

Ulopidae of the Palaearctic – the state of the art (Hemiptera: Clypeorrhyncha: Membracoidea)

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Abstract

The Palaearctic representatives of the family Ulopidae are reported. The key to genera and species of the Palaearctic Region is given.

Key words: *Ulopa* GERM., *Utecha* EM., *Asichnus* EM., *Neobufonaria* KOÇ, *Pyrenaeibufonaria* SZW., *Megulopa* LNV., Ulopidae, distribution, key to genera and species.

Introduction

The family Ulopidae is an archaic group of leafhoppers; it consists of almost 40 genera and over 120 species of recently known Membracoidea (SZWEDO & GĘBICKI 2001). Views on Ulopidae vary considerably; EVANS (1947, 1977), HAMILTON (1983), KNIGHT (1973) and NAST (1972, 1987) treat them as a

unclear. Ulopidae are widely distributed on all continents, with the exception of the Nearctic and Neotropical Region (SZWEDO & GĘBICKI 1988, SZWEDO & GĘBICKI 2001). Ulopidae are rather small, rarely medium sized leafhoppers, 2.5 to 12 mm long, in most cases obscure in colour, or with a simple colour pattern. Most ulopids lack the hind wings, and their tegmina are stiff and coriaceous. Ulopidae, as generally recognized, hide in the soil, on the roots and root-necks of plants, in the litter or on low plants; only a few, probably derivatively, feed on shrubs and trees. It can be supposed that most of these species are nocturnal. The lack of reliable biological data on most of the species is a serious research problem.

Palaeartic Ulopidae

In the Palaeartic Region, the family Ulopidae is represented by the single tribe Ulopiini, comprising only five genera with 11 species (SZWEDO & GĘBICKI 2001). The genera *Ulopa* GERMAR 1821 and *Utecha* EMELJANOV 1996 are recorded from Europe and south and east parts of the Mediterranean (Figs 1, 2), and *Megulopa sahlbergorum* LINDBERG 1825 is to be found in the southernmost parts of the Palaeartic Region. The remaining genera are recorded from isolated montane localities (Fig. 3): *Asichnus* EMELJANOV 1992 (monotypic) from the Altai Mts.; *Neobufonaria* KOÇAK 1981 with three reported species: *N. costata* (EMELJANOV 1963) from the North Tian-Shan, *N. oshanini* (EMELJANOV 1963) from the South Tian-Shan and the West Pamirs (SZWEDO & GĘBICKI 2001), and *N. hermelensis* ABDUL-NOUR 2000 from the mountains of Lebanon (ABDUL-NOUR 2000); and *Pyrenaeibufonaria lousiaraphaeli* (DELLA GIUSTINA & BLASCO-ZUMETA 1998) from the Pyrenées Mts. (DELLA GIUSTINA & BLASCO-ZUMETA 1998, SZWEDO 2001b).

The genus *Ulopa* GERM. comprises two species. *Ulopa reticulata* (FABRICIUS 1794) is widespread in Europe, reaching far north to southern Finland and Sweden, and northern Morocco in the south (Fig. 1). It is connected with *Calluna vulgaris* (L.) HULL, of the family Ericaceae. The life-cycle of this species is two years long. Two allochronic generations

Fig. 1:
Distribution of the species of *Ulopa*
FALL.

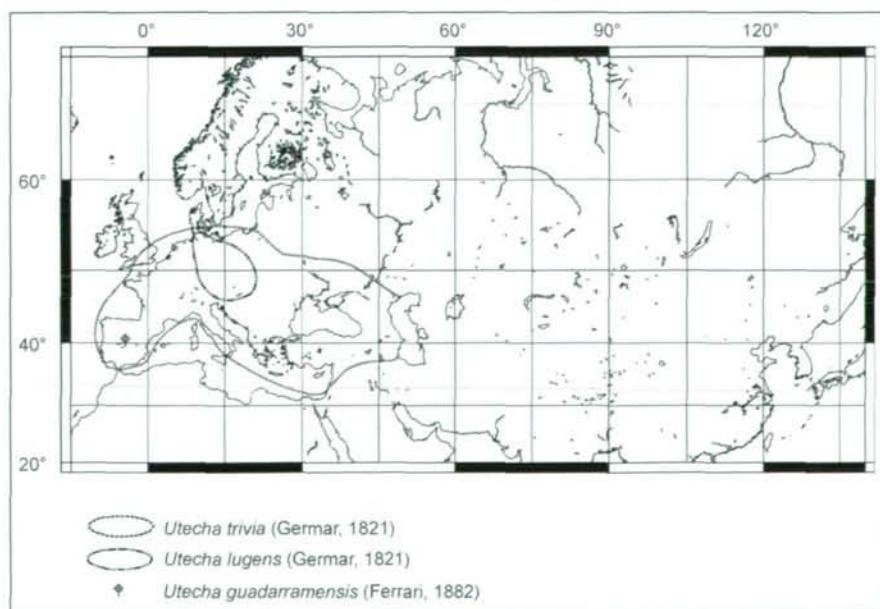
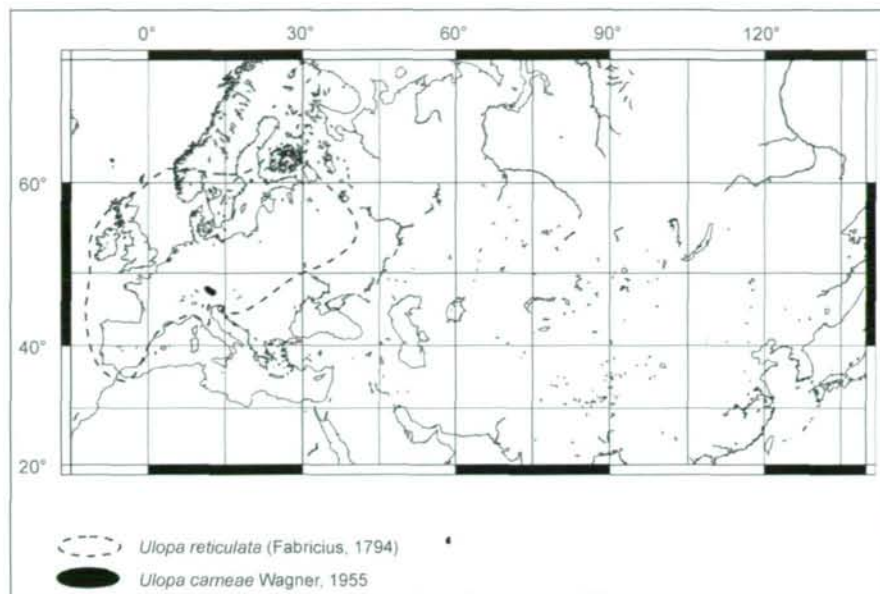


Fig. 2:
Distribution of the species of *Utecha*
EM.

subfamily of Cicadellidae. On the other hand, RIBAUT (1936), METCALF (1962), MÜLLER (1962), OROSZ (1977) and EMELJANOV (1987, 1996) suggest family status of the group. The internal division within Ulopidae into lower rank taxa (subfamilies and tribes) is still

coexists, with one reproducing in the even, and the other in the odd years. Nymphs of 2nd or 4th instar hibernate. The nymphs were collected from the end of April to the middle of August, larval development is complete in August of the following year. The main breeding time occurs after hibernation, from April to June. Observations of the life cycle and population dynamics of *U. reticulata* (F.) are given in MELBER (1989). WALOFF (1981) also includes some biological data in the description of *Halictophagus silwoodensis* WALOFF 1981 (Strepsiptera) – a parasite of *U. reticulata* (F.). According to WALOFF, hibernation occurs in 3rd or 5th instar or in adult forms, and the number of generations per year (two or three) depends on the thermal conditions in early spring and in autumn. The other species – *Ulopa carneae* WAGNER 1955 – is limited in distribution to the Eastern Alps (Fig. 1). It feeds on *Erica herbacea* L. (= *Erica carnea* L.), and was collected 700–2200 m a.s.l. (NICKEL 1999).

