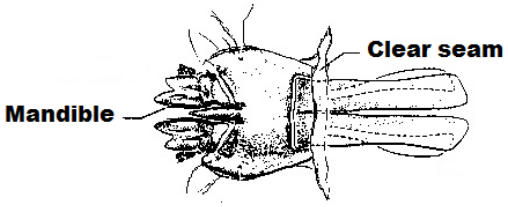
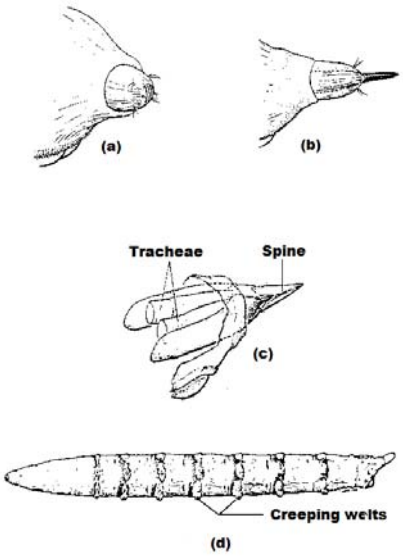
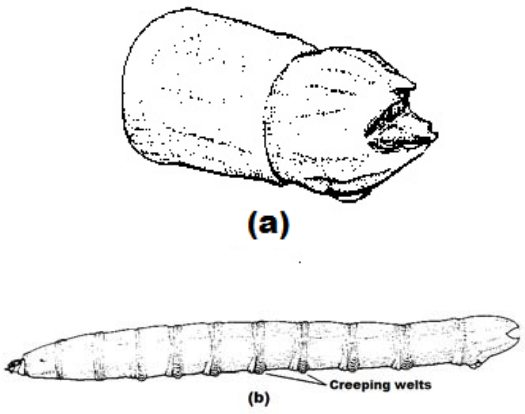
Either:	**Or:**
5a. Prominent bruch of setae present on either side of labrum. Antenna of moderate length, usually with short apical setae.  **Culicidae**	**5a`.** Labral setae absent or few in number and not divided into 2 groups on either side of labrum. Antenna sometimes prehensile, without or with long apical setae. **Go to (6)**
Either:	**Or:**
6a. Head capsule usually with pair of conspicuous labral fans dorsolaterally. Abdomen elongated distally; terminal segment ending in ring or circlet of numerous radiating rows of minute hooked spines. Attached to substrate in flowing water.  **Simuliidae**	**6a`.** Head capsule lacking labral fans. Abdomen not conspicuously swollen distally; terminal segment without radiating row of hooked spines posteriorly, but sometimes with 1 or 2 crochet –bearing anal prolegs. **Go to (7)**
Either:	**Or:**
7a. Body segments, except sometimes caudal one. Lacking prominent tubercles and setae.  **Chironomidae**	**7a`.** Body segments with prominent tubercles or setae or both. **Go to (8)**

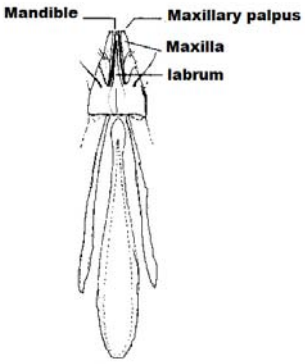
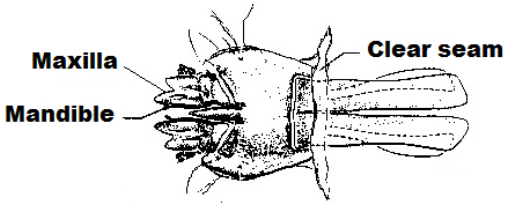
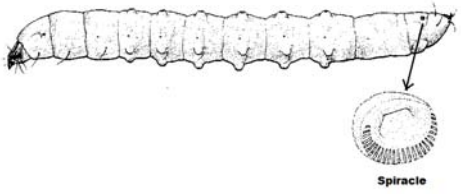
Either:	**Or:**
8a. Respiratory system apneustic. Larva slender, with uniform segments: integument smooth; long setae only on terminal abdominal segment.  **Ceratopogonidae**	**8a`.** Respiratory system amphipneustic or metapneustic. Larva usually somewhat wrinkled, with segments secondarily divided; distinctive setation or sclerotized plaques present on most segments. **Go to (9)**
Either:	**Or:**
9a. Posterior spiracles and pair of fan-like setal brushes either borne dorsally at apical margin of sclerotized plate on caudal abdominal segment or at apex of short respiratory siphon projecting posterodorsally from caudal segment. Sclerotized plaque or plaques dorsally on 1 or more secondary segmental divisions. In aquatic or semiaquatic habitats or in decaying organic material.  **Psychodidae**	**9a`.** Posterior spiracles not borne on respiratory siphon. Sclerotzed plaques absent dorsally. **Go to (10)**

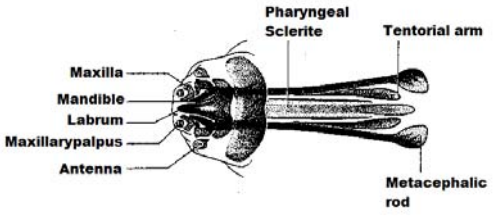
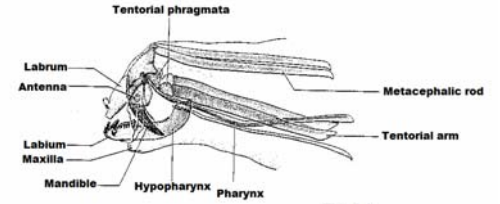
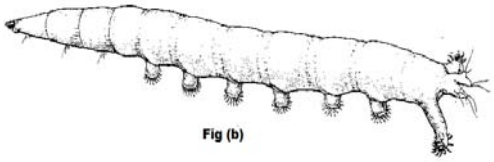
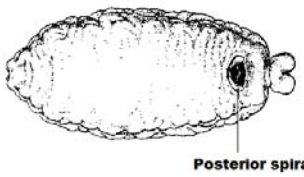
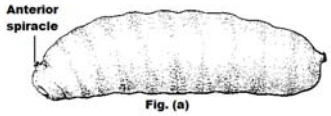
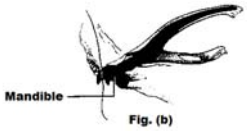
Either:	**Or:**
10a. Posterior tentorial bridge complete or nearly so (bridge usually visible beneath integument within occipital cavity in preserved specimens without special treatment). Abdominal creeping welts lacking sclerotized spicules.  **Sciaridae**	**10a`.** Posterior tentorial bridge absent, or if bridge partially formed, abdominal creeping welts with sclerotized spicules.  **Mycetophilidae**
Either:	**Or:**
11a. External sclerotized portions of cranium present and usually (but not always) partially exposed externally. Labrum, mandibles, or maxillae recognizable (check closely).  **Lateral view of head capsule** **Brachycera-Aschiza** **Go to (12)**	**11a`.** External sclerotized portions of cranium completely lacking; only membranous peseudocephalic segment anterior to prothorax remaining, this segment normally with 2 pairs of papilla-like projections, through to be vestiges of antenna and palpi; characteristically shaped cephalopharyngeal skeleton retracted completely within prothorax (or almost entirely absent in some usually parasitic species). Labrum, mandibles, and maxillae not clearly definable. **Brachycera-Schizophora** **Go to (24)**
Either:	**Or:**
12a. Body dorsoventrally depressed. Integument hardened by small roundish or hexagonal calcareous plates giving shagreened patern to body surface. Head capsule always partially exposed, capable of only slight independent movement.  **Stratiomyidae**	**12a`.** Body form various. Integument not hardened by calcium deposits, sometimes tough and leathery. Head capsule capable of much independent movement. **Go to (13)**

