

Morphology of the Ovipositor in the Subfamily Issinae (Homoptera, Cicadina, Issidae)

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Abstract—The structure of the ovipositor is described for members of 20 genera of the subfamily Issinae (Issidae). The genera are grouped into 3 subtribes of the tribe Issini: *Issina* Spinola, 1839; *Hysteropterina* Melichar, 1906; and *Agalmatiina* subtrib. n. The new subtribe *Agalmatiina* (type genus *Agalmatium* Emeljanov, 1971) is distinguished by the median field of gonapophyses IX having the form of a large appendage turned to the base of gonapophyses, distal parts of the posterior connective laminae of gonapophyses IX widely arcuate before the apex, and gonoplares bearing transverse carinae on the outer surface. *Mulsantereum* gen. n. (type species *Hysteropterum maculifrons* Mulsant et Rey, 1855) is erected in the subtribe *Hysteropterina*. The new genus is characterized by the distal parts of the posterior connective laminae of gonapophyses IX curved at right angle before the apex, entire median field of gonapophyses IX having a characteristic longitudinal fold on the median line, and triangular sclerotized plate bearing a large pigmented fold near the base of the anterior connective lamina. *Logvinenkoana* subgen. n. (type species *Hysteropterum pictifrons* Melichar, 1906) is erected in the genus *Bubastia* Emeljanov, 1975. The new subgenus is distinguished by the female anal tube very wide in dorsal view and dorsal margin of gonocoxa VIII lobe-like projecting over the triangular sclerotized plate.

Up to now, the classification of the family Issidae has been essentially based on characters of the external morphology and structure of the male genitalia. In particular, about 50 genera have been described from the western Palaearctic Region (Emeljanov, 1971; Dlabola, 1987). Characters of the ovipositor structure were used for identifying the family group taxa (Fennah, 1954; Emeljanov, 1999). In the present study, representatives of 20 genera of the subfamily Issinae in the fauna of the western Palaearctic Region were examined to ascertain characters of the structure of the ovipositor, which can be used to identify the genera and infrageneric groups and elaborate a classification of suprageneric taxa of the subfamily. Most of the genera discussed are represented in the European fauna, which allows use of the characters revealed for compiling keys to the family Issidae in this region.

The tribal classification of the subfamily Issinae Spinola has been elaborated by Melichar (1906), Muir (1930), and Dlabola (1980, 1987). In particular, Dlabola distinguished the following 4 tribes in the subfamily on the basis of the external morphology: *Adenissini* Dlabola, 1980; *Issini* Spinola, 1839; *Hysteropterini* Melichar, 1906; and *Hemisphaerini* Melichar, 1906. In the present study, representatives

of the tribes *Issini* and *Hysteropterini* (after Dlabola, 1980, 1982, 1987) were examined. The genera studied were grouped into the 3 subtribes of the tribe *Issini*: *Issina* Spinola, 1839; *Hysteropterina* Melichar, 1906; and *Agalmatiina* subtrib. n. (see a key to the subtribes). Most of the genera are placed in the subtribe *Hysteropterina*, where several groups of genera are distinguished; some of these may be considered later as subtribes. The subtribe *Issina* includes the genera *Issus* Fabricius, 1803 and *Latissus* Dlabola, 1974. The subtribe *Agalmatiina* subtrib. n. includes the genus *Lindbergatium* Dlabola, 1984, in addition to the type genus.

The nomenclature of the female genital structures follows that by Scudder (1961), Emeljanov (1969), and Bourgoin (1993), with some supplements. For each genus, the species examined are listed with indication of the material.

The present study is based on the material from the following museums: HNHM, Hungarian Natural History Museum (Budapest, Hungary); NMW, Naturhistorisches Museum Wien (Austria); MNHN, Museum national d'Histoire naturelle (Paris, France); BIZ, Institute of Zoology, Bulgarian Academy of Sciences (Sofia, Bulgaria); and ZIN, Zoological Institute, Russian Academy of Sciences (St. Petersburg, Russia).

FAMILY ISSIDAE SPINOLA, 1839

Subfamily ISSINAE

Tribe ISSINI

Description. Anal tube (*An*) elongate to nearly round (in dorsal view). Gonoplasts (*Gp 1* and *Gp 2*) convex (Fig. 5);¹ border between 1st (*Gp 1*) and 2nd (*Gp 2*) lobes in the form of a transverse notch or inconspicuous, only presented by a fold or a stripe of faint pigmentation. Fusion along inner margin of 3rd lobes of gonoplasts (*Gp 3*) incomplete; median margin of lobes, fork (*Fk*), and membranous areas adjoining median margin distinctly pigmented there (Fig. 7). Outer surfaces of gonoplasts (*Gp 1* and *Gp 2*) occasionally with transverse carinae. Gonapophyses IX (*Gpo IX*), fused in proximal part, moveably articulated with scoop-like gonospiculum bridge (*Gbd*), which, in turn, connected to posterior vagina (*VP*) (Fig. 1). In most of the genera discussed, proximal part of posterior connective lamina of gonapophysis IX (*pPCL*) convex, constricted laterally (Fig. 3). In representatives of the genera *Phasmena* Melichar, *Hysterochus* Dlabola, and *Tshurtshurnella* Kusnezov, constriction weak or absent. Distal parts of posterior connective laminae of gonapophyses IX (*dPCL*) arcuately or angularly bent (Fig. 2). Faintly pigmented median field (*mf*), lying between distal parts of posterior connective laminae, occasionally weakly convex, frequently with 2 lobes in upper part (Figs. 2, 3), or produced in a long

process (Figs. 62, 63). Faintly pigmented lateral fields (*lf*) flat (Fig. 62) or protruding in the form of processes, situated between fibulae of posterior connective laminae (*Fp*) and proximal parts of posterior connective laminae (*pPCL*) (Fig. 2). Fibula of posterior connective lamina (*Fp*) connected to gonocoxa IX (*Gx IX*) formed by narrow plate and firmly connected to gonoplasts (*Gp 1* and *Gp 2*) (Fig. 1). Gonocoxa IX (*Gx IX*) connected, in turn, to intergonocoxal plate (*iGxP*) and gonospiculum bridge (*Gbd*). Endogonocoxal process (*GxP*) bearing apical (*al*) and subapical (*sl*) lobes. Apical lobe (*al*) simple or digitate (Figs. 4, 6, 8, 9). Surface of endogonocoxal process (*GxP*) usually with 2 more intensely pigmented plates (*pp*) (Figs. 6, 8). Anterior connective lamina of gonapophysis VIII (*ACL*) in the form of serrate lobe with apical (*at*) and lateral (*lt*) groups of teeth (Fig. 9). Apical group including 1–3 teeth; lateral one, 2–5 teeth. Endogonocoxal lobe (*GxL*) with setae on outer surface. Gonocoxa VIII (*Gx VIII*) in the form of transverse plate with rows of setae on outer surface. Dorsal margin of gonocoxa VIII (*Gx VIII*) occasionally lobe-like projecting (*db*) beyond the plane of triangular sclerotized plate (*TPL*), which, in turn, occasionally protruding at base of anterior connective lamina (*ACL*) to form appendage (*ap*) (Fig. 5).

Key to Subtribes of the Tribe Issini Spinola

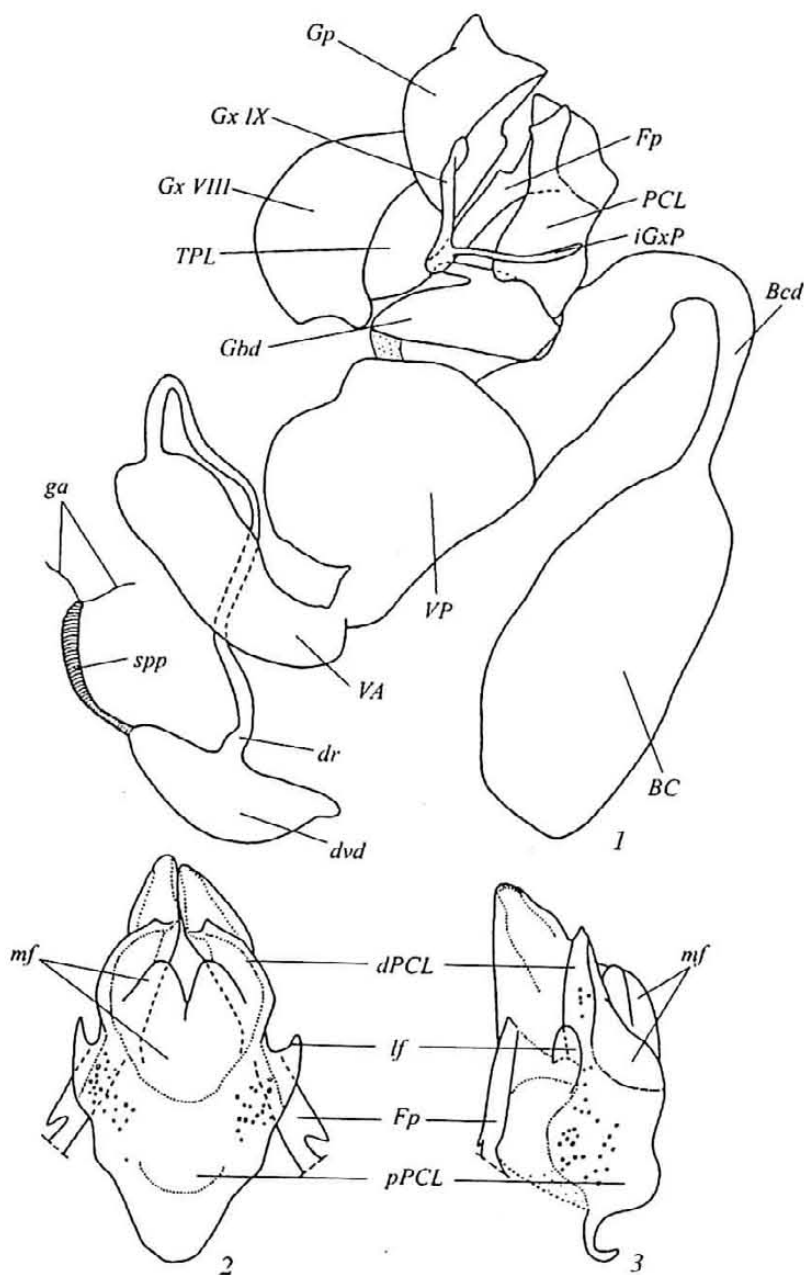
- 1(2). Apical lobe of endogonocoxal process (*al*) two- or three-digitate (processes long). Lateral group (*lt*) of anterior connective lamina of gonapophysis VIII with 2 teeth (lower one ill-defined)
..... Issina Spinola, 1839.
- 2(1). Apical lobe of endogonocoxal process (*al*) simple or two-digitate (processes short). Lateral group (*lt*) of anterior connective lamina of gonapophysis VIII with 2 or more teeth.
- 3(4). Median field (*mf*) protruding in the form of large process directed toward base of gonapophyses IX (*Gpo IX*) Agalmatiina subtrib. n.
- 4(3). Median field *mf* without process directed toward base of gonapophyses IX (*Gpo IX*)
..... Hysteropterina Melichar, 1906.

