

Notes on delimitation of families of the Issidae group with description of a new species of Caliscelidae belonging to a new genus and tribe (Homoptera, Fulgoroidea)

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A new subdivision of the families related to the family Issidae mainly based on the structure of ovipositor is proposed; (1) families with round type of ovipositor: Issidae (including Bladininae) and Caliscelidae (including Ommatidiotinae); (2) families with laterally compressed type of ovipositor: Nogodinidae s. str. and Acanaloniidae (Acanaloniinae, Tonginae, Trienopinae). Caliscelidae are divided into two subfamilies: Caliscelinae and Ommatidiotinae, stat. n. Ommatidiotinae are divided into tribes Ommatidiotini, Augilini, stat. n., and Bocrini trib. n. *Bocra ephedrina* gen. et sp. n. is described from W. Pamir (Tajikistan). Larvae of I-III and V instars of *Bocra ephedrina* are described.

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The classification of families of plant-hoppers (Fulgoroidea) was proposed by Muir (1923, 1930) and supported almost unreservedly in the 50's to 80's by Fennah who was the best expert in this family. The most vulnerable point of this classification is the problem of distinguishing of the family Issidae from the closely related families Nogodinidae and Acanaloniidae. Fennah (1954), in contrast to Muir, lowered the rank of Acanaloniidae to a subfamily of the Issidae, established the subfamily Trienopinae in this family and confirmed Baker's (1927) Tonginae.

At the end of his life, Fennah (1987) has revised Nogodinidae, included in this family some genera of Issidae and transferred from Lophopidae to Issidae the subfamily Augilinae described by Baker (1915) as a subtribe of the tribe Ommatidiotini. These, in my opinion correct, decisions do not solve the problem as a whole. In my paper (Emeljanov, 1990) concerning the phylogeny of Fulgoroidea, I proposed some additional changes in the definition of the families Issidae and Nogodinidae based on characteristics of the structure of their ovipositor. Unfortunately, I have omitted peculiarities of its structure in Acanaloniinae, Tonginae

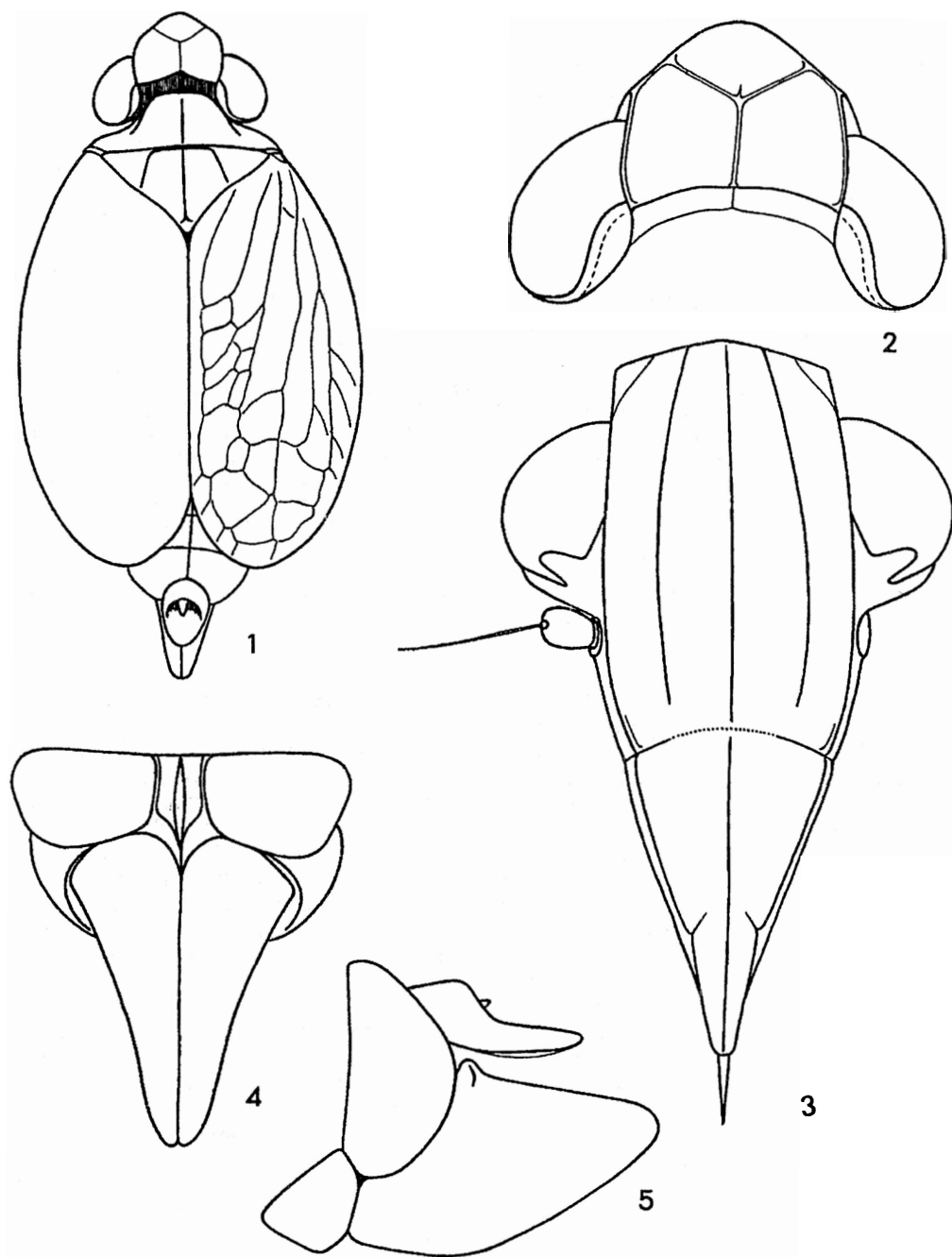
and Trienopinae which indicate that the above subfamilies cannot be included in Issidae sensu genuino, but should be considered as related to Nogodinidae because they have a laterally compressed ovipositor with teeth on the margin of lower lobes of the third valvules (Fennah, 1954).

The family Acanaloniidae should be extended by incorporation of the subfamilies Tonginae and Trienopinae and be restored as a sister or daughter group of Nogodinidae.