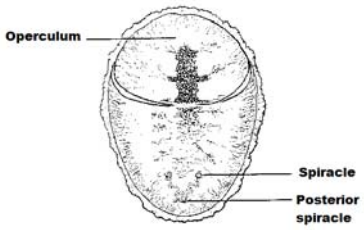
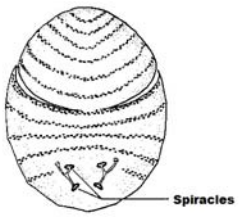
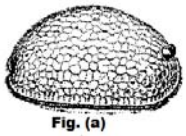
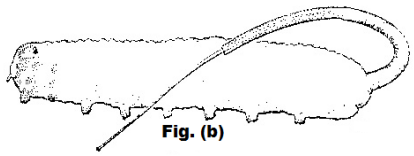
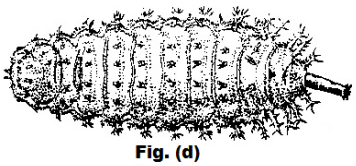
Either:	Or:
13a. Body long and slender, eel-like, apparently composed of 20 segments (fig. a). Posterior spiracles situated laterally on fourth segment from caudal end of body. Head capsule (fig. b) seemingly complete and permanently exserted, articulated posteriorly with slender or spatulate metacephalic rod lying within thorax.  (Fig. a)  (Fig. b) **Go to (14)**	**13a`.** Body not eel-like, composed of no more than 12 apparent segments. Posterior spiracles on ultimate or penultimate abdominal segment. Head capsule more or less reduced, especially posteroventrally, and partially retracted within thorax, with or without single broad or nonspatulate metacephalic rod lying within thorax, occasionally with 2 such rods. **Go to (15)**
Either:	**Or:**
14a. Metacephalic rod expanded apically, spatulate, antenna minute and peg-like (fig. a). Setae on each side of thoracic segments shorter than diameter of segments and situated ventrolaterally (fig. b). Predacious in soil and decaying wood.  (Fig. b)  (Fig. b) **Therevidae**	**14a`.** Metacephalic rod slender throught (fig. a). Antenna long and filamentous setae on each side of thoracic segments at least as long as diameter of segments, mesothoracic setae situated higher on segment than are prothoracic and metathoracic setae (fig. b). Predacious on insects in homes, stored foods, and wood.  (Fig. a)Head capsule dorsal view  **Scenopinidae**

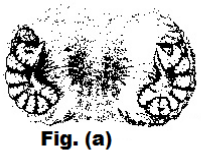
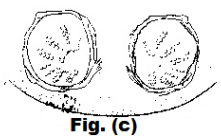
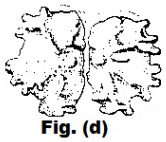
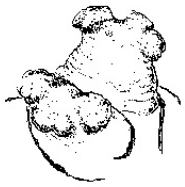
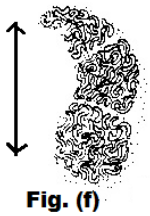
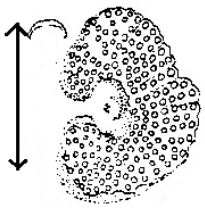
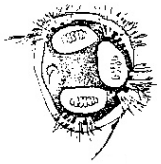
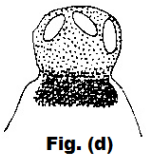
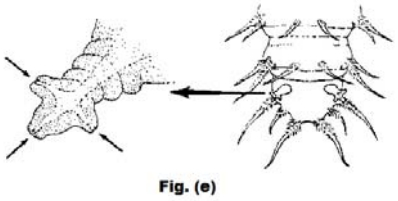
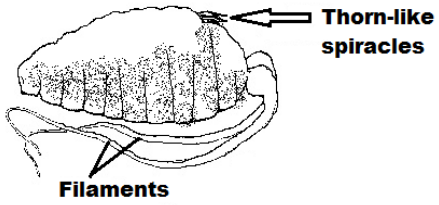
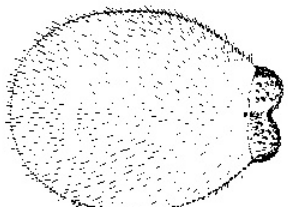
Either:	Or:
15a. Body plump and grub-like. Head usually small, almost completely retracted within thorax. Only mandibles or maxillae and at least vestige of labrum visible externally. Larva parasitic within the body of other Arthropoda.  **Go to (16)**	**15a`.** Body usually elongate and slender. Portions of head capsule and mouth parts visible externally. Larva free-living. **Go to (18)**
Either:	**Or:**
16a. Body robust, integument tough and leathery. Terminal abdominal segment with blunt projections on posterodorsal margin. Maxillae large and shovel-shaped; mandibles absent. Parasitic within grasshoppers and beetle larvae.  **Nemestrinidae**	**16a`.** Body whitish, integument thin and transparent. Terminal abdominal segment without blunt projections posterodorsally. Mandibles present, slender and pointed, often smaller than maxillae. **Go to (17)**
Either:	**Or:**
17a. Body pear-shaped, with abdomen enlarged. Parasitic in bodies of spiders.  **Acroceridae**	**17a`.** Body somewhat crescent-shaped, tapering toward both ends. Larvae parasitic on insects.  **Bombyliidae**