Subtribe HYSTEROPTERINA Melichar, 1906

Genus PHASMENA Melichar, 1902

Description. Anal tube (*An*) elongate, narrowed or widely rounded at apex (in dorsal view). Anal column

¹ Designations used in Figs. 1–9 and in the text: *An*, anal tube; *AC*, anal column; *Ltg IX*, latero-tergite IX; *Gx VIII*, gonocoxa VIII; *Cx IX*, gonocoxa IX; *iGxP*, intergonocoxal plate; *GxP*, endogonocoxal process; *al*, apical lobe of endogonocoxal process; *sl*, subapical lobe of endogonocoxal process; *pp*, pigmented plates of endogonocoxal process; *GxL*, endogonocoxal lobe; *db*, protruding dorsal blade of gonocoxa VIII; *Gpo VIII*, gonapophysis VIII; *Gpo IX*, gonapophysis IX; *Gp 1*, *Gp 2*, *Gp 3*, 1st, 2nd, and 3rd gonoplast lobes; *Fk*, fork of 3rd gonoplast lobes; *Gbd*, gonospiculum bridge; *ACL*, anterior connective lamina of gonapophysis VIII; *at*, apical teeth of anterior connective lamina; *lt*, lateral teeth of anterior connective lamina; *TPL*, triangular sclerotized plate of gonapophysis VIII; *ap*, appendage at base of anterior connective lamina; *Fa*, fibula anterior of anterior connective lamina of gonapophysis VIII; *PCL*, posterior connective lamina of gonapophysis IX; *pPCL*, proximal part of posterior connective lamina of gonapophysis IX; *dPCL*, distal part of posterior connective lamina of gonapophysis IX; *Fp*, fibula of posterior connective lamina of gonapophysis IX; *mf*, median field; *lf*, lateral field; *AV*, anterior vagina; *VP*, posterior vagina; *BC*, bursa copulatrix; *Bcd*, bursa copulatrix ductus; *spp*, spermathecal pars intermedialis; *dvd*, diverticulum ductus of spermatheca; *dr*, ductus receptaculi; *ga*, glandula apicalis of spermatheca.



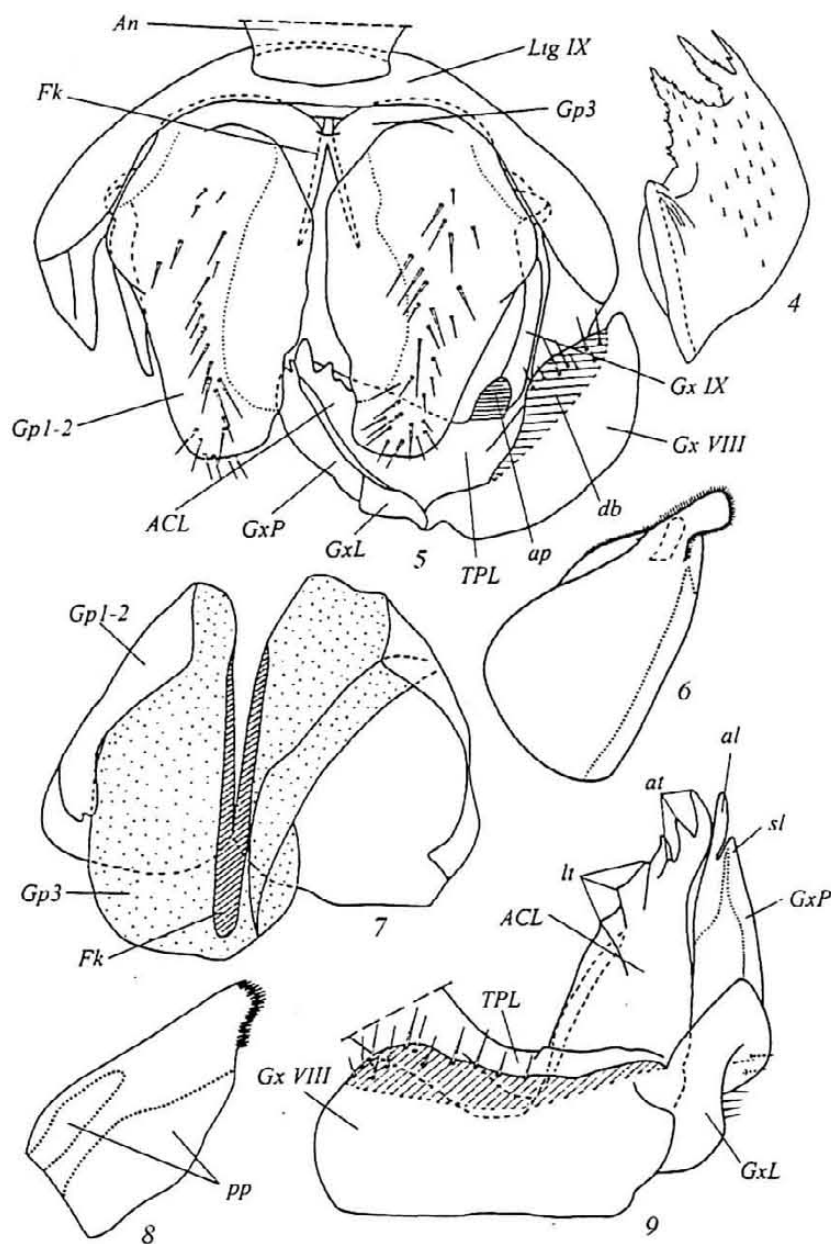
Figs. 1-3. Ovipositor and genital ducts: (1) *Mycterodus ovifrons* Puton, ovipositor and complex of ectodermal genital ducts, lateral view; (2, 3) *Hysteropterum schaefferi* Metcalf, gonapophyses IX [(2) dorsal and (3) lateral view]. For designations, see text.

(AC) short (0.20-0.25 times as long as anal tube). Border between 1st (*Gp* 1) and 2nd (*Gp* 2) gonoplac lobes obsolete. Distal parts of posterior connective laminae (*dPCL*) bent before apex arcuately or at right angle. Median field (*mf*) with, or without shallow notch in apical part; lobes not separated. Lateral fields (*lf*) not projecting or forming short appendages (in dorsal view). Gonocoxa VIII (*Gx* VIII) with lobe-like protruding dorsal margin (*db*) most distinct in proximal part. Apical lobe of endogonocoxal process (*al*)

short (*Ph. cardinalis* Emeljanov, 1978; *Ph. tardiviva* Emeljanov, 1978) or, by contrast, very narrow, in the form of long process (*Ph. spiraeae* Mitjaev, 1967; *Ph. petrensis* Emeljanov, 1972). Apical group (*at*) of anterior connective lamina (*ACL*) with 2 or 3 teeth; lateral group (*lt*) with 3 or 4 teeth.

Phasmena spiraeae Mitjaev, 1967.

Material. Mongolia, Gobi-Altai aimak, 15 km S of Beger, 14.VII.1970 (E.P. Nartshuk) (ZIN).



Figs. 4-9. Ovipositor: (4) *Issus coleoptratus* (Fabricius), endogonocoxal process, ventral view; (5) *Mulsantereum maculifrons* (Mulsant et Rey), genital segments, dorsal view; (6) *Latematium latifrons* (Fieber), endogonocoxal process, ventral view; (7) *Mycterodus ovifrons* Puton, gonoplasts, ventral view; (8) *Hysteropterum schaefferi* Metcalf, endogonocoxal process, ventral view; (9) *Rhissolepeus ergenense* (Becker), gonapophysis VIII, ventral view. For designations, see text.

Phasmena petrensis Emeljanov, 1972.

Material. Mongolia, Kobdo Aimak, Nariin-Bulak Spring, Ikh-Khavtgiin-Nuru Range, 24.VII.1970 (I.M. Kerzhner) (ZIN).

Phasmena cardinalis Emeljanov, 1978 (Figs. 10-12).

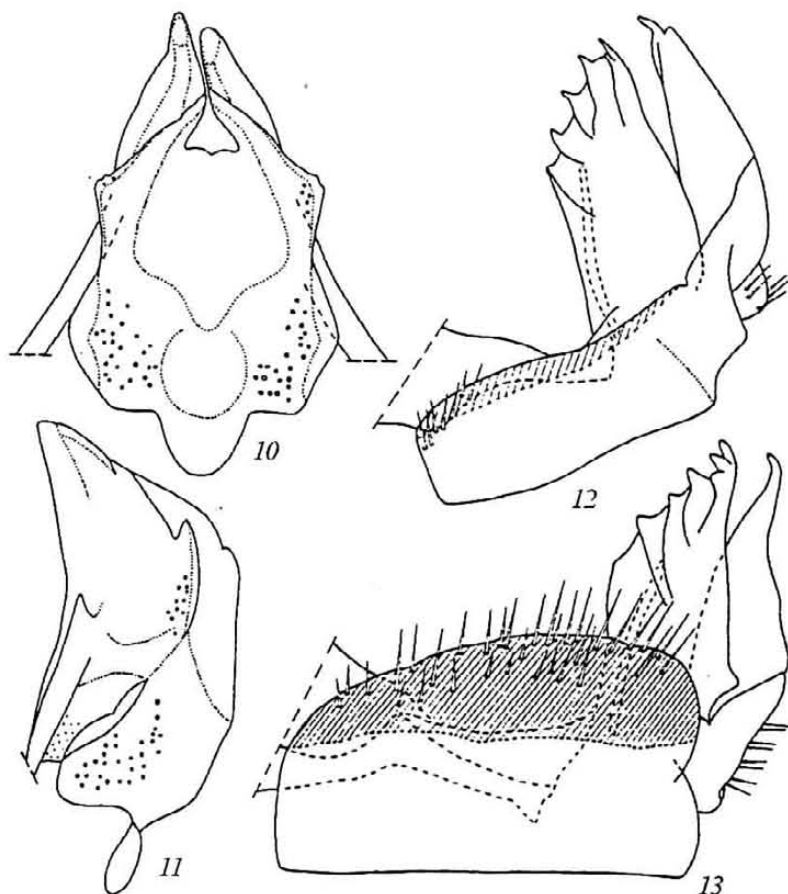
Material. Turkmenia, Ipai-Kala, 12 km S of Karaul, Kopet Dag, 18.VII.1973 (A.F. Emeljanov) (ZIN).

