KEY TO THE GENERA OF THE HEPTAGENIIDAE (EPHEMEROPTERA) OF THE HOLARCTIC, ORIENTAL AND ETHIOPIAN REGION

I. T O M K A and A. Z U R W E R R A

Introduction

The present work is a critical review of the literature on the generic composition of the family Heptageniidae (Ephemeroptera) for the Holarctic, Oriental and Ethiopian regions. The aim of this compilation was to eliminate contradictions reported until 1985 on the generic elements of Heptageniidae. Practical results of this work are the nymphal and imaginal keys for all together 31 genera of the Heptageniidae. There are 36 genera reported for this family:

Walsh	1862:	Heptagenia
Eaton	1868:	Ecdyonurus
	1881:	Atopopus, Compsoneuria, Epeorus, Paegniodes, Rhithrogena, Thalerosphyrus
	1883:	Iron
	1885:	Bleptus, Cinygma
Bengtsson	1908:	Arthroplea
Lestage	1924:	Afronurus
McDunnough	1931:	Anepeorus, Pseudiron
	1933:	Cinygmula
Traver	1933:	Stenonema
	1935:	Ironodes, Ironopsis
	1939:	Ororotsia
Kimmins	1937:	Cinygmina
Ulmer	1938:	Compsoneuriella, Epeorella, Rhithrogeniella
Crass	1947:	Notonurus
Demoulin	1964:	Afghanurus, Epeiron, Sigmoneuria
Dang	1967:	Ecdyonuroides
Tshernova	1974:	Notacanthurus
Jensen	1974:	Stenacron
Edmunds & Jensen	1974:	Spinadis
Lehmkuhl	1979:	Macdunnoa
Flowers	1980:	Leucrocuta, Nixe
Zurwerra & Tomka	1985:	Electrogena

Four of this genera are not anymore valid: Tshernova (1974) withdrew the generic rank of Ironopsis, Iron and Ironodes and

considered these as subgenera in Epeorus. Edmunds et al. (1979) supported this concerning Iron and Ironopsis. Puthz (1971) withdrew the taxon Notonurus (synonym Compsoneuriella; Puthz made here an error by giving the author of the genus Compsoneuriella as Gillies). Tshernova (1974) gave strong evidences for the synonymy of the taxa Epeiron (=Epeorus) and Afghanurus (=Ecdyonurus). Sinitshenkova (1978) reinvestigated the Iron-Epeorus problem and gave Iron the generic rank. In the present work we came to the same conclusion and also in the case of Ironodes. Of the 32 valid genera we could not incorporate the Himalayan genus Ororotsia in the key due to insufficient information. Three of the residual 31 genera are not known in the larval stage (Atopopus, Epeorella, Rhithrogeniella) and one is not known in the imaginal stage (Spinadis). We built up the systematics of the Heptageniidae on the basis given in the works of Tshernova (1974, 1976) and Edmunds et al. (1979). Hitherto there are several points where we diverge from the keys given in these publications. We will refer to this points in the discussion.

Nymphs

1 (2) Claws elongate as long as or longer than tarsi (Edmunds et al.,1979:209,Fig.406); gill plates with lanceolate branch arising near middle (Edmunds et al.,1979:58,Fig.55). Nearctic. 3 species. .... Subfamily **Pseudironinae** ..... 1 genus: **Pseudiron** Mc Dunnough,1931

2 (1) Claws much shorter than tarsi; gill plates without lanceolate branch .....

3 (4) Maxillary palpi appearing as thin very long sweeping structures with long conspicuous setae, the length of which is four times that of the galea and the lacinia (Edmunds et al.,1979:59,Fig.56). Holarctic. 2 species. ..... Subfamily **Arthropleinae** ..... 1 genus: **Arthroplea** Bengtsson,1908

4 (3) Maxillary palpi considerably shorter .... Subfamily **Heptageniinae**

5 (14) Two caudal filaments .....

6 (9) Outer margin of maxilla without three mobilely articulated thick teeth (Tshernova,1976:48,Fig.3). Tufts of gill filaments well developed. .....