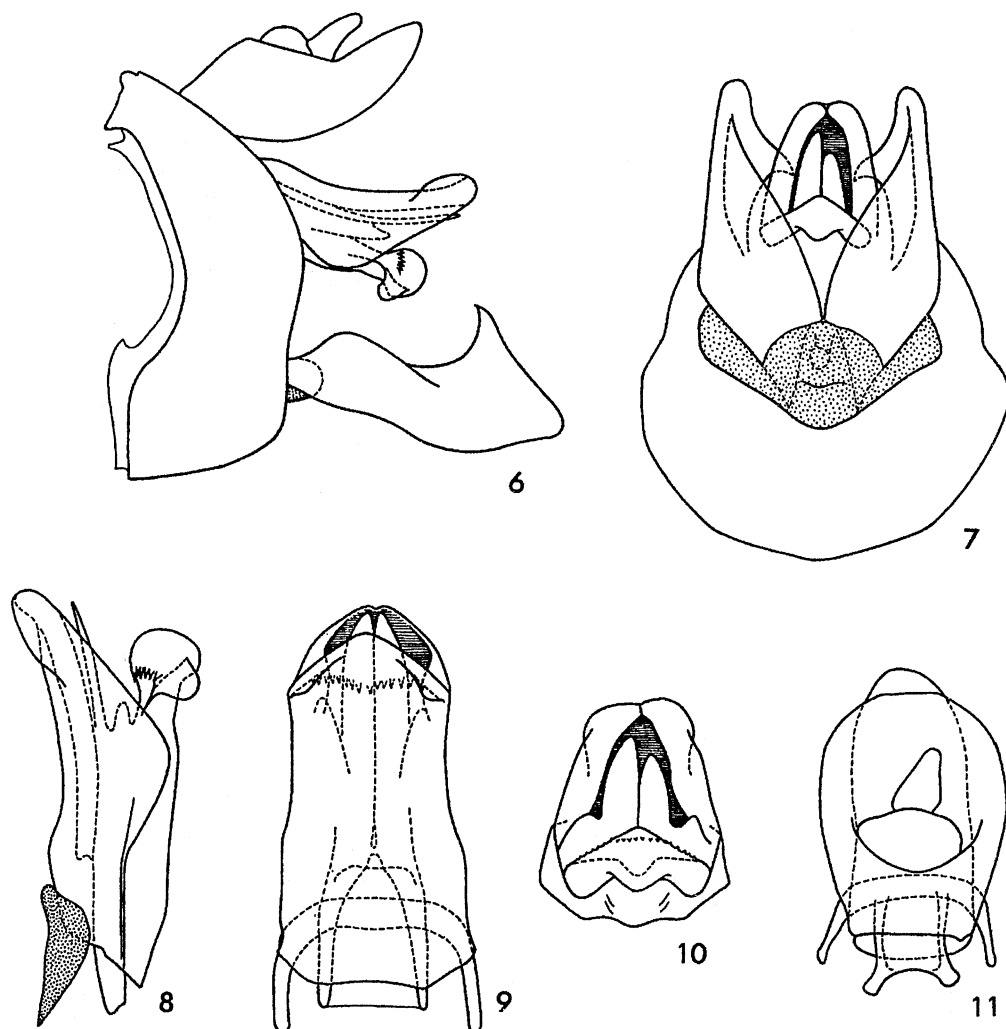
The family Issidae in restricted sense may be divided into two sharply different parts: Issidae (without Caliscelinae) and Caliscelidae as the most peculiar group for which I propose a family rank.

(1) Issidae s. str. are distinguished by the pterygomonomorphism with slightly diminished, peculiar, case-shaped or steeply tectiform tegmina. Caliscelidae are distinguished by the pterygodimorphism with prevalence of strongly brachypterous form.

(2) In Issidae, the styles have a peculiar head of dorsal process with apical and lateral teeth; in Caliscelidae, the styles lack such a structure; a simple acuminate and bent up apex is present instead, as in Nogodinidae, Ricaniidae and Flatidae. The ho-



Figs 1-5. *Bocra ephedrina* gen. et sp. n., imago. 1, body from above (legs not shown); 2, head, dorsal view; 3, head (face), anteroventral view; 4, female genitalia, ventral view; 5, same, lateral view (left side).



Figs 6-11. *Bocra ephedrina* gen. et sp. n., male genitalia. 6, genital block, left side; 7, same, ventral view; 8, penis, left side; 9, penis ventral view; 10, penis, caudal view; 11, anal tube and penis, dorsal view.

mology of the dorsal process of the styles in Issidae and pointed styles in Caliscelidae is not clear.

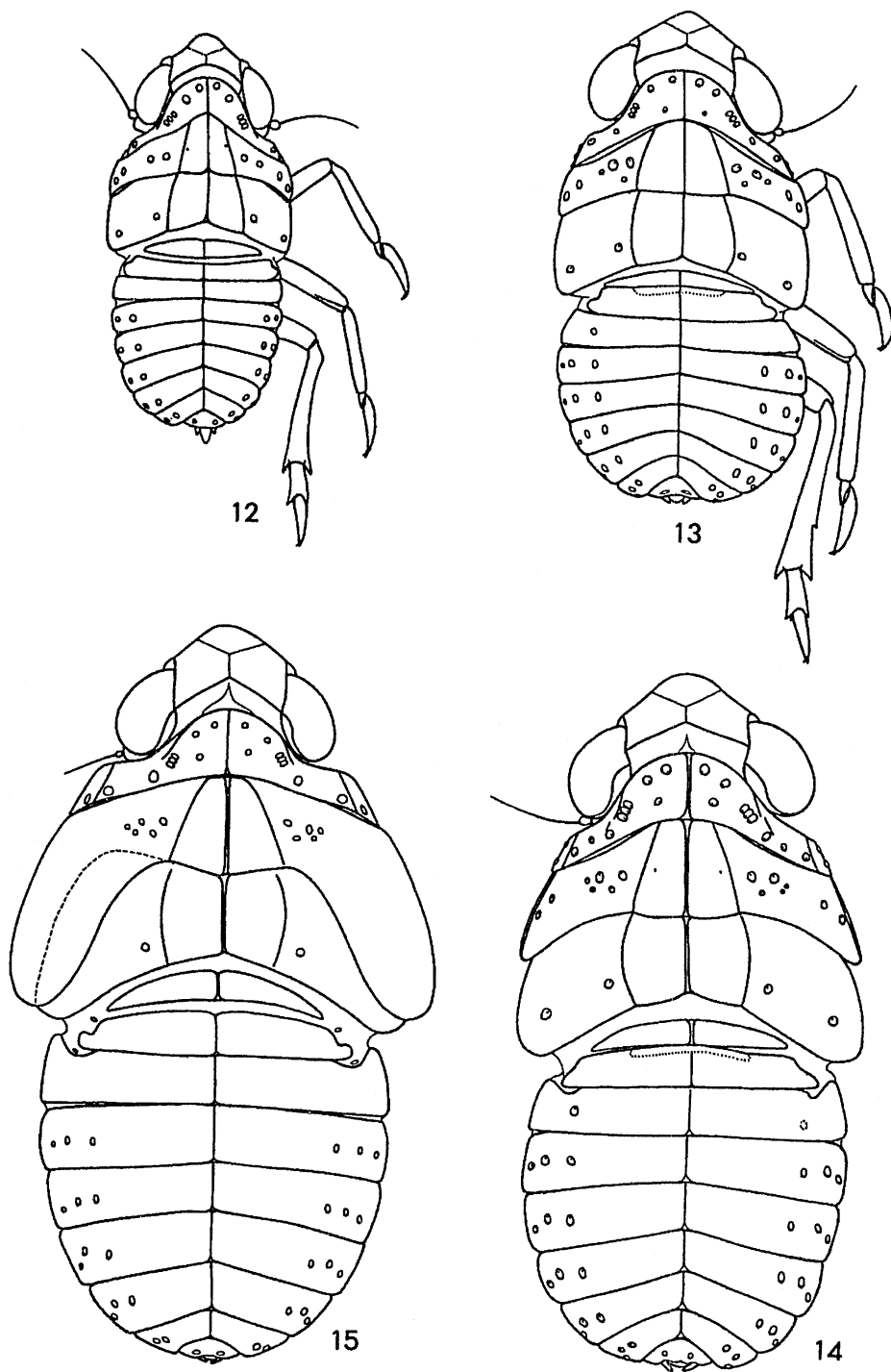
(3) Caliscelidae, unlike Issidae, possess an anteriorly bifurcated median keel of the coryphe and a fore areolet between the strongly divergent, often transverse fore branches of keel. This areolet is probably homologous with callus apicalis of Dictyopharidae head which in some cases is also transformed into a large apical areolet (Emeljanov, 1980: 10, 72).

