

A new tribe of the family Issidae with comments on the family as a whole (Homoptera: Cicadina)

V.M. Gnezdilov

Gnezdilov, V.M. 2003. A new tribe of the family Issidae with comments on the family as a whole (Homoptera: Cicadina). *Zoosystematica Rossica*, 11(2), 2002: 305-309.

Colpopterini trib. n. is erected in the subfamily Issinae (type genus: *Colpoptera* Burmeister, 1835). The subfamily Parahiraciinae Cheng & Yang, 1991 downgraded to a tribe of Issinae (Parahiraciini, stat. n.). The tribe Adenissini Dlabola, 1980 is transferred from Issidae to Caliscelidae. The diagnosis of the family Issidae is refined, and a key to the tribes of the subfamily Issinae is given.

V.M. Gnezdilov, Zoological Institute, Russian Academy of Sciences, Universitetskaya nab. 1, St.Petersburg 19034, Russia.

Introduction

The family Issidae Spinola is one of the largest families of fulgoroid planthoppers. Up to now, the phylogenetic position of Issidae among the fulgoroid planthoppers as well as the scope of the family are not defined clearly. The history of notions about suprageneric system of the family Issidae s. l. has about one hundred years. Traditionally, the features of external morphology, in particular those of the wings, were used for erecting the taxa of the family group. Melichar (1906) considered three subfamilies in the family Issidae (Issinae Spinola, Hysteropterinae Melichar, and Thioniinae Melichar) and treated Caliscelidae Amyot & Serville and Hemisphaeriidae Melichar as separate families. According to Haupt (1929) and Muir (1930), the family Issidae consists of three subfamilies: Issinae, Caliscelinae and Hemisphaeriinae. Muir (1930) recognized in the subfamily Issinae three tribes: Issini, Hysteropterini and Thioniini. On the other hand, Fennah (1954) included in Issidae five subfamilies: Issinae, Tonginae, Trienopinae, Caliscelinae, and Acanaloniinae. Dlabola (1980) erected a tribe Adenissini in the subfamily Issinae for the genera *Adenissus* Linnavuori, 1973 and *Anissus* Dlabola, 1980. Cheng & Yang (1991) on the basis of larval features erected the subfamily Parahiraciinae for the genus *Parahiracia* Ouchi, 1940, which was transferred to Issidae from Tropiduchidae by Fennah (1982). Emeljanov (1990, 1999) proposed to treat the tribe Bladinini Kirkaldy, 1907 erected in the family Ricaniidae and later transferred to the family Nogodinidae

(Fennah, 1978), as a subfamily of the family Issidae. Gnezdilov (2002) after the study of the ovipositor structure proposed to treat Hysteropterini as a subtribe of the tribe Issini and erected a new subtribe, Agalmatiina.

According to the phylogenetic scheme by Emeljanov (1990), the family Issidae s. l., including Issinae, Tonginae, Trienopinae, Caliscelinae, Acanaloniinae, and Bladininae, has no autapomorphies. Bourgoin with coauthors (1997) also indicated probable paraphyly of the family. Actually, molecular and morphological data indicate a heterogeneity of Issidae s. l. (Yeh et al., 1998; Emeljanov, 1999). At present, the families Caliscelidae and Acanaloniidae (with subfamilies Acanaloniinae, Tonginae and Trienopinae) are considered as separate families (Emeljanov, 1999; Yang & Chang, 2000). The structure of ovipositor shows that the family Issidae s. str., including the subfamily Issinae with the tribes Issini, Hemisphaeriini and Thioniini, distinctly differs from the family Caliscelidae as well as from the families Nogodinidae, Acanaloniidae and Ricaniidae being closely related according to the ovipositor structure (Gnezdilov, unpubl. data).

Systematic part

Chan & Yang (1994) placed the genus *Parahiracia* in the tribe Thioniini, but without any comments on the previous taxonomic position of the genus. However, *Parahiracia sinensis* Ouchi is distinguished by the characteristically bilobed hind wing, which has no incision of anal lobe

and is supplied with net of veins (Chan & Yang, 1994: Fig. 35 F). The similar characters were described by Shcherbakov (1982) for the genus *Prosonoma* Melichar, 1906. Such wing structure is not similar to the hind wing pattern of Thioniini s. str., which has almost trilobed hind wing (Shcherbakov, 1982: Fig. 8). Thus, in my opinion, the genus *Parahiracia* occupies an isolated position in the subfamily Issinae and belongs to a separate tribe.

The characters of the ovipositor allow identification of the taxonomic position for some groups with high certainty. So, according to the ovipositor structure (gonoplags flat; anterior connective lamina of gonapophyse VIII narrow, with three rounded flattened teeth at apex and three long spine-shaped teeth before apex) (Gnezdilov, unpubl. data), the tribe Adenissini Dlabola, 1980 is to be transferred to the family Caliscelidae.