7 (8) Outer margin of maxilla with soft hairs (Tshernova,1976: 48,Fig.2); on abdominal terga no paired tubercles. Palearctic. 1 species. ..... **Bleptus** Eaton,1881

8 (7) Outer margin of maxilla with spines; well developed paired tubercles present on abdominal terga I-IV (Edmunds et al.,1979:71,Fig.116), Holarctic (Nearctis, Himalaya). 7 species. ..... **Ironodes** Traver,1935

9 (6) Outer margin of maxilla with three mobilely articulated thick teeth (Tshernova,1976:48,Fig.4); tufts of gill filaments weakly developed .....

10 (13) Abdominal terga with dense median row of setae (Edmunds et al.,1979:71,Fig.117). Holarctic. Approximately 10 species. ..... **Epeorus** sensu Zurwerra et al.,1986a,Eaton,1881

11 (12) Gill leaflets I and VII forming a closed disk on the ventral side. ..... subgen. **Ironopsis** Traver,1935

12 (11) Gills leaflets I and VII large but not forming a closed disk on the ventral side. .... subgen. **Epeorus** nec Tshernova,1976

13 (10) Abdominal terga without dense median row of setae. Holarctic. Approximately 30 species. ..... **Iron** Eaton,1883

14 (5) Three caudal filaments .....

15 (20) First gill platelets not leaflike .....

16 (17) First gill platelets very small like a scale; no posterolateral suture between pronotum and mesonotum (Tshernova,1976:48,Fig.5); second and third gill plates laterally joined. Oriental. 2 species. **Paegniodes** Eaton,1881

17 (16) First gill platelets slender (Edmunds et al.,1979:59, Fig.59) lanceolate structures; posterolateral suture between pronotum and mesonotum (Edmunds et al.,1979:213, Fig.408); abdominal gills on segments 2-3 inserted ventrally. .....

18 (19) Gills on all abdominal segments similar in shape and position; without dorsal tubercles on head, thorax and abdomen. Holarctic. 3 species..**Anepeorus** McDunnough,1925

19 (18) Gills on abdominal segments vary in form and position; dorsal tubercles present on head, thorax and abdomen (Edmunds et al.,1979:213,Fig.408). Nearctic. 1-3 species. ..... **Spinadis** Jensen,1974

20 (15) Leaflike gill plates invariably present on abdominal segment 1. .....

21 (22) Gill plates on abdominal segments 1 and 7 meet beneath abdomen (Edmunds et al.,1979:71,Fig.118). Holarctic. Approximately 80 species. ..... **Rhithrogena** Eaton,1881

22 (21) Gill plates does not meet beneath abdomen on abdominal segments 1 and 7. .....

23 (24) Gills on abdominal segment 6 reduced Nearctis. 2 species. ..... **Macdunnoa** Lehmkuhl,1979

24 (23) Gills on abdominal segment 6 not reduced .....

25 (28) Gill leaflets on abdominal segment 7 reduced to slender filaments (Edmunds et al.,1979:71,Fig.119). .....

26 (27) Gills on abdominal segments 1 - 6 with apex pointed (Edmunds et al.,1979:71,Fig.122); maxillae with stout spines on apical margin of galea lacinia (Edmunds et al.,1979:71,Fig.123). Nearctis. Approximately 10 species.

..... **Stenacron** Jensen,1974

27 (26) Gills on abdominal segments 1 - 6 with apex rounded (Edmunds et al.,1979:71,Figs.126,127); maxillae with plumose hairs on apical margin of galea lacinia (Edmunds et al.,1979:71,Figs.124,125). Nearctis. Approximately 40 species. ..... **Stenonema** Traver,1933
+ Thalerosphyrus sinuosus Navas (Ulmer,1938:Figs.419,428)

28 (25) Gill leaflets on abdominal segments 7 not reduced to slender filaments. .....

29 (32) Abdomen with long spiniform paranotal processes (Tshernova,1976:48,Fig.6). .....

30 (31) Lateral margins of pronotum discoidably widened, their posterior angles extending onto the mesonotum (Tshernova, 1976:48,Fig.7); median lobe of hypopharynx not notched (Braasch & Soldan,1984a:204,Fig.14). Oriental. 2 species. ..... **Ecdyonuroides** Dang,1967

31 (30) Pronotum not extending onto the mesonotum (Ulmer,1938: Fig.401); median lobe of hypopharynx perceptibly notched (Tshernova,1976:49,Fig.17). Oriental. Approximately 3 species. ..... **Thalerosphyrus** Eaton,1881

32 (29) Abdomen without long paranotal processes. .....