The opinion that Caliscelidae should be considered as a separate family receives cur-

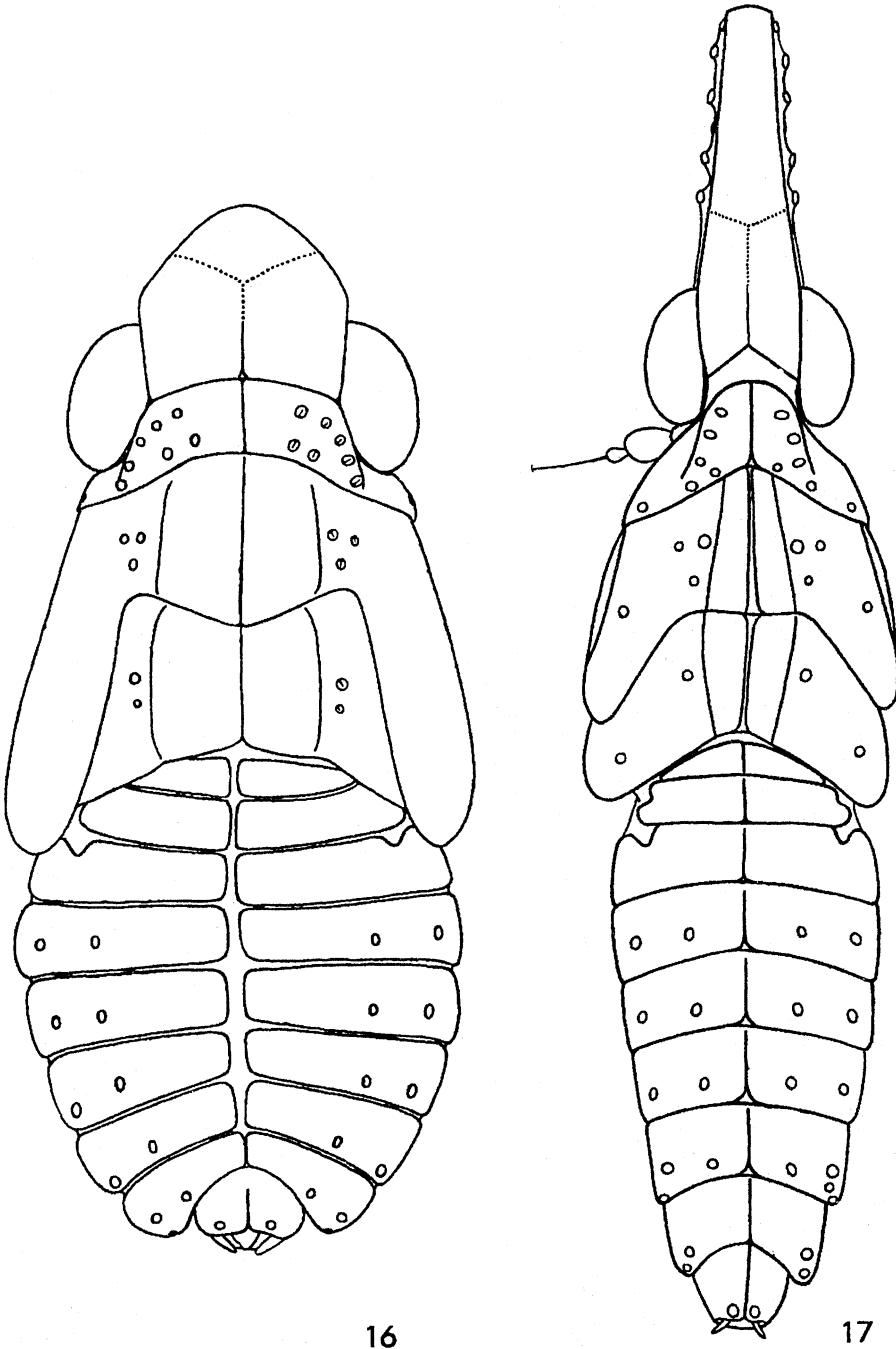
rently wide acceptance (Chang & Yang, 1997; Cheng & Yang, 1997; Tishechkin, 1998).

Key for identification of *Issidae* and related families

- 1(4). Ovipositor rounded (round type), or broad and convex at base but with slightly attenuate and compressed apices of lateral lobes of third valvules which are always edentate (attenuate round type).
- 2(3). Coryphe with simple median keel and punctate apical callus; if median keel visible, it extends to apex of metope. Moderately brachypterous; fore wings monomorphic, coriaceous, convex, nearly always completely covering abdomen . . . **Issidae**



Figs 12-15. *Bocra ephedrina* gen. et sp. n., larva, dorsal view. 12, first instar; 13, second instar; 14, third instar, legs not shown; 15, fifth instar, legs not shown.



