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Skeleto-muscular mechanism of the cephalo-pharyngeal skeleton of the mature larva of the melon fly, *Dacus (Strumeta) cucurbitae* COQUILLET

(Diptera: Trypetidae)

With 4 text figures

In contrast to the vast multitude of studies available on the cephalo-pharyngeal skeleton of cyclorrhaphous larvae, those dealing with its skeleto-muscular relationship are very few. THOMPSON (1920, 1928), MILLER (1932), ASHBY & WRIGHT (1946), HEWITT (1914), KEILIN (1919), LUDWIG (1949), and RANADE (1964) are some of such studies. So far as the family Trypetidae is concerned, SNODGRASS (1924) has briefly described the musculature in *Rhagoletis*. The present study deals with details of the skeleto-muscular mechanism in the mature larva of the melon fly, *Dacus (S.) cucurbitae* COQUILLET.

Material and Methods

Fully mature third instar larvae were first killed by dropping them in water heated to nearly fifty degrees centigrade. All the larvae thus got fully stretched. They were then dissected in water to which a little Glycerine had been added.

Description

In order to arrive at an understanding of the skeleto-muscular mechanism, a description of the cephalo-pharyngeal skeleton is given here, without going into the various controversies regarding the homologies of its components. A fuller account of the cephalo-pharyngeal skeleton with observations on other cyclorrhaphous larvae will be published separately.

The cephalo-pharyngeal skeleton of the melon fly larva (Fig. 1) is a prominent structure lying in the anterior portion of the body, and apically bears a pair of highly sclerotised mouth hooks.

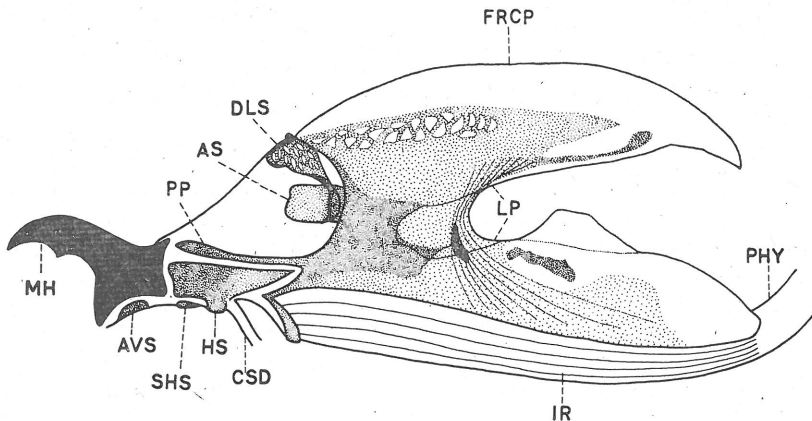


Fig. 1. Lateral view of cephalo-pharyngeal skeleton of melon fly larva

A greater portion of the skeleton is involved in the formation of supra-structure of a sucking pump in the larva which bears a marked resemblance with the stirrup-shaped sucking pump of the adult melon fly (ZAKA-UR-RAB 1971), and the two appear to be homologous structures. However, unlike the adult, the sucking pump of the larva is a composite structure consisting of both cibarial as well as pharyngeal elements.

The roof of the sucking pump consists of a thin, transparent, narrowly U-shaped sclerotic strip, with the arms pointing in the posterior direction. Since the roof is the seat of origin of the cibarial as well as the pharyngeal muscles, it morphologically represents a fronto-clypeus (Fig. 1; *FRCP*). The greater part of the fronto-clypeus is, however, composed of the clypeus with the frons occupying a small indefinite area in the posterior-most region.

Laterally on either side, the fronto-clypeus is internally projected in the form of a large and pigmented inflection (Fig. 1; *LP*) which fuses with the lateral margin of the sucking pump. These internal inflections form the most conspicuous feature of the cephalo-pharyngeal skeleton and provide bracing support to the sucking pump. These plates have been given different names by different workers on dipterous larvae. With a view to eliminate the un-necessary confusion created by multitude of names coined for describing the same structure, the present author suggests that these be called simply as the lateral plates, and has like-wise designated the same in this paper.

Each lateral plate, besides being concave on the anterior aspect, is so deeply notched on the posterior side that it literally gets divided into a dorsal and a ventral portion.

Antero-laterally each lateral plate is produced forward in the form of a slender Parastomal process (*PP*), which besides re-inforcing the lateral portion of the membranous atrial wall, provides insertion at its tip to the dorsal retractor muscles of the head (Fig. 2; 3a, 3b).

The Hypostomal sclerite (Fig. 1; *HS*) lies interpolated between the lateral plates and the mouth hooks, and consists of two lateral, roughly triangular, sclerites ventrally connected with each other by a short transverse bridge, thereby giving the impression of being an 'H-shaped' structure when viewed from below. The common salivary duct (*CSD*) opens just proximal to its base.