33 (34) A rib on the median line on each of the tergites (2-9) terminating in a small spinule (Tshernova,1976:48,Fig.8). Paleartic. 1 species. .... Notacanthurus Tshernova,1974

34 (33) Abdomen without a rib along median line of tergites. ...

35 (36) Apical margin of maxilla (galea lacinia) with a dense row of long hairs (Tshernova,1976:52,Fig.34). Holarctic. Approximately 10 species. ..... **Cinygma** Eaton,1885

36 (35) Maxillae with pectinate spinules on apical margin of galea lacinia. .....

37 (38) Anterior margin of head distinctly concave (Tshernova, 1976:49,Fig.20); gill tufts represented by a few weak filaments which may be absent (Tshernova,1976:49,Fig.21). Holarctic. Approximately 20 species. .....
..... **Cinygmula** Mcdunnough,1933

38 (37) Anterior margin of head entire, sometimes weakly convex; gill tufts well developed .....

39 (44) Paraglossae slightly extended laterally (Flowers,1980a:95, Fig.4); Superlinguae of hypopharynx short, not recurved (Ulmer,1938:Fig.460); maxilla with ventral setae of galea-lacinia in a submedian row (Tshernova,1976:48,Fig. 9). .....

40 (43) Mandible has one or no prosthecal setae and a row of small setae between incisor and molar areas (Tshernova, 1976:49,Fig.10). .....

41 (42) Third segment of maxillary palp (smaller than 1/10 of second segment) present (Tshernova,1976:48,Fig.9), elongated, acutely pointed. Oriental. 1 species. .....

..... **Compsoneuria** Eaton,1881

42 (41) Maxillary palp two-segmented, apical segment not elongated (Flowers,1980a:95,Fig.5), Holarctic, Oriental. Approximately 50 species. ..... **Heptagenia** s.str. sensu Flowers,1980,Walsh,1862

43 (40) Mandible with more than one prosthecal setae and no small setae between incisor and molar areas. Palearctic. 2 species. ..... **Sigmoneuria** Demoulin,1964

44 (39) Paraglossa strongly expanded laterally (Flowers,1980:95, Fig.8); Superlinguae of hypopharynx laterally elongated, recurved (Flowers,1980a:95,Fig.8); maxilla with scattered setae of galea-lacinia (Flowers,1980a:95,Fig.9). .....

45 (46) Gill leaflets on abdominal segment 5 (sometimes also on abdominal segments 2-6) with acutely pointed apical elongation (Braasch & Soldan,1984b:198,Fig.5). Oriental. 4 species. ..... **Cinygmina** Kimmins,1937

46 (45) Gill leaflets without acutely pointed apical elongation

47 (48) Gill leaflets on abdominal segments 5 an 6 broadened at apex (Ulmer,1938:Figs.442-443). Oriental, Ethiopian. 2 species. ..... **Compsoneuriella** Ulmer,1938

48 (47) Gill leaflets on abdominal segments 5 and 6 not broadened at apex. .....

49 (52) Mandible with less than six plumose prosthecal setae (Flowers,1980a:95,Figs.6,7); maxilla with less than 13 pectinate spinules on apical margin. .....

50 (51) Head capsule slightly wider than the pronotum; absence of fine setae on the caudal filaments. Neartic. Approximately 5 species. ..... **Leucrocuta** Flowers,1980

51 (50) Head capsule does not exceeds the width of the pronotum; fine setae on the caudal filaments. Holarctic. 15 species. ..... **Nixe** Flowers,1980

52 (49) Mandible with more than five plumose prosthecal setae; maxilla with more than 13 pectinate spinules on apical margin. .....

53 (54) Lateral margins of pronotum with sharply expressed discoidal dilatations extending onto the side of the mesonotum (Tshernova,1976:51,Fig.23). Palearctic. Approximately 35 species. ..... **Ecdyonurus** s.str. Zurwerra & Tomka,1985;Eaton,1868

54 (53) Posterolateral margins of pronotum not extending onto the sides of mesonotum .....