Figs 16, 17. 16, *Ommatidiotus dissimilis* Fall., larva, fifth instar; 17, *Symplana* sp., larva, fourth instar (Vietnam).

3(2). Coryphe with apical callus transformed into a large areolet fused with coryphe and recognizable by a weak suture; median keel (or suture) of coryphe bifurcates anteriorly and its arms diverge at

obtuse angle. Brachyptery pronounced, combined with macropterous form, or monomorphic macropterous or moderately brachypterous **Caliscalidae**

- 4(1). Ovipositor laterally compressed from fore margin of third valvules on; lateral lobes of third valvules usually with teeth on apical margin (compressed type).
 5(6). Precostal area present, with transverse veinlets. Hind tibiae with lateral spines. Postclypeus with lateral keels **Nogodinidae** [s. str.]
 6(5). Precostal area absent. Postclypeus without lateral keels **Acanaloniidae**

Family **CALISCELIDAE** Amyot & Serville, 1843

Caliscelidae are distinctly divided into two groups which I am recognizing here as subfamilies Caliscelinae and Ommatidiotinae. Ommatidiotinae may be distinguished by the characteristic construction of ovipositor (Figs 4, 5) which is intermediate between rounded convex type of Issidae and flat compressed type of Nogodinidae, Flatidae and others. In Ommatidiotinae, the basal parts of third valvulae of ovipositor together form convex and broad area as in Issidae, but apical part of valvulae is flat and compressed in sagittal plane as in Nogodinidae. Ovipositor of Caliscelinae is nearly of common Issidae type, but often with protruded, small, undivided, apical flat lobes. The sensory pits in the larvae (Figs 12-17) of all Ommatidiotinae have small complementary lateral chaetae on pit border (Figs 31-36); the sensory pits of Caliscelinae are of common type without complementary setae.

Subfamily **OMMATIDIOTINAE** Fieber, 1875

Key to tribes of the subfamily Ommatidiotinae

- 1(2). Apex of first tarsomere of hind legs with uninterrupted row of denticles; supporting pulvillus situated behind the row (postpectinal pulvillus). Pronotum considerably wider than head
 **Bocrini** trib. n.
 2(1). Apex of first tarsomere of hind legs with only two lateral denticles or without denticles; supporting pulvillus occupies most of the plantar surface of tarsomere. Pronotum nearly as wide as head.
 3(4). Apex of first tarsomere of hind legs with two lateral denticles. Brachypterous form present and prevailing. Brachypterous specimens with short pronotum; paradiscal fields very short, nearly linear **Ommatidiotini** Fieber, 1875
 4(3). Apex of first tarsomere of hind legs usually without denticles. Always macropterous; paradiscal fields of pronotum comparatively long
 **Augilini** Baker, 1915

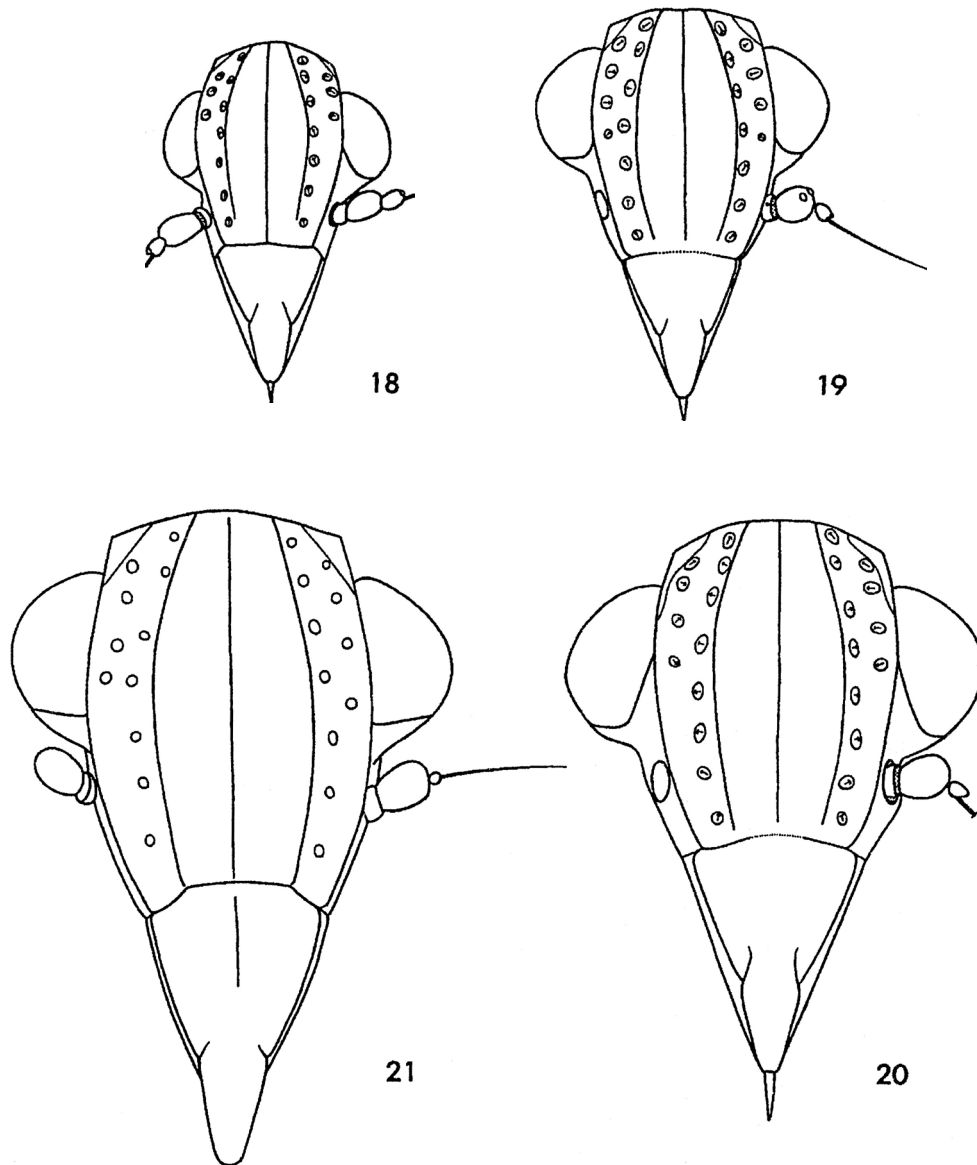
Tribe **Bocrini** trib. n.

Monotypic, see the key above and the description of *Bocra* gen. n.

Bocra gen. n.