Taxonomic position of the tribe Bladinini Kirkaldy is problematic, but, in my opinion, this group does not belong to the family Issidae. The genus *Bladina* Stål (subtribe Bladinina) is characterized by the distinctive anterior connective laminae similar to those of the family Fulgoridae (Gnezdilov, unpubl. data). In addition, O'Brien & Wilson (1985) noted that the subtribe Gaetuliina (tribe Bladinini) takes an intermediate position between Issidae and Nogodinidae. Probably, Bladinini sensu Fennah, 1978 is a combined group.

Within the subfamily Issinae, the genus *Colpoptera* Burmeister, 1835 is notable for long mesonotum, narrow fore wing with distal part supplied with net of veins, and the female genitalia with gonoplags fused medially. It is necessary to note also that the examined species, *Colpoptera carlota* Myers, is characterized by the extremely peculiar ovipositor, with a specialization manifested in narrowing of the anterior connective lamina of gonapophyse VIII and endogonocoxal process of gonocoxa VIII, in loss of the teeth of anterior connective lamina, and also in transformation of the posterior connective laminae of gonapophyse IX. The features discussed above testify to absolutely different type of oviposition as compared with that of Issidae s. str., in which the rake-mixing oviposition type predominates (Emeljanov, 1979; Boulard, 1987). In the case of *C. carlota*, the elongated and fused gonoplags are probably used as a directing case for the narrow and pointed endogonocoxal processes and anterior connective laminae in oviposition. Probably, *Colpoptera punctata* Metcalf, 1954 has a similarly specialized ovipositor, according to figure 20 in Metcalf (1954). Based on the hind wing venation, *Colpoptera* is related to the tribe Thioniini s. str., which is characterized by the following: Cubitus anterior (*CuA*) or second branch

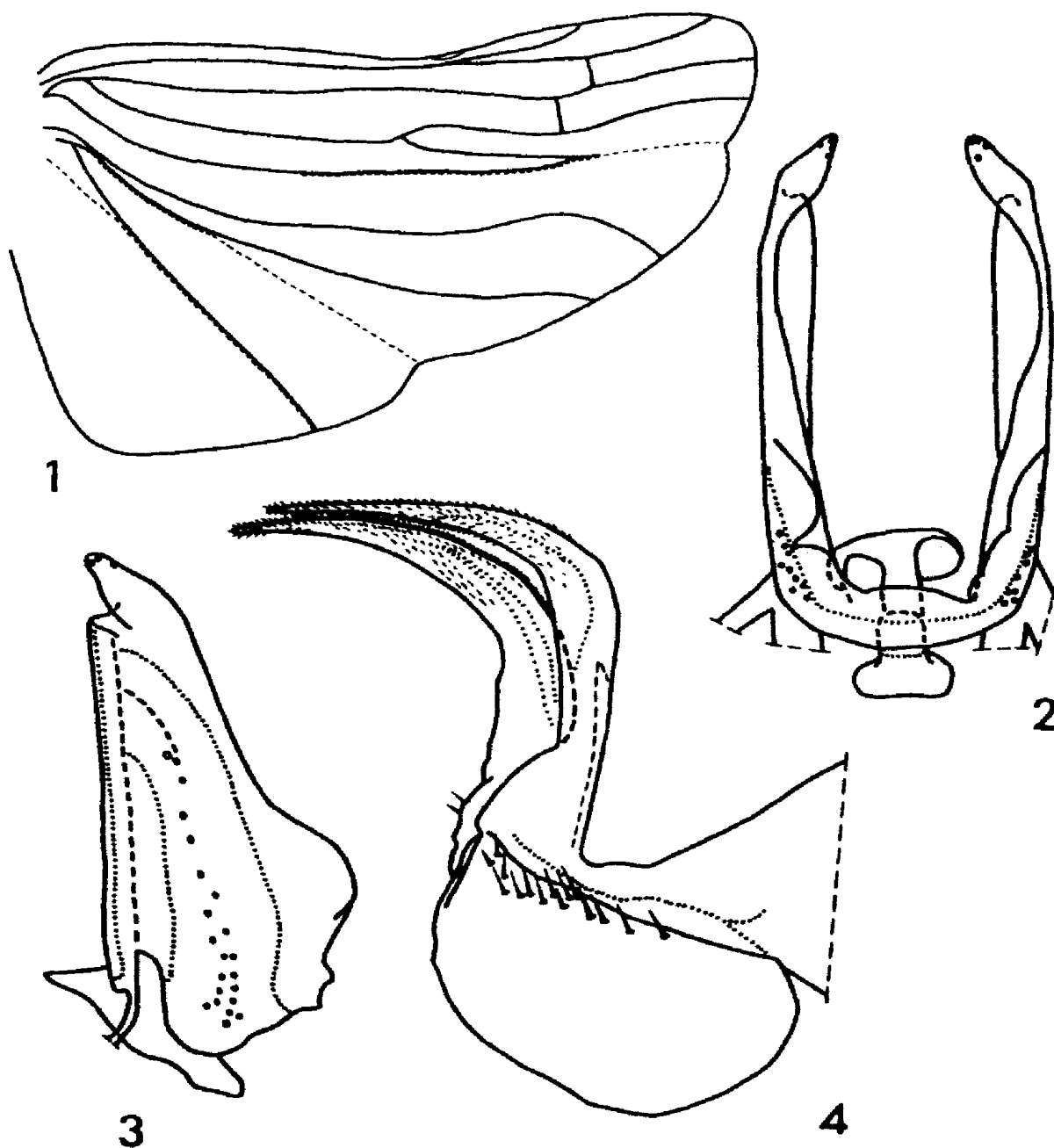
of Cubitus anterior (*CuA*₁) runs into Cubitus posterior (*CuP*) and *CuA*₂ + *CuP* runs into a deep incision of wing margin; the remigium, fore part of vannus and anal part of wing are in the shape of three almost equal lobes (Shcherbakov, 1982). In contrast to Thioniini, in the genus *Colpoptera* the wing margin is without deep incisions. I propose to erect a new tribe in the subfamily Issinae for the genus *Colpoptera*.