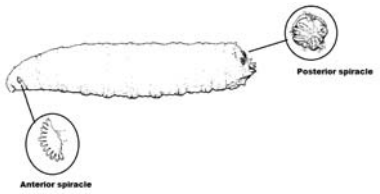
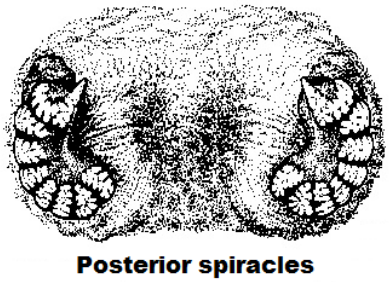
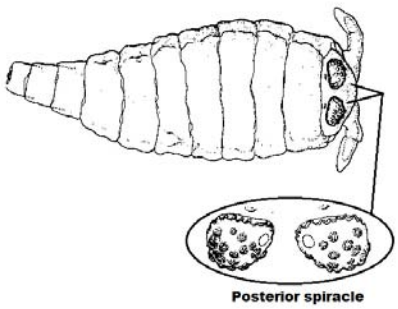
Either:	Or:
18a. Brush of retrorse spines situated above base of each mandible. Portion of cranium lying within thorax continuous with anterior exposed portion without apparent break, although desclerotization may suggest bilateral division. Tentorial arms solidly connected with tentorial phragmata.  **Go to (19)**	**18a`.** No Brush of spines associated with mandibles. Portion of cranium (metacephalic rod or rods) lying within thorax. Separated from anterior exposed portion by clear seam allowing independent movement in both portions. Tentorial arms flexibly attached to tentorial phragmata.  **Go to (20)**
Either:	**Or:**
19a. Posterior spiracles either lying within fissures on either side of pair of abutting vertically linear bars (fig. a) or borne on retractable, laterally compressed spine (fig. b&c). Tracheal trunks closely approximated within siphon and caudal segment (fig. c). Terminal segment without lobes or tubercles. Several or all of 7 anterior abdominal segments with encircling row of projections that sometimes bear apical spicules (fig. d) and serve as prolegs. Submentum present.  **Tabanidae**	**19a`.** Posterior spiracular openings exposed; each spiracle circular or oval. Tracheal trunks distinctly separated caudally. Terminal segment deeply cleft posteriorly to form 2 or 4 lobes (fig. a) or bearing pair of sclerotized horn-like processes dorsally and pair of rounded lobes ventrally; posterior spiracles on caudal face of dorsal lobes. First 7 abdominal segments with ventral creeping welts (fig. b). Submentum absent.  **Rhagionidae**

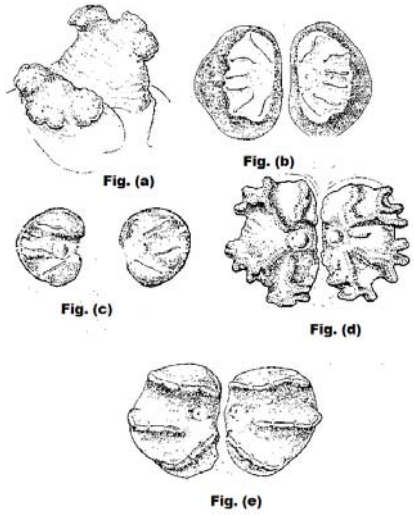
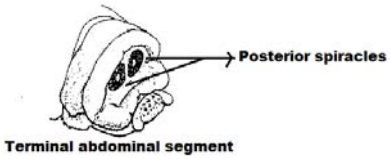
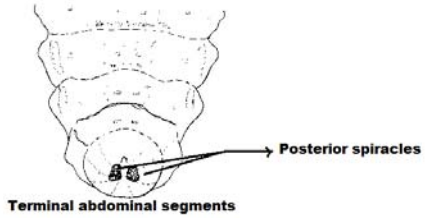
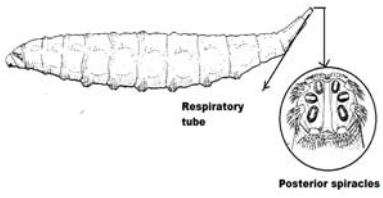
Either:	**Or:**
20a. Head largely membranous, with single narrow or broader metacephalic rod that is sometimes split almost to base. Sclerotized submentum present ventrally on head capsule. Maxillae large and heavily sclerotized, more prominent than slender mandibles. Nine abdominal segments. Respiratory system functionally amphipneustic, although remnants of spiracles forming holopneustic system usually visible; posterior spiracles situated laterally on abdominal segment 8. Larva usually longer than 15 mm. at maturity. **Go to (21)**	**20a`.** Head skeletonized, with 2 slender metacephalic rods and 2 tentorial arms particularly prominent; no submentum; maxillae sometimes seemingly absent, never heavily sclerotized or more prominent than mandibles. Eight abdominal segments; posterior spiracles, if present, located caudally on last segment. Respiratory system amphipneustic, metapneustic or apneustic. Larvae usually less than 15 mm at maturity. **Go to (23)**
Either:	**Or:**
21a. Maxillae laterally compressed, tending to cup mandibles, similar in length to mandibles; maxillary palpus apical. Larvae in loges or soil, predacious.  **Largely membranous head** **Mydidae**	**21a`.** Maxillae more or less dorsoventrally compressed, often toothed apically and concave ventrally to form digging structures, usually much longer than mandibles; maxillary palpus lateral.  **Largely membranous head** **Go To (22)**
Either:	**Or:**
22a. Abdominal segment 8 no longer than half its diameter. Posterior spiracles situated dorsolaterally in distal half of segment 8.  **Asilidae**	**22a`.** Abdominal segment 8 about twice as long as wide; posterior spiracles lateral near anterior margin of abdominal segment 8. **Go To (23)**

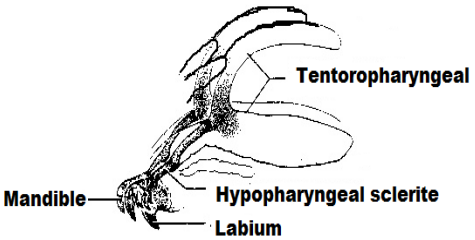
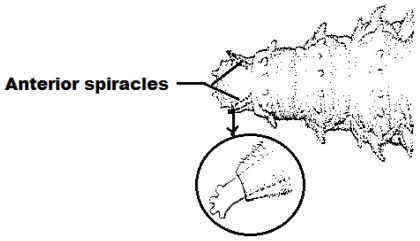
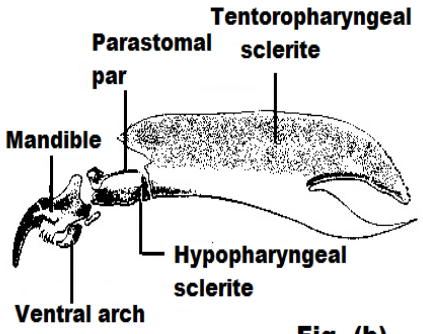
Either:	**Or:**
23a. Metacephalic rods moderately expanded or spatulate apically (fig. a). Terminal abdominal segment either evenly rounded (in plant- mining species) or with 4 (rarely 2 ventral) primary lobes surrounding posterior spiracles; 1 pair of abdominal prolegs and either 6 or 7 abdominal creeping welts (fig. b).  Fig. (a)  Fig. (b) **Dolichopodidae**	**23a`.** Metacephalic rods evenly slender throughout. Terminal abdominal segment either bearing single median protuberance below posterior spiracles (fig. a) or if more than 1 terminal lobe present, then respiratory system often apneustic and with 7 or 8 pairs of crochet bearing prolegs (fig. b).  Fig. (a)  Fig (b) **Empididae**
Either:	**Or:**
24a. Posterior spiracles on a common, distinctive, sclerotzed plate. Parasitic within bodies of Homoptera.  **Pipunculidae**	**24a`.** Posterior spiracles not on a co mmon sclerotized plate. (Spiracles sometime hidden in a pit). **Go to (25)**
Either:	**Or:**
25a. Anterior spiracles close together on dorsum of prothorax (fig. a). Mandibles with longitudinal axis at oblique or right angle to remainder of cephalopharyngeal skeleton, each mandible usually bearing 2 or more pairs of equal-sized, anteriorly directed teeth (fig. b). Phytophagous; mostly leaf miners, some stem miners.  Fig. (a)  Fig. (b) **Agromyzidae**	**25a`.** Anterior spiracles arising on lateral or dorsolateral surface of prothorax. Mandibles usually on same plane as remainder of cephalopharyngeal skeleton, each either bearing fewer than 2 pairs of teeth or bearing 2 or more pairs of unequally sized teeth. **Go to (26)**