Type species *Bocra ephedrina* sp. n.

Description. Moderately oblong oval, weakly depressed dorsoventrally, brachypterous (Fig. 1). Head short (Figs 2, 3). Coryphe pentagonal, with shallowly concave hind margin and rounded apex and anterolateral angles, as broad as its median length, nearly horizontal. Surface of coryphe shallowly concave, with raised marginal keels; its hind half with a weak median keel which anteriorly becomes bifurcated with arms divergent at obtuse angle, very weak or even looks as light line; lateral ends of this line touching to fore margin of coryphe opposite upper edges of lateral areas of metope. Metope transversally weakly convex, nearly rectangular in outline, twice as long as broad, with weakly convex upper margin; lateral margins a little converging upwards but at lower margin rounded medially to the narrower postclypeus. Lower (clypeal) margin shallowly concave. Lateral, intermediate and median keels of metope entirely developed, raised and nearly equidistant, intermediate keels slightly convex, meeting coryphe margin far from head top, only slightly bent mesad. In lateral aspect, the angle between coryphe and metope acute. Clypeus with raised median keel but without lateral ones. Rostrum as long as clypeus, reaching a little beyond hind coxae. Antennae small, simple. Ocelli absent. Eyes without distinct postocular callosities. Pronotum with semicircular disc protruding forward and short (narrow) upper lateral postocular parts. Discal lateral keels disappear after transition on fore margin of upper lateral lobes. Median discal keel raised; lateral pronotal keels and collateral paranotal keels absent. Mesonotal scutellum transverse, triangular, with nearly straight fore margin and attenuate, short, rounded apex. Mesonotal keels raised, lateral ones united anteriorly with transverse keel. Elytra abbreviated and slightly narrowed, parabolically rounded posteriorly, extending to VII-VIII tergites. General longitudinal veins keel-like; claval suture disappeared; cross veins scarcely developed. Claval vein (*Pcu* + *A1*) without clear boundary passes into irregular submarginal vein of membrane; submarginal vein running to costal margin, gradually weakening. Tegulae present; elytra retain axillary mobility, and the insect is capable to raising elytra and returning them to rest position. Hind wings competely absent. Abdomen rather broad, protruding posteri-



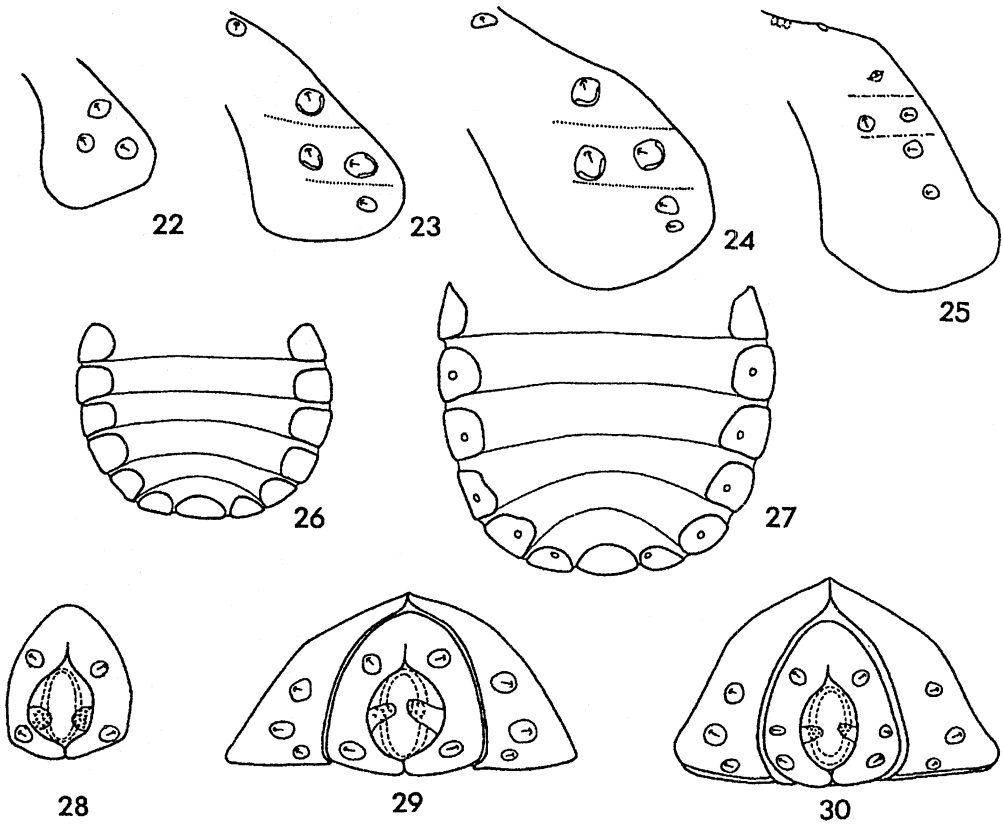
Figs 18-21. *Bocra ephedrina* gen. et sp. n., head of larva, face. 18, first instar; 19, second instar; 20, third instar; 21, fifth instar.

only laterad to costal margins of elytra. Tergite VI with weak sublateral keels; tergite VII with raised sublateral keels. Legs simple, medium-sized. Fore and middle coxae long and narrow, $2/3$ times as long as corresponding femora. Middle femora and tibiae slightly longer than fore ones. Fore coxae exceeding apex of anteclypeus. Hind tibiae with 1 lateral tooth in distal third; tibial apex with 7 teeth (2 + 5). Hind basitarsus large,

apically with arcuate row of 8 teeth; behind the row a convex rounded supporting pillow with little short spinulae present; hind mesotarsus apically with two lateral teeth and a similar pillow between them.

Ovipositor of a construction intermediate between the rounded and compressed types (Figs 4, 5).

Male genitalia (Figs 6-11). Pygofer simple, significantly higher than wide, without



Figs 22-30. *Bocra ephedrina* gen. et sp. n., larva. 22-25, lateral part of pronotum, left side view: 22, first instar; 23, second instar; 24, third instar; 25, fifth instar; 26, abdomen ventral view, second instar; 27, same, third instar; 28-30, end of abdomen, caudal view: 28, first instar; 29, second instar; 30, third instar.

raised lateral projections, with hind margin declined below. Anal tube small, dorsoventrally depressed, rounded in dorsal aspect. Penis with sclerotized tubular theca; hind theca opening funnel-shaped; penis hooks straight, short, reaching slightly beyond embouchure of theca. Styles not large, with simple acuminate rectangular apical part bent upwards, in ventral view with a gap behind middle, but closed at apices.