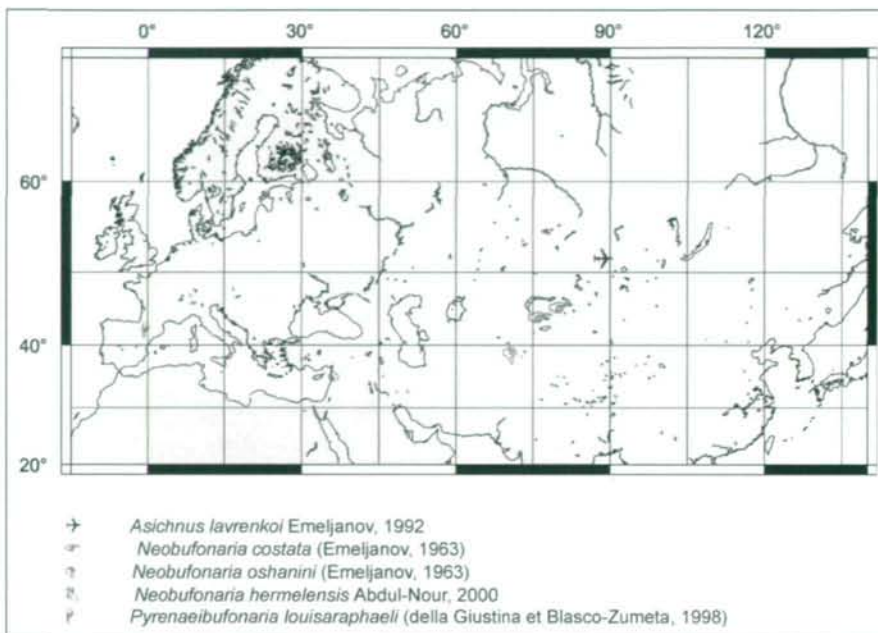
The species named "*Ulopa grisea*" described by WALKER (1851), with its primary homonym *Ulopa grisea* REY 1894, was of uncertain identity. After a re-examination (SZWEDO 2001a) of the type material of Walker and Rey, *Ulopa grisea* WALK. was established as a junior synonym of *Utecha trivialis* (GERMAR 1821).

The genus *Utecha* EMELJANOV 1996 comprises three species (Figs 5–7), of which *Utecha trivialis* (GERM.) is widely distributed in the south-western Palaearctic, reaching north to Denmark, south-east to the Caucasus, and Iran in the south (Fig. 2). The taxonomic status of *Utecha lugens* (GERMAR 1821) is not clear, it is not certain whether it is a distinct species, as stated by OROSZ (1977), or only a macropterous form of *Utecha trivialis* (GERM.). It is worth noting that macropterous forms of *Ulopa reticulata* (F.) have also been recorded, but in low numbers, about 0.1% of the specimens caught (MELBER 1989). *Utecha guadarraensis* (FERR.) is another species that calls for a re-examination (work in progress), as well as some forms from the Greek Islands which differ from the typical *Utecha trivialis* (GERM.). Little is known about the biology of the species of the genus *Utecha* EM., probably all are

connected with the plants of the family Boraginaceae, growing in dry and warm habitats. *U. trivialis* (GERM.) was collected on *Echium vulgare* L., the strict host-plant for other species is not known.

The monotypic genus *Asichnus* EMELJANOV 1992 with *A. lavrenkoi* (EMELJANOV 1992) is known from the Altai Mts. (Figs 3 & 8) Both adults and nymphs were collected

Fig. 3:
Distribution of the species of *Asichnus* EM., *Neobufonaria* KOÇ. and *Pyrenaeibufonaria* SZW.



from the litter and the upper stratum of soil in July–August. *A. lavrenkoi* (EM.) was found 550 up to about 1000 m a.s.l. No data about the host plant or biology of the species are known.

Megulopa sahlbergorum LINDBERG 1925 (Fig. 9) is to be found in the southernmost parts of the Palaearctic Region.

The genus *Neobufonaria* KOÇAK 1981 with three species is known from isolated localities in the Tian-Shan Mts., the West Pamirs and the Lebanon Mts. (Fig. 4) The type-species — *N. oshanini* (EMELJANOV 1963) — is reported from Tadzhikistan (Figs 3 & 10); it was collected in dry "semisavannas" with short grass and many other plants growing on high, dome-like hills, dry in summer and more humid in winter, with occasional freeze. It was found at 1000–1500 m. a.s.l. Another species — *N. costata* (EM.) — lives much higher, 2500–3500 m. a.s.l., in dry, rocky steppes. Recently another species has been described and placed in the genus *Neobufonaria* KOÇ.— *N. hermelenensis*

ABDUL-NOUR 2000 from the Lebanon Mts. This species was found at the altitude of 2000 m a.s.l. among grass and low vegetation of the high montane plateaux (ABDUL-NOUR 2000). Regarding the morphological characters, it seems to be related to *N. costata* (EM.).

The genus *Pyrenaeibufonaria* SZWEDO 2001 (Fig. 11) was erected on the basis of characters of both external morphology and the male

genital block (SZWEDO 2001b). It comprises a single species, once placed in the genus *Neobufonaria* KOÇ., *P. louisaraphaeli* (DELLA GIUSTINA & BLASCO-ZUMETA 1983), described from the Pyrenées (DELLA GIUSTINA & BLASCO-ZUMETA 1983). This species is connected with *Lithodora fruticosa* (L.) GRIESB. of the family Boraginaceae, a plant growing to the altitude of 1500 m. a.s.l. only in the Medi-

Fig. 7:
Utecha guadarramensis (FERR.) –
male specimen from Spain



Fig. 4:
Ulopa reticulata (F.) –
female specimen from Poland



Fig. 5:
Utecha trivia (GERM.) –
male specimen from Poland



Fig. 6:
Utecha lugens (GERM.) – female specimen from Poland in lateral view

terranean zone. According to original data, adult forms appear quite late, in September, and the species is probably univoltine.

It seems that *Pyrenaeibufonaria* SZW., together with *Neobufonaria* KOÇ, from mountains of Lebanon and the Tian Shan, and yet undescribed genus from East Africa, form a group of relict, montane, closely related genera of quite old origin (SZWEDO 2001b).

Fig. 8:
Asichnus lavrenkoi Em. – female specimen from the Altai Mts. in lateral view



Fig. 9:
Megulopa sahlebergorum Ldb. – specimen from Nigeria



Our knowledge of the Palaearctic Ulopidae is still rather nebulous. Further research is necessary to clarify taxonomic and phylogenetic relations within this family. More data about biology, and observation in the field and in the laboratory are necessary. Detailed morphological analysis of the Palaearctic ulopids as well as of Ulopidae from other regions should be carried out. This group deserves also genetic and biochemical studies, which could help find the answer to the question of the origin and relationships of and within Ulopidae, even if recent Ulopidae are highly specialized leafhoppers (or rather 'root-hoppers'). Last but not least, a cladistic analysis supplemented by biogeographical data is necessary.