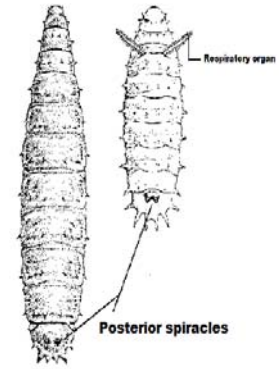
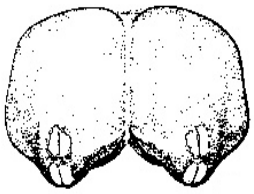
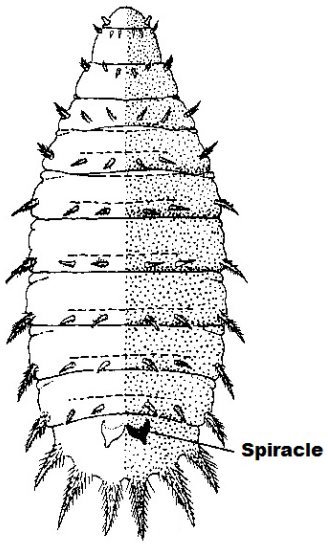
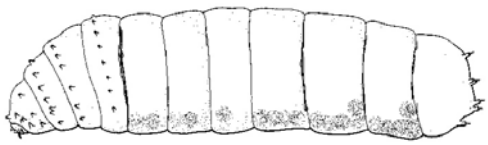
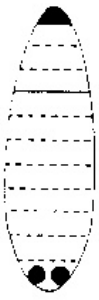
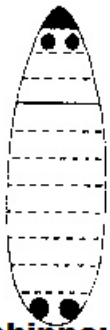
Either:	**Or:**
26a. Larva up to 2mm. long, oval to globular in shape. Two pairs of posterior spiracles present, the posterior pair sometimes united into 1 plate; spiracles on each side usually visibly joined by slender convoluted branches of felt chamber. No cephalopharyngeal skeleton. Ectoparasitic on bats. **Go to (27)**	**26a`.** Larva variable in length and shape. No more than 1 pair of posterior spiracles. Cephalopharyngeal skeleton usually present. Not associated with bats. **Go to (28)**
Either:	**Or:**
27a. Posterior spiracles composed of simple circular pore-like spiracular openings.  **Nycteribiidae**	**27a`.** Posterior spiracles oval, crescent-shaped, or with numerous spiracular openings placed circularly on margin, or otherwise modified.  **Streblidae**
Either:	**Or:**
28a. Posterior spiracles projecting above body on structures ranging from short prominence (fig. a) to very long and retractile tube (fig. b); spiracular plates united along median margin (fig. c). Body bearing dense pubescence or spicules or tubercles (fig. d).  Fig. (a)  Fig. (b)  Fig. (c)  Fig. (d) **Syrphidae**	**28a`.** Posterior spiracles sessile or elevated above surface of caudal abdominal segment; spiracular plates normally well-separated, but if appearing fused, then body lacking dense pubescence, prominent spicules, or tubercles. **Go to(29)**

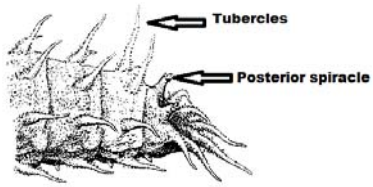
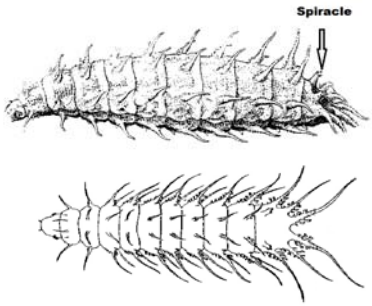
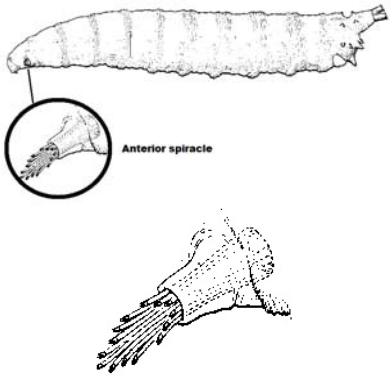
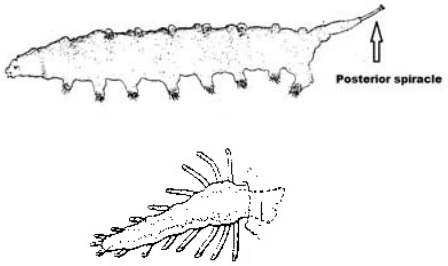
Either:	Or:
29a. Each posterior spiracle with numerous roundish, oval, or short slit-like spiracular openings (fig. a-g); openings either randomly arranged or located along margin of spiracular plate or associated with intricately convoluted coral-like or serpentine bands; spiracles not thorn-like. Body usually highly wrinkled or otherwise rather swollen and roundish to pearshaped.  Fig. (a)  Fig. (b)  Fig. (c)  Fig. (d)  Fig. (e)  Fig. (f)  Fig. (g) **Go to (30)**	**29a`.** Each posterior spiracle with 3 isolated oval or slit-like relatively large and sometimes sinuous spiracular opening (fig. a-e) (rarely with 4 to 6 such openings or sometimes thornlike) (fig. f). Body usually rather slender and subcylindrical or flattened.  Fig. (a)  Fig. (b)  Fig. (c)  Fig. (d)  Fig. (e)  Thorn-like spiracles Filaments Fig. (f) **Go to (36)**
Either:	**Or:**
30a. Larva deposited as smooth, generally featureless oval to round prepupa having darkly sclerotized spiracular plate that often covers posterior end of body, some species bear integumentary setae. Ectoparasitic on birds and mammals.  **Hippoboscidae**	**30a`.** Larva not as in (30a). **Go To (31)**