55 (56) Apical border of labrum on at least 1/3 of its median part concave, emarginate (Demoulin,1973:16,Fig.9a). Palearctic, Oriental. Approximately 17 species. .....
..... **Electrogena** Zurwerra & Tomka,1985

56 (55) Border of labrum on at least 1/3 of its median part expanded apically, if emarginate only much less than 1/3 of its median border (Demoulin,1973:9,Fig.5a).Ethiopian,

Palearctic. Approximately 8 species. .... **Afronurus** Lestage,1924

Imagines

1 (2) Hind tarsi four-segmented, basal segment partially fused to tibiae (Edmunds et al.,1979:95,Fig.234). Neartic. Approximately 3 species. ..... Subfamiliy **Pseudironinae** ..... 1 genus: **Pseudiron** McDunnough,1931

2 (1) Hind tarsi distinctly five-segmented (Edmunds et al., 1979:95,Fig.235) .....

3 (4) Gonostylus five-segmented (Tshernova,1974:54,Fig.1). RS_{4+5} in the hind wing not furcate. Holarctic. .... Subfamily **Arthropleinae** ..... 1 genus: **Arthroplea**, Bengtsson,1908

4 (3) Gonostylus four-segmented. RS_{4+5} in the hind wing furcate. ....Subfamily **Heptageniinae**

5 (6) Hind wing narrow, with weakly devoloped cubital and anal regions, in which there are only 2 longitudinal veins, not connected by cross-veins. Costal vein not extending to the wing apex (Tshernova,1974:54,Fig.2). Fore tarsus of the male almost 1.5 times longer than the tibia; hind tarsus approximately 1/3 as long as the tibia. The genitalia are similar to those of Rhithrogena. Paleartic. 2 species. ..... **Bleptus** Eaton,1885

6 (5) Hind wing broader, normally developed, after the medial bifurcation with four longitudinal veins connected to one another by cross-veins. .....

7 (10) Fore wing with relatively few thickened cross-veins forming 4 - 5 well separated transverse rows (Tshernova, 1974:54,Fig.3). .....

8 (9) Fore leg of the male with first tarsal segment very short, equal to 1/4 the length of the second segment. In the female, the first tarsal segment in the fore leg a little shorter than the second segment, as in Compsoneuriella. The hind tarsus of both male and female only 2/5 - 1/2 as long as the tibia. Penis-lobes laciniate to the level of the styliger, with a distinct incision in the apex; titillators absent (Tshernova,1974:54,Fig.4). Oriental region (Java, Sumatra). 1 species. .... **Compsoneuria** Eaton,1881

9 (8) First tarsal segment of the fore leg long, only slightly shorter than the second. Hind tarsus of both male and female virtually the same length as the tibia. Penis-lobes broad, outer margin with a process which is separated by an incision from the main part of the lobe. Titillators small, short; in addition to these, there

are 2 spines diverging laterally (Tshernova,1974:54, Fig.5). Oriental (Java, Sumatra, Borneo) and Ethiopian region. 2 species. ..... **Compsoneuriella** Ulmer,1938

10 (7) Fore wing with numerous cross-veins of the usual type, forming a dense network of cells .....

11 (12) Hind tarsus of the male appreciably longer than the tibia (11/3-2): in the female it is also longer than the tibia. First segment of the hind tarsus markedly elongate, in the male virtually as long as the four remaining segments together, and in both male and female somewhat shorter than the tibia (Tshernova,1974:54,Fig.6). Styliger short, deeply incised, but with a small protuberance on the median line. Penis-lobes rounded at the apices, titillators straight, distinct (Tshernova,1974:54,Fig.7). Caudal filaments almost twice as long as the body. Oriental region (Borneo, Phillipines). 2species. .... **Atopopus** Eaton,1881

12 (11) Hind tarsus in both male and female usually appreciably shorter than or equal to the tibia (only in Thalerosphyrus is it as long as the tibia). First tarsal segment of the hind leg not markedly elongate, differing little from the second segment (sometimes a little longer or shorter or the same length) .....

13 (14) Hind tarsus in the male varying from as long as tibia to two-thirds as long, or even a little shorter. Penis-lobes slightly cleft, rounded, titillators very small or entirely absent (Tshernova,1974:54,Fig.9). Oriental region (Java, Sumatra, Philippines). 5 species..... ..... **Thalerosphyrus** Eaton,1881

14 (13) Hind tarsus 1/3 or 1/2 as long as the tibia .....