Phasmena tardiviva Emeljanov, 1978.

Material. Kazakhstan, 35 km NNE of Sai-Utyos, Sandy locality, 11.IX.1973 (A.F. Emeljanov) (ZIN).

Genus *HYSTERODUS* Diabola, 1980

Description. Anal tube (An) weakly narrowed before apex (in dorsal view), convex (in lateral view). Anal column (AC) rather long (about 0.33 times as long as anal tube). Border between 1st (Gp 1) and 2nd



Figs. 10–13. Ovipositor: (10–12) *Phasmena cardinalis* Emeljanov [(10) gonapophyses IX, dorsal view; (11) gonapophyses IX, lateral view; (12) gonapophysis VIII, ventral view]; (13) *Hysteropterum schaefferi* Metcalf, gonapophysis VIII, ventral view.

(Gp 2) gonoplac lobes obsolete. Third gonoplac lobes (Gp 3) with faintly pigmented lateral fields and partly pigmented fork (Fk). Distal parts of posterior connective laminae (dPCL) arcuately bent before apex. Lateral fields (lf) scarcely projecting (in dorsal view). Median field (mf) with longitudinal notch in apical part; lobes ill-defined. Gonocoxa VIII (Gx VIII) with lobe-like protruding dorsal margin (db) most distinct in proximal part. Endogonocoxal process (GxP) gradually narrowed to apex; apical lobe (al) simple, narrow. Apical group (at) of anterior connective lamina with 3 teeth, comb narrow, lateral group (lt) bearing 2 teeth with carinae.

Hysterodus sp. (Figs. 14–16).

Material. Tajikistan, Western Pamir, 25 km NE of Khorog, 28.VII.1979 (A.F. Emeljanov) (ZIN).

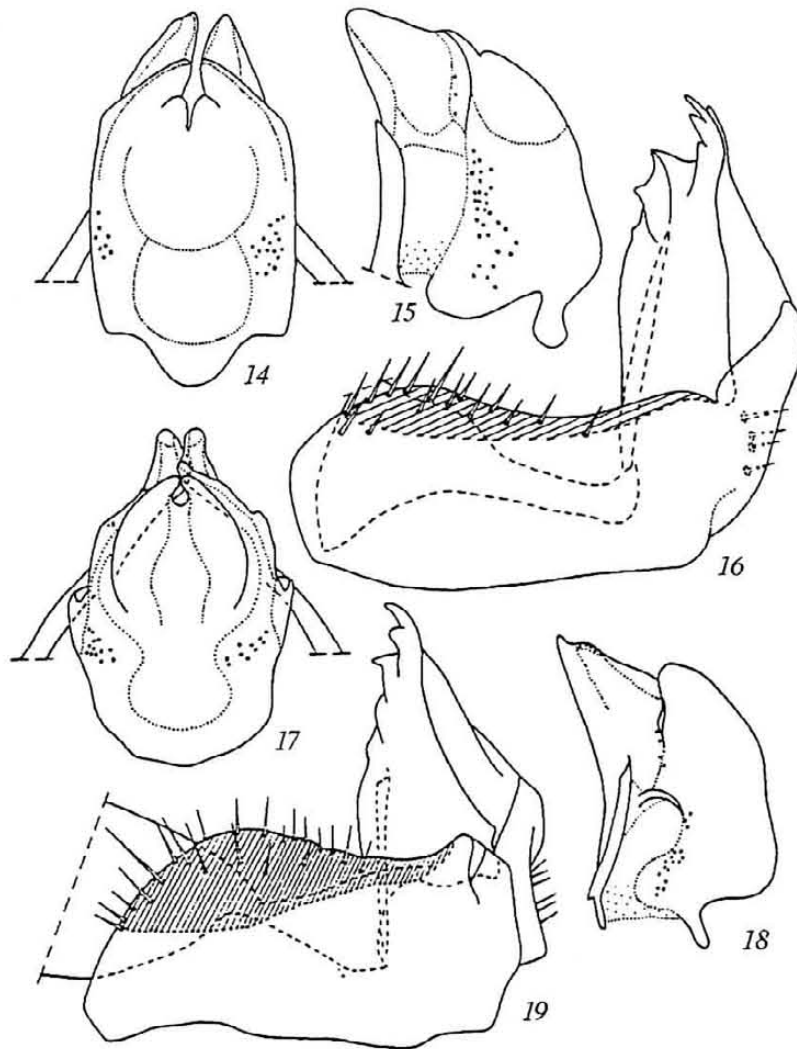
Genus *TSHURTSHURNELLA* Kusnezov, 1927

Description. Anal tube (An) widened in middle part, rounded apically (in dorsal view). Anal column (AC)

short (0.20–0.25 times as long as anal tube). Border between 1st (Gp 1) and 2nd (Gp 2) gonoplac lobes in the form of transverse fold. Proximal part of posterior connective lamina (pPCL) convex, without constriction (in lateral view). Distal parts of posterior connective laminae (dPCL) arcuately bent before apex (in dorsal view). Lateral fields (lf) projecting to form short appendages. Median field (mf) in the form of 2 lobes in apical part. Gonocoxa VIII (Gx VIII) with lobe-like protruding dorsal margin (db) most distinct in proximal part. Endogonocoxal process (GxP) gradually (*T. eugeniae*) or sharply (*T. despecta*) narrowed to apex; apical lobe (al) simple and shortened (*T. eugeniae*) or long and narrow (*T. despecta*). Apical group (at) of anterior connective lamina with 2 or 3 teeth; lateral group (lt) bearing 3 teeth with carinae.

Tshurtshurnella eugeniae Kusnezov, 1927 (Figs. 17–19).

Material. Ukraine, the Crimea, Belogorsk District, Belaya Skala, 23.VI.1963 (V.N. Logvinenko) (ZIN).



Figs. 14–19. Ovipositor: (14–16) *Hysteroodus* sp. [(14) gonapophyses IX, dorsal view; (15) gonapophyses IX, lateral view; (16) gonapophysis VIII, ventral view]; (17–19) *Tshurtshurnella eugeniae* Kusnezov [(17) gonapophyses IX, dorsal view; (18) gonapophyses IX, lateral view; (19) gonapophysis VIII, ventral view].

Tshurtshurnella despecta (Linnavuori, 1965).

Material. Turkey, 50 km S of Aksaray, 7.VIII.1963 (R. Linnavuori) (ZIN).

Genus *HYSTEROPTERUM* Amyot et Serville, 1843

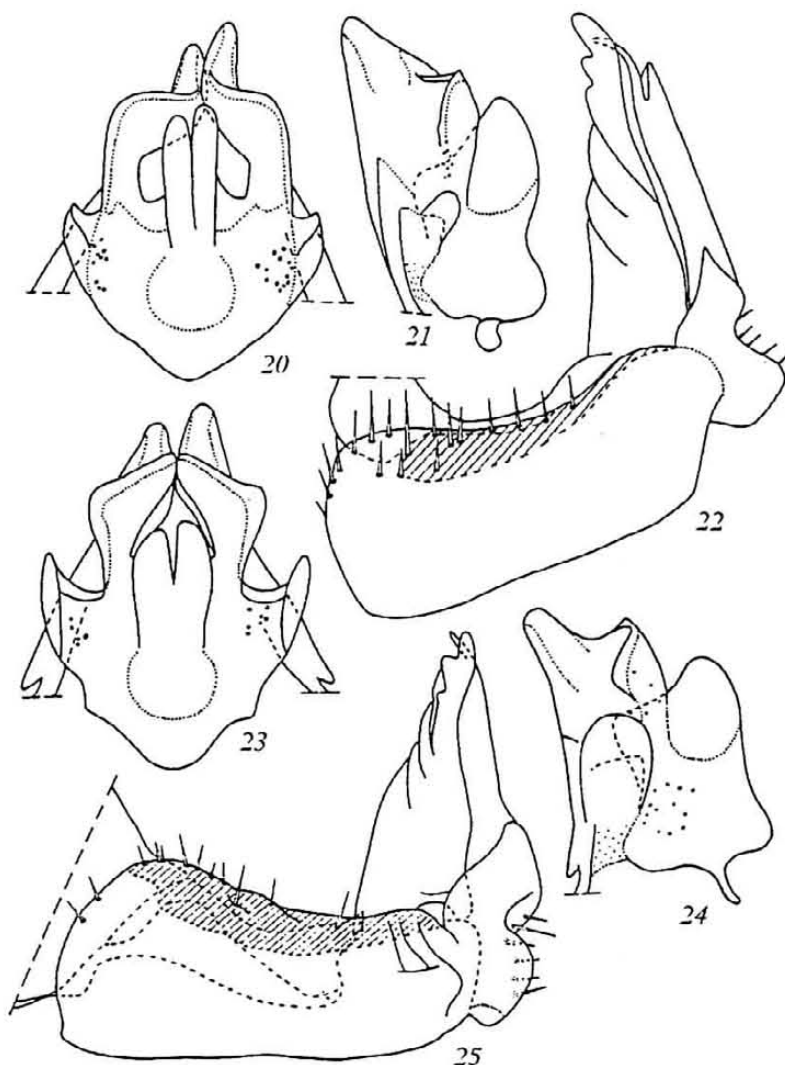
Hysteropterum schaefferi Metcalf, 1958 (Figs. 2, 3, 8, 13).