Fig. 11:
Pyrenaeibufonaria louisaraphaeli (G. & BL.-Z.) – paratype male specimen from Spain



Fig. 10: *Neobufonaria oshanini* (Em.) – male specimen from the Tian Shan Mts.

Key to the identification of Palaearctic Ulopidae

- 1 Edeagus with double shaft and with two gonopores (Figs 12, 20, 28, 33, 37) 2
- Edeagus with single shaft and gonopore (Figs 47, 53, 59, 62)..... 9
- 2 Head distinctly widened at apex, flattened, lateral margins of vertex diverging anteriad. Vertex with three faint longitudinal depressions. Vertex at apex distinctly wider than width of vertex at base, measured between compound eyes. Frontoclypeus flattened, not sharply delimited from anteclypeus. Tegmina coriaceous, distinctly longer than abdomen, narrow, tapered apically. Coarse and dense punctation along elevated longitudinal veins distinct (Fig. 9). Pygofer short, without dorsal incision and with blunt appendix in postero-lateral portion (Fig. 46). Genital styles sharpened and curved apically, with process placed in about half of style length. Edeagus with dorsal gonopores, shafts settle down outside on each side from external wall of pygofer (Figs 45-46). Female with 7th sternite medially insinuated..... **Megulopa** LINDBERG
In the Palaearctic only one species, in the south-eastern Mediterranean — *M. sahlbergorum* LINDBERG 1925.
- Head not widened apically, lateral margins not distinctly diverging anteriad. Vertex short, anterior margin at least slightly wider than posterior measured between compound eyes. Frontoclypeus more or less swollen, sharply divided from anteclypeus by deep furrow. Anteclypeus convex..... 3
- 3 Width of frontoclypeus subequal to width of genal part of face measured below compound eyes (Fig. 44). Posterior margin of pronotum in lateral view straight. Tegmina coriaceous, with elevated longitudinal veins (Fig. 8). Apical processes curved dorsad of shafts of edeagus. Genital valve separated from pygofer by oblique sutures not reaching its anterior margin. Genital style with widened and flattened apical portion, basal portion widened posteriad, bearing large subapical appendices and thickening from above, merged with connective (Figs 37-42). Altai Mts..... **Asichnus** EMELJANOV
Only one species — *Asichnus lavrenkoi* EMELJANOV 1992.
- Frontoclypeus distinctly wider than genae measured below compound eyes. Posterior margin of pronotum in lateral view with posteroventral incision 4
4. Both apices of edeagal shafts obliquely cut, finished with short spine-like subapical appendices (Figs 20-21, 28-29, 33-34). Lateral portion of pygofer lobes without additional appendices on external side or posteriad. Anal tube simple. Antecocular angular protrusions of head lacking. Anteclypeus longer than wide - Fig. 43 (genus *Utecha* EMELJANOV)...
..... 5
Three species *U. guadarrensis* FERRARI 1882, *U. trivia* GERMAR 1821 (type-species) and *U. lugens* GERMAR 1821
- Apices of edeagus straight, with two long apical appendices directed at each other. (Fig. 12). Genital styles tapered apically, with apical portion curved, with quite long lateral appendix. Genital valve completely fused with pygofer. Anterior margin of vertex slightly sinuate - Figs 12-19 (genus *Ulopa* FALLÉN)
..... 8
- 5 Outline of body in lateral aspect ellipsoid, upper line evenly curved (Fig. 27). Hind wings lacking 6
- Outline of body in lateral aspect not evenly curved (Fig. 32), anterior part (head and pronotum) declivitous, broken to almost straight median portion, posterior portion curved ventrally. Tegmina less coriaceous apically. Hind wings developed. Edeagus in dorsal view more obtuse. The space between edeagus shafts wider than width of single shaft (Fig. 33). Apical margin of style in lateral aspect concave (Fig. 35).....
..... **Utecha lugens** (GERMAR)
The taxonomic status of this species is still not resolved.
- 6 Edeagus in dorsal view less obtuse. Single edeagus shaft wider than space between shafts (Fig. 20). Apical margin of style in lateral aspect straight (Fig. 22).....
..... **Utecha trivia** (GERMAR)
Two subspecies *Utecha trivia trivia* (GERM.) and *U. trivia elbursica* DLABOLA are recognized, differing in coloration of male specimens.
- Edeagus with subapical appendices almost touching (Fig. 33). Stylus of simpler spatial form as the other two related species, apical portion in lateral view more slender (Fig. 35)
..... **Utecha guadarrensis** (FERRARI)
The taxonomic status of this species demands further research.
- 8 General colour reddish-brown to brownish, with two oblique whitish streaks on tegmina. On *Calluna vulgaris*
..... **Ulopa reticulata** (FABRICIUS)

- Slightly bigger species, with brighter coloration and drawing as in *U. reticulata* (F.). Longitudinal veins in some cases darker, brownish. On *Erica carnea*, 700-2200 m a.s.l., in the Alps: Tirol, Carinthia, Steiermark, Nieder- and Oberösterreich, Upper Bavaria *Ulopa carneae* WAGNER

9 Lateral outline of body curved (Fig. 58). Anterior margin of head with distinct concavity. Mesonotum with three carinae. Lateral lobes of pygofer with appendix or two appendices in upper portion. Edeagus band-like or tube-like, gonopore ventral - Figs 53-67 (genus *Neobufonaria* KOÇAK)..... 10
Three species described so far.

- Lateral outline of body not convex, almost straight (Fig. 52). Anterior margin of head less concave. Mesonotum with two mediolateral carinae and two less distinct lateral carinae. Median carina obsolete. Genital valve fused with pygofer, but distinguishable (Fig. 51). Lateral lobe of pygofer with single appendix in lower portion (Fig. 50). Edeagus tube-like, gonopore dorsal (Figs 47-48). Genital styles slightly curved in apical portion, with small subapical tooth (Fig. 49). The Pyrenées, 900 m a.s.l. *Pyrenaeibufonaria* SZWEDO