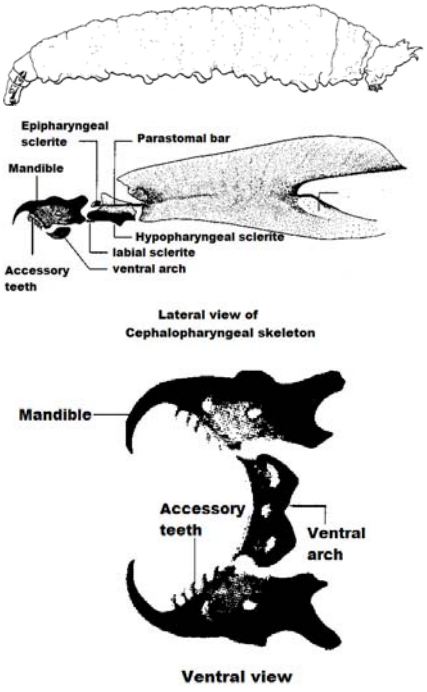
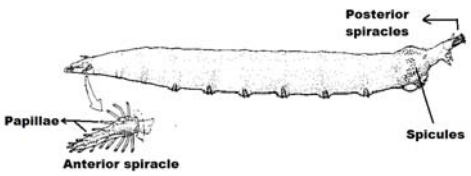
Either:	Or:
31a. Spiracular openings oval, arrayed in circle on margin of spiracular plate. Parasitic within bodies of grasshoppers.  **Anthomyiidae**	**31a`.** Spiracular openings distributed rather evenly over spiracular plate. **Go to (32)**
Either:	**Or:**
32a. Posterior spiracular plates kidney-shaped, each consisting of series of curvilinear bands, each with 8-14 yellowish to orange clusters of round or oval to short bar-like spiracular opening, and with uppermost cluster extended into short spine. Parassitic within bodies of Scarabaeidae.  **Posterior spiracles** **Pyrgotidae**	**32a`.** Posterior spiracular plates, not as in (32a). **Go To (33)**
Either:	**Or:**
33a. Posterior spiracular plates dome-shaped, either with circular wart-like protuberances each bearing several pale spiracular openings or with linear clusters of pores radiating from ecdysial scar. Parasitic on bees and wasps.  **Posterior spiracle** **Conopidae**	**33a`.** Posterior spiracular plates not dome-shaped and without wart-like protuberances. Parasitic on other arthropods or mammals. **Go to (34)**

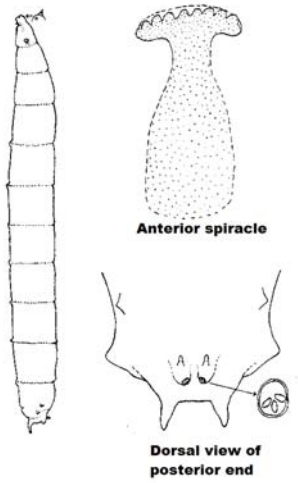
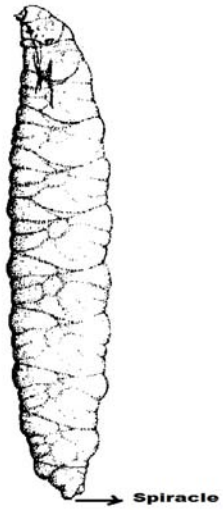
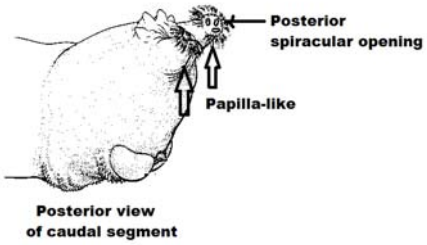
Either:	**Or:**
34a. posterior spiracles each with numerous openings elevated on coral-like sculpturing of spiracular plate; spiracular plate usually more or less 3-parted (fig. a-e). Parasitic on various insects and centipedes.  **Tachinidae**	**34a`.** Posterior spiracles not as described in (33a). **Go to (35)**
Either:	**Or:**
35a. Posterior spiracles placed on dorsal surface of transverse cleft in terminal abdominal segment, spiracles frequently concealed within cleft when opposing surfaces are brought together.  **Oestridae (Oestrinae)**	**35a`.** Posterior spiracles not placed within cleft but no evenly rounded terminal extremity of body.  **Oestridae (Hypodermatinae)**
Either:	**Or:**
36a. Posterior spiracles on short telescopic respiratory tube that is not forked terminally; spiracles separated only by slight depression. Restricted to coastal habitats  **Canacidae**	**36a`.** Posterior spiracles either not on telescopic respiratory tube, or on telescopic tube that is conspicuously forked terminally. **Go to (37)**

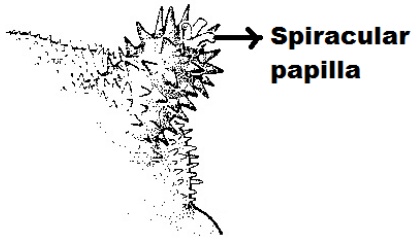
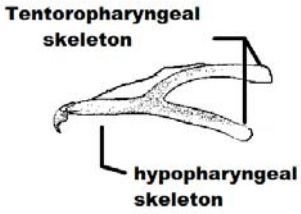
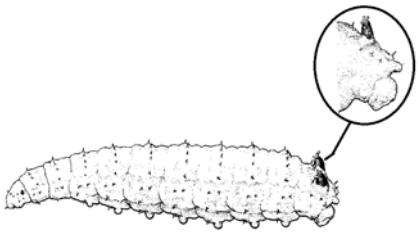
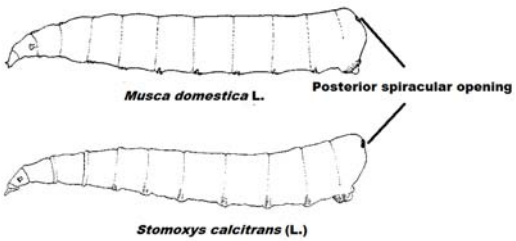
Either:	Or:
37a. Anterior spiracles simple, each with 1 to several sessile spiracular openings placed peripherally at apex of short tubular or conical projection (fig. a). Body often somewhat dorsoventerally flattened. All body segments usually bearing several systematically spicules or tubercles, usually with those situated laterally most prominent. Tentoropharyngeal and hypopharyngeal sclerites finely constructed and fused to each other (fig. b); hypopharyngeal sclerites usually continuous anteriorly with single or multi-toothed median labial sclerite, or with paired mandibles, or with both structures.  **Fig. (a)** **Anterior spiracle**  Fig. (b) **Go to (38)**	**37a`.** Anterior spiracles either lacking or if present, bearing 2 or more short papillae, or bearing long filaments arising on apex of spiracular atalk (fig. a). Body not as above. Tentoropharyngeal and hypopharyngeal sclerites often more strongly constructed than above, and distinctly separated (fig. b); hypopharyngeal sclerite fused to hook-like labial sclerite only in the first instar of some species.  Fig. (a)  Fig. (b) **Go to (39)**