15 (18) Fore tarsus of the male shorter than 5/6 of the tibia; fore tarsus of the female half as long as the tibia. Penis-lobes in the form of plates, broader in the basal than in the apical part, between which there is a slight incision. .....

16 (17) Basal costal and subcostal cross-veins of fore wings strongly developed (Demoulin,1964a:354,Fig.3a). Palearctic. 2 species. ..... **Sigmoneuria** Demoulin,1964

17 (16) Basal costal and subcostal cross-veins of fore wings weakly developed, detached. Holarctic. 3 species. .... **Anepeorus** McDunnough,1925

18 (15) Fore tarsus of the male longer than 5/6 the tibia. Fore tarsus of the female over 1/2 as long as the tibia. Penis-lobes varying in structure, often broadened apically. .....

19 (34) First segment of the hind tarsus in both male and female shorter than or equal to the second (only in Heptagenia fuscogrisea Retz. and H. perflava Br. it is virtually

equal to the second). .....

20 (23) Penis-lobes deeply divided, titillators also far apart..

21 (22) Penis-lobes far apart, almost parallel, broadened clavately at the ends. Titillators thick, with rounded ends (Tshernova,1974:55,Fig.13). Oriental region (South China). 2 species. ..... **Paegniodes** Eaton,1881

22 (21) Penis-lobes separated, narrow, rod-shaped, divergent laterally; titillators broad, closely adhering to the lobes, crenate or pointed apically (Tshernova,1974:55,Fig. 14). Holarctic. Approximately 75 species. .... **Rhithrogena** Eaton,1881

23(20) Penis-lobes fused medially at least in basal half (Edmunds et al.,1979:103,Figs.280-284; Flowers,1982:27,Figs. 13,14); titillators if present approximated (Edmunds et al.,1979:103,Figs.280-284). .....

24 (25) The outer lateral sclerite on the penis-lobes separated from the ventral sclerite by a deep incision (Tshernova, 1974:55,Fig.15). Holarctic, Oriental. Approximately 50 species. ..... **Heptagenia** s.str. Flowers,1980;Walsh,1862

25 (24) The outer lateral sclerite on the penis-lobes not separated from the ventral sclerite. .....

26 (27) Penes with lateral cluster of spines (Edmunds et al., 1979:103,Figs.280,281); wings with two or three crossveins below bullae between veins R_1 and R_2 connected or nearly connected by dark pigmentation (Edmunds et al., 1979:101,Fig.277). Nearctic. Approximately 10 species. ..... **Stenacron** Jensen,1974

27 (26) Penes without lateral cluster of spines; wings may have cross-veins below bullae clouded but never as above (26)

28 (29) Penes distinctly L-shaped; without subdiscal sclerotised ridge (Edmunds et al.,1979:103,Figs.282,283); first segment of hind tarsus shorter than second. Nearctic. Approximately 40 species. ..... **Stenonema** Traver,1933

29 (28) Penes not distinctly L-shaped; subdiscal sclerotised ridge often present (Flowers,1980a:99,Figs.17-21); first segment of hind tarsus subequal to second. .....

30 (31) Segments 3 and 4 of the forceps are each longer than 1/4 of second (Flowers,1980a:99,Fig.19); eyes of male meeting on the vertex. Holarctic. 15 species...**Nixe** Flowers,1980

31 (30) Segments 3 and 4 of the forceps are each shorter than 1/4 of second; eyes of male not meeting on the vertex. .....

32 (33) Discal and large dorso-lateral spines on the penes (Flowers,1980a:99,Figs.17,18). Nearctic. Approximately 5 species. ..... **Leucrocuta** Flowers,1980

33 (32) Apex of penes lacking of spines (Flowers,1982:27,Fig.13, 14). Nearctic. 4 species. ..... **Macdunnoa** Lehmkuhl,1979

34 (19) First segment of the hind tarsus in both male and female

longer than the second .....

35 (42) First segment of the fore tarsus of the male longer than 3/4 of the second segment .....

36 (37) Eyes of male separated dorsally by space twice the width of median ocellus. Basal costal cross-veins of fore wing strongly developed, attached anteriorly. Holarctic. 7 species. ..... **Ironodes** Traver,1935

37 (36) Eyes of male contiguous or nearly contiguous dorsally. Basal costal cross-veins of fore wing weakly developed, detached anteriorly .....

