UDC 595.753(4-013) Entomological Review, 73 (5), 1994

Morphological Peculiarities of Larvae of the Family Dictyopharidae (Homoptera). I. General Characteristics and a Key to Genera of the Palearctic Fauna*

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Abstract. This work is complementary to one on the same subject by the same author in 1980.

Key words: Homoptera; Dictyopharidae; systematics; morphology; faunistics; immature stages.

This work was completed in 1979 and partly published in brief form (Yemel'yanov, 1980: 31-36), but it was delayed because of some gaps in the material on 1st-instar larvae (nymphs).

In the literature there are few scattered data about nymphs of Dictyopharidae (Fulton and Sirrine, 1914; Müller, 1940; Wilson and McPherson, 1981). The paper by Wilson and McPherson contains many complete descriptive details; and it includes characteristics of earlier instars of representatives of the subfamily Dictyopharinae, including the 1st instar, which I did not have when I described instars of Dictyopharidae in the paper dedicated to the phylogeny of the subfamily Orgeriinae (Yemel'yanov, 1980).

Among Fulgoroidea, larvae (nymphs) of Dictyopharidae, together with Delphacidae, in habitus and way of life are most similar to imagines. As compared with imagines, larvae (nymphs) are characterized by a general simplicity, weak differentiation of several structures, especially those not directly associated with feeding and locomotion; a weaker sclerotization, abundance of membranous areas, especially in the sternal area; presence of accessory sutures which break out during molting and facilitate growth between molts together with membranous areas; the simplified structure of the first two abdominal segments, legs, and antennae; presence of some provisional structures and organs, the sensory pits, wax glands, pleurocoxal articulation in the metathorax, and serrated locking of the structures of hindtrochanters. Some of the differences from imagines cited above are distinct in earlier instars; other differences are distinct in later instars; and still other differences remain somewhat unchanged during the entire larval (nymphal) period of development. Differences in habitus and proportions of individual body parts are most distinct in earlier instars (Figs. 1-22, 29, 30). Some structures progressively developed in larvae, for example, the wax glands and, in many cases, the sensory pits, are lost in imagines. Vestiges of wings and genitalia appear in middle instars.

The head of the larva (Figs. 1-25) differs from that of the imago in the replacement of the longitudinal coryphal carina by a larval suture and outcurved lateral lobes of the metope bearing sensory pits.

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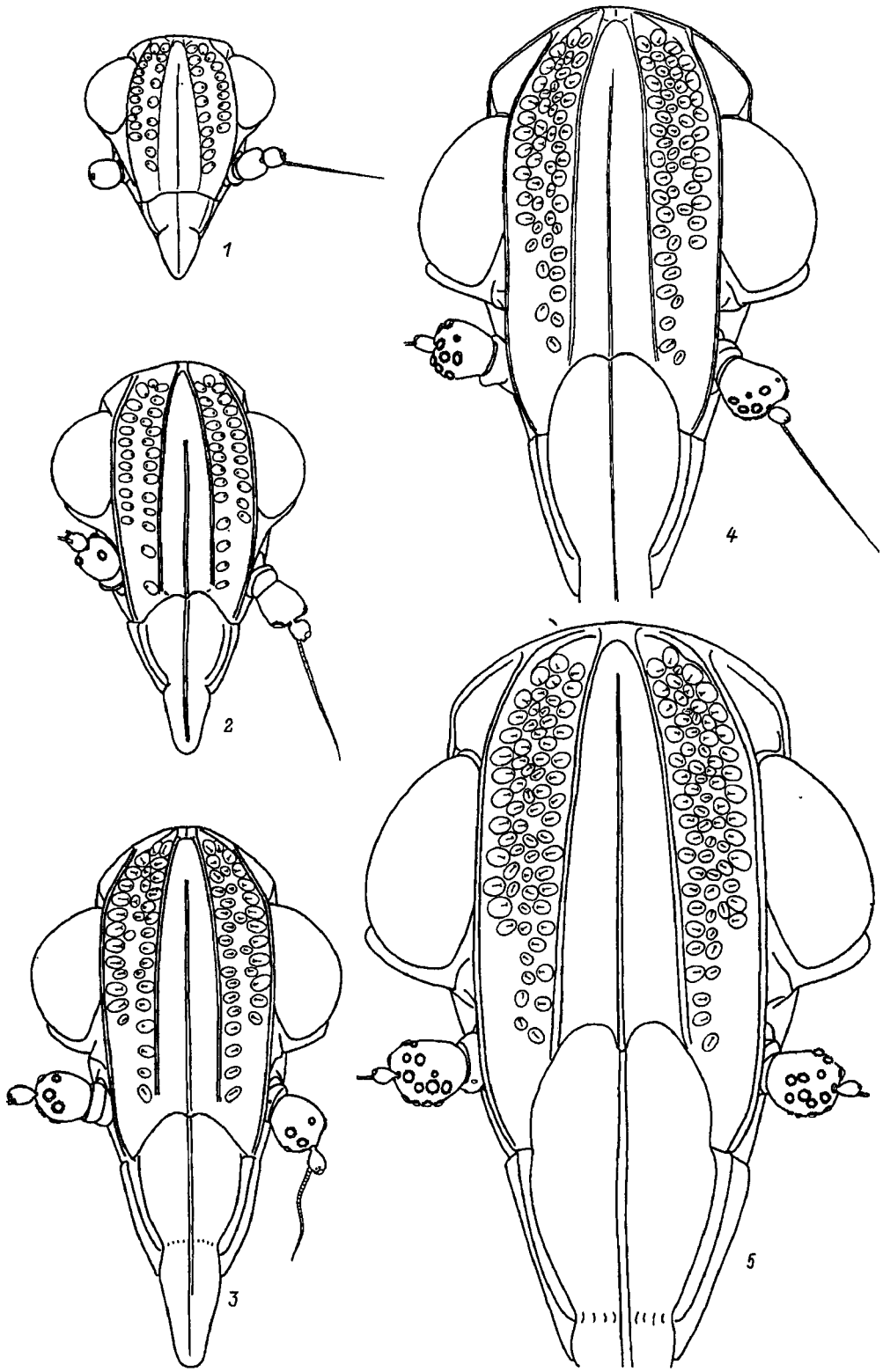
*Originally published in Entomologicheskoye Obozreniye, Vol. 72, No. 3, 1993, pp. 794-812.

ISSN0013-8738/94/0005-0059



Figs. 1-5. *Haumavarga fedtschenkoi*; head of larvae of 1st-5th instars.

The thoracic part (Figs. 26-36) is characterized by weak sclerotization of the sternal and, to a lesser extent, pleural areas. The terga area along the medial line is divided by the molting suture.

The pronotum bears sensory pits divided into groups, most of which are separated by carinae (Figs. 11, 25-30). The posterior peak of the pronotum covering the mesonotum is weakly developed. The mesonotum and metanotum are of approximately similar structure. Their middle parts, the discs, are separated from the lateral parts by discal carinae. The lateral notal parts of the pterothorax are transient to vestiges of wings without borders. Under the wing vestiges, between the base of the vestige and the upper margin of the pleurite there is a triangular, membranous upper surface, which widens posteriorly and medially, because the bases of the wing vestiges (in older nymphs) are distinctly shifted posteriorly to the anterior line of the body (Fig. 31). The triangular area under the wing posteriorly is bordered by tergal structures of the following segment. Vestiges of the forewings dorsally bear subcostal and claval carinae.

Pleural structures of the prothorax and mesothorax have almost the same structure as in adults, but they are more weakly sclerotized in the upper and intersegmental areas; dorsally the pleurite is not fused with the tergite. The pleural apodemes are more or less completely developed. Imaginal axillary structures of the pterothorax are entirely absent.

Sternal sclerotization of the prothorax is limited to the stripe connecting the bases of the sternal apodemes; on the mesothorax a similar bridge is broader and, also here, from the bases of apodemes extend lobes directed posteriorly. The sternal area of the metathorax is wholly membranous, except for the small middle part of the precoxal bridge and a bifurcate cuticular structure extending anteriorly from the postcoxal bridge. Probably this is the furcasternum with rudiments of sternal apodemes, not a special structure, as I assumed earlier (Yemel'yanov, 1981). The sternal apodemes of the prothorax and mesothorax are developed nearly completely.