Description. Anal tube (*An*) wide, weakly narrowed in middle part, rounded and shallowly emarginate apically (in dorsal view). Anal column (*AC*) long (about half as long as anal tube). Distal parts of posterior connective laminae (*dPCL*) arcuately bent before apex. Median field (*mf*) forming 2 lobes in apical part.

Lateral fields (*lf*) protruding to form appendages (in dorsal view). Gonocoxa VIII (*Gx VIII*) with dorsal margin (*db*) lobe-like projecting along entire length. Endogonocoxal process (*GxP*) gradually narrowed to apex; apical lobe (*al*) simple, short. Apical group (*at*) of anterior connective lamina with 3 teeth on carina; lateral group (*lt*) bearing 3 teeth with carinae (and additional tubercle on comb).

Material. Austria, Mödling (Handlirsch); Bad Vöslau (Paganetti); same locality, [18]91 (Handlirsch) (NMW).

The *Kervillea* group of genera: *Kervillea* Bergevin, 1918; *Latematium* Dlabola, 1979; *Scorlupella* Emelja-



Figs. 20–25. Ovipositor: (20–22) *Kervillea placophora* (Horváth) [(20) gonapophyses IX, dorsal view; (21) gonapophyses IX, lateral view; (22) gonapophysis VIII, ventral view]; (23–25) *Latematium latifrons* (Fieber) [(23) gonapophyses IX, dorsal view; (24) gonapophyses IX, lateral view; (25) gonapophysis VIII, ventral view].

nov, 1971; *Falcidiopsis* Kusnezov, 1930; *Rhissolepus* Emeljanov, 1971; and *Boothea* Emeljanov, 1964. The genera are grouped based on the following characters: lobes of median field (*mf*) closely approximate, folded (Fig. 20) and distal parts of the posterior connective laminae bent before apex arcuately or at an obtuse angle (Figs. 23, 29).

Genus *KERVILLEA* Bergevin, 1918

Description. Anal tube (*An*) slightly narrowed to rounded apex (in dorsal view). Anal column (*AC*) rather long (about 0.33 times as long as anal tube). Border between 1st (*Gp 1*) and 2nd (*Gp 2*) gonoplac lobes formed by deep transverse notch. Third gonoplac

lobes (*Gp 3*) heavily sclerotized and pigmented, fork (*Fk*) nearly merged with lateral fields. Distal parts of posterior connective laminae (*dPCL*) abruptly curved toward median line. Lateral fields (*lf*) projecting to form appendages. Dorsal margin of gonocoxa VIII (*Gx VIII*) projecting slightly beyond the plane of triangular sclerotized plate (*TPL*) in proximal part. Endogonocoxal process (*GxP*) gradually (*K. conspurcata*, *K. tekirdagica*) or abruptly (*K. placophora*) narrowed to apex; apical lobe (*al*) simple and short (*K. placophora*, *K. conspurcata*) or elongate (*K. tekirdagica*). Apical group (*ar*) of anterior connective lamina (*ACL*) with 3 teeth on carina; lateral group (*lt*) bearing 3 teeth with carinae.

Kervillea placophora (Horváth, 1905) (Figs. 20–22).

Material. Asia Minor, Angora [Ankara], 26.V.1925 (Biró) (HNHM).

Kervillea conspurcata (Spinola, 1839).

Material. Yugoslavia, Deliblát, Banat (Holtz) (ZIN).

Kervillea tekirdagica (Dlabola, 1982).

Material. Bulgaria, Perla, 27.V.1973 (V. Bayryamova) (BIZ).

Genus *LATEMATIUM* Dlabola, 1979

Description. Anal tube (*An*) elongate (nearly rectangular), rounded apically (in dorsal view). Anal column (*AC*) long (0.33–0.50 times as long as anal tube). Border between 1st (*Gp 1*) and 2nd (*Gp 2*) gonoplac lobes in the form of deep notch. Distal parts of posterior connective laminae (*dPCL*) bent before apex at an obtuse angle (in dorsal view). Lateral fields (*lf*) protruding to form long appendages. Gonocoxa VIII (*Gx VIII*) with lobe-like protruding dorsal margin (*db*) most distinct in proximal part. Endogonocoxal process (*GxP*) gradually narrowed to apex; apical lobe (*al*) simple and short. Apical group (*at*) of anterior connective lamina (*ACL*) with 3 teeth; lateral group (*lt*) bearing 2 or 3 teeth with carinae.

Latematium latifrons (Fieber, 1877) (Figs. 6, 23–25).

Material. Bulgaria, 3 km NE of Bosnek, 1000–1100 m a.s.l., 21.VII.2000 (Gnezdilov) (ZIN); Yugoslavia, Deliblát, Banat (Holtz) (ZIN).

Genus *SCORLUPELLA* Emeljanov, 1971

Description. Anal tube (*An*) slightly narrowed to widely rounded apex (in dorsal view). Anal column (*AC*) rather long (0.33–0.50 times as long as anal tube), narrow. Border between 1st (*Gp 1*) and 2nd (*Gp 2*) gonoplac lobes in the form of shallow notch and fold. Distal parts of posterior connective laminae (*dPCL*) arcuately (*S. discolor*, *S. montana*) or obtuse-angularly (*S. medea*) bent before apex. Lateral fields (*lf*) projecting to form short appendages (dorsal view). Gonocoxa VIII (*Gx VIII*) with dorsal margin (*db*) lobe-like protruding along entire length. Endogonocoxal process (*GxP*) gradually narrowed to apex; apical lobe (*al*) simple, wide, short. Apical group (*at*) of anterior connective lamina (*ACL*) with 3 teeth; lateral group (*lt*) bearing 3 teeth with carinae.

Scorlupella discolor (Germar, 1821) (Figs. 26–28).

Material. Ukraine, the Crimea, northwestern spurs of the Ai-Petrinskaya Yaila Range, Sarykaya Mt., 23.V.2000 (N.N. Yunakov) (ZIN).

Scorlupella medea Logvinenko, 1978.

Material. Russia, Krasnodar Territory, Azovskaya Vill., 23.V.1997 (Gnezdilov) (ZIN).

Scorlupella montana Becker, 1865.

Material. Russia, Krasnodar Territory, Bol'shoi Utrish Vill., 28.V.1999 (Gnezdilov) (ZIN).

Genus *FALCIDIOPSIS* Kusnezov, 1930

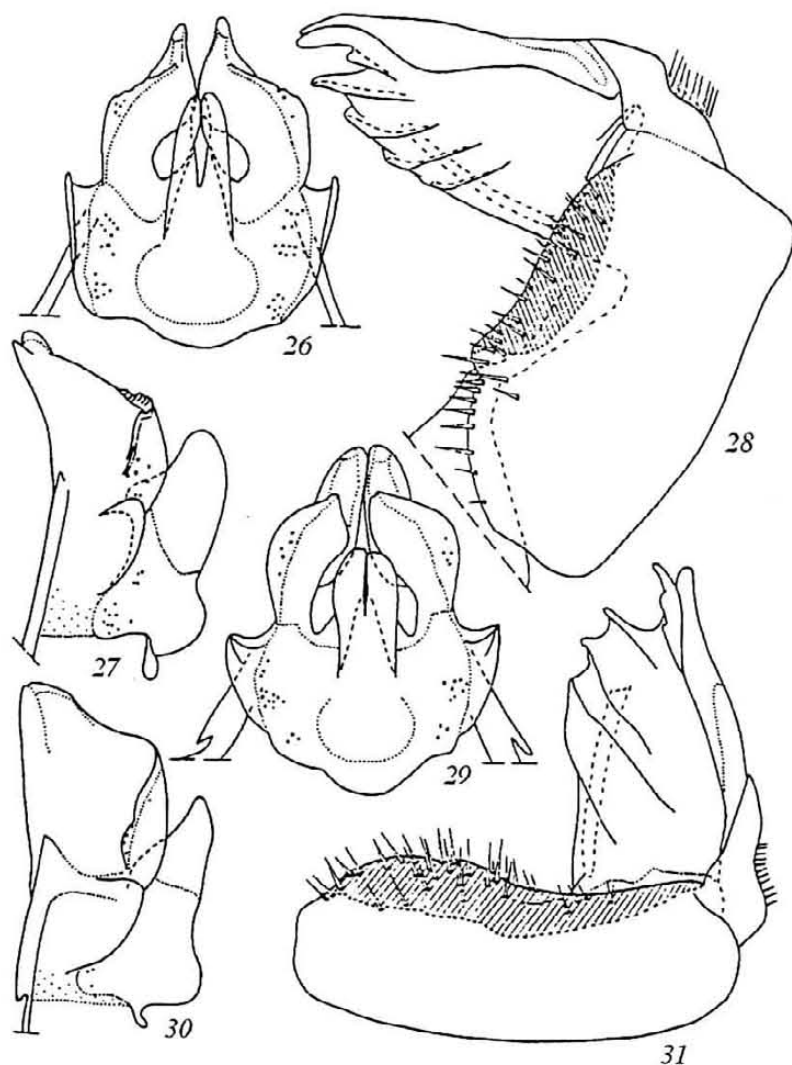
Description. Anal tube (*An*) slightly narrowed at ends (in dorsal view), slightly convex (in lateral view). Anal column (*AC*) short (0.16–0.20 times as long as anal tube), narrow. Border between 1st (*Gp 1*) and 2nd (*Gp 2*) gonoplac lobes in the form of transverse fold. Distal parts of posterior connective laminae (*dPCL*) arcuately bent before apex. Lateral fields (*lf*) projecting to form short appendages (dorsal view). Gonocoxa VIII (*Gx VIII*) with lobe-like protruding dorsal margin (*db*) most distinct in proximal part. Endogonocoxal process (*GxP*) gradually narrowed to apex; apical lobe (*al*) simple, short. Apical group (*at*) of anterior connective lamina (*ACL*) with 3 teeth (lower tooth smoothed); lateral group (*lt*) bearing 3 teeth with carinae.

Falcidiopsis kirgisorum Kusnezov, 1930 (Figs. 29–31).

Material. Kazakhstan, Ural Province, Lake Inder, 1–2.VI.1932 (F.K. Lukjanovitsh) (ZIN).