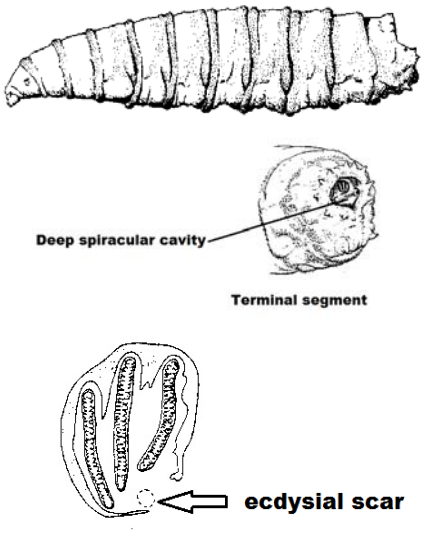
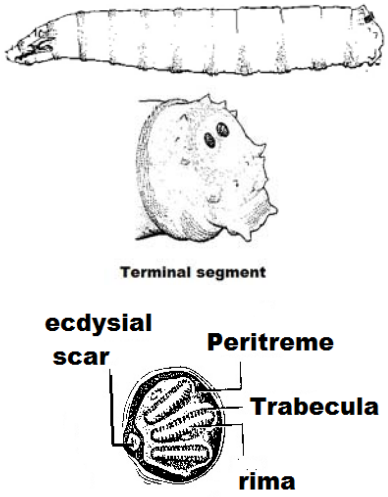
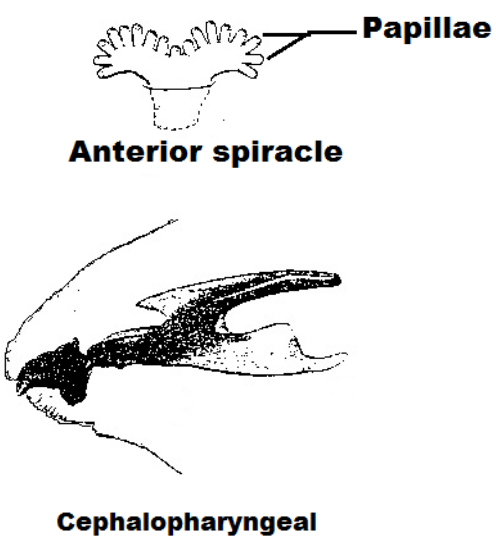
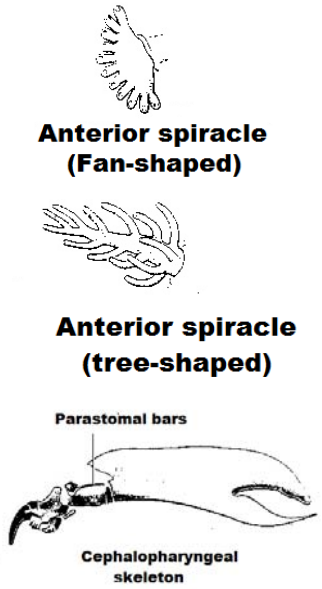
Either:	**Or:**
38a. Posterior spiracles variously supported, with spiracular openings arranged in 2 pairs placed one behind the other.   **Posterior spiracles** **Phoridae** (some species)	**38a`.** Posterior spiracles are a pair of distendable fleshy lobes borders the perianal pad.  **Phoridae** (other species)
Either:	**Or:**
39a. First 4 segments and terminal abdominal segment with encircling rows of small strobiliform tubercles. Respiratory system metapneustic; posterior spiracles sessile. Tentoropharyngeal and hypopharyngeal sclerites fused to each other. Mining walls of bee combs.   **Metapneustic** **Braulidae**	**39a`.** If tubercular processes present on thoracic segments, then tubercles also present on most abdominal segments. Respiratory system usually amphipneustic, with posterior spiracles elevated. Tentoropharyngeal and hypopharyngeal sclerites usually separate.  **Amphipneustic** **Go to (40)**

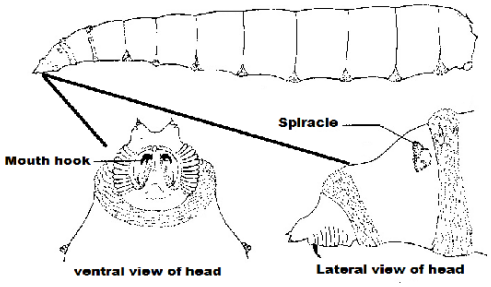
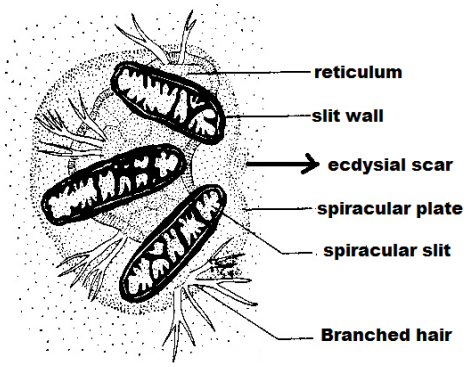
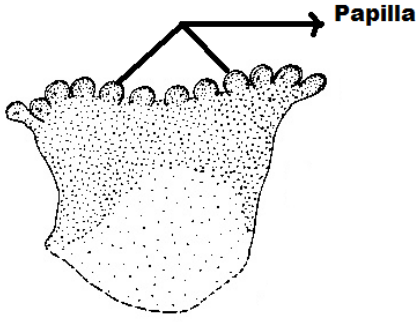
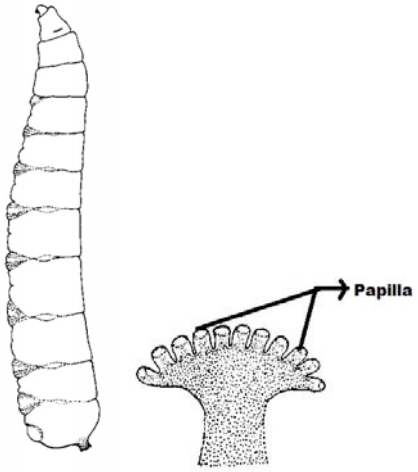
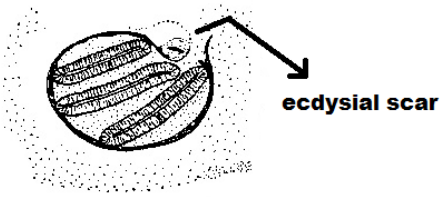
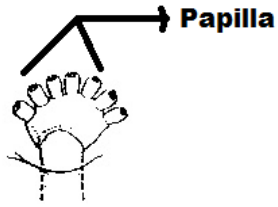
Either:	**Or:**
40a. Spiculate or setiferous tubercles present on several body segments preceding terminal one.  **Go to (41)**	**40a`.** Tubercles lacking or situated only on terminal abdominal segment. **Go to (43)**
Either:	**Or:**
41a. Tubercles present only on abdominal segments. Body cylindrical. **Superfamilies: Ephydroidea (Ephydridae and Drosophilidae)** **Go to (42)**	**41a`.** Tubercles present on both thoracic and abdominal segments. Body dorsoventrally flattened.  **Muscidae** in part **(Genus *Fannia* and *Lispe*)**
Either:	**Or:**
42a. Anterior spiracle with basal stalk terminating in many long filamentous processes, spiracle retractile into body.  **Anterior spiracle** **Drosophilidae**	**42a`.** Anterior spiracle absent or having different form than in opposite (Drosophilidae), but if in form of elongate retractile stalk, and then bearing short lateral papillae near apex of stalk.  **Anterior spiracle (if present)** **Ephidridae**