The pleura area of the metathorax (Figs. 31, 32, 34, 35) has a considerably weaker structure than in the imago, but is similar thereto, more complex than the corresponding area in the mesothorax. The hindcoxa in the larvae, unlike in adults, is segmented, and not fused with the pleurite. The pit of the pleural apophysis and most structures situated near it, forming the so-called heel of the apimeron are not developed; the antecoxale is entirely absent and replaced by membrane.

The pleurite of the metathorax is a longitudinal, arcuately convex stripe corresponding to the epimeron, in the anterior part of which downward and medially originates a small episternum similar to that of the adult. In the longer posterior part the pleural suture is situated along the border with a continuous sternal membrane; here the episternum is narrowest.

The pleural apodeme of the metathorax (Fig. 36) lacks lateral lobes, sacs, and an apophysis cavity, which are typical of imagines (Yemel'yanov, 1981); it is a powerful and simple (not secondary) pleural crest; anteriorly it is transient into the episternal apodeme, posteriorly forming at its end a door type (linear) articulation with the coxa. The nymphal pleurocoxal articulation crosses structures which are uniform in imagines, but retain the same composition and shape. The base of the pleural apodeme near the articulation is of T-shaped section, being slightly widened at the episternal and epimeral ends. These widened parts together with similar structures of the coxa strongly restrict swinging motions of the coxa along the axis of the joint.

The pleurocoxal articulation secures the closing and opening of the serrated lock of the hindtrochanters (Figs. 33-36). Evidently, exactly these functions induced coxae of nymphs to form a small apodeme extending laterally into the coxotrochanteral membrane. The serrated connection (Šulc,

1928, 1929b; Sander, 1956; Yemel'yanov, 1979; Heilig and Sander, 1986) bear extended medial walls of trochanters (Figs. 34, 35). The coupling secures the synchronization of movement of hindlegs during jumping.

Structure of legs of nymphs (Figs. 68-71, 86-89, etc.) in all except peculiarities of hindcoxae and trochanters described above, reflecting the stages of direct development of those structures which became completely developed in imagines.

The abdomen (Figs. 37-40) is sclerotized only in the tergal area, the sternal borders of the segments being darkened like folds only in the middle of the abdomen. The posterior margins of the tergites slightly overlap the anterior margins of the following tergites. The abdomen slightly narrows to the base, is narrower to the apex, and rounded.

Lateral margins of the first two segments are membranous, the tergites are narrowed respectively, but in their length and general simplicity the structures retain homogeneity, unlike in the imaginal stage. Tergite I is in the form of a segment oriented with convex arch forward; tergite II is in the form of a trapezoid with a shorter anterior base. The first abdominal stigmata, as well as in adults, are closer to the metanotum, but are situated freely in the membrane. The second stigmata are also free and situated anteriorly on sides of tergite II.

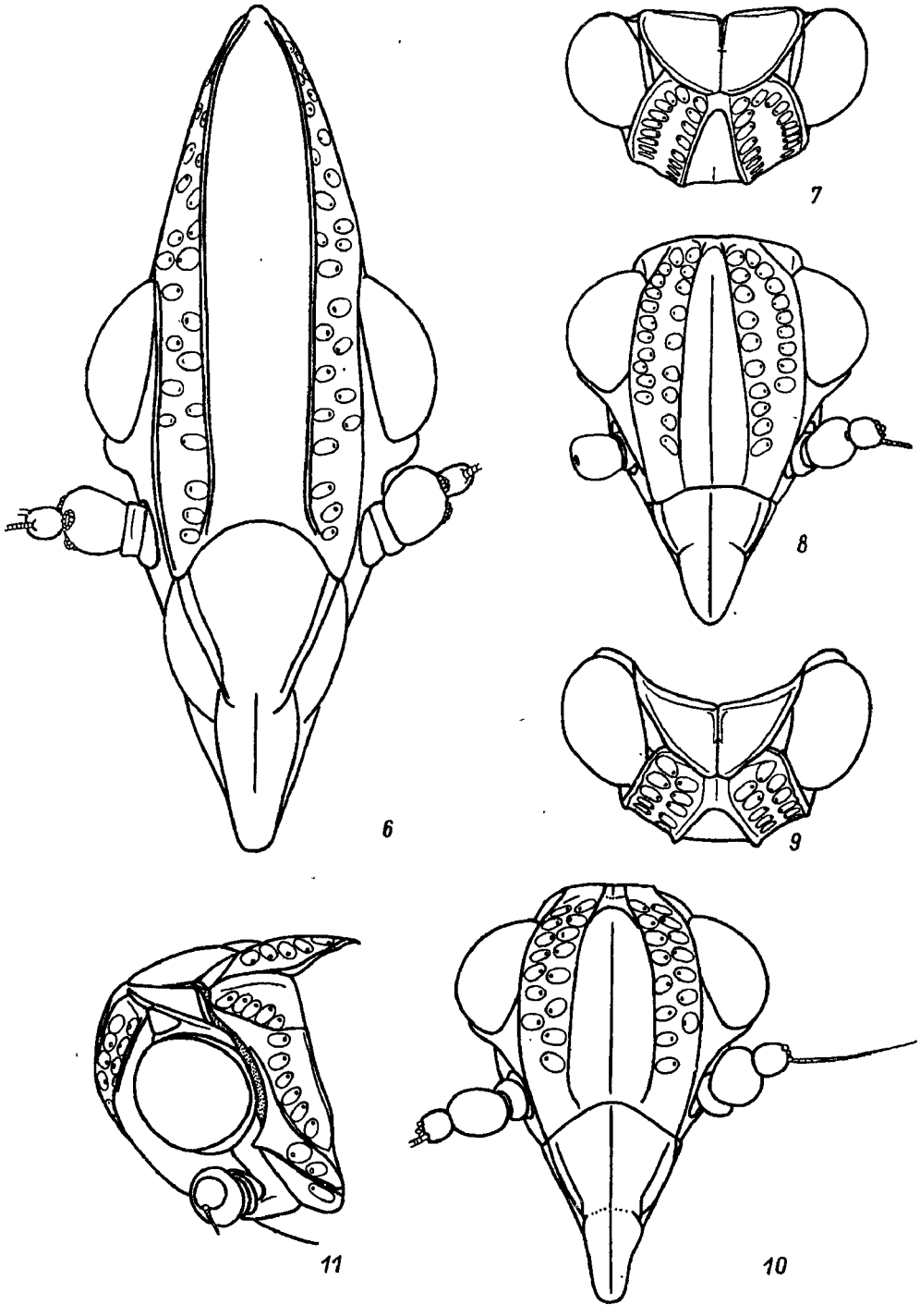
Tergites I to VIII bear the medial carina, and tergites III-VIII bear also sublateral carinae, on which lateral areas are bent downward. Laterotergites (Yemel'yanov, 1987) are not sclerotized, stigmata of segments III-VIII situated ventrally in membrane, near lateral areas of tergites. On segment VIII, similar to imago, sclerotization of tergite posterior to the stigmata extends laterally as far as sternal membrane. The common border of tergal and sternal areas in the middle of the abdomen developed in form of longitudinal stripe extending mesad of stigmata.

Posterior tergites in middle slightly curved at a forwardly directed angle. Tergite IX curved in an inverted U-shape, its lateral margins curve toward each other and converge almost to becoming contiguous. The upper margin of converged lobes (primarily posterior) bears a pair of triangular processes, dorsolateral plates, covering posteriorly the small following segments. Small annular, entirely sclerotized segment XI, which is sclerotized dorsally and laterally, but membranous ventrally.