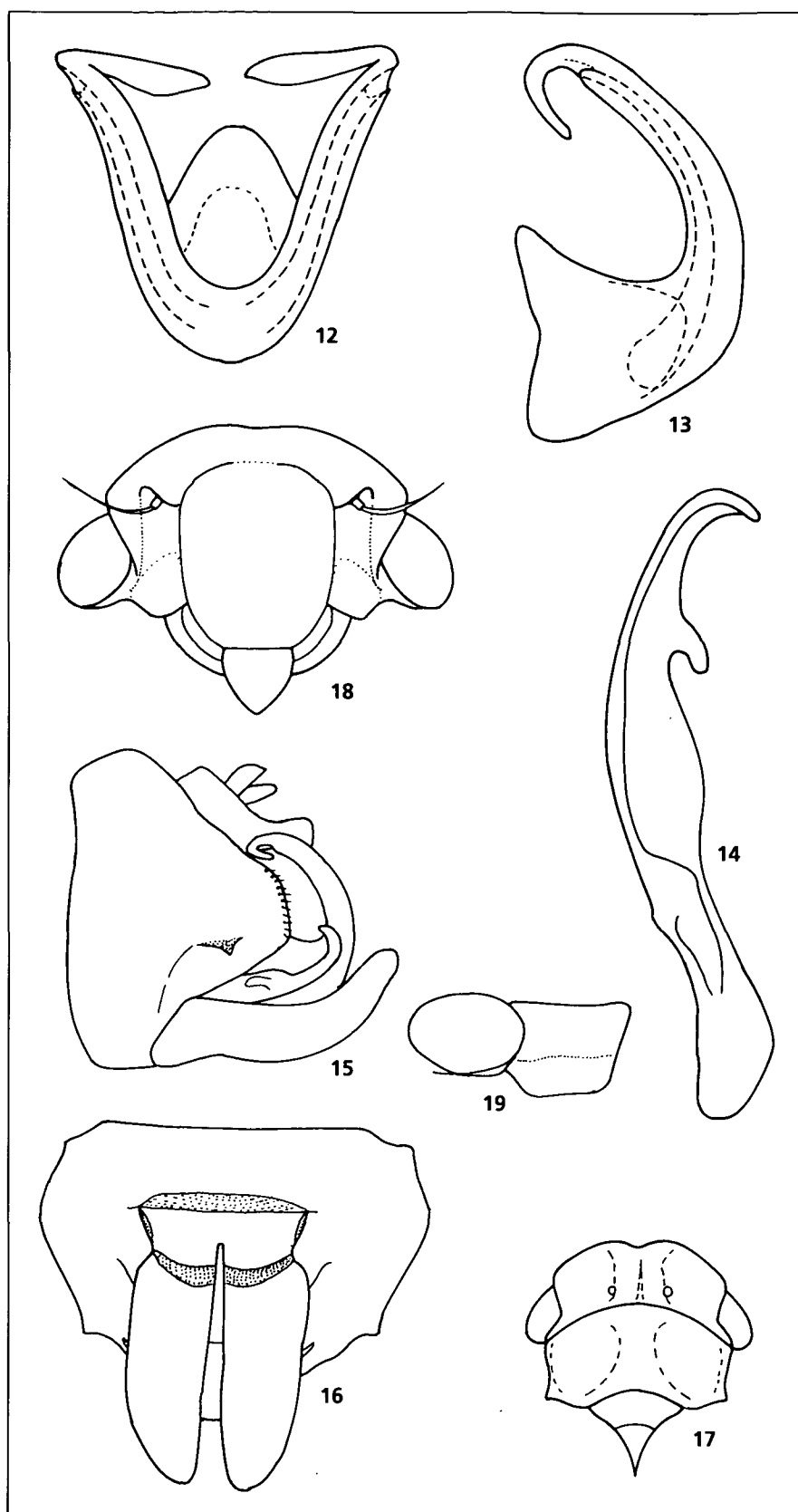
Only one species — *Pyrenaeibufonaria louisaraphaeli* (DELLA GIUSTINA & BLASCO-ZUMETA 1998).

10 Genital plates not divided by transverse suture in distal and base portions, and not fused at base (Fig. 57). Edeagus tube-like with two apical appendices emerging from common point. Lateral lobe of pygofer with two posterolaterally directed appendices in upper portion - Figs 53-57. Middle Tadzhikistan: the South Tian-Shan, southern Fergana Valley. The West Pamirs: Vaksh Range. In dry semisavannas, largely covered with rubble. 1100-1200 m a.s.l. *Neobufonaria oshanini* (EMELJANOV)

- Edeagus wide, apical appendices emerging from sides of shaft..... 11

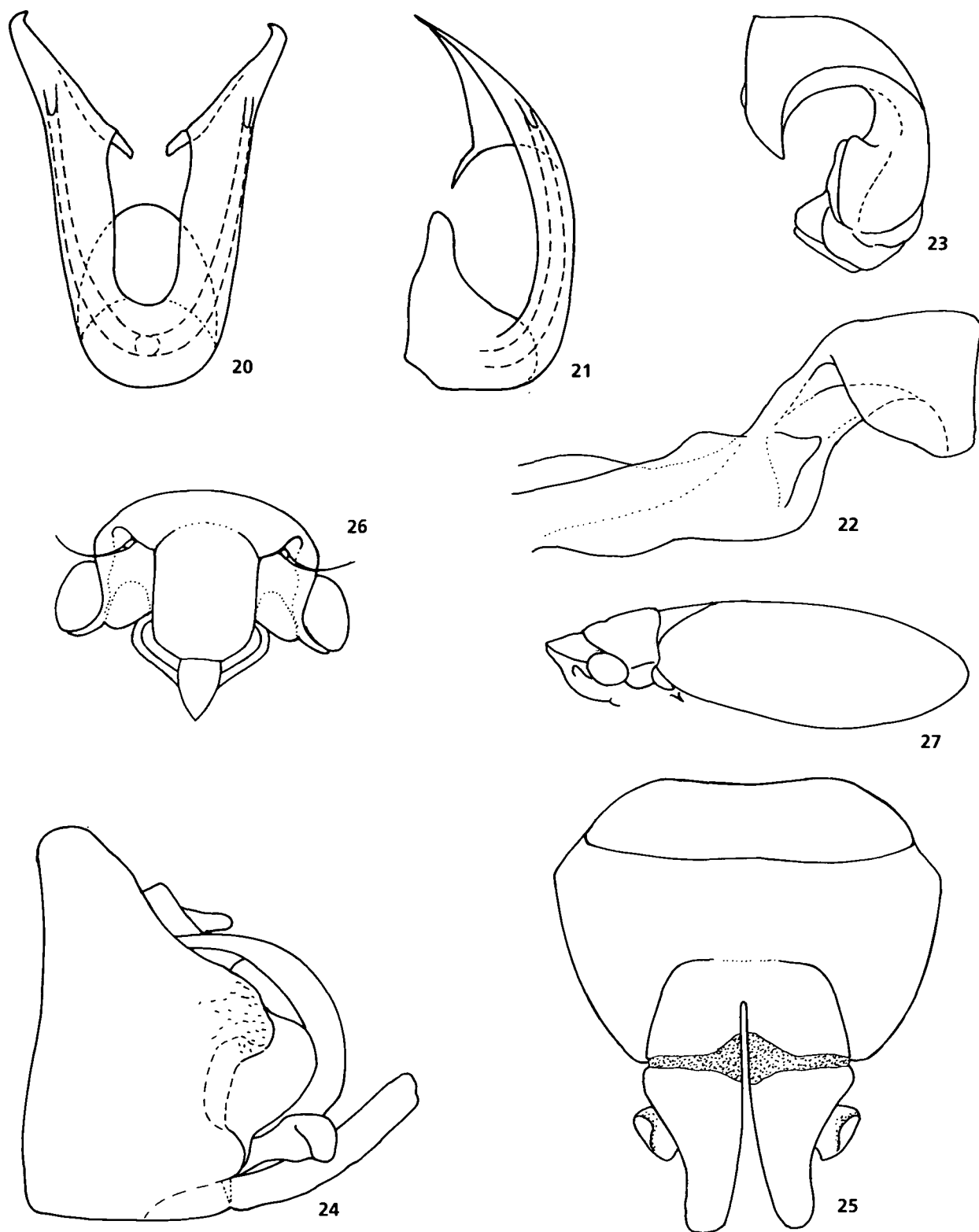
11 Styles distinctly curved apically, without subapical tooth (Figs 59-61). Kazakhstan, Kyrgystan: the North Tian-Shan. Dry, rocky steppes 2500-3500 m a.s.l. *Neobufonaria costata* (EMELJANOV)