38 (41) Penes with median titillators minute or absent, the lobes at their apices not attenuated, the outer apical corner not forming a tooth (Tshernova,1974:56,Fig.17). Holarctic. Approximately 10 species. ..... **Epeorus** sensu Zurwerra et al.,1986a;Eaton,1881

39 (40) Penes with laterally expanded lobes, apices blunt .... subgen. **Epeorus** nec Tshernova,1976

40 (39) Penes rod-like (Tshernova,1974:56,Fig.19). .... subgen. **Ironopsis** Traver,1935

41 (38) Penes with well developed median titillators, the lobes at their ends attenuated, the outer apical corner forming a tooth (Tshernova,1974:56,Fig.18). Holarctic. Approximately 30 species. ..... **Iron** Eaton,1883 (Syn. Epeorus, Belovius p.p.)

42 (35) First segment of the fore tarsus shorter than 3/4 of the second. .....

43 (44) Styliger in the middle projecting markedly tubercle-like to the level of the base of the second segment of the gonostylus. Penis small, lobes closely approximated, separated by a narrow fissure only, with rounded apices. Titillators absent (Tshernova,1974:58,Fig.21). Oriental region (Borneo). 1 species. ..... **Epeorella** Ulmer,1938

44 (43) Middle part of the styliger not protruding tubercle-like to the level of the base of the second segment of the gonostylus . .....

45 (46) Penis-lobes far apart, rod-like in form, with straight margins and rounded ends. Titillators absent (Tshernova, 1974:58,Fig.22). Oriental region (Sumatra). 1 species. ..... **Rhithrogeniella** Ulmer,1938

46 (45) Penis-lobes different in structure .....

47 (48) Penis-lobes not separated, bounded distally by a slightly concave margin; the apical processes (lateral and ventral sclerites) directed laterally and mounted on a long and broad fused base, protruding markedly beyond the margin of the styliger. Titillators broad, curved, with crenations on the ends (Tshernova,1974:58,Fig.23). Palearctic region (Kazakhstan). 1 species. .... **Notacanthurus** Tshernova,1974

48 (47) Penis-lobes with a narrow incision along the median line or separated completely .....

49 (50) Penis-lobes very deeply separated and in the apical part sometimes divergent laterally. Titillators usually present, sometimes absent; besides the titillators, there is usually a pair of processes situated below the titillators and on the outer side (Tshernova,1974:58,Fig.24). Postgenital plate of the female well developed, its apical margin with a V-shaped incision. Holarctic. Approximately 20 species. ..... **Cinygmula** McDunnough,1933

50 (49) Penis-lobes with a fused base and an incision in the end

51 (52) Penis-lobes diverging laterally, a broad saddle-shaped incision between them; fused base protruding beyond the margin of the styliger, only slightly longer than the lobes. Titillators absent or reduced to small thin plates (Tshernova,1974:58,Fig.25). Oriental region (Assam). 1 species. ..... **Cinygmina** Kimmins,1937

52 (51) Penis-lobes without a saddle-shaped incision between them. Penis-lobes on a long fused base, only the actual apices disjunct. .....

53 (54) Stigmatic area of wing divided by fine vein into upper and lower series of cellules (Edmunds et al.,1979:101, Fig.271). Titillators very small at the level of the styliger (Tshernova,1974:58,Fig.26). Holarctic. Approximately 10 species. ..... **Cinygma** Eaton,1885

54(53) Stigmatic area of wing not as above. Titillators well developed above the level of the styliger (Tshernova, 1974:58,Fig.27) .....

55 (56) Lateral sclerite and inner sclerite or lateral sclerite and apical sclerite on the penis-lobes present (Tomka & Hasler,1978:148,Figs.5,6;149,Figs.7,9). Palearctic. Approximately 25 species. ..... **Ecdyonurus** s.str. Zurwerra & Tomka,1985; Eaton,1868

56 (55) Lateral sclerite and inner or apical sclerite not present .....

57 (60) Compound eyes of males contiguous .....