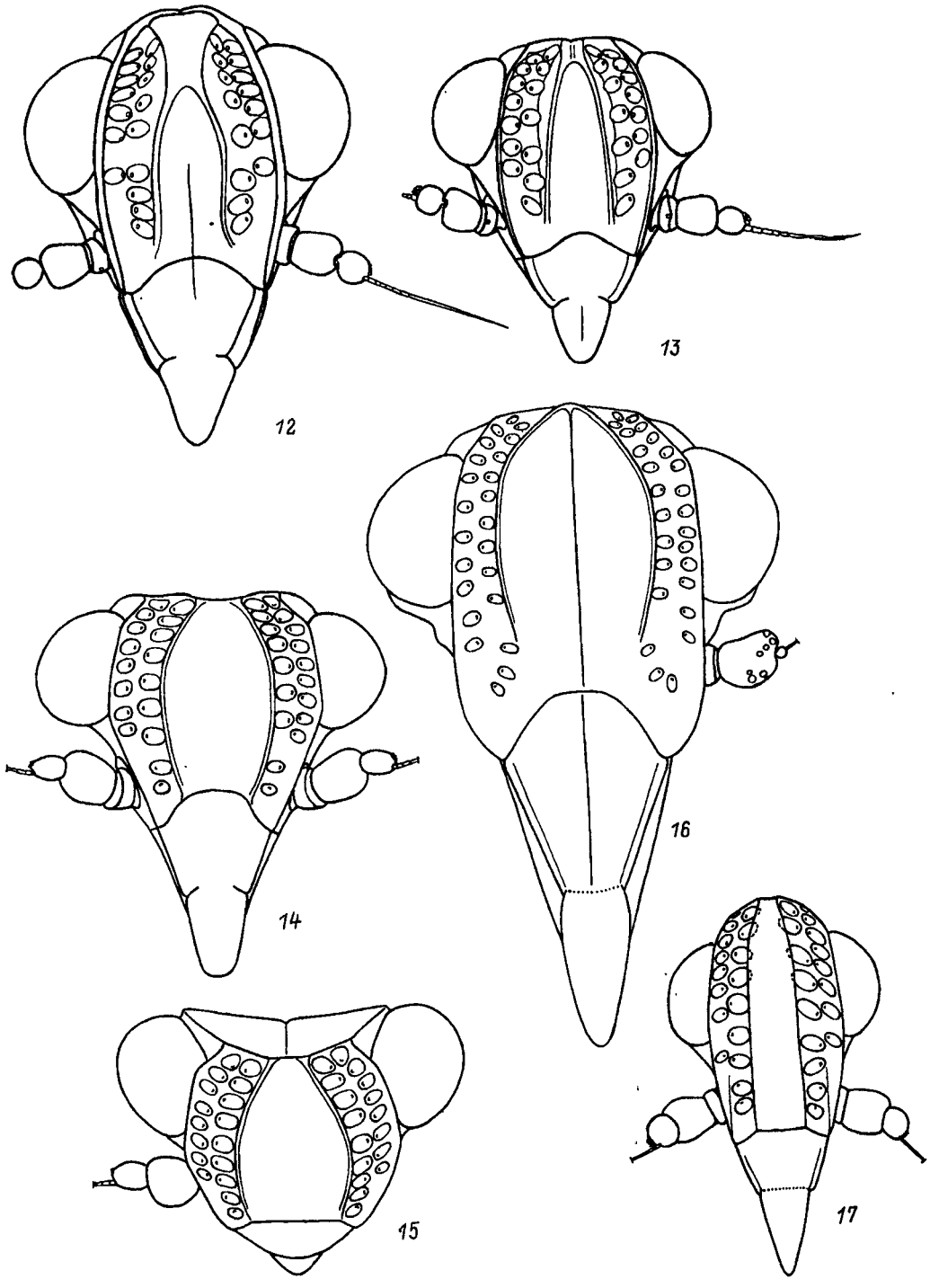
Beginning from approximately the 3rd instar sexual differences are observed in the structure of sternal parts of segments VIII and IX. Genital vestiges of larvae of Fulgoroidea have been studied predominantly in Delphacidae (Lindberg, 1939; Fennah, 1945); in the literature remarks concerning other families have also been made (Pruthi, 1924; Muir, 1925). Because genital vestiges in Dictyopharidae and Delphacidae develop very similarly, the available data obtained on Delphacidae are applicable to Dictyopharidae.

In ♂s (Fig. 39) ventrally under the inverted U-shaped structure of tergite IX, posterior to sternite VIII there is a transverse sclerite with a median longitudinal groove and a slightly bilobate posterior margin. Posterior to sclerite is a pair of tubercles above which a transverse, cleftlike depression is present. The bilobate sclerite, according to its position in relation to tergite IX and the preceding sternite, corresponds to sternite IX, and tubercles posterior to it correspond to its appendages, the harpagones. The transverse cleft is a rudiment of the genital cavity and penis.

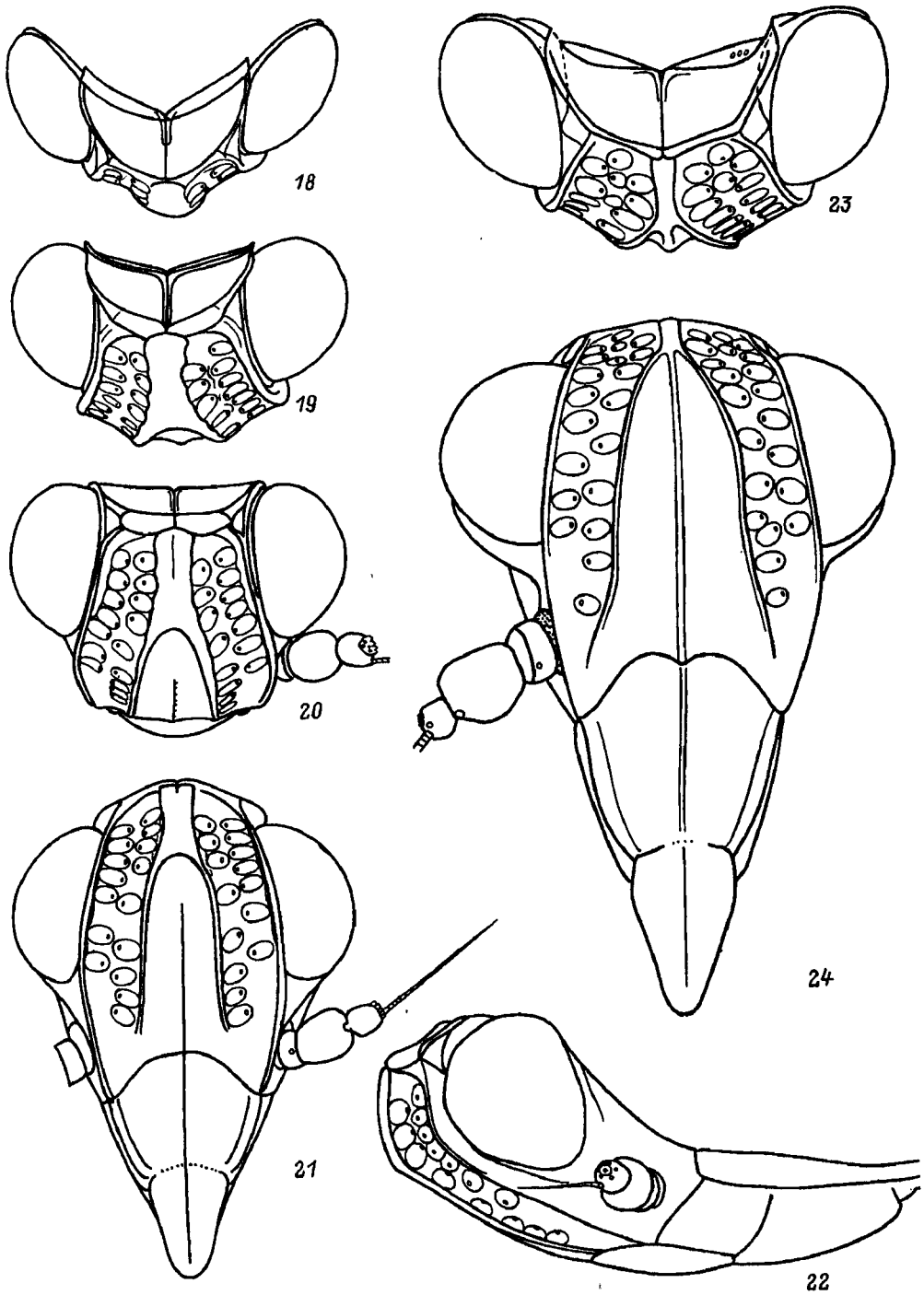
In ♀s (Fig. 40), posterior to sternite VIII 2 lobate processes are formed, which by their position are appendages of sternite VIII and, therefore, correspond to the pair of halves of the ovipositor to it a small bilobate sclerite is situated, consisting of a pair of rounded, weakly convex parts. In position and shape it corresponds to the bilobate sclerite in ♂s, in other words to sternite IX, and therefore, is most



Figs. 6-11. Head of larvae of earlier instars: 6) *Dictyophara pannonica*, 2nd instar, in anteroventral view; 7, 8) *Haumavarga fedtschenkoi*, 1st instar in dorsal (7) and in anteroventral view (8); 9-11) *Scirtophaca junatovi*, 1st instar in dorsal view (9), anteroventral view (10), and laterodorsal view (11).