- Styles strongly bent at 2/3, with subapical tooth (Figs 64-65). Lateral lobe of pygofer with single appendix (Figs 66-67), in posterior view directed mediadorsally (Fig. 67). The Lebanon Mts. Low plant vegetation, grassy areas. 2000 m a.s.l. *Neobufonaria hermelensis* ABDUL-NOUR

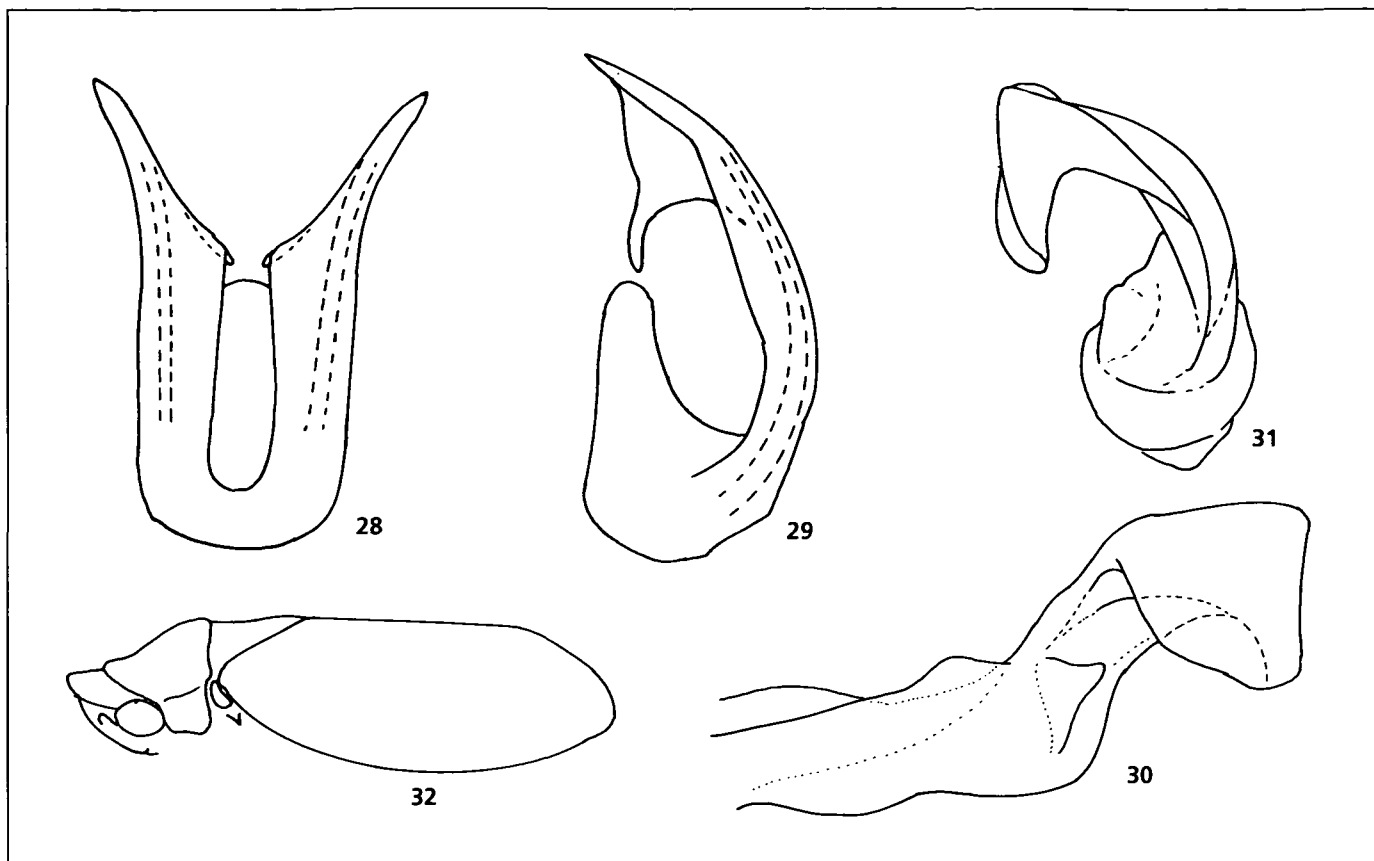


Figs 12-19:

Ulopa reticulata (F.) (12) edeagus in caudal view; (13) edeagus in lateral view; (14) right genital style; (15) pygofer in lateral view; (16) pygofer in ventral view; (17) anterior part of the body; (18) face; (19) pronotum in lateral view; Fig. 19 after EMELJANOV (1992)

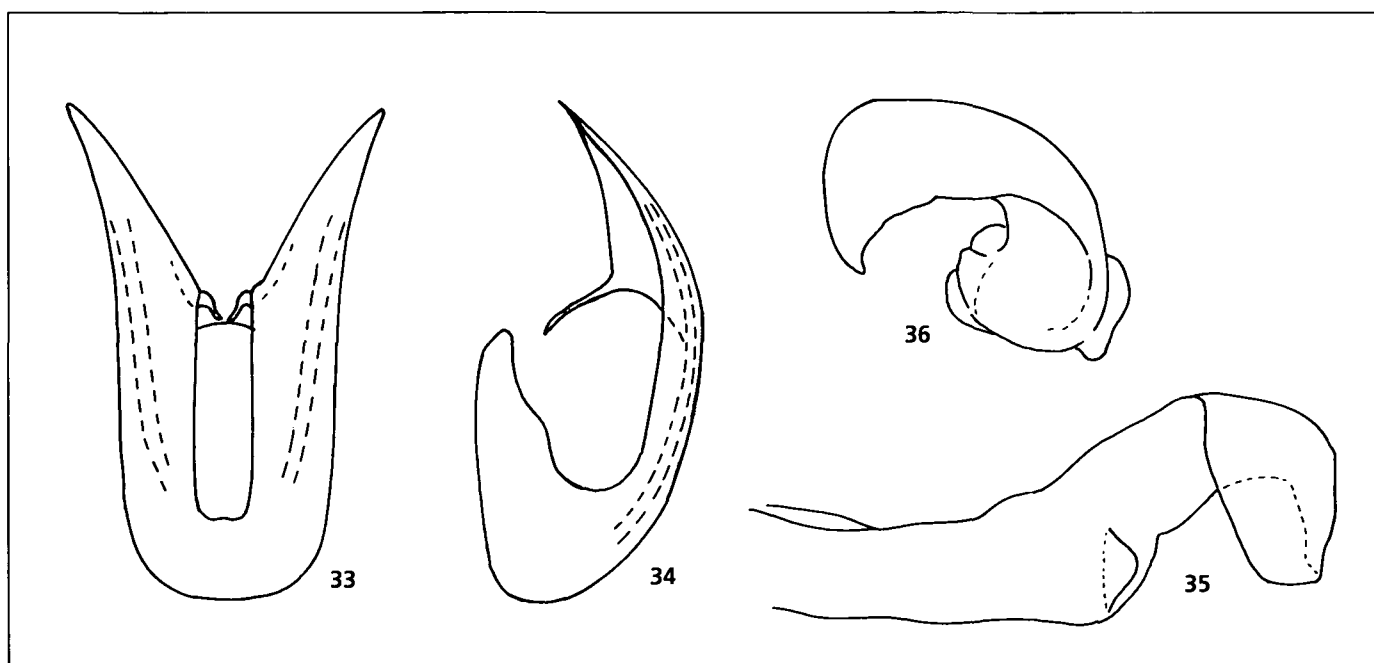


Figs 20-27:
Utecha trivia (GERM.) (20) edeagus in caudal view; (21) edeagus in lateral view; (22) style in lateral view; (23) style in caudal view; (24) pygofer in lateral view; (25) pygofer in ventral view; (26) face; (27) outline of the body in lateral view; Figures 22 and 23 after OROSZ (1977)