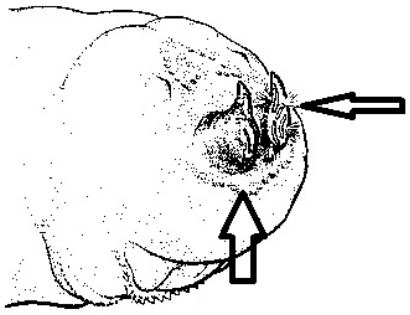
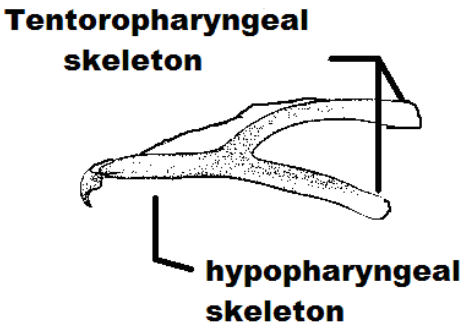
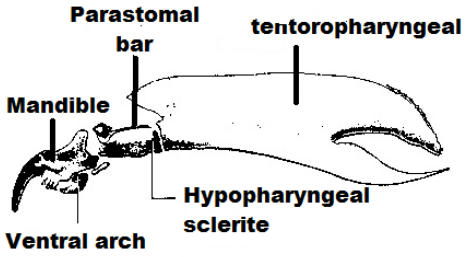
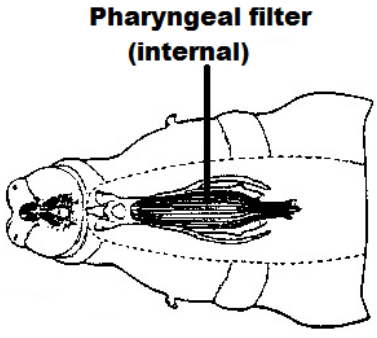
Either:	**Or:**
43a. One or more body segments densely clothed with minute setulate or spicules, caudal abdominal segment elongated to form respiratory tube; terminal abdominal segment bearing distinctive array of 1 or more pairs of symmetrically placed papillae or tubercles, that are usually distinctive, but sometimes more reduced. **Go to (44)**	**43a`.** All body segments lacking abundant setulae, spicules, papillae, or tubercles, generally featureless except for spicules on creeping welts; welts occasionally encircling anterior margins of a few segments. **Go to (47)**
Either:	**Or:**
44a. Cephalopharyngeal skeleton with venteral arch below base of mandibles. Larva a predator or parasitoid on freshwater, shoreline, and terrestrial mollusks or their eggs.  **Sciomyzidae**	**44a`.** Cephalopharyngeal skeleton lacking venteral arch below mandibles. **Go to (45)**
Either:	**Or:**
45a. Spicules and pubescence extensively covering terminal abdominal segment only. Posterior spiracles usually with well-developed spiracular setae; each anterior spiracle with papillae projecting on either side of more or less elongate central axis.  **Sepsidae**	**45a`.** Spicules present either only at segmental margins of terminal abdominal segment or extensively covering other segments besides the terminal one. Posterior spiracles with spiracular setae inconspicuous or absent; each anterior spiracle with papillae projecting fan-like. **Go to (46)**

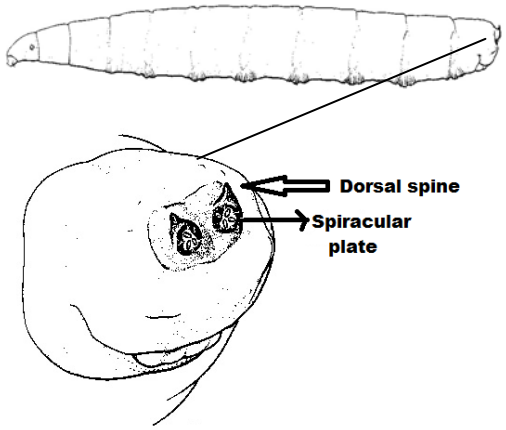
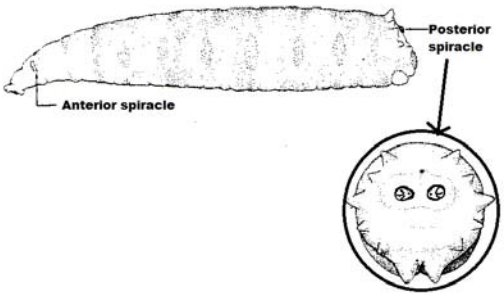
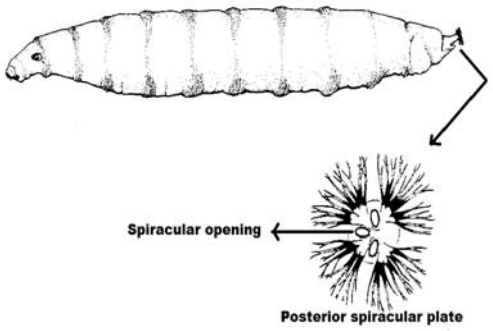
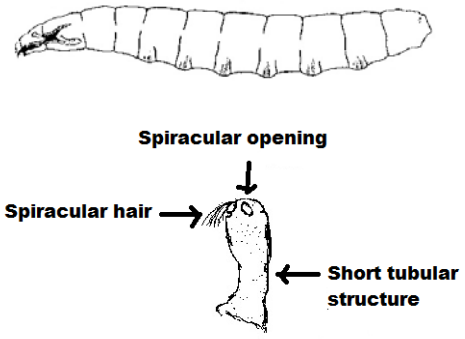
Either:	**Or:**
46a. Posterior spiracles situated on median sloping faces of spiracuular prominences and appearing capable of retraction on one another. Segments immaculate except for tubercles on terminal segment and spicules on anterior ventral creeping welts of abdominal segments.  **Piophilidae**	**46a`.** Posterior spiracles situated on apices of spiracular prominences. Spicules on abdominal segments usually much more extensive than described before.  **Lauxaniidae**
Either:	**Or:**
47a. Posterior spiracular openings arranged so that 2 openings are nearly parallel to each other, whereas third opening forms nearly right angle; each spiracular opening often isolated on its own papilla-like projection. Terminal segment often with transverse ridge of 3 or 4 small tubercles on dorsum near base of spiracular prominences.  **Milichiidae**	**47a`.** Posterior spiracular openings usually rather symmetrically radiating from ecdysial scar. Terminal segment lacking ridge of tubercles at base of spiracular prominences. **Go to (48)**
Either:	**Or:**
48a. Integument of all segments clothed with fine pubescence or spicules. **Go to (49)**	**48a`.** Integument of at least part of each thoracic segment free from pubescence or spicules. **Go to (50)**