Genus *RHISSOLEPUS* Emeljanov, 1971

Description. Anal tube (*An*) constricted slightly above the middle, shallowly emarginate apically (in dorsal view), convex (in lateral view). Anal column (*AC*) rather long (about 0.33 times as long as anal tube). First gonoplac lobes (*Gp 1*) with faintly pigmented area on outer surface. Border between 1st (*Gp 1*) and 2nd (*Gp 2*) gonoplac lobes formed by deep notch. Distal parts of posterior connective laminae (*dPCL*) arcuately bent before apex. Lateral fields (*lf*) projecting to form short appendages (in dorsal view). Gonocoxa VIII (*Gx VIII*) with lobe-like protruding dorsal margin (*db*) most distinct in proximal part. Endogonocoxal process (*GxP*) gradually narrowed to apex; apical lobe (*al*) simple, short. Apical group (*at*) of ante-



Figs. 26–31. Ovipositor: (26–28) *Scolopella discolor* (Germar) [(26) gonapophyses IX, dorsal view; (27) gonapophyses IX, lateral view; (28) gonapophysis VIII, ventral view]; (29–31) *Falcidiopsis kirgisorum* Kusnezov [(29) gonapophyses IX, dorsal view; (30) gonapophyses IX, lateral view; (31) gonapophysis VIII, ventral view].

rior connective lamina (ACL) with 3 teeth (lower tooth short); lateral group (*lt*) bearing 3 teeth with carinae.

Rhissolepus ergenense (Becker, 1865) (Figs. 9, 35, 36).

Material. Kazakhstan, Akmolinsk Province, Kokshe Tau Mt., near Tersakkan River, 28.V.1957 (A.F. Emeljanov) (ZIN).

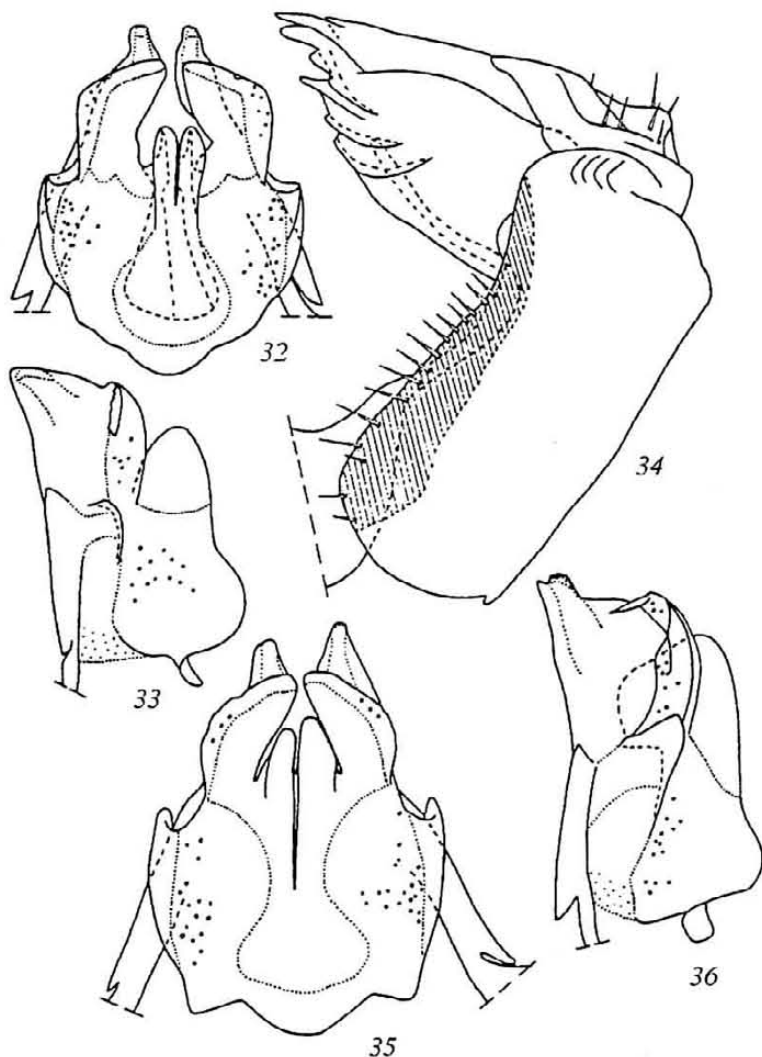
Genus *BOOTHECA* Emeljanov, 1964

Description. Anal tube (*An*) elongate, weakly constricted in middle part, emarginate at apex (in dorsal view). Anal column (*AC*) rather long (about 0.33 times as long as anal tube). Border between 1st (*Gp 1*) and 2nd (*Gp 2*) gonoplac lobes formed by deep notch. Dis-

tal parts of posterior connective laminae (*dPCL*) bent before apex at obtuse angle. Lateral fields (*lf*) projecting to form short appendages (dorsal view). Gonocoxa VIII (*Gx VIII*) with lobe-like projecting dorsal margin (*db*) most distinct in proximal part. Endogonocoxal process (*GxP*) abruptly (angularly) narrowed to apex; apical lobe (*al*) simple, rather short. Apical group (*at*) of anterior connective lamina (*ACL*) with 3 teeth on carina; lateral group (*lt*) bearing 3 teeth with carinae.

Bootheca taurus (Oshanin, 1870) (Figs. 32–34).

Material. Ukraine, Vinnitsa Province, Yampol' District, Severinovka Vill., 29.VI.1966 (V.N. Logvinenko) (ZIN).



Figs. 32–36. Ovipositor: (32–34) *Boothecca taurus* (Oshanin) [(32) gonapophyses IX, dorsal view; (33) gonapophyses IX, lateral view; (34) gonapophysis VIII, ventral view]; (35, 36) *Rhissolepus ergenense* (Becker) [(35) gonapophyses IX, dorsal view; (36) gonapophyses IX, lateral view].

The *Bubastia* group of genera: *Bubastia* Emeljanov, 1975; *Mulsantereum* gen. n., and *Falcidius* Stål, 1866. The genera are similar in the presence of the entire median field (*mf*) with a specific longitudinal fold running along the median line (Figs. 37, 40, 43).

Genus *BUBASTIA* Emeljanov, 1975

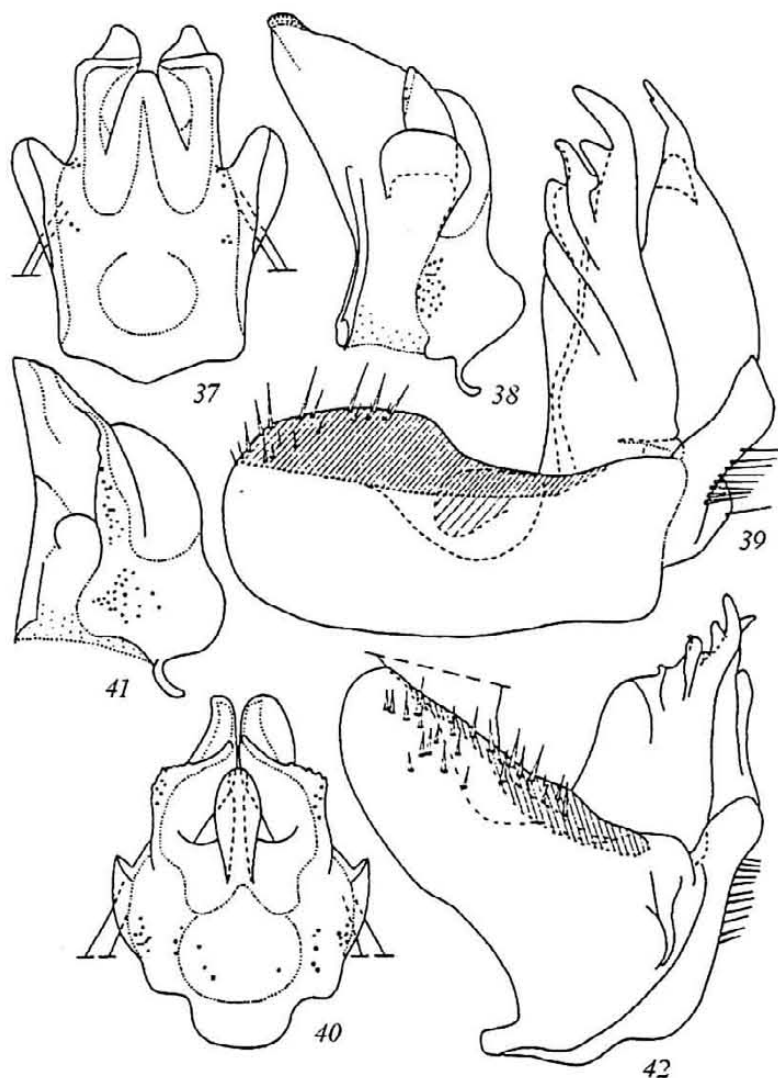
Description. Anal tube (*An*) narrowed, or, in contrast, strongly widened to apex (in dorsal view). Anal column (*AC*) rather short (0.25–0.33 times as long as anal tube), narrow. Border between 1st (*Gp 1*) and 2nd (*Gp 2*) gonoploc lobes presented by small fold. Distal parts of posterior connective laminae (*dPCL*) obtuse-angularly or arcuately bent before apex. Lateral fields (*lf*) projecting to form short appendages (in dorsal

view). Dorsal margin of gonocoxa VIII (*Gx VIII*) weakly or lobe-shaped (*db*) projecting. Endogonocoxal process (*GxP*) gradually narrowed to apex; apical lobe (*al*) simple, rather narrow. Apical group (*at*) of anterior connective lamina (*ACL*) with 3 teeth; lateral group (*lt*) bearing 2 or 3 teeth with carinae.

Subgenus *Bubastia* Emeljanov, 1975

Description. Anal tube (*An*) narrowed to apex (in dorsal view). Dorsal margin of gonocoxa VIII (*Gx VIII*) protruding slightly beyond the plane of triangular sclerotized plate (*TPL*) (Fig. 42).

The subgenus is also characterized by the presence of a wide apex of the stylus in male (in dorsal view).