***Bocra ephedrina* sp. n.**

(Figs 1-15, 18-34, 37-40)

Holotype. ♂, Tajikistan, Montane-Badakhshan Autonomous Region, 15 km NE of Vanch, 16.VI.1986 (Emeljanov).

Paratypes. Tajikistan, Montane-Badakhshan Autonomous Region: 4 ♂, 3 ♀, larva V, as holotype, 16-17.VI.1986 (Emeljanov, Volkovitsh); 1 ♂, some Larvae I-III, same locality, 31.VII.1979 (Emeljanov); 1

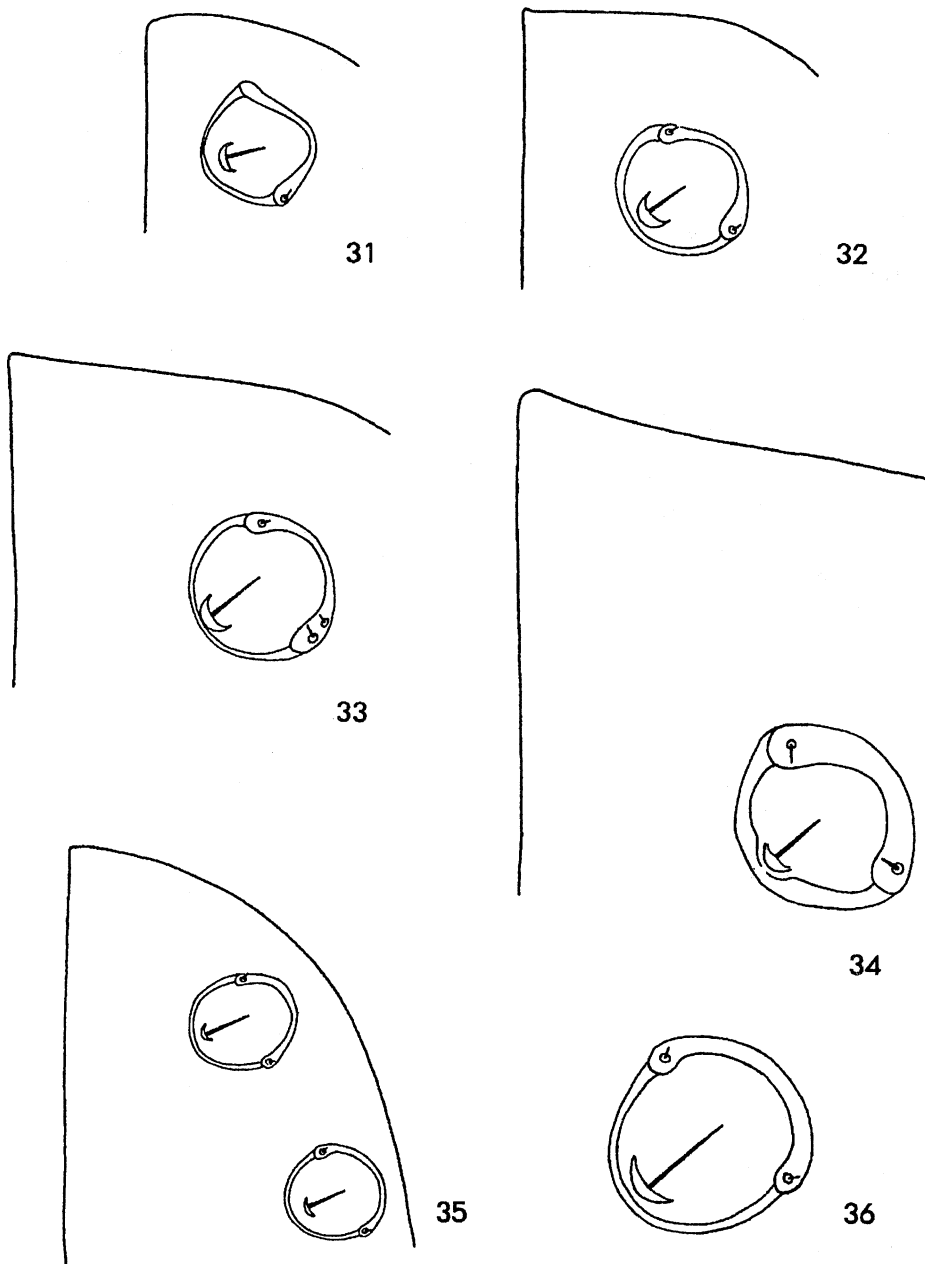
♂, 2 ♀, Shakhara River, 25 km ESE of Roshtkala, 20.VI.1979 (Emeljanov).

Description of imago (Figs 1-11). Dull black with light wax pruinosity. Head and thoracic keels slightly lighter; elytra and underside of body sometimes also lighter. Hind margins of abdominal tergites yellowish. Hind femora with light lines along keels and light upper surface. Hind legs with first two tarsal segments and apices of tibiae greenish, except the black teeth.

Length ♂ 5.4-7.0 mm, ♀ 6.1-7.8 mm.

Biology. Lives on *Ephedra* sp. cf. *distachya* on steep crumbling mountain slopes. Hibernating probably as nymphs of IV-V instars.

Description of immature instars (Figs 12-15, 18-34, 37-40). Larvae of I-III instars captured on 1.VIII.1979, larva of V instar on 17.VI.1986. Larvae of IV instar are unknown. Dark brown to black, as imago. Larvae of I instar with thorax and legs