The Dorso-lateral sclerite (*DLS*) is located just beyond the anterior margin of the lateral plate in the dorsal proximity. Dorsally it is fused with its counter-part from the other side to form a dorso-median plate lying embedded in the membranous wall of the sucking pump just beyond, and contiguous to, its roof. Since the dorso-lateral sclerite shows through the transparent membranous wall of the atrium, it gives the false impression of being located in the latter. The sclerite exhibits a typical network-like structure. It is being recorded for the first time in Trypetidae. Ventrally, the dorso-lateral sclerite is fused with the anterior sclerite (*AS*) which was first recorded in Trypetidae by EXLEY (1955).

The Anterior sclerite (Fig. 1; *AS*) is a more or less rectangular structure lying in the membranous lateral wall of the sucking pump just contiguous to the anterior margin of the lateral plate on either side. This sclerite arises from the antero-mesal portion of the lateral plate, and is intimately fused with the dorso-lateral sclerite of its side.

A pair of Antero-ventral sclerites (*AVS*) are located in the ventral wall between the bases of the two mouth hooks.

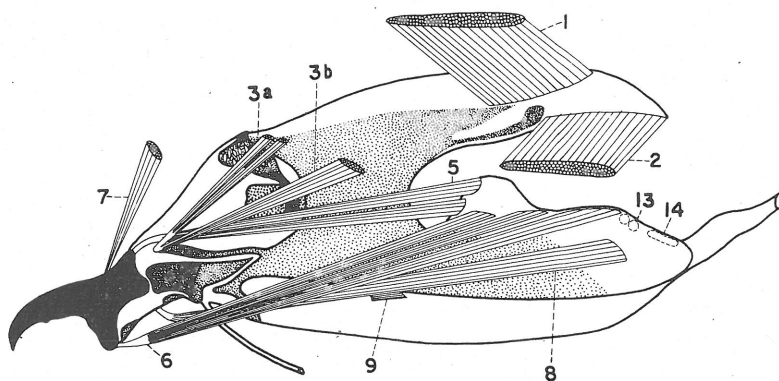
A pair of small Sub-hypostomal sclerites (*SHS*) are located just beyond the ventral bridge of the hypostomal sclerite, and together form the complex sub-hypostomal sense organ.

There is no trace in the melon fly larva of the Epistomal sclerite said to lie in the dorsal wall of the atrium above the bases of the oral hooks in certain cyclorrhaphous larvae.

The mouth hooks (*MH*) are highly sclerotized, more or less sickle-shaped structures which basally articulate with the anterior ends of the hypostomal sclerite. Each hook is operated by an adductor and an abductor muscle which enables it to work in a vertical plane.

The labrum (*LM*) is in the form of a small cuneiform sclerite lying above the functional mouth (Fig. 3; *MTH*), the true mouth (*MTH*) being located just below the frontal ganglion.

As already mentioned earlier, the sucking pump includes both cibarial as well as pharyngeal elements. The floor of the sucking pump is provided with seven longitudinal internal ridges (*IR*) which are a rather characteristic feature of phytophagous cyclorrhaphous larvae.



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Fig. 2. Lateral view of cephalo-pharyngeal skeleton showing muscles

Musculature

1. Dorsal Protractor of the Head: (Fig. 2; No. 1)

This strong muscle arises dorso-laterally on the median portion of the pro-thorax, and is inserted postero-dorsally on the lateral arm of the fronto-clypeus.

2. Ventral Protractor of the Head: (Fig. 2; No. 2)

This strong muscle arises ventro-laterally on the posterior portion of the pro-thorax, and is inserted on the postero-ventral aspect of the arm of the frontoclypeus.

3. Dorsal Retractors of the Head: (Fig. 2; No. 3a, 3b)

These muscles consist of two sets, viz., a pro-thoracic set and a meso-thoracic set. The former consists of two slender muscle bundles which arise dorso-laterally on the posterior margin of the pro-thorax, and is inserted on the tip of the parastomal process of its side.

The second set consists of a single but stronger muscle bundle which arises dorso-laterally on the posterior margin of the meso-thorax, and is inserted on the tip of the parastomal process.

4. Ventral Retractors of the Head: (Fig. 4; No. 4a, 4b)

These muscles consist of two sets which arise medio-laterally on the posterior margin of the meso-, and meta-thorax, respectively and get inserted on a short sclerotic plate projecting inwards from the posterior margin of the ventral wall of the head segment. Each set consists of three bundles. LUDWIG (1949) in *Calliphora* shows these muscles to arise on the meta-thorax and first abdominal segment respectively, and to insert on the ventral wall of the prothorax.

5. Abductor of the Mouth Hook: (Fig. 2; No. 5)

This muscle consists of two bundles which arise medio-laterally on the ventral half of the lateral plate, and making a common tendon get inserted dorsally on the base of the mouth hook of their side.

6. Adductor of the Mouth Hook: (Fig. 2; No. 6)

This muscle is stronger than the abductor. It consists of three bundles which arise postero-laterally on the ventral half of the lateral plate, and making a common tendon get inserted ventrally on the base of the mouth hook of their side.