Figs. 12-17. Head of 1st-5th-instar larvae. 12) *Ototettix jaxtartensis*, 1st instar, anteroventral view; 13) *Orgamarella lata*, 1st instar, in anteroventral view; 14, 15) *Elysiaca* sp. prope *fusca*, 1st instar: 14) anteroventral view, 15) anterodorsal view; 16) *E. chomutovi*, 5th instar, in anteroventral view; 17) *Nersia florens*, 1st instar, in anteroventral view.



Figs. 18-24. *Repetekia orbicularis*, head of 1st (18-22) and 3rd (23 and 24) instar larvae: 18) in dorsal view, 19) in dorsoanterior view, 20) in anterior view, 21) anteroventral view, 22) lateral view, 23) dorsal view, 24) anteroventral view.

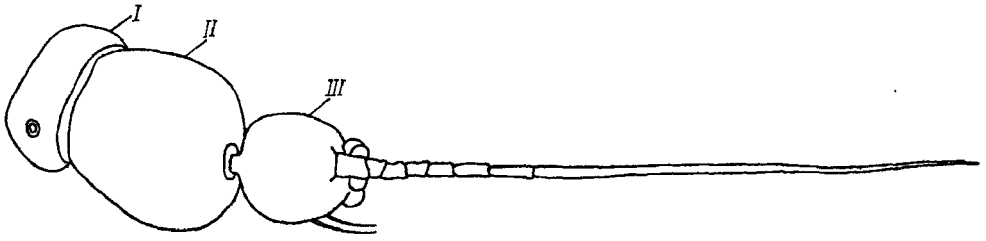
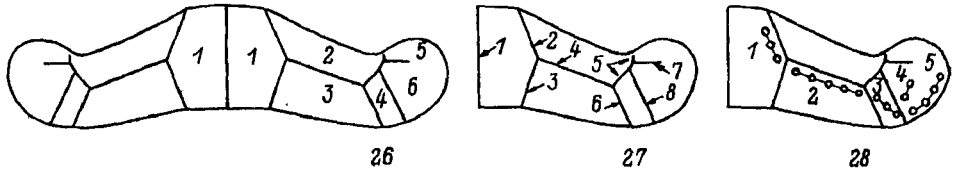


Fig. 25. *Haumavarga fedtschenkoi*, antenna of 1st-instar larva.



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Figs. 26-28. Structural plan of pronotum and nomenclature of its parts. Schematic development. Plan and nomenclature: 26) Areas [*1* - discal, *2* - postocular, *3* - paradiscal (lateral) (*1-3* - upper side of pronotum, or eunotum), *4* - humeral (supracarinal), *5* - anterior pectoral subcarinal or precarinal), *6* - posterior pectoral subcarinal or postcarinal) (*4-6* - sides of pronotum, or paranotum)]; 27) Carinae [*1* - middle carina of pronotal disc, *2* - anterior discal, *3*) postdiscal, *2, 3*) lateral carina of disc, *4*) postocular, *5*) subocular, *6*) lateral (lateral carina of upper side of pronotum), *7*) pectoral (vertical carina of sides of pronotum), *8*) collateral (horizontal carina of sides of pronotum)]; 28) sensory pits [groups: *1*) discal, *2*) paradiscal (lateral), (*1, 2* - eunotal), *3*) humeral (upper paranotal), *4*) anterior pectoral (anteroventral paranotal), *5*) posterior pectoral (postventral paranotal) (*4, 5* - pectoral (lower paranotal))].

likely homologous to the second valvifer. Posterior to sternite IX, between its postdorsal margins and the ventromedial margins of tergite IX is a pair of extended elevations, vestiges of the second pair of halves.

Unlike the homologous relationships described above, Fennah considers the bilobate sclerite in ♀s to be vestiges of the second pair of halves together with the valvifers, and the extended elevations situated posterior to them as vestiges of a third element of the ovipositor. Fennah's understanding is that larval dorsolateral plates in ♂s correspond to lateral teeth of the pygophore, and in ♀s they have nothing to correspond to and are lost. However, taking into account the strong narrowed part and reconstruction of the sternal area of the genital segments, it is quite possible that the dorsolateral plates are dorsally shifted sternal structures, which in adult ♀s correspond to the third elements of the ovipositor, and in the pygophore of ♂s to the lateral teeth of the pygophore. The sternal nature of the lateral teeth of the pygophore in ♂s so far is as acceptable as tergal, because the border of the tergite and sternite on the pygophore is still unsettled.

Sensory pits are a consistent peculiarity of nymphs of Fulgoroidea (besides Tettigometridae), but sometimes they may also be present in imagines. The sensory pits cover only the tergal structures, they are present on the head, thorax, and abdomen. Larger and permanent basal pits and smaller, less constant, accessory pits are distinguishable.

The position of sensory pits on the head, pronotum, and abdomen in nymphs (Figs. 1-24, 29, 30, 44-95) is approximately similar to that in imagines of tribes Almanini and Orgeriini (Yemel'yanov,

1969, 1980). Unlike those in other parts of the body, on the pterothorax the larval plan of position of pits is never retained in the imago. Here two major groups are distinguished, the inner and the outer. In Dictyoptera the outer group is often divided into 2-3 subgroups. The inner group on the mesonotum consists of several pits in one group (Dictyopharidae) or in form of transverse, often oblique row (Orgeriinae). Size of pits declines laterally. In Dictyopharinae 1-2 pits are sometimes present on costal area of vestiges of forewings. On the mesonotum the inner group consists of several pits, always in one group, and each outer group consists of 1-2 situated (if there are 2) along an oblique line from the anterior inner side to the posterior outer side of the inner group.

The inner group of pits on segments of the pterothorx corresponds to the eunotal group of pits of the pronotum or its lateral part, because it is lateral to the discal carina. The outer group of pits on segments of the pterothorax is on wing vestiges and probably corresponds to the paranotal groups of pits of the pronotum; more detailed homology is difficult to trace.

Various peculiarities of the external structure of larvae of individual groups of Dictyopharidae are indicated in the following key.

KEY TO SUBFAMILIES AND TRIBES BY LAST-INSTAR NYMPHS

1 (4). Areas of wax glands present on abdominal tergites VI-VIII (Fig. 44).[1] Vestiges of forewings extending to apices of vestiges of hindwings, distal sensory pit of posterior vestiges covered by anterior vestiges (Fig. 44). Sensory pits on abdomen arranged variously on tergites IV-V and VII-VIII. Apical ridge of teeth of 1st and 2nd hindtarsal segments lacking preapical setae. (Subfamily Dictyopharinae).