Figs. 37–42. Ovipositor: (37–39) *Mulsantereum maculifrons* (Mulsant et Rey) [(37) gonapophyses IX, dorsal view; (38) gonapophyses IX, lateral view; (39) gonapophysis VIII, ventral view]; (40–42) *Bubastia taurica* (Kusnezov) [(40) gonapophyses IX, dorsal view; (41) gonapophyses IX, lateral view; (42) gonapophysis VIII, ventral view].

Bubastia taurica (Kusnezov, 1926) (Figs. 40–42).

Material. Russia, Krasnodar Territory, Gelendzhik, Markotkh Range, 16.IX.1996 (Gnezdilov) (ZIN).

Bubastia ludviki Dlabola, 1979.

Material. Bulgaria, near Beledie Khan, 18.VII.2000 (Gnezdilov) (ZIN).

Bubastia josifovi Dlabola, 1980.

Material. Bulgaria, 2 km E of Khyrsovo, 31.VII.2000 (Gnezdilov) (ZIN).

Subgenus *Logvinenkoana* Gnezdilov, subgen. n.

Type species *Hysteropterum pictifrons* Melichar, 1906:140 (non sensu Linnavuori, 1952; Dlabola, 1979).

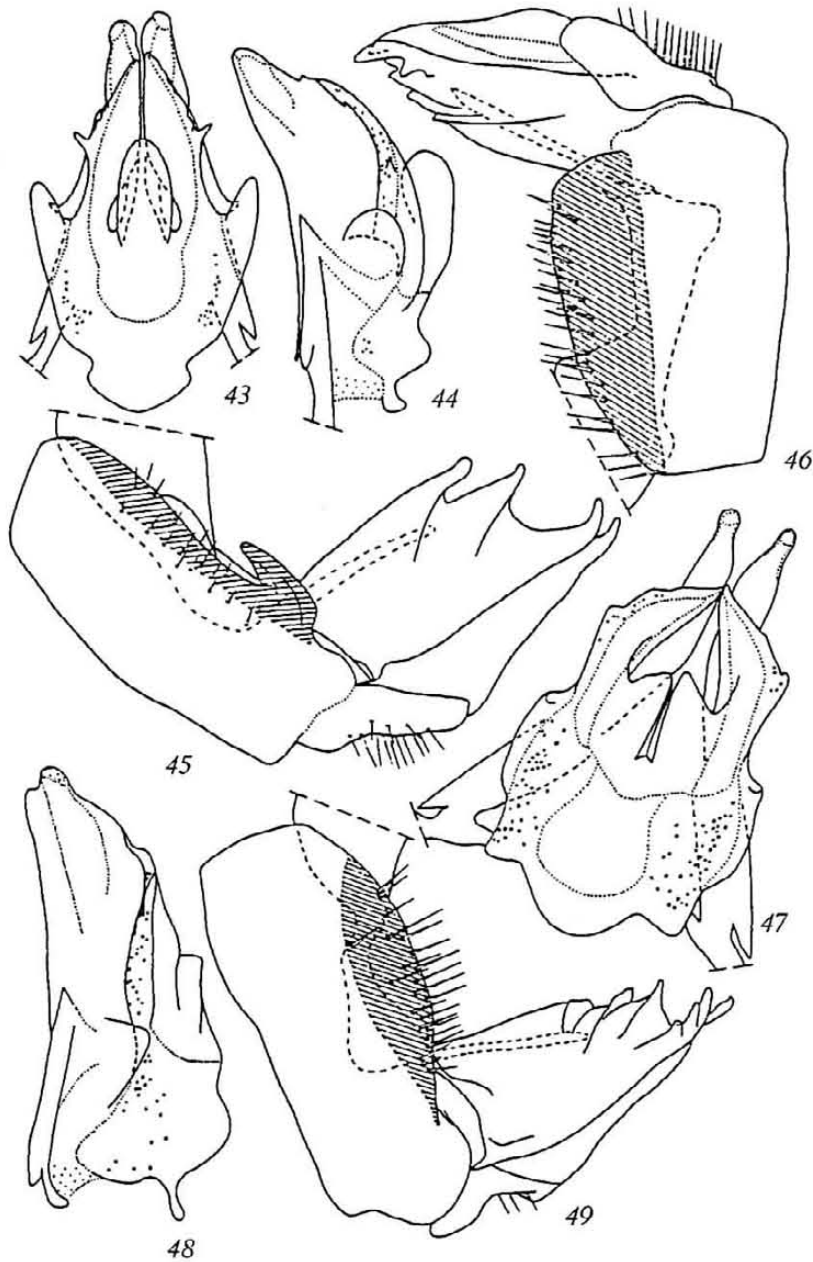
Description. Anal tube (An) strongly widened in apical part (in dorsal view). Dorsal margin of gonocoxa VIII (*Gx VIII*) lobe-like (*db*) projecting beyond the plane of triangular plate of gonapophysis VIII (Fig. 46).

The subgenus is also characterized by narrow apex of the stylus in male (dorsal view).

Etymology. The subgenus is named for V.N. Logvinenko, a well-known investigator of the Cicadina fauna of the Caucasus.

Bubastia pictifrons (Melichar, 1906) (Fig. 46).

Material. Armenia, Akhtala, 28.VIII.1923 (ZIN).



Figs. 43–49. Ovipositor: (43–46) *Falcidius apterus* (Fabricius) [(43) gonapophyses IX, dorsal view; (44) gonapophyses IX, lateral view; (45) gonapophysis VIII, ventral view; (46) *Bubastia pictifrons* (Melichar), gonapophysis VIII, ventral view]; (47–49) *Mycterodus intricatus* Stål [(47) gonapophyses IX, dorsal view; (48) gonapophyses IX, lateral view; (49) gonapophysis VIII, ventral view].

In addition to the type species, this subgenus also includes *Bubastia transcaucasica* (Melichar, 1914), *B. karabachica* (Logvinenko, 1975), and *B. midica* (Logvinenko, 1975).

Genus *MULSANTEREUM* Gnezdilov, gen. n.

Type species *Hysteropterum maculifrons* Mulsant et Rey, 1855 : 101–103.

Description. Anal tube (*An*) parallel-sided, emarginate apically (in dorsal view). Anal column (*AC*) short (0.20–0.25 times as long as anal tube), wide. Border between 1st (*Gp 1*) and 2nd (*Gp 2*) gonoplac lobes inconspicuous. Distal parts of posterior connective laminae (*dPCL*) bent before apex at right angle (dorsal view). Lateral fields (*lf*) projecting in the form of appendages. Dorsal margin of gonocoxa VIII (*Gx VIII*)

lobe-like protruding (*db*) beyond the plane of triangular plate (*TPL*) only in proximal part. Triangular plate (*TPL*) with large pigmented fold (*ap*) at base of anterior connective lamina (*ACL*). Endogonocoxal process (*GxP*) gradually narrowed to apex, apical lobe (*al*) simple. Apical (*at*) and lateral (*lt*) groups of anterior connective lamina (*ACL*) bearing 3 teeth with carinae.

Etymology. The genus is named for E. Mulsant and Cl. Rey.

Mulsantereum maculifrons (Mulsant et Rey, 1855), **comb. n.** (Figs. 5, 37–39).

Material. Hispania, Montserrat (Coll. Horváth, HNHM); France, Banyuls (Pyrénées Orientales), 23.V.1934 (Coll. Ribaut, MNHN).

Genus *FALCIDIUS* Stål, 1866

Description. Anal tube (*An*) nearly parallel-sided, weakly constricted near middle (in dorsal view). Anal column (*AC*) rather long (about 0.33 times as long as anal tube). Gonoplasts with low transverse carinae on outer surface. Border between 1st (*Gp 1*) and 2nd (*Gp 2*) gonoplast lobes formed by deep notch. Distal parts of posterior connective laminae (*dPCL*) converging toward apex at acute angle (in dorsal view), with 2 robust teeth at place of curve. Lateral fields (*lf*) projecting to form long appendages (in dorsal view). Dorsal margin of gonocoxa VIII (*Gx VIII*) weakly projecting; in *F. apterus*, distal part with leaf-shaped lobe overlying triangular plate (*TPL*). Endogonocoxal process (*GxP*) gradually narrowed to apex; apical lobe (*al*) simple, narrow. Apical group (*at*) of anterior connective lamina (*ACL*) with 3 teeth on carina (upper tooth well developed, lower one inconspicuous); lateral group (*lt*) bearing 2 large teeth with carinae and small tubercle on inner side at base of *ACL*.

Falcidius apterus (Fabricius, 1794) (Figs. 43–45).

Material. Algeria, [18]60 (C. Morawitz) (ZIN).

The *Mycterodus* group of genera: *Mycterodus* Spinola, 1839; *Latilica* Emeljanov, 1971; *Kovacsiana* Synave, 1956; and *Kivupterum* Dlabola, 1984. The genera share a great number of characters: the anal tube (*An*) is elongate and narrowed to the apex (dorsal view), convex (lateral view). Border between 1st (*Gp 1*) and 2nd gonoplast lobes is inconspicuous; the distal parts of the posterior connective laminae (*dPCL*) are bent before the apex at an obtuse angle; lateral fields (*lf*) protrude to form short appendages (dorsal view);

upper part of the median field (*mf*) forms 2 short lobes (dorsal view); and gonocoxa VIII (*Gx VIII*) has a lobe-like projecting dorsal margin (*db*).

Genus *MYCTERODUS* Spinola, 1839

Description. Anal column (*AC*) short (0.16–0.20 times as long as anal tube). Gonocoxa VIII (*Gx VIII*) with lobe-like dorsal margin (*db*) projecting only in proximal part. Apical group (*at*) of anterior connective lamina (*ACL*) with 3 teeth; lateral group (*lt*) bearing 4 or 5 teeth with carinae.

Subgenus *Mycterodus* Spinola, 1839

Description. Anal column (*AC*) wide. Endogonocoxal process abruptly narrowed to apex; apical lobe (*al*) distinctly two-digitate (*M. intricatus*) or weakly bifurcate (*M. rostratulus*). Apical group (*at*) of anterior connective lamina (*ACL*) with 3 teeth; lateral group (*lt*) with 5 teeth.

Mycterodus intricatus Stål, 1861 (Figs. 47–49).

Material. Ukraine, the Crimea, Simferopol Uezd, near Neizau, 16.V.1924 (V.N. Kusnezov) (ZIN).