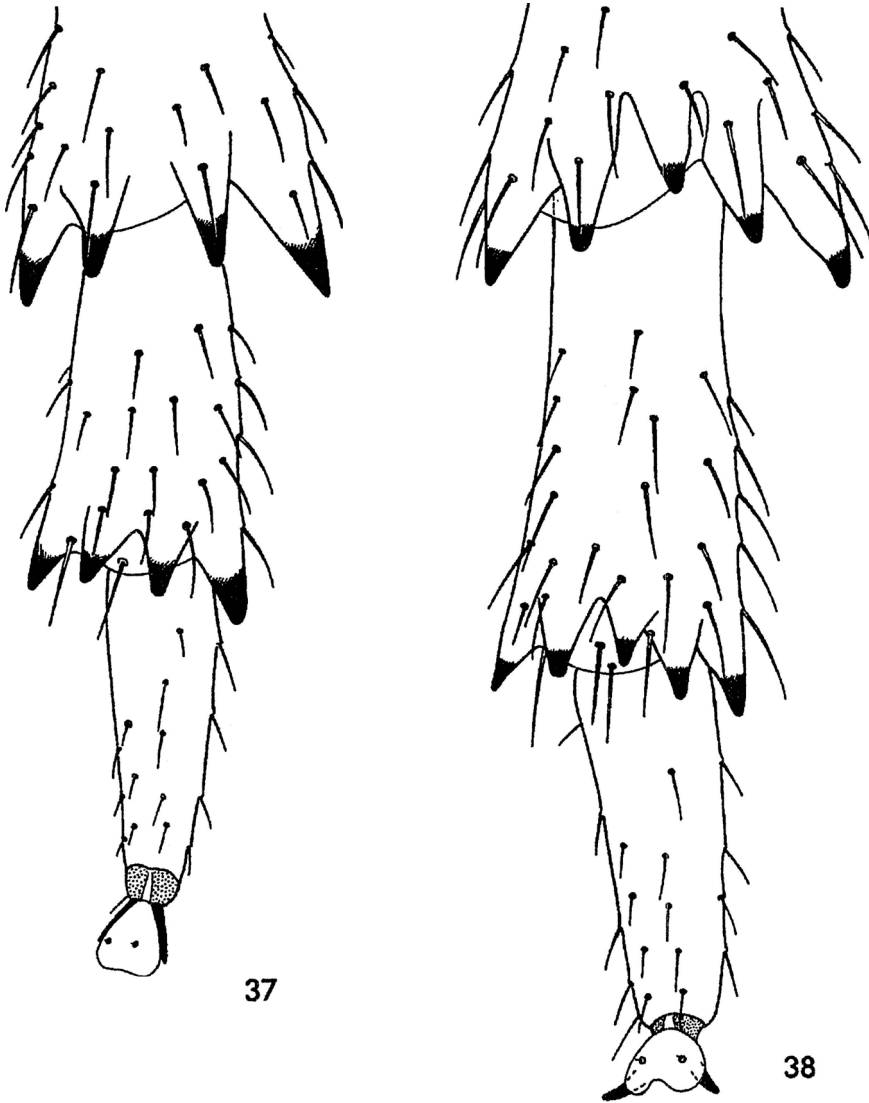


Figs 31-36. Sensory pits in anteromedial corner of pronotum in larvae of Ommatidiotinae. 31-34, *Bocra ephedrina* gen. et sp. n.: 31, first instar; 32, second instar; 33, third instar; 34, fifth instar; 35, *Symplana* sp., fourth instar; 36, *Ommatidiotus dissimilis* Fall., fifth instar.

lighter, whitish; larvae of all other instars brown. All data concerning sensory pits are given for one side of body.

I instar (Figs 12, 18, 22, 28, 31, 37). Head: median row of metope with 7 pits, lateral

one with 3 pits opposite to interspaces of 4 upper pits; antennae without plac; rostrum with unsclerotized distal part of first article extended to hind coxae as in imago and other larval instars. Prothorax: Discal group

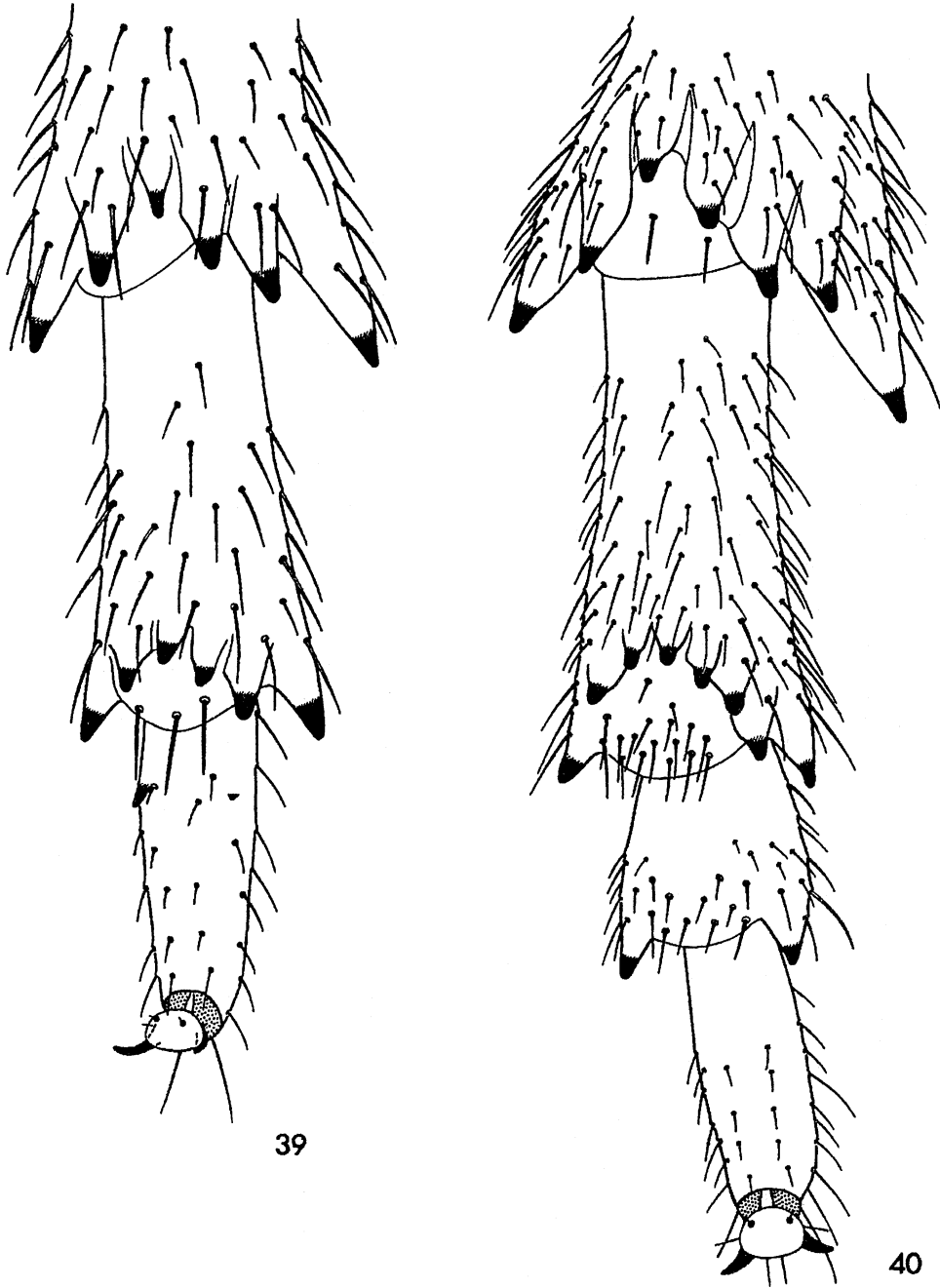


Figs 37, 38. *Bocra ephedrina* gen. et sp. n., larva, apex of hind tibia and tarsus, ventral view. 37, first instar; 38, second instar.

of pits with two isolated pits and posterolateral subgroup with 3 closely connected pits (Fig. 12); paradiscal group represented by one pit close to lateral margin forming a triangular group together with two humeral pits; humeral and collateral keels not developed. Mesonotum with two pits in median paradiscal group and two in lateral group. Metanotum with one median and one lateral paradiscal pits. Abdomen: IV-VIII tergites with two pits mesad of lateral keel; lateral areas without pits; IX tergite with two pits.