Either:	**Or:**
49a. Each posterior spiracular opening on papilla-like projection from spiracular plate (fig. a). Cephalopharyngeal skeleton with hypopharyngeal and tentoropharyngeal sclerites fused (fig. b). Predators and parasitoids of aphids, adelgids, and coccids.  **Fig. (a)**  **Fig. (b)**  **Chamaemyiidae**	**49a`.** Posterior spiracular openings sessile on surface of terminal segment. Hypopharyngeal and tentoropharyngeal sclerites separated.  **Mucsidae (Genus of *Musca* and Stomoxys)**
Either:	**Or:**
50a. Posterior spiracles nearly or quite sessile on surface of anal segment and lacking a sclerotized peritreme, or with spiracular openings slit-like and with all slits oriented in a predominantly vertical or median direction. **Go to (51)**	**50a`.** Posterior spiracles distinctly elevated later plane of terminal segment and longitudinal axis of one or more spiracular openings orinted dorsally or dorsomedially. **Go to (53)**

Either:	Or:
51a. Spiracular openings oriented more or less vertically; posterior spiracles frequently within deep spiracular cavity on terminal segment; ecdysial scar usually not visible; periterme not completely encircling each spiracular plate.  **Sarcophagidae**	**51a`.** Spiracular openings obliquely or horizontally oriented; posterior spiracles at surface of terminal abdominal segment; ecdysial scar Clearly visible; peritreme completely encircling each spiracular plate.  **Calliphoridae** **Go to (52)**
Either:	**Or:**
52a. Anterior spiracle 2-branched, with papillae present along each diverging arm. Cephalopharyngeal skeleton without parastomal bars.  **Scathophagidae**	**52a`.** Anterior spiracle fan-shaped or tree-like or parastomal bars present in cephalopharyngeal skeleton or both features present.  **Heleomyzidae** **Sphaeroceridae** **Curtonotidae**

Either:	**Or:**
53a. Posterior spiracles sessile on terminal segment. **Go to (54)**	**53a`.** Posterior spiracles distinctly elevated above surface of terminal segment. **Go to (55)**
Either:	**Or:**
54a. Spiracular peritremes unpigmented.   Caudal spiracle  Anterior spiracl **Tephritidae**	**54a`.** Spiracular peritremes usually distinctly pigmented.  Anterior spiracle  Caudal spiracle **Otitidae**  Anterior spiracle **Chloropidae**

Either:	Or:
55a. Posterior spiracular openings short and oval, lying nearly at right angles to one another.  **Go to (56)**	**55a`.** Posterior spiracular openings radiating from ecdysial scar at distinctly less than right angles, or irregularly or peripherally located.  **Go to (58)**
Either:	**Or:**
56a. Tentoropharyngeal and hypopharyngeal sclerites fused; pharyngeal filter lacking. Living in roots, stems or galls of plants.  **Psilidae**	**56a`.** Tentoropharyngeal and hypopharyngeal sclerites separated; pharyngeal filter present.   **Go to (57)**

Either:	Or:
57a. Posterior spiracle with distinct dorsal spine. Larva living in damaged or decaying plant material, under bark, or in pine cones.  **Lonchaeidae**	**57a`.** Posterior spiracles lacking dorsal spine. Larva living in decaying seaweed.  **Dryomyzidae**
Either:	**Or:**
58a. Posterior spiracles borne at apices of separate tubular bases, each spiracular projection subtended ventrally by short tubercle; three elongate-oval spiracular openings that are nearly perpendicular to each other; ecdysial scar not apparent.  **Diopsidae** (New recorded in Egypt)	**58a`.** Posterior spiracles very small, borne on apices of short tubular structures; each spiracular plate with 3 diverging, oval spiracular openings; at least 1 branching spiracular hair present on each plate.  **Odiniidae**

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ARABIC SUMMARY

مفتاح مصور ليرقات رتبة ذات الجناحين بمصر

أيمن محيى الدين ابراهيم
معهد بحوث وقاية النباتات

تعتبر رتبة ذات الجناحين واحدة من أهم و أكبر رتب الحشرات وتشمل هذه الرتبة أنواع الذباب والتى تتغذى أغلبها على ءافرازات الأزهار أو على المواد العضوية التالفة بينما تكون يرقاتها مفترسة كيرقات بعض أنواع السرفيد أو طفيلية كيرقات التكاينا.

دورة حياة معظم الذباب هو تطور كامل حيث أن الأناث تضع بيضا ليتحول ليرقات ثم عزارى ثم الحشرة الكاملة إلا أن بعض أنواع الذباب يلد يرقات مثل ذباب اللحم وفى بعض أنواع الذباب يحدث التوالد المسمى بال (Paedogenesis) فى اليرقات إذ تتوالد داخل اليرقة الواحدة عدة يرقات تتغذى كل منها ءالى أن تكبر ثم يتولد داخل كل من هذه عدة يرقات أيضا وهكذا و أخيرا تتحول اليرقات إلى عزارى.

يرقات الذباب يطلق عليها Maggot أى عديمة الرأس والأعين إلا فى القليل منها كما فى يرقات البعوض أما فى اليرقات الأخرى كيرقات الذباب العادى فلها فكان كاذبان (Mouth hook) يعملان فى مستوى رأسى كما هو الحال فى تحت رتبة البراكسرا أو تتحرك للخلف كما هو فى الذباب تحت رتبة النيماتوسيرا.

يرقات رتبة ذات الجناحين ليس لها أرجل حقيقية إلا أن لبعضها أقداما كاذبة تساعدها على الحركة و تتنفس من ثغور على جانبى الجسم أو من زوجين من الثغور أحدهما على الصدر والثانى فى نهاية الطرف الخلفى أو من زوج واحد فى الطرف الخلفى وفى بعض اليرقات المائية توجد خياشيم.

الطور اليرق فى رتبة ذات الجناحين كما فى كثير من رتب الحشرات تعتبر من أخطر و أهم الأطوار حيث أنها المتسبب الأول فى أتلاف كثير من الزراعات الأقتصادية الهامة إلا أن بعض اليرقات تقوم بالتطفل على يرقات أخرى وهى بدورها تعتبر مدخلا لعمل برنامج كامل للمكافحة البيولوجية كما هو الحال فى ذباب التكاينا.

ولأهمية هذا الطور كان هذا العمل الذى لم يتطرق لة أحدا من قبل والذى يمكن من خلالة فصل العائلات من الطور اليرقى.