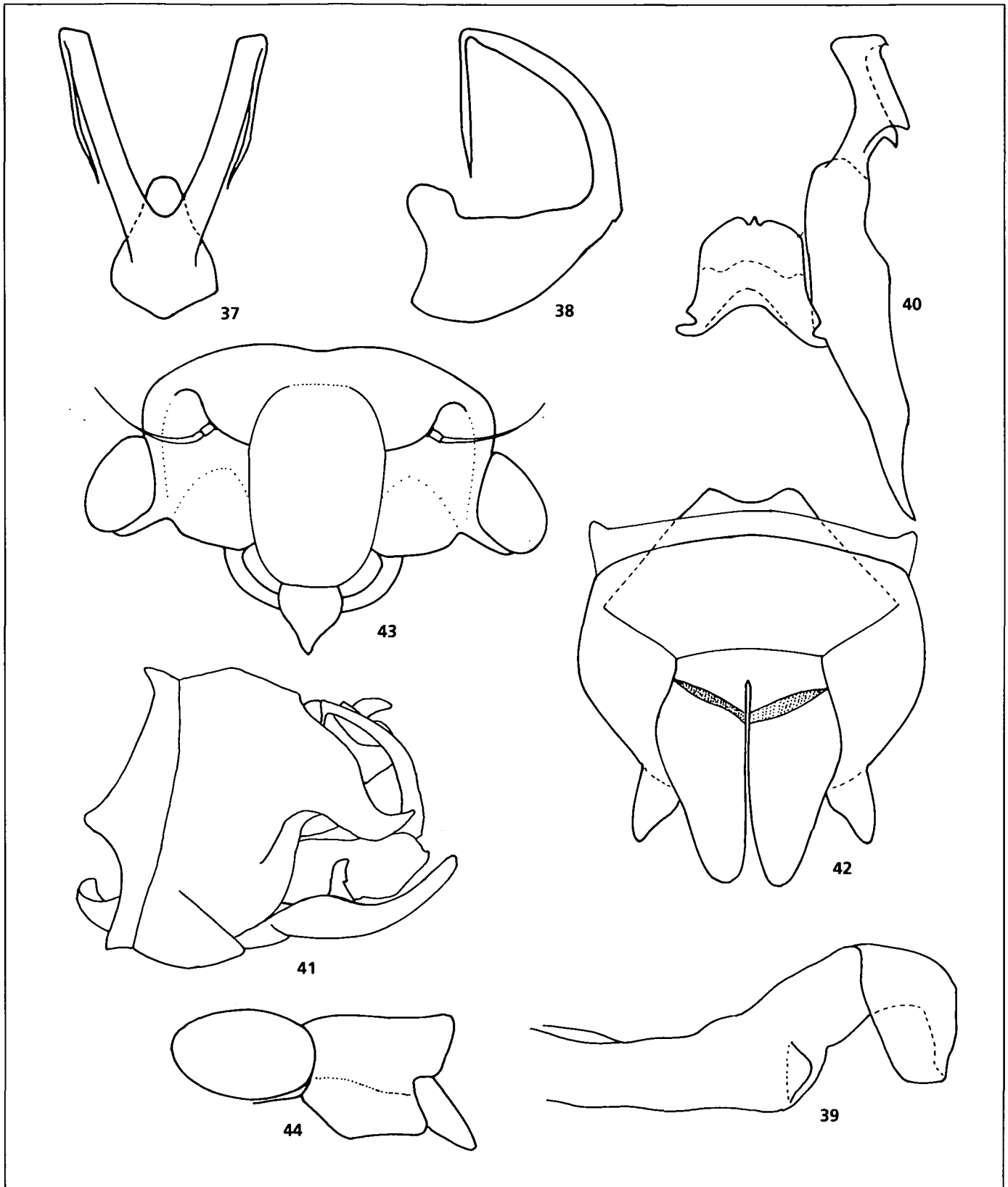
Figs 28-32:

Utecha lugens (GERM.) (28) edeagus in caudal view; (29) edeagus in lateral view; (30) style in lateral view; (31) style in caudal view; (32) outline of the body in lateral view; Figures 30 and 31 after OROSZ (1977)



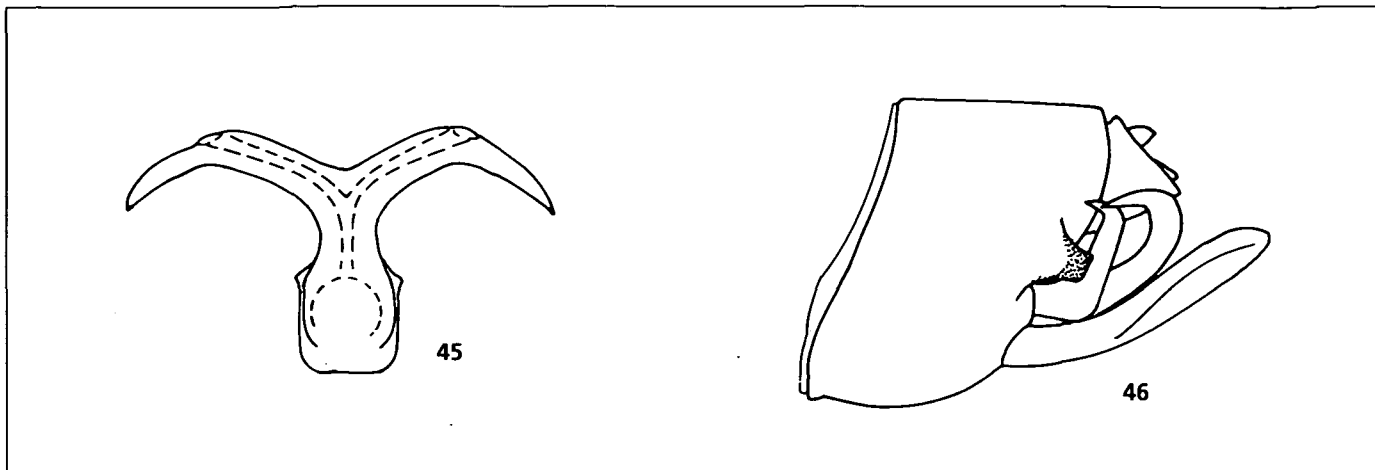
Figs 33-36:

Utecha gadarramensis (FERR.) (33) edeagus in caudal view; (34) edeagus in lateral view; (35) style in lateral view; (36) style in caudal view; Figures 35 and 36 after OROSZ (1977)