Hind legs (Fig. 37): tibiae without lateral spines, with 4 denticles at apex; tarsi two-segmented; first tarsomere with 4 denticles, without subapical setae, as with all following instars. Bud of extrapectinal pulvillus with 1 seta. Praetarsus small, with short claws bearing no setae and with longer arolium bearing a pair of setae, as with all subsequent instars.

II instar (Figs 13, 19, 23, 26, 28, 32, 38). Head: lateral row of metope with 4 pits, the fourth pit added on upper end of row. An-



Figs 39, 40. *Bocra ephedrina* gen. et sp. n., larva, apex of hind tibia and tarsus, ventral view. 39, third instar; 40, fifth instar.

tennae with 3 places. Prothorax: one pit added on pronotal disc near median keel from behind; in paradiscal group, one pit added near disc; one little pit of pectoral

group appears. Mesothorax: median group comprises additionally two little pits behind two preceding. Metathorax without alteration. Abdomen: in sublateral area of IV-VIII

tergites, 1 little pit appears laterally of primary pits. Hind legs (Fig. 38): on tibia 1 lateral spine appears in distal third; apex of tibia with 5 denticles: 2 medial and 3 lateral; apex of first tarsomere also with 5 denticles in analogous position; pulvilla with 2 setae. Praetarsus small, but claws already longer than arolium.

III instar (Figs 15, 20, 24, 27, 30, 33, 39). Head: median row of metope with 8 pits, the 8th pit added on upper end of row; distal part of first rostral article sclerotized. Prothorax: paradiscal group of pronotum with a third, intermediate, facultative, additional pit; in pectoral group, a second pit appears behind the first pit. Mesothorax: in median group, a third pit added, the number of pits being now 5. Abdomen: one pit appears on lateral areas of IV-VIII tergites (Fig. 25); a facultative pit appears in lateral region of third tergite, corresponding to median pit of subsequent tergites; a third intermedial little pit appears on IX tergite. Hind legs (Fig. 39): there are 6 teeth (2+4) on apex of tibia, the same on first tarsomere; extrapectinal pulvilla of first tarsomere with 3 setae; second tarsomere with a pair of lateral denticles near middle marking the apex of definitive second tarsomere. Pretarsus with one seta on each claw.

IV instar unknown.

V instar (Figs 15, 21, 25, 34, 40). Head: median row of metope with 7 pits (lower pit, which was present in III instar, is absent); lateral row with 4 pits. Prothorax: as in III instar, but without facultative paradiscal pit. Mesothorax: median group as in III instar; lateral group (which must be present on wing pad) is absent. Metathorax: only one pit of median group present. Abdomen: as in III instar, but facultative pit on III tergite absent (probably individual variation) and intermediate pit on IX tergite absent. Hind legs (Fig. 40): tarsus 3-segmented (as it must be in IV instar); apex of tibia with 7 teeth (2 + 5), two extrapectinal setae present; first tarsomere with 8 denticles; extrapectinal pulvilla with numerous setae; second tarsomere with 2 apical denticles and setae between them.

Sensory pits of *Bocra* are very peculiar (Figs 31-34). In the I instar, the border of the

pit bears one very small accessory seta on one side; in the II instar, such a small seta is present on each side; in the III instar one side of pit border bears one accessory seta and another side bears two setae brought together. However, in the V instar the number and disposition of accessory lateral setae are the same as in the II instar.

References

- Baker, C.F.** 1915. Notices of certain Philippine Fulgoroidea, one being of economic importance. *Philipp. J. Sci.*, **10**: 137-144, pls. 1-2.
- Baker, C.F.** 1927. Spolia Mentawiensia: Homoptera-Fulgoroidea. *Philipp. J. Sci.*, **32**: 391-411, pl. 1.
- Chang, T.-Y. & Yang, Ch.-T.** 1997. A preliminary observation on the evolutionary trend of Fulgoromorpha male genitalia. *Program & Abstract Book, 9th Internat. Auchenorrhyncha Congress, 17-21 February 1997*: 27-28. Sydney.
- Cheng, Ch.-L. & Yang, Ch.-T.** 1997. The evolutionary trends of Fulgoromorpha antennal sensory plaque organs (Homoptera: Auchenorrhyncha). *Program & Abstract Book, 9th Internat. Auchenorrhyncha Congress, 17-21 February 1997*: 29-30. Sydney.
- Emeljanov, A.F.** 1980. Phylogeny and evolution of subfamily Orgeriinae (Homoptera, Dictyophariidae). *Chtenija pamyati Kholodkovskogo* [Lectures in memory of Cholodkovsky], **32**: 3-96. (In Russian).
- Emeljanov, A.F.** 1990. An attempt of construction of phylogenetic tree of the planthoppers (Homoptera, Cicadina). *Entomol. Obozr.*, **69**(2): 353-356. (In Russian).
- Fennah, R.G.** 1954. The higher classification of the family Issidae (Homoptera, Fulgoroidea) with description of new species. *Trans. R. entomol. Soc. London*, **105**(19): 455-474.
- Fennah, R.G.** 1987. A recharacterisation of the Ommatidiotini (Hem.-Hom., Fulgoroidea, Issidae, Calliscellinae) with the description of two new genera. *Entomol. mon. Mag.*, **123**: 243-248.
- Muir, F.** 1923. On the classification of the Fulgoroidea (Homoptera). *Proc. Hawaiian entomol. Soc.*, **5**(2): 205-247.
- Muir, F.** 1930. On the classification of the Fulgoroidea. *Ann. Mag. nat. Hist.*, **10**(6): 461-478.
- Tishechkin, D. Yu.** 1998. Acoustic signals of Issidae (Homoptera, Cicadinae, Fulgoroidea) compared with signals of some other Fulgoroidea with notes on taxonomic status of the subfamily Caliscellinae. *Zool. Zhurn.*, **77**(11): 1257-1265. (In Russian).

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