2 (3). Forefemora with step before apex. Abdominal tergite III lacking sensory pits. Middle lobes of metope widening before apex. ..... **Orthopagini.**

3 (2). Forefemora without preapical step, here only tooth may be present. Abdominal tergite III often with sensory pit. Middle lobes of metope not widening before apex. .... **Dictyopharini.**

4 (1). Lacking areas of wax glands on abdomen. Vestiges of forewings far short of apices of vestiges of hindwings, distal sensory pit visible (Figs. 57, 60, 66, etc.). Sensory pits on tergites IV-VII positioned according to common plan. (Subfam. Orgeriinae)

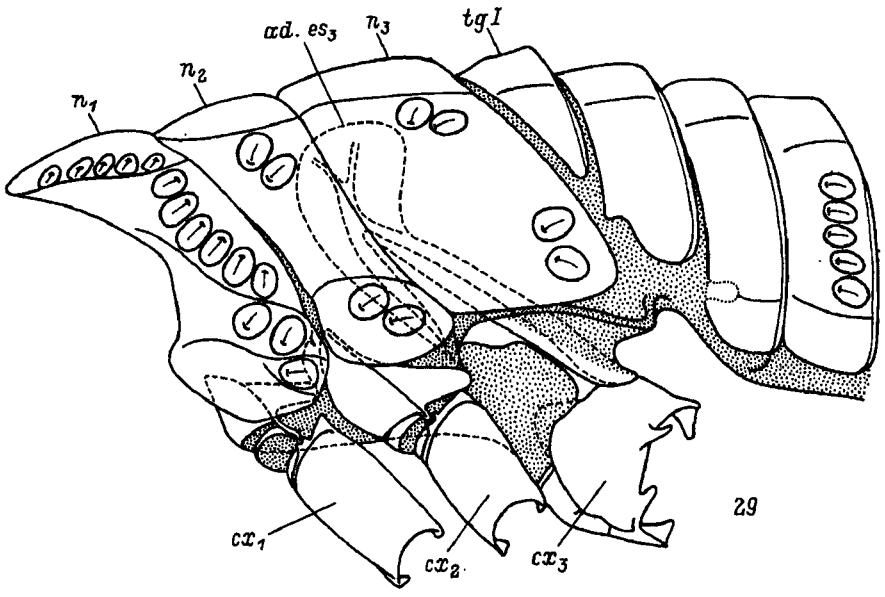
5 (6). Inner row of sensory pits of lateral lobes of metope extending to clypeus (Fig. 16). Apical ridge of teeth on apices of hindtibia consisting of 8 teeth. Preapical setae on teeth of apical ridge of 1st and 2nd hindtarsal segments present. ..... **Ranissini.**

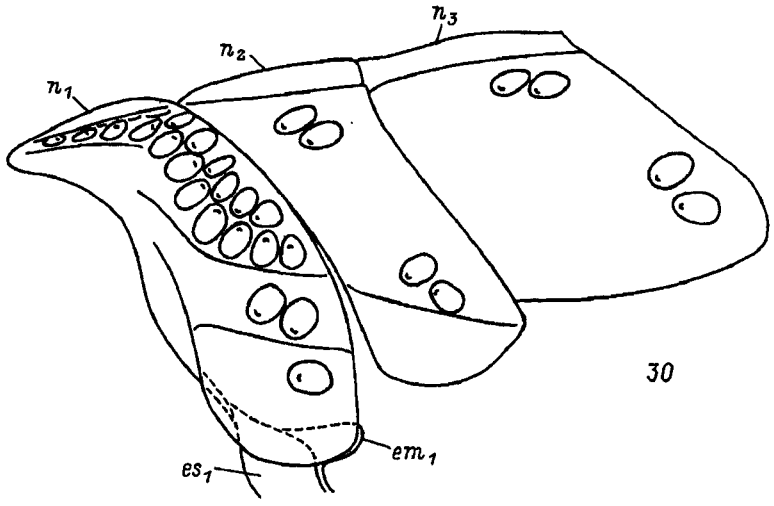
6 (5). Inner row of sensory pits of lateral lobes of metope not extending below eyes, here only 1-2 separate sensory pits present. Apical ridge of teeth on apices of hindtibia consisting of 7, very rarely 6, teeth. Preapical setae on teeth of apical ridge of 1st and 2nd hindtarsal segments absent.

7 (8). Sensory pits on abdominal tergite IX absent. Abdominal tergite III lacking separate group of pits (Fig. 60). Metathorax with single pit in inner group. ..... **Orgeriini.**

8 (7). 2 sensory pits on abdominal tergite IX (Fig. 61). Abdominal tergite III lacking sensory

[1]Figures 41-49 will be published in the second part of the paper.



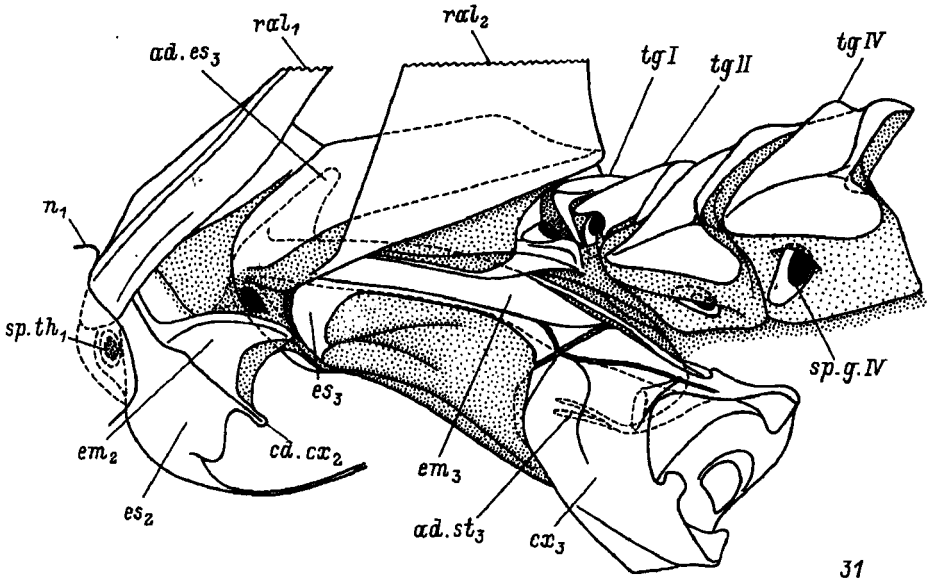


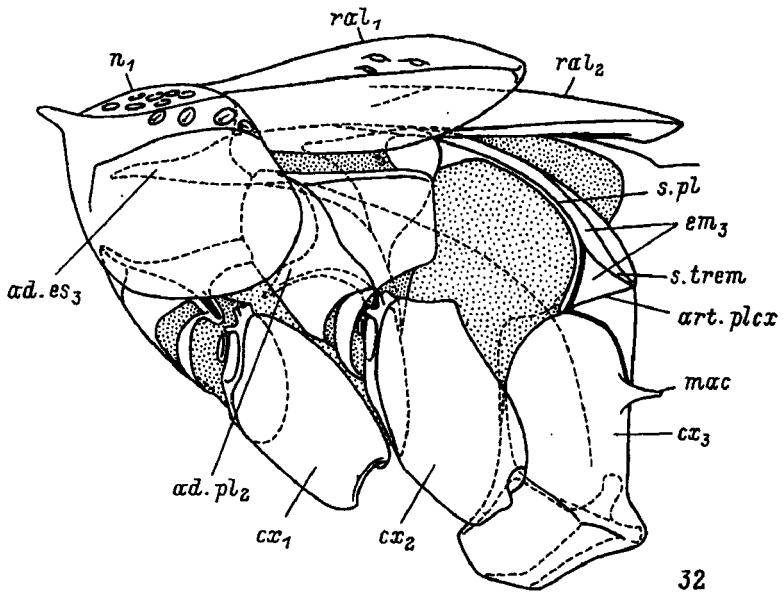
Figs. 29, 30. *Scirtophaca junatovi*, thorax and base of abdomen of 1st-instar (29) and 2nd-instar (3) larvae. *ad. es*) episternal apodeme of metathorax, *cx*) coxa, *em*) epimeron, *es*) episternum, *n*) notum, *tg I*) abdominal tergite I.

pits or pits present only inward of sublateral carina. Metathorax with 2 pits in inner group. ..... **Almanini.**

KEY TO GENERA OF THE TRIBE ORTHOPAGINI BY LAST-INSTAR NYMPHS .

1 (2). Sides of pronotum, below collateral carina with 2 rows of sensory pits, along posterior margin, with number pits more than 4. Outer row of sensory pits on metope extending to lower side; subantennal pits of inner row considerably larger than pits of outer row. Sublateral carina of abdomen on tergites IV-V interrupted by 2-3 sensory pits. Rows of pits on tergites IV-V not interrupted. Head short. ..... ***Orthopagus.***





Figs. 31, 32. Thorax and base of abdomen of 5th-instar larvae of *Lycorma delicatula* (Fulgoridae) (31) and *Ranissus scytha* (32) in lateral view. *ad. es*) episternal apodeme of metathorax, *ad. pl*) pleural apodeme, *art. plcx*) pleurocoxal junction, *cd. cx*) coxal articulation, *cx*) coxa, *em*) epimeron, *es*) episternum, *mac*) meracanth, *n*) notum, *ral*) vestiges of wings, *sp. g*) abdominal spiracles, *s. pl*) pleural suture, *sp. th*) thoracic spiracles, *s. trm*) transepimeral suture,) tergite (of adomen); Roman numbers indicate segments of abdomen.