Mycterodus rostratulus Emeljanov, 1964.

Material. Russia, Krasnodar Territory, Anapa, 18.VI.1997 (Gnezdilov) (ZIN).

Subgenus *Comporodus* Kocak, 1982

Description. Anal column (*AC*) narrow. Endogonocoxal process (*GxP*) gradually narrowed to apex; apical lobe of process (*al*) weakly bifurcate apically. Apical group (*at*) of anterior connective lamina (*ACL*) with 3 teeth; lateral group (*lt*) bearing 4 teeth with carinae.

Mycterodus ovifrons (Puton, 1890).

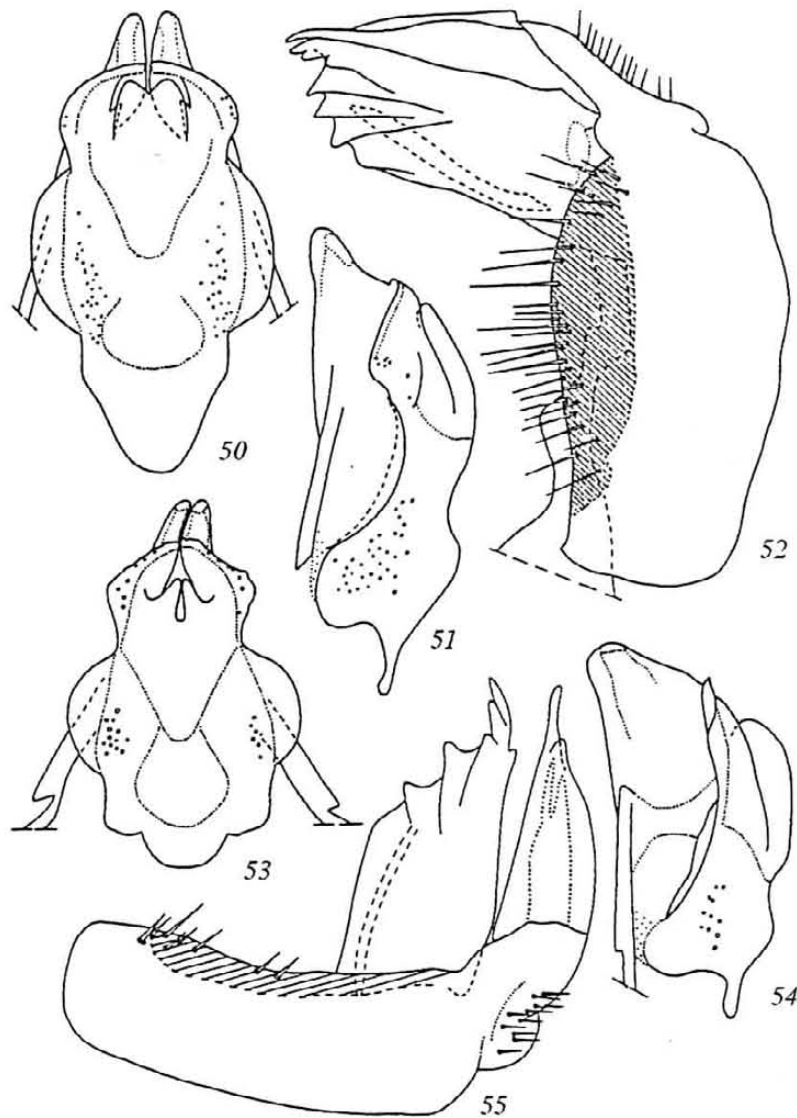
Material. Russia, Krasnodar, 21.VIII.1998 (Gnezdilov) (ZIN).

Subgenus *Aconosimus* Dlabola, 1983

Description. Anal column (*AC*) narrow. Endogonocoxal process (*GxP*) abruptly (angularly) narrowed to apex; apical lobe (*al*) simple. Apical group (*at*) of anterior connective lamina (*ACL*) with 3 teeth; lateral group (*lt*) bearing 4 teeth with carinae.

Mycterodus goricus Dlabola, 1958.

Material. Armenia, Lichk, Megri, 1953 (V.A. Trjapitzin) (ZIN).



Figs. 50–55. Ovipositor: (50–52) *Latilica emeljanovi* Logvinenko [(50) gonapophyses IX, dorsal view; (51) gonapophyses IX, lateral view; (52) gonapophysis VIII, ventral view]; (53–55) *Kivupterum melichari* (Schmidt) [(53) gonapophyses IX, dorsal view; (54) gonapophyses IX, lateral view; (55) gonapophysis VIII, ventral view].

Genus *LATILICA* Emeljanov, 1971

Description. Anal tube (*An*) weakly constricted near the middle (in dorsal view). Anal column (*AC*) rather short (0.25–0.33 times as long as anal tube), narrow. Gonoplares with transverse prominence on outer surface. Dorsal margin of gonocoxa VIII (*Gx VIII*) lobe-like projecting (*db*) along entire length (*L. emeljanovi*) or weakening in distal part (*M. maculipes*). Endogonocoxal process (*GxP*) gradually narrowed to apex; apical lobe (*al*) two-digitate (weakly bifurcate). Apical group (*at*) of anterior connective lamina (*ACL*) with 3 teeth; lateral group (*lt*) bearing 3 teeth with carinae.

Latilica emeljanovi Logvinenko, 1975 (Figs. 50–52).

Material. Ukraine, the Crimea, Nikitskii Botanical Garden, 20.VII.1951 (M.M. Loginova) (ZIN); Nikita Vill., Cape Mart'yan, 16.XI.2000 (N.N. Yunakov) (ZIN).

Latilica maculipes (Melichar, 1906).

Material. Italy, Lazio, Tirrenian Sea coast, Goeta, 8.IX.2000 (M.G. Volkovitsh) (ZIN).

Genus *KOVACSIANA* Synave, 1956

Description. Anal tube (*An*) weakly constricted near the middle (in dorsal view). Anal column (*AC*)

rather long (about 0.33 times as long as anal tube), narrow. Dorsal margin of gonocoxa VIII (*Gx VIII*) lobe-like projecting (*db*) in proximal part, forming triangular lobe in distal part. Endogonocoxal process (*GxP*) abruptly (angularly) narrowed to apex; apical lobe (*al*) simple, narrow. Apical group (*at*) of anterior connective lamina (*ACL*) with 3 teeth; lateral group (*lt*) bearing 4 teeth with carinae.

Kovacsiana abyssinica Synave, 1956 (Figs. 56–58).

Material. "Abessinia or.," Harrar, 17.III.[18]99 (Dmitriev) (ZIN); Ethiopia, 35 km W of Ambo, Adis-Alem, 13.VI.1990 (A.F. Emeljanov) (ZIN).

Genus *KIVUPTERUM* Dlabola, 1984

Description. Anal column (*AC*) rather short (0.20–0.33 times as long as anal tube), narrow. Dorsal margin of gonocoxa VIII (*Gx VIII*) lobe-like projecting (*db*) along entire length. Apical lobe (*al*) of endogonocoxal process simple, narrow. Apical group (*at*) of anterior connective lamina (*ACL*) with 3 teeth; lateral group (*lt*) bearing 2 or 3 teeth with carinae.

Kivupterum melichari (Schmidt, 1910) (Figs. 53–55).

Material. Ethiopia, Ambo, 9.VI.1990 (A.F. Emeljanov) (ZIN).

Kivupterum kivuense (Synave, 1957).

Material. Sudan, Equatoria, Kateri-Gilo, 18.III.1963 (R. Linnavuori) (ZIN).

Genus *ALLOSCELIS* Kusnezov, 1930

Description. Anal tube (*An*) elongate, tapered apically (in dorsal view), with carina along median line on dorsal surface. Anal column (*AC*) short (about 0.14 times as long as anal tube), wide. Border between 1st (*Gp 1*) and 2nd (*Gp 2*) gonoplac lobes obsolete. Third gonoplac lobes (*Gp 3*) faintly pigmented. Distal parts of posterior connective laminae (*dPCL*) abruptly bent before apex (at nearly right angle). Lateral fields (*lf*) protruding in the form of appendages. Median field (*mf*) with 2 prominent lobes along median line (in dorsal view). Dorsal margin of gonocoxa VIII (*Gx VIII*) lobe-like protruding (*db*) in proximal part. Endogonocoxal process (*GxP*) gradually narrowed to apex; apical lobe (*al*) simple, rather short. Apical group (*at*) of anterior connective lamina (*ACL*) with 1 tooth (preapical tubercle also present); lateral group (*lt*) bearing 5 teeth with carinae; inner side with rather small prominence at base of *ACL*.

Alloscelis vittifrons (Ivanoff, 1885) (Figs. 59–61).

Material. Russia, Krasnodar Territory, Kavkazskaya Vill., 5.VII.1999 (Gnezdilov) (ZIN).

Morphological (Emeljanov, 1964; Logvinenko, 1975; Dlabola, 1987) and bioacoustical (Tishechkin, 1998) data show that the genus *Alloscelis*, previously erroneously placed in the subfamily Caliscelinae (family Caliscelidae at present), undoubtedly belongs to the subfamily Issinae. The genus holds a distinctive position in the subtribe, differing from the other genera in the presence of a longitudinal carina on the anal tube.

Subtribe **AGALMATIINA** Gnezdilov, subtrib. n.

Type genus *Agalmatium* Emeljanov, 1971.

Genus *AGALMATIUM* Emeljanov, 1971

Description. Anal tube (*An*) slightly narrowed at ends, widely rounded at apex, or strongly widened and emarginate apically (in dorsal view). Anal column (*AC*) rather long (about 0.33 times as long as anal tube), narrow. Border between 1st (*Gp 1*) and 2nd (*Gp 2*) gonoplac lobes obsolete. Gonoplacs with transverse carinae on outer surface. Distal parts of posterior connective lamina (*dPCL*) gently arcuately bent before apex. Lateral fields (*lf*) flat. Median field (*mf*) with 2 lobes in upper part (in dorsal view). Dorsal margin of gonocoxa VIII (*Gx VIII*) lobe-like protruding (*db*) along entire length, angularly projecting in distal part. Endogonocoxal process (*GxP*) gradually narrowed to apex; apical lobe (*al*) simple, narrow. Apical group (*at*) of anterior connective lamina (*ACL*) with 3 teeth (lowest tooth ill-defined); lateral group (*lt*) bearing 2 or 3 teeth and 4 or 5 carinae (on right and left *ACL* in one specimen of *Agalmatium bilobum*).