7. Anterior Dilator of the Atrium: (Fig. 2; No. 7)

This muscle arises dorso-laterally on the median portion of the pro-thorax, and is inserted dorsally along with its counterpart from the other side on the antero-median portion of atrium above the bases of the mouth hooks.

8. Ventral Dilator of the Atrium: (Fig. 2; No. 8)

This muscle arises ventrolaterally on the lateral plate below the origin of the adductor muscle of the mouth hook, and passing mesally in relation to the latter, gets inserted on the floor of the atrium anterior to the sub-hypostomal sclerite. LUDWIG (1949) considers this muscle as a labial retractor.

9. Dilator of Salivary Duct: (Fig. 2, 3; No. 9)

This small and slender muscle arises lateral on the ventral wall of the sucking pump in the anterior portion, and is inserted on the salivary duct shortly before the latter opens on the floor of the atrium.

Muscles of the Sucking Pump:

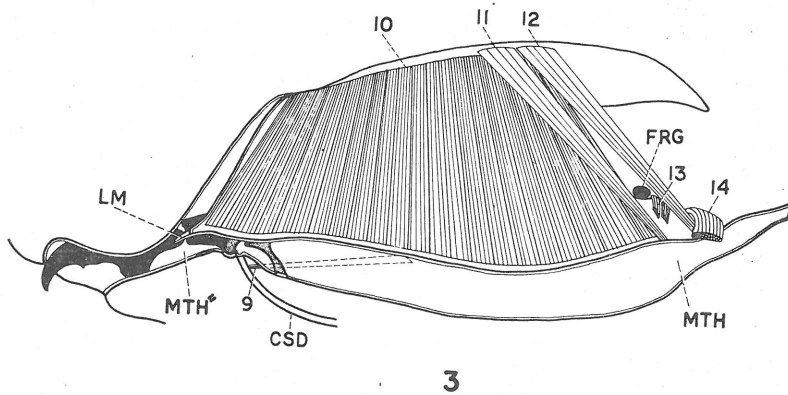


Fig. 3. Inner lateral view of cephalopharyngeal skeleton showing muscles of the sucking pump

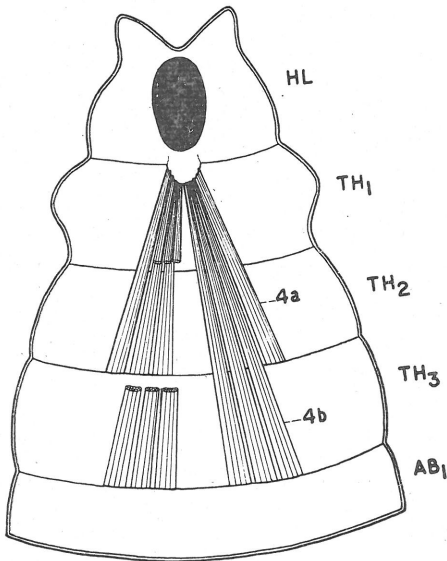


Fig. 4. Inner ventral view of anterior region of larva, with cephalo-pharyngeal skeleton removed, showing ventral retractor muscles of head

10. Dilator of the Cibarium: (Fig. 3; No. 10)

This strong and broad muscle consists of several bundles which arise broadly on the fronto-clypeus (on an area obviously belonging to the clypeus) and get inserted laterally on the roof of the cibarium.

11. Posterior Dilator of the Cibarium: (Fig. 3; No. 11)

This muscle arises posteriorly on the fronto-clypeus, mesal in relation to the dilator of the cibarium, and is inserted postero-medially on the roof of the cibarium.

12. Anterior Dilator of Pharynx: (Fig. 3; No. 12)

This muscle arises on the fronto-clypeus, posterior in relation to the posterior dilator of the cibarium (on an area obviously belonging to frons), and is inserted on the pharyngeal roof:

13. First Dorsal Compressor of the Pharynx: (Fig. 3; No. 13)

This muscle consists of two bundles which, running posterior to the frontal ganglion but anterior in relation to the anterior dilator of the pharynx, extend transversely over the dorsal surface of the anterior-most portion of the pharynx.

14. Second Dorsal Compressor of the Pharynx: (Fig. 3; No. 14)

This rather flat muscle extends transversely over the dorsal surface of the pharynx just before the latter is freed of the sucking pump, posterior in relation to the anterior dilator of the pharynx.

Summary

The skeleto-muscular mechanism of the cephalo-pharyngeal skeleton of the mature, third instar, larva of the melon fly, *Dacus (S.) cucurbitae* COQUILLETT (Diptera: Trypetidae) has been described in detail.

Zusammenfassung

Der Skelett-Muskel-Mechanismus des Cephalopharyngealskeletts im letzten Larvenstadium von *Dacus (S.) cucurbita* COQUILLETT (Diptera: Trypetidae) wird ausführlich beschrieben.

Резюме

Описывается механизм скелета и мускулов цефалофарингеального скелета в последней личиночной стадии *Dacus (S.) cucurbitae* COQUILLETT (Diptera: Trypetidae).

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