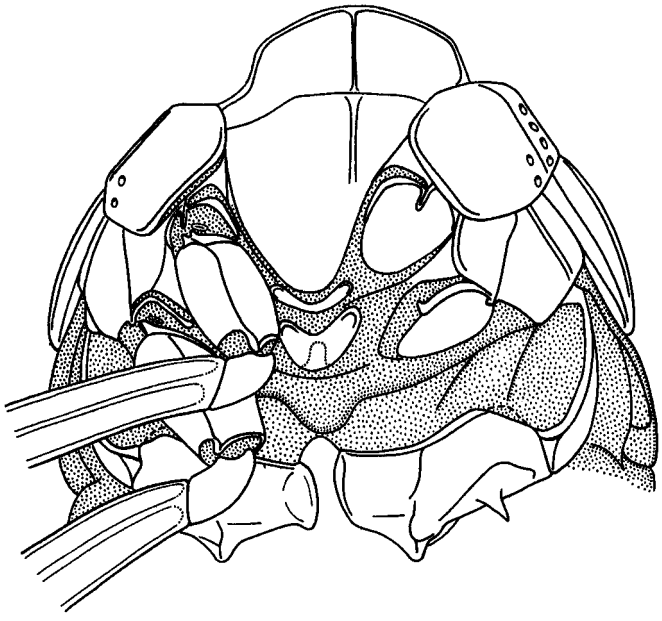


Fig. 33. *Ranissus scytha*, thorax of 5th-instar larva, left legs removed.

2 (1). Sides of pronotum, below collateral carina, with 1 row of sensory pits, number of pits not more than 4. Outer row of sensory pits on metope, terminating below antennae. Sublateral carina of abdomen on tergites IV-V interrupted by no more than 1 pit. Rows of pits on tergites IV-V, near inner margins, with separate pit. Head long. ..... ***Saigona.***

KEY TO GENERA OF THE TRIBE DICTYOPHARINI BY LAST-INSTAR NYMPHS

1 (2). Forefemora on posterior margin before apex with at least 1 tooth present. Abdominal tergite III with 1-3 sensory pits. ..... ***Dictyophara*** (Fig. 44).

2 (1). Forefemora, on posterior margin before apex without teeth. Abdominal tergite III lacking sensory pits. Pronotum lacking postdiscal carinae. ..... ***Raivuna.***

KEY TO GENERA OF THE TRIBE RANISSINI BY LAST-INSTAR NYMPHS

1 (2). Abdominal tergites IV-VII mesad of sublateral carina with 7-8 sensory pits on each (1+2+4, or 1+2+5). ..... (***Parorgerius***)[1].

2 (1). Abdominal tergites IV-VII, mesad of sublateral carina, with no more than 6 sensory pits, distal group consisting of no more than 2 pits (versus 4-5 pits in *Parorgerius*).

3 (4). Abdominal tergites IV-VIII, mesad of sublateral carina with 6 sensory pits (1+3+2, or 1+4+1). ..... ***Elysiaca, Phyllorgerius*** (Fig. 58).

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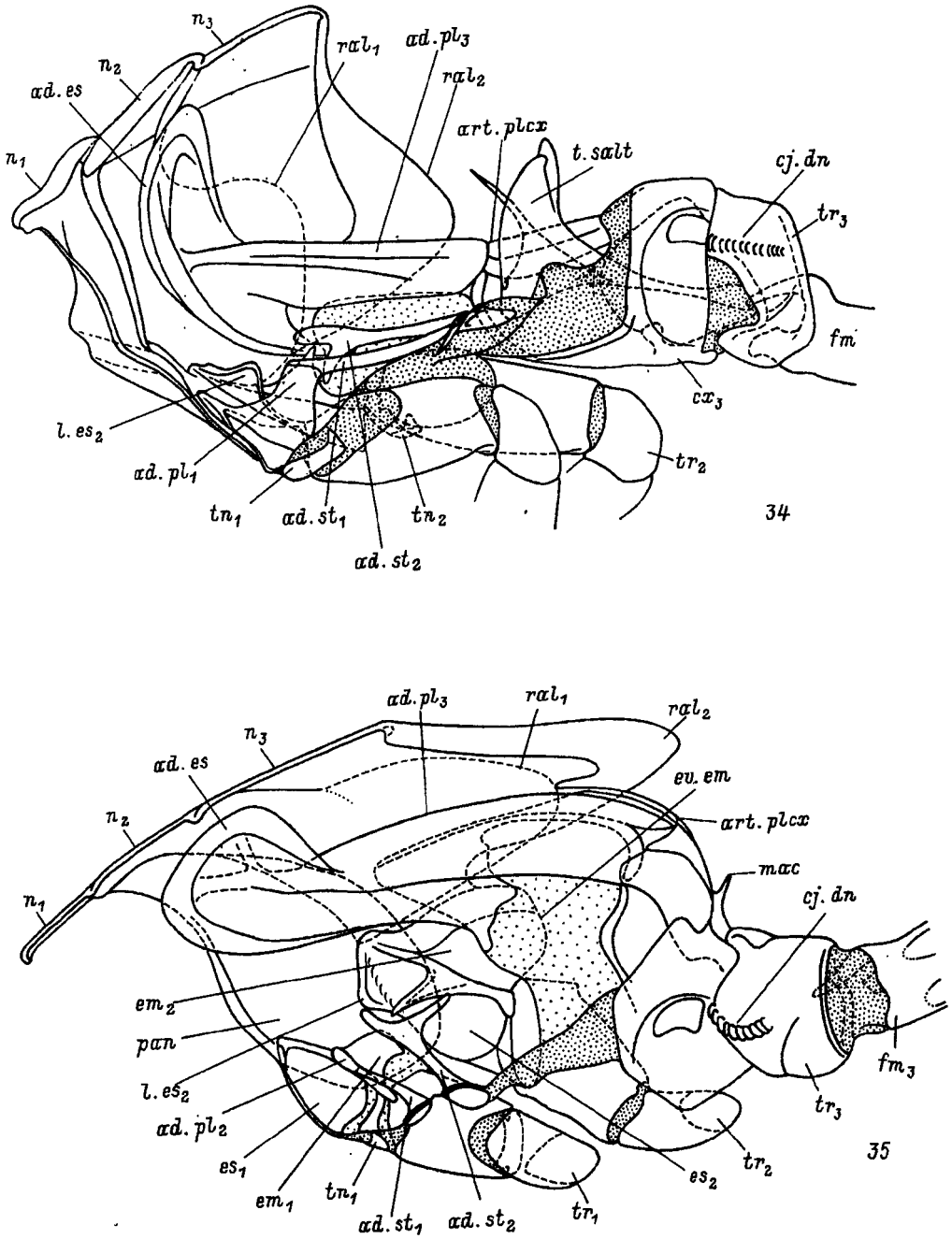
[1]This genus is included in the key conditionally; the number and distribution of pits is determined by their traces in imago.



Figs. 34, 35. *Ramissus scytha*, sagittal section of thorax of 5th-instar larva; 34) medial view, 35) medioposterior view. *ad. es*) episternal apodeme of metathorax, *ad. pl*) pleural apodeme, *ad, st*) sternal apodeme (furca), *art. plcx*) pleurocoxal junction of metathorax, *cj. dn*) serrated coupling of hindtrochanters, *cx*) coxa, *em*) epimeron, *es*) episternum, *ev. em*) peak of epimeron of mesothorax, *fm*) femur, *l. es* 2) lobe of anterior margin of episternum of mesothorax, *mac*) meracanth, *n*) dorsum of thorax, *pan*) lateral lobes (paranota) of pronotum, *ral*) vestiges of wings, *tn*) trochantin, *tr*) trochanter, *t. salt*) saltatory tendon of hindtrochanter.