Agalmatium flavescens (Oliver, 1791) (Figs. 62–64).

Material. Bulgaria, Kamilski Dol Vill., 5.VIII.2000 (Gnezdilov) (ZIN).

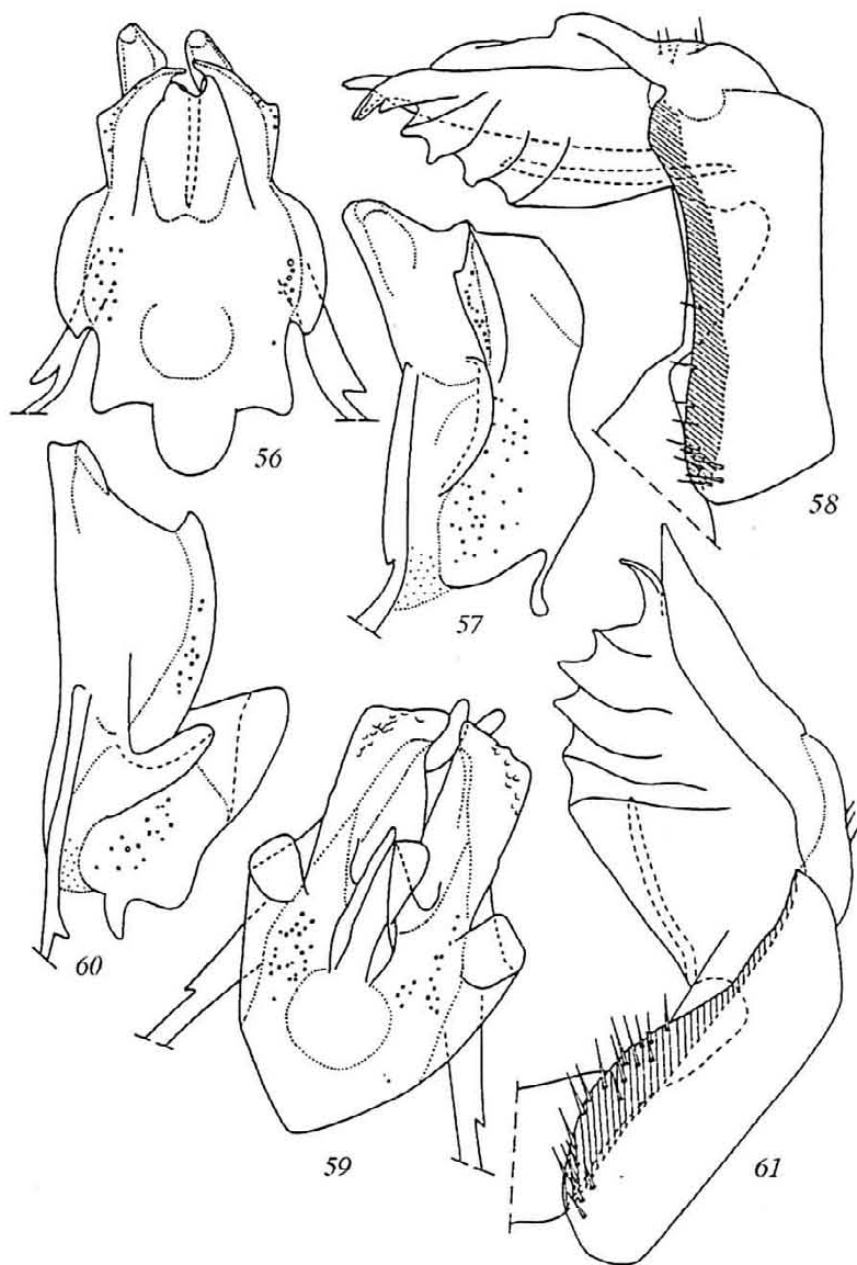
Agalmatium bilobum (Fieber, 1877).

Material. Russia, Krasnodar Territory, environs of Novorossiisk, Markotkh Range, 25.VII.1997 (Gnezdilov) (ZIN).

Subtribe **ISSINA** Spinola, 1839

Genus *ISSUS* Fabricius, 1803

Description. Anal tube (*An*) gradually narrowed to apex or slightly narrowed at ends (in dorsal view). Anal column (*AC*) short (0.20–0.25 times as long as anal tube), wide. Border between 1st (*Gp 1*) and 2nd



Figs. 56–61. Ovipositor: (56–58) *Kovacsiana abyssinica* Synave [(56) gonapophyses IX, dorsal view; (57) gonapophyses IX, lateral view; (58) gonapophysis VIII, ventral view]; (59–61) *Alloscelis vittifrons* (Ivanoff) [(59) gonapophyses IX, dorsal view; (60) gonapophyses IX, lateral view; (61) gonapophysis VIII, ventral view].

(Gp 2) gonoplac lobes obsolete. Gonoplacs without transverse carinae on outer surface. Distal parts of posterior connective laminae (*dPCL*) arcuately, or at obtuse angle, bent before apex. Median field (*mf*) forming 2 lobes in upper part. Lateral fields (*lf*) flat. Dorsal margin of gonocoxa VIII (*Gx VIII*) lobe-like protruding (*db*). Apical lobe (*al*) of endogonocoxal process two- or three-digitate. Apical group (*at*) of anterior connective lamina (*ACL*) with 1 [*Issus rarus* Lindberg species-group (Remane, 1985)] or 3 teeth on carina;

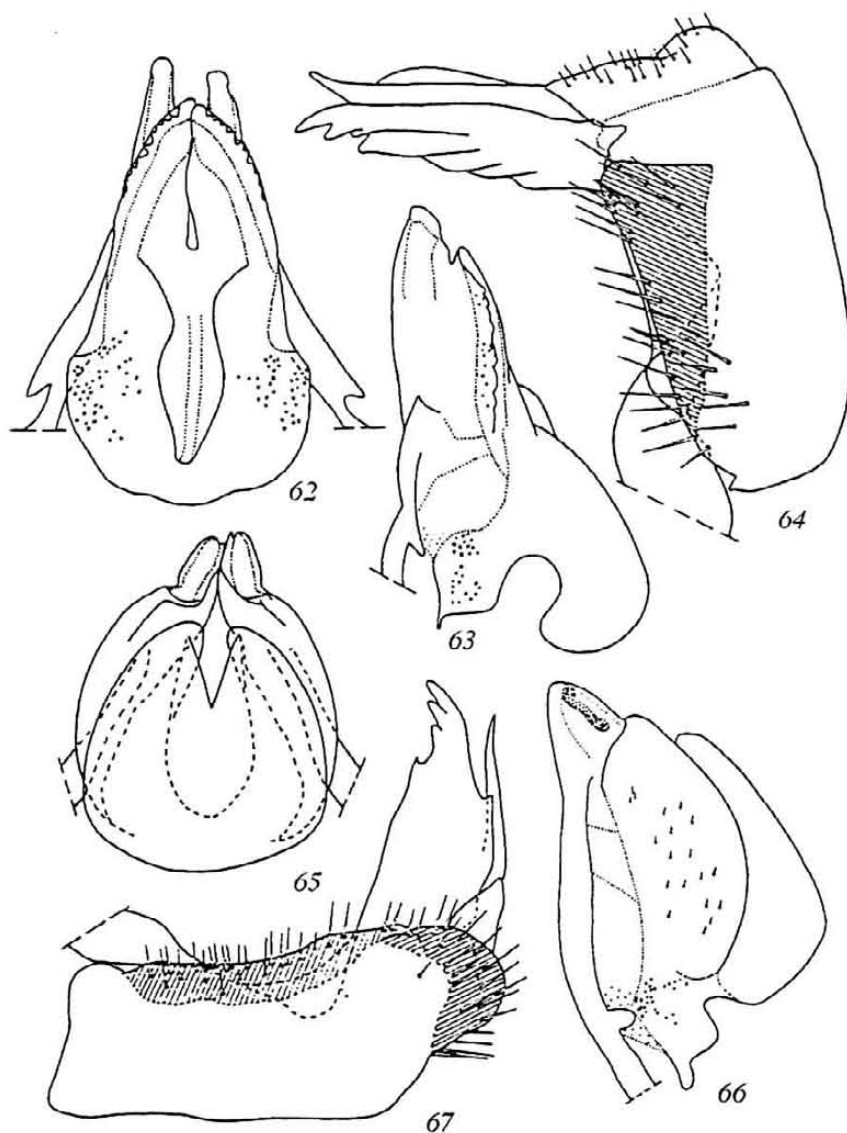
lateral group (*lt*) with 2 teeth (lower tooth ill-defined), 1 or 2 teeth present on the side opposite to comb.

Issus coleoptratus (Fabricius, 1781) (Figs. 4, 65–67).

Material. Switzerland, Vendome–Bonmont, 24.V.1990 (Y. Basset); Slovenia, Gorjansko, Brje pri Komnu, 23.VI.2001 (Gnezdilov) (ZIN).

Issus patruelis Stål, 1861.

Material. Morocco, 1900 (Voucher) (ZIN).



Figs. 62–67. Ovipositor: (62–64) *Agalmatium flavescens* (Olivier) [(62) gonapophyses IX, dorsal view; (63) gonapophyses IX, lateral view; (64) gonapophysis VIII, ventral view]; (65–67) *Issus coleoptratus* (Fabricius) [(65) gonapophyses IX, dorsal view; (66) gonapophyses IX, lateral view; (67) gonapophysis VIII, ventral view].

Issus muscaeformis (Schrank, 1781).

Material. Ukraine, the Crimea, southern slope of Ai-Petrinskaya Yaila Range, near Ugan-Su Waterfall, 15.V.2000 (N.N. Yunakov) (ZIN).

Issus pospisi Dlabola, 1958.

Material. Russia, Krasnodar Territory, 17 km S of Chemigovskoe Vill., 1400–1700 m, 27.V.1998 (V.I. Shchurov) (ZIN).

Issus sp.

Material. Canary Islands, Tenerife, NW of El Tanque, 15.IV.1998 (M.G. Volkovitsh).

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