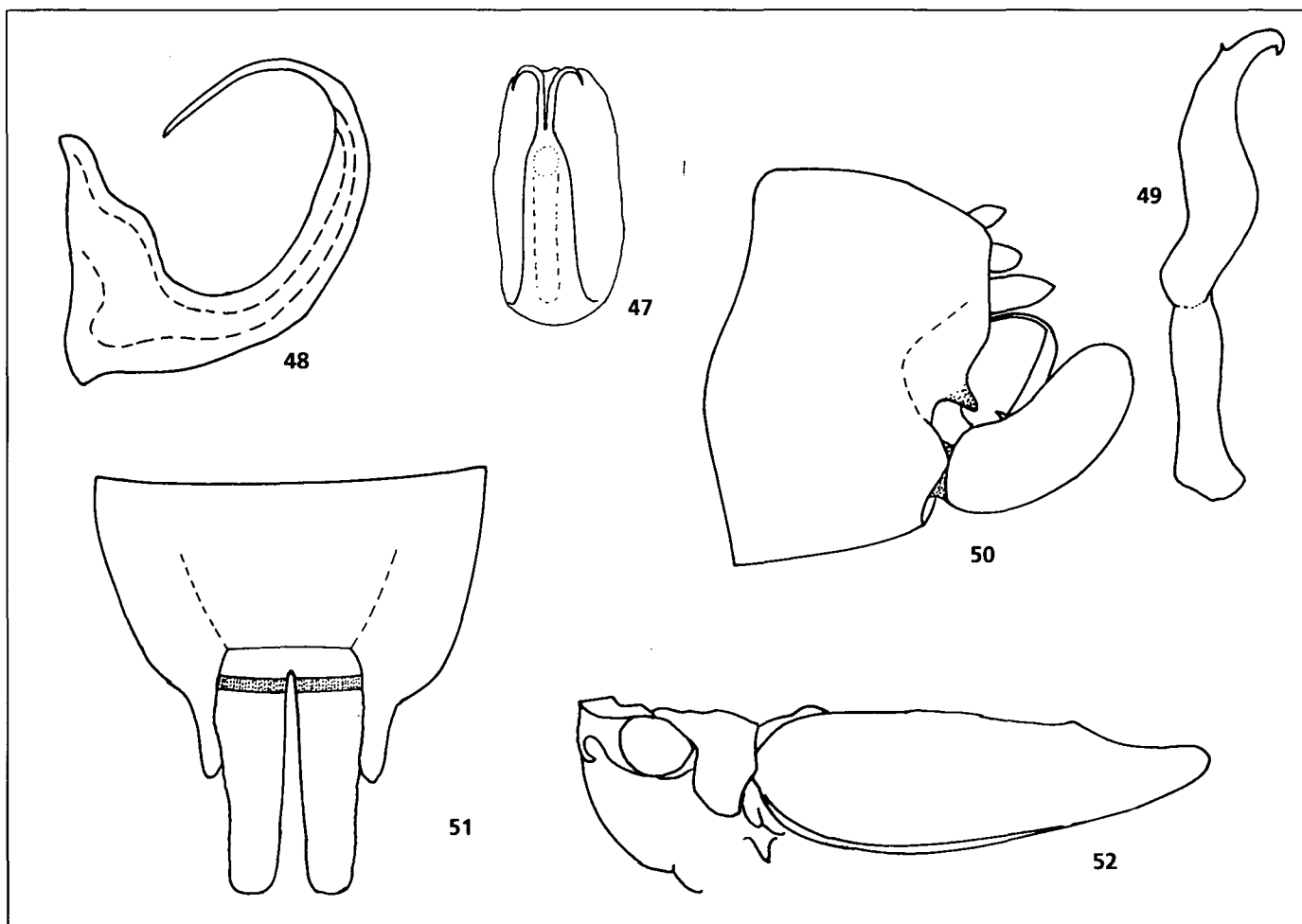
Figs 37-44:

Asichnus lavrenkoi Em. (37) edeagus in caudal view; (38) edeagus in lateral view; (39) genital style in lateral view; (40) connective and genital style in dorsal view; (41) pygofer in lateral view; (42) pygofer in ventral view; (43) face; (44) pronotum in lateral view; Figures 37-42 after EMEJANOV (1996), figures 43 and 44 after EMEJANOV (1992)



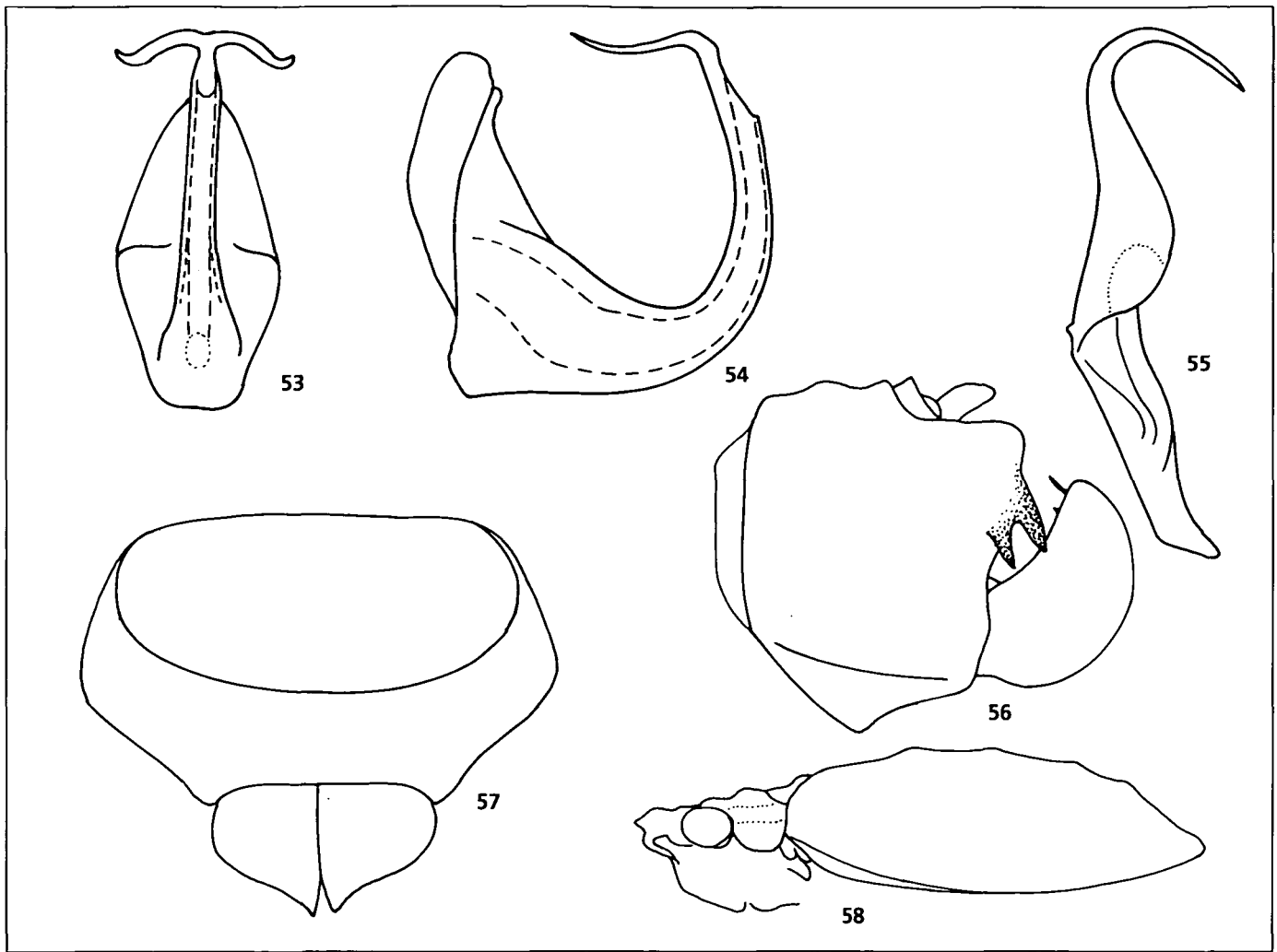
Figs 45-46:

Megulopa sahlbergorum Ldb. (45) edeagus in ventral view; (46) pygofer in lateral view; Figure 46 after EMEJANOV (1996)



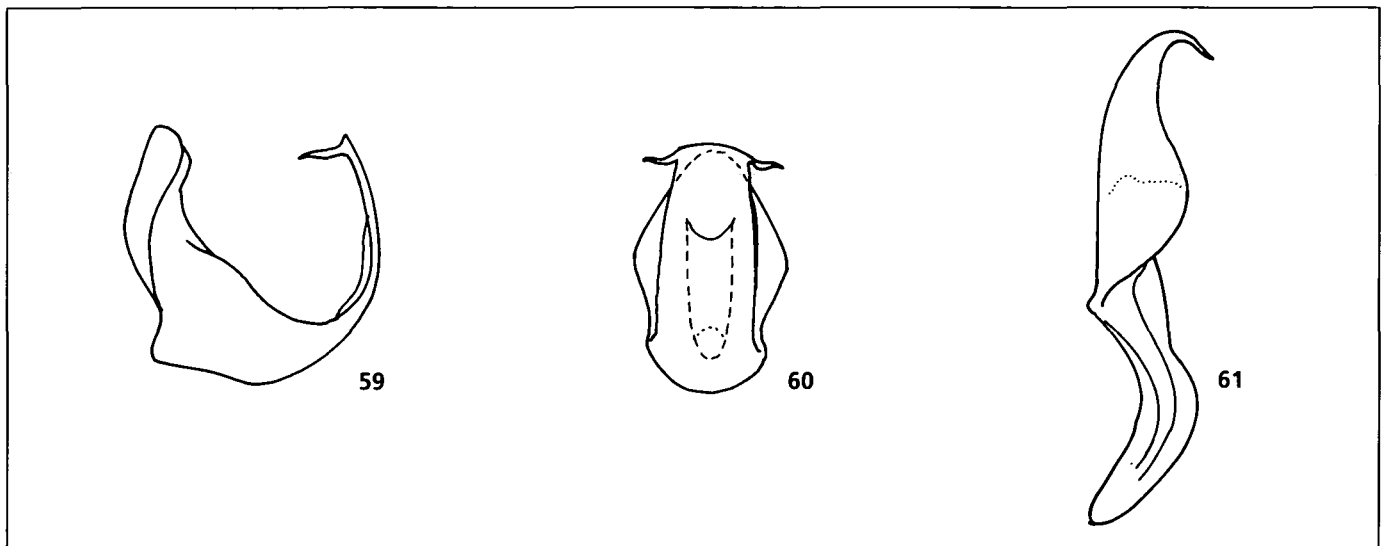
Figs 47-52:

Pyrenaeibufonaria lousaraphaeli (D. G. & Bl.-Z.) (47) edeagus in caudal view; (48) edeagus in lateral view; (49) genital style in lateral view; (50) pygofer in lateral view; (51) pygofer in ventral view; (52) outline of the body in lateral view



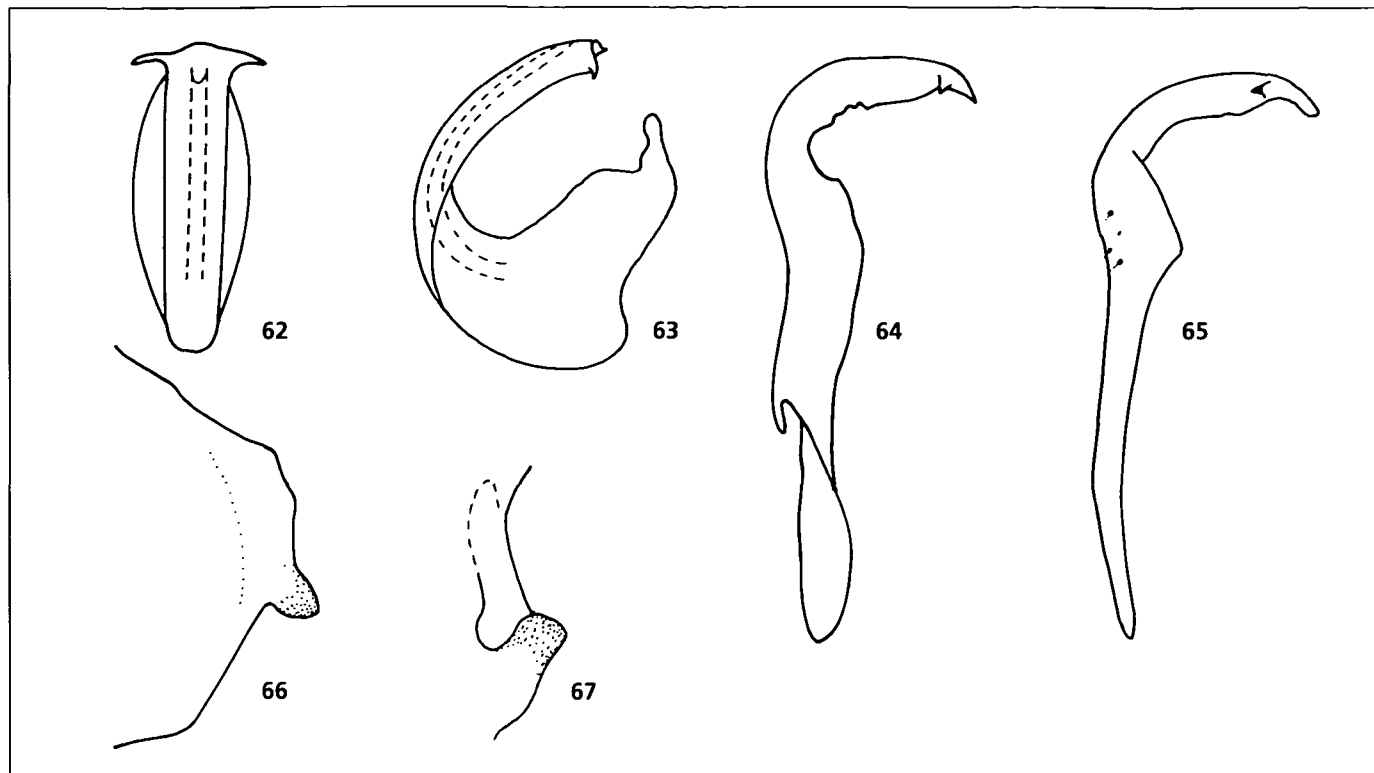
Figs 53-58:

Neobufonaria oshanini (Em.) (53) edeagus in caudal view; (54) edeagus in lateral view; (55) genital style in lateral view; (56) pygofer in lateral view; (57) pygofer in ventral view; (58) outline of the body in lateral view; Figures 53-57 after EMEJANOV (1996)



Figs 59-61:

Neobufonaria costata (Em.) (59) edeagus in caudal view; (60) edeagus in lateral view; (61) genital style in lateral view; Figures 59-61 after EMEJANOV (1996)



Figs 62-67:

Neobufonaria hermelensis A.-N. (62) edeagus in caudal view; (63) edeagus in lateral view; (64) genital style in ventral view; (65) genital style in lateral view; (66) appendix of pygofer in lateral view; (67) appendix of pygofer in caudal view; Figures 62-67 after ABDUL-NOUR (2000)

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Zusammenfassung

In dieser Arbeit werden die paläarktischen Vertreter der Familie Ulopidae vorgestellt und ein Bestimmungsschlüssel zu den Gattungen und Arten präsentiert.

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