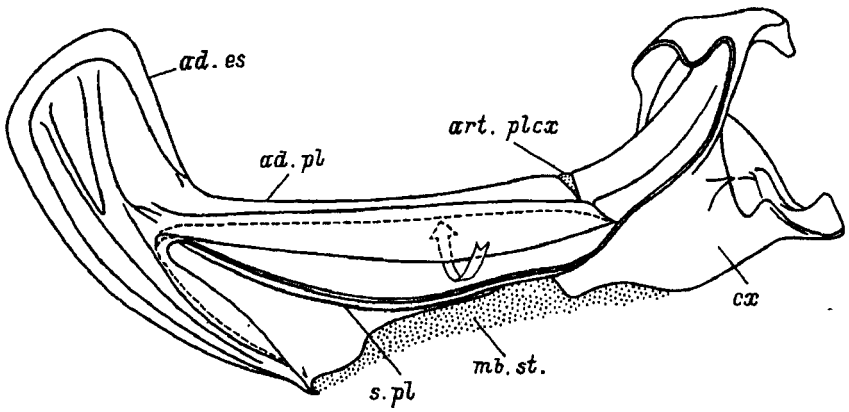


Fig. 36. *Elysiaca ferganensis*, synapodeme of metathorax of 5th-instar larva, in lateral view. *ad. pl*) pleural apodeme, *ad. es*) episternal apodeme, *art. plcx*) pleurocoxal junction, *cx*) coxa, *mb. st*) sternal membrane, *s. pl*) pleural suture; arrow indicates inner side.

4 (3). Abdominal tergites IV-VII, mesad of sublateral carina, with no more than 5 sensory pits.

5 (6). Abdominal tergites IV-VII, mesad of sublateral carina, with 5 sensory pits (1+2+2, or 1+3+1). ..... ***Cnodalum, Ranissus.***

6 (5). Abdominal tergites IV-VII, mesad of sublateral carina, with 4 sensory pits (1+2+1). ..... ***Sphenocratus.***

KEY TO GENERA OF THE TRIBE ALMANINI BY LARVAE OF ALL INSTARS

1 (18). Rhinaria on 2nd antennal segment absent. 1st segment of hindtarsus with 4 teeth. Sides of hindtibia lacking teeth. Paradiscal group of pits of pronotum in single row.

2 (11). Apical callus not enlarged. If pits of eunotal group of pronotum differentiated, then discal group with 4 pits, and pits of second row absent. Claws slightly longer than arolium. Tergite III, if pits present, with inner pit distant as well as on following segments.

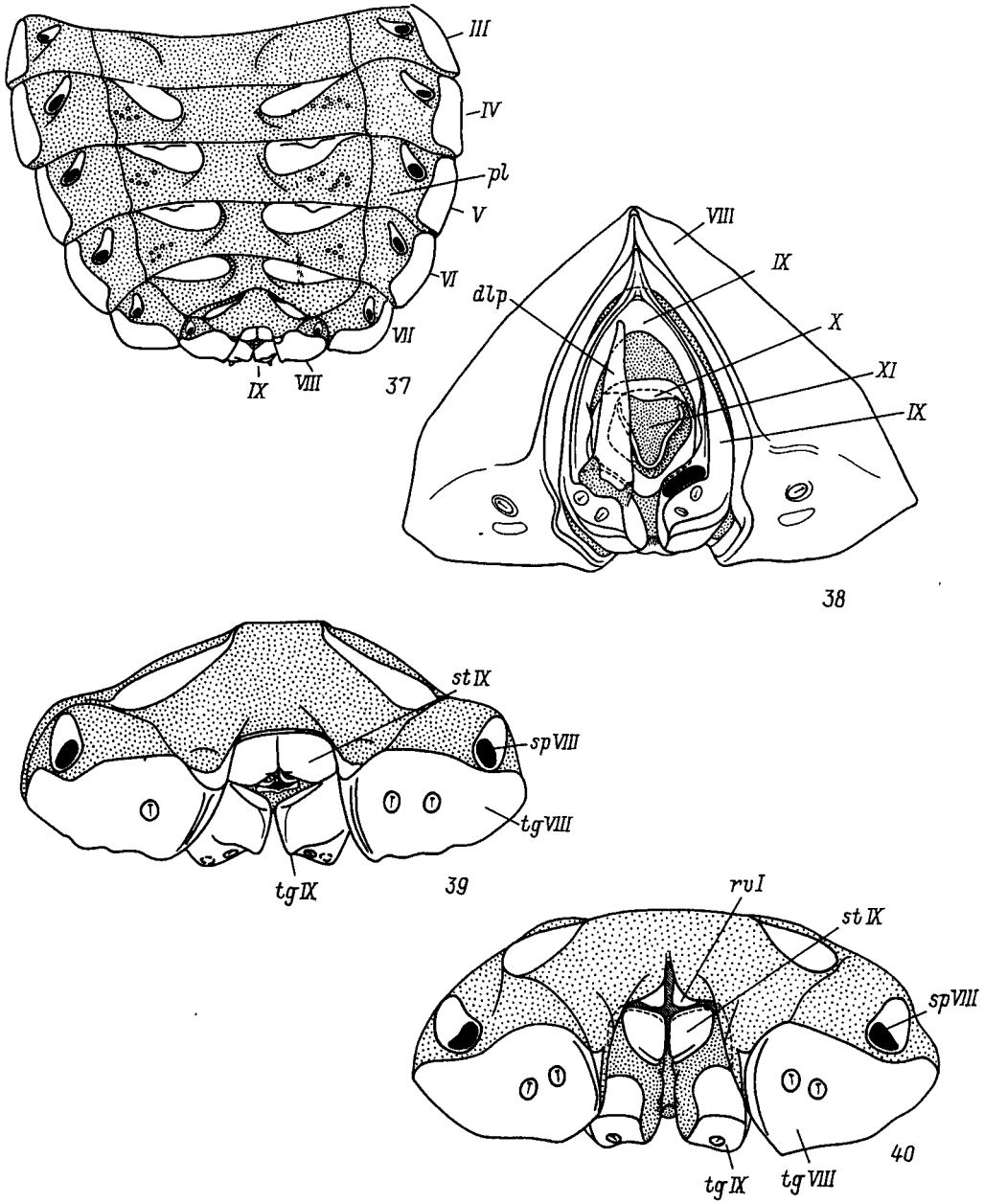
3 (4). Eunotal pit group differentied into discal and paradiscal subgroups, with the boundary (the corina) clearly visible.

4 (3). With single eunotal pit.

5 (8). Sensory pits on abdominal tergite III absent.

6 (7). Pits on pronotal disc lacking, distant from each other as far as lateral margins on vertex. Upper part of metope with each lateral area wider than middle areas combined. Rows of sensory pits on metope in middle part farther apart than transverse diameter of pit. ..... ***Haumavarga***, I (Fig. 68).

7 (6). Pits of eunotal group present on disc up to inner ends. Each lateral area of metope narrower than 2 middle areas combined. Rows of sensory pits on metope parallel, closer together than transverse diameter of pit. ..... ***Scirtophaca***, I (Fig. 75).



Figs. 37-40. *Lycorma delicatula* (Fulgoridae), abdomen of 5th-instar larva: 37) abdomen in ventral view, 38) apex of abdomen in posterior view, 39) apex of abdomen of ♂ in ventral view, 40) same of ♀. *dlp*) dorsal processes of segment IX, *pl*) pleurite, *rv I*) vestiges of first halves of ovipositor, *sp*) spiracle, *st*) sternite, *tg*) tergite; roman numbers (except I) designate abdominal segments.

8 (5). Sensory pits present on abdominal tergite III.

9 (10). Metope with vestige of medial carina marked by pale line in relief. Apical callus punctiform, intermediate carinae of metope closer to it and weakly curving outwardly. ..... ***Mesorgerius***, I (Fig. 77).

10 (9). Metope with medial carina not distinct in relief or in pattern. Intermediate carinae of metope closer to corypha, almost parallel, slightly curving inward at this point, between carinae darker and harder area forming, separated by slight step from basal surface of metope. ..... ***Orgamarella***, I (Fig. 82).

11 (2). Apical callus enlarged. Claws considerably longer than arolium. Basal row of eunotal group with 3 discal pits. Abdominal tergite III with inner pit not distant from other pits.

12 (15). Pronotal disc with single pit in second row.

13 (14). Eunotal group consisting of 7 pits. ..... ***Ototettix***, I (Fig. 86).

14 (13). Eunotal group consisting of 8-9 pits. ..... ***Repetekia***, I (Fig. 91).

15 (12). Pronotal disc with all pits in single row.