58 (59) Fore tarsus shorter than tibia, usuallly fore tarsus 5/6 times as long as tibia. Ethiopian, Oriental. Approximately 8 species. ..... **Afronurus** Lestage,1924

59 (58) Fore tarsus equally long or longer than tibia. Oriental. Approximately 3 species. ..... **Ecdyonuroides** Dang,1967

60(57) Compound eyes of males not contiguous. Palearctic. Approximately 17 species. .... **Electrogena** Zurwerra & Tomka,1985

Discussion

To Tshernova the genera Spinadis, Stenacron, Macdunnoa, Leucrocuta, Nixe and Electrogena, when compiling her keys, were not

yet known. We also could find sufficient differential-diagnostic arguments (Demoulin, 1973) for the genus Sigmoneuria which was not considered by Tshernova. We reinvestigated on European (also Caucasus) and Nearctic material (larval and imaginal) the genera Iron, Ironodes and Epeorus and introduced considerable changes in the systematics of this complex (Zurwerra et al., 1986a,b). We eliminated from the nymphal key of Tshernova the number of segments of the maxillar palpi, which gave a confusing diagnostic element. We could further complete Tshernova's key for the nymphal stage by the genera: Anepeorus, Cinygmina and Afronurus (Barnard, 1932; Braasch & Soldan, 1984b; Edmunds et al., 1979; Demoulin, 1964b, 1965). These genera were known to Tshernova only in their imaginal stages. Further to this only the nymphal stage of the genus Ecdyonuroides was known to Tshernova (1974, 1976). Braasch & Soldan (1984a) took up a distressed argumentation to prove the synonymy of Ecdyonuroides with Thalerosphyrus. We were not able to follow their argumentation but the conclusion they reach as a result of breeding the larva of Ecdyonuroides vietnamensis to the imaginal stage is entirely wrong. The authors themselves deliver namely the proof that the imago which they gained by the breeding cannot belong to the genus Thalerosphyrus (what they miss to conclude). Braasch & Soldan (1984b) give on page 202 in their paper the proportions and measures for the hind leg of their succesfully bred imago male. The tibia on the hind leg is given as twice as long as the tarsus, which proportion is clearly excluding Thalerosphyrus as a possible genus (in the sense of Ulmer, Eaton and Tshernova, loc. cit.) for the questioned imago bred by Soldan.

We could find evidences for the presence of the genera Nixe (Heptagenia joernensis) and Ironopsis (Epeorus alpicola, E. yougoslavicus) in Europe (Zurwerra et al., 1986a,b).

The reports of Kapur (1961) and Kapur & Kripalani (1961) give strong arguments for the presence of the genera Ecdyonuroides, Iron, Ironodes and Epeorus (subgenus Ironopsis) in the Himalayas.

For the genus Electrogena Zurwerra & Tomka, 1985 we compiled a species list:

Electrogena affinis (Eaton, 1885): Netherlands
Electrogena aspoecky (Braasch, 1984): Greece (Chios)
Electrogena bothmeri (Braasch, 1983): Iran
Electrogena fallax (Hagen, 1864): Corse
Electrogena galileae (Demoulin, 1973): Israel
Electrogena grandiae (Belfiore, 1981): Italy
Electrogena gridellii (Grandi, 1953): Italy, Yugoslavia, Switzerland
Electrogena hellenica n.sp. Zurwerra & Tomka, 1986 (in litt.): Greece
Electrogena lateralis (Curtis 1834): Palearctic
Electrogena fascioculatus (Sowa 1974): Poland
Electrogena pseudograndiae n.sp. Zurwerra & Tomka, 1986 (in litt.): Corse

Electrogena ozrensis (Tanasijevic, 1975): Yugoslavia (Ozren)
Electrogena malickyi (Braasch, 1983): Creta
Electrogena quadrilineatus (Landa, 1970): Czechoslovakia, Germany
Electrogena ressli (Braasch, 1981): Turkey
Electrogena ujhelyii (Sowa, 1981): Hungary (Balaton)
Electrogena vipavensis n.sp. Zurwerra & Tomka, 1986 (in litt.): Yugoslavia

In our laboratories is work in continuation on the pyhlogenetic relationships in the family of the Heptageniidae. This work is based on morphological and biochemical methods.

Zusammenfassung

Der vorliegende Gattungsschlüssel der Heptageniidae, gültig für die holarktische, orientalische und äthiopische Region, umfasst insgesamt 31 Genera (Larven 28, Imagines 30).

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