16 (17). Abdominal tergites with larger interval between inner pit and other group well developed. Metope entirely pale. ..... ***Kumlika***, (Fig. 90).

17 (16). Abdominal tergites with inner pit not separate from main group of pits. Middle lobes of metope ventrally with large dark spot. ..... ***Repetekia***, II (Fig. 92).

18 (1). Rhinaria on 2nd antennal segment present. 1st hindtarsal segment with no less than 6 teeth. Sides of hindtibia with teeth. Paradiscal group of sensory pits of pronotum in at least 2 rows.

19 (36). 3 rhinaria on 2nd segment of antenna. 6 teeth on apices of hindtibia, and also 6 on 1st hindtarsal segment.

20 (31). Sensory pits on abdominal tergite III present.

21 (24). Claws approximately as long as arolium.

22 (23). Apical callus small, coriphal margin no wider than metopal margin. Pronotal disc broad, sensory pits occupying only lateral parts. ..... ***Mesorgerius***, II

23 (22). Apical callus enlarged, metopal margin considerably wider than coryphal margin. Pronotal disc relatively narrow, sensory pits occupying about half its width. ..... ***Orgamarella***, II (Fig. 83).

24 (21). Claws approximately twice as long as arolium.

25 (26). Vestigal teeth on apices of hindtibia less than half length of developed teeth. Apical callus punctiform. ..... ***Tigrahauda***, II (Fig. 79).

26 (25). All teeth almost same, lesser developed teeth only slightly shorter than well developed teeth. Apical callus linear-longitudinal.

27 (28). Group of sensory pits on abdominal tergite III situated similarly to those on tergites IV-VII. ..... ***Kumlika***, II.

28 (27). Group of sensory pits on tergite III shifted medially as compared with similar groups of sensory pits on tergites IV-VII.

29 (30). Anterior margin of corypha sharply angulate, corypha longer than pronotum. Sides of pronotum with brown fused spots, somewhat flat. Metope with only brown, diffused spots distinct. ..... ***Ototettix***, II (Fig. 87).

30 (29). Anterior margin of corypha obtusely angulate, corypha shorter than pronotum. Sides of pronotum entirely darkened, distinctly convex (vestiges of mammoids). Lower part of metope on middle lobes with doubled black spot. ..... ***Repetekia***, III (Fig. 93).

31 (20). Without sensory pits on abdominal tergite III.

32 (33). Eunotal pits distinctly divided into discal and paradiscal groups. ..... ***Nymphorgerius***, II (Fig. 64).

33 (32). Eunotal pits in single group.

34 (35). Pits on pronotal disc absent. Upper part of metope with each lateral area wider than 2 middle areas combined. Rows of sensory pits on metope farther from each other than transverse diameter of pit. Vestiges of teeth on 2nd hindtarsal segment completely absent. ..... ***Haumavarga***, II (Fig. 69).

35 (34). Pits on pronotal disc present. Each lateral area of metope narrower than 2 middle pits combined. Rows of sensory pits on metope closer to each other than transverse diameter of pit. Vestiges of teeth on 2nd hindtarsal distinct. ..... ***Scirthophaca***, II (Fig. 74).

36 (19). Rhinaria on 2nd antennal segment not less than 7. 7 teeth on apices of hindtibia, apices of 1st hindtarsal segments with at least 7 teeth.

38 (41). Hindtarsi with 2 segments. Vestiges of forewings not developed, posterior margin of mesonotum on sides straight. Among 7 teeth on apices of hindtibia 3 teeth distinctly less developed.

39 (40). 2nd segment of hindtarsi, in middle ventrally on sides, with 3 (2+1) teeth. Metope with only 2 rows of basic sensory pits. Each lateral spot of metope narrower than 2 middle areas combined. Pits on pronotal disc present. ..... ***Nymphorgerius***, III (Fig. 66).

40 (39). 2nd hindtarsal segment lacking teeth. Metope with 4 rows of sensory pits. Upper part of metope with each lateral area wider than 2 middle areas combined. Without pits on pronotal disc. ..... ***Haumavarga***, III (Fig. 70).

41 (38). Hindtarsi with 3 segments. Vestiges of forewings distinctly developed in curve of posterior margin of mesonotum on sides. All teeth on apices of hindtibia somewhat developed.

42 (43). Without sensory pits on abdominal tergite III. ..... ***Scirtophaca***, III (Fig. 75).

43 (42). Sensory pits present on abdominal tergite III.

44 (45). Sensory pits present on entire surface of pronotal disc.

46 (49). Apical callus punctiform or rounded.

47 (48). Apical callus with broad border bearing corypha and narrowing anteriorly. Sensory pits on pronotal disc closes to middle carina posteriorly, and slightly farther laterally anteriorly. Tergites IV-VII with 4 pits on each side. ..... ***Orgamarella***, III (Fig. 84).

49 (46). Apical callus longitudinally extended and linear.

40 (51). Group of sensory pits on abdominal tergites III exactly as on following tergites IV-VII. ... . ***Kumlika***, III.

51 (50). Group of sensory pits on tergite III shifted medially as compared with same groups on tergites IV-VII.

52 (53). Corypha longer than pronotum, anterior margin acutely angulate. Mammoids absent. .... ***Ototettix***, III (Fig. 88).

53 (52). Corypha slightly shorter than pronotum, anterior margin obtusely angulate. Mammoids distinct. ..... ***Repetekia***, IV (Fig. 94).

54 (37). Rhinaria on 2nd antennal segment no fewer than 13. Teeth on 1st hindtarsal segment more than 8.

55 (72). 13 rhinaria on 2nd antennal segment.

56 (59). 2nd hindtarsal segment with 5 teeth.

57 (58). Pits on pronotal present. Postlateral carinae of pronotal disc present. Accessory rows of pits on metope absent. Each lateral area of metope narrower than 2 middle areas combined. ..... ***Nymphorgerius***, IV (Fig. 68).

58 (57). Pits on pronotal disc absent. Postlateral carinae of pronotal disc absent. Upper part of metope with each lateral area wider than 2 middle areas combined. .... ***Haumavarga***, IV (Fig. 71).

59 (56). 2nd hindtarsal segment with 6-8 teeth.

60 (61). Without sensory pits on abdominal tergite III. ..... ***Scirtophaca***, IV (Fig. 75).

61 (60). Sensory pits present on abdominal tergite III.

62 (63). Sensory pits on most of pronotal disc, except postlateral parts bordering lateral areas absent. ..... ***Mesorgerius***, IV.

63 (62). Sensory pits present on entire surface of pronotal disc.

64 (67). Apical callus punctiform or round.

65 (66). Apical callus with wide border with corypha, and narrowing anteriorly. Sensory pits on pronotal disc closest to anterior carina posteriorly, diverging to sides anteriorly. Tergites

IV-VII with 4 pits on each side. ..... ***Tigrahauda***, IV (Fig. 81).

66 (65). Apial callus with narrow border with corypha, and widening anteriorly. Sensory pits on pronotal disc everywhere equally close to middle carina. Tergites IV-VII with 5 pits on each side. ..... ***Orgamarella***, IV (Fig. 85).

67 (64). Apical callus linear and extended longitudinally.

68 (69). Group of sensory pits on abdominal tergite III placed exactly as pits on following tergites IV-VII. ..... ***Kumlika***, IV.

69 (68). Group of sensory pits on tergite III shifted medially as compared with similar groups on tergites IV-VII.

70 (71). Corypha longer than pronotum, transverse margin approximately rectangular. Mammoids absent. ..... ***Ototettix***, IV (Fig. 89).

71 (70). Corypha slightly shorter than pronotum, anterior margin obtusely angulate. Mammoids well developed. ..... ***Repetekia***, V (Fig. 95).

72 (55). 18 rhinaria on 2nd antennal segment.

73 (74). Pits on pronotal disc present. Postlateral carinae of pronotal disc present. Each lateral area of metope narrower than 2 middle areas combined. Metope with no more than 1 row of accessory pits present. ..... ***Nymphorgerius***, V (Fig. 67).

74 (73). Pits on pronotal disc absent. Postlateral carinae of pronotal disc absent. Upper part of metope with each lateral area wider than 2 middle areas combined, 2-3 irregular accessory rows of pits. ..... ***Haumavarga***, V (Fig. 72).

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