Family ISSIDAE Spinola, 1839

Diagnosis. Adults with body more or less oval or hemisphaerical. Coryphe often short and broad. Metope often with median and sublateral keels. Frontoclypeal suture arched or almost straight. Postclypeus without lateral keels. Pronotum with large disc and narrow lateral lobes. Fore wing dull, rigid and convex (elytriform), often with hypocostal lobe and knee prominence. Hind wing normally developed or rudimentary. Legs usually short and strong (but may be more or less long), with lateral teeth. The axis of coxotrochanter articulation of hind leg, as a rule, more or less horizontal. Metatarsomere I ventrally with a row of apical setae on high socles. Metatarsomere II with one placoid sensillum dorsally in basal part and with two apical setae on high socles ventrally. Arolium of pretarsus with a deep notch or without it, bearing 1-2 pairs of elongated dorsolateral plates without setae; claws with 1-4 pairs of setae.

Male. Penis with sclerotized phallobase; the latter, as a rule, with dorsolateral and ventral lobes, the first ones often bearing teeth or processes. Aedeagus with or without ventral hooks. Style with distinct capitulum bearing apical and lateral teeth.

Female. Gonoplags convex, sometimes with transverse keels outside, fused basally (in this case, their medial margins distinctly pigmented in form of a fork) or fused entirely along median line. Gonapophyses IX fused in proximal part and joined with scoop-shaped gonospiculum bridge. Posterior connective laminae of gonapophyses IX with convex proximal parts and straight, arcuated, or curved at angle distal parts. Median field, a weakly pigmented area, present between distal parts of posterior connective laminae. Median field weakly convex and often bilobed distally, or in form of a large process curved to the base of gonapophyses. Lateral fields, weakly pigmented areas, present between posterior fibulae and the proximal parts of posterior connective laminae. Lateral fields flat or in shape of projections. Endogonocoxal process either simple or 2-3-lobed. Anterior connective lamina of gonapophyse VIII, as a rule, in shape of relatively broad denticated plate with apical



Figs 1-4. *Calpoptera carlota* Myers. 1, hind wing; 2, posterior connective laminae of gonapophyses IX, in dorsal view; 3, same, in lateral view; 4, anterior connective lamina of gonapophyse VIII and gonocoxa VIII, in lateral view.

and lateral groups of teeth (these groups include 1-3 and 1-5 teeth, respectively) or narrow without teeth (in *Colpoptera* spp). Hind margin of gonocoxa VIII often protruded as a lobe over triangular sclerotized plate.

At present it is too early to make conclusions about the subfamilial and tribal system of the family Issidae on the whole. It will be possible only after a revision of most of the described genera.

Subfamily **ISSINAE** Spinola, 1839

Tribe **Colpopterini** trib. n.

Type genus *Colpoptera* Burmeister, 1835.

Diagnosis. Pronotum short. Scutum and scutellum combined long, about 4 times as long as pronotum, broad, with strong median and sub-lateral keels (see figure on Plate 12 in Metcalf, 1938). Fore wing narrow, more or less narrowed

to rounded, truncate or acute apex, with relatively narrow or broad hypocostal lobe. Radius (*R*) and Mediana (*M*) bifurcated, Cubitus anterior (*CuA*) simple. Distal part of fore wing with longitudinal veins having numerous branches. Hind wing always normally developed. Radius (*R*) and Cubitus anterior (*CuA*) bifurcated; Mediana (*M*), Cubitus posterior (*CuP*), Postcubitus (*Pcu*), and anal veins (*A*₁ and *A*₂) simple. Mediana (*M*) and Cubitus anterior (*CuA*) fused basally. Second branch of Cubitus anterior (*CuA*₂) running into Cubitus posterior (*CuP*). *CuA*₂ + *CuP* weakened, running into weak incision of wing margin. *Pcu* and *A*₁ not fused. Coupling lobe of hind wing present. Hind tibia with one lateral tooth. Hind margin of female sternum VII with process. Female gonoplares fused medially along almost entire length.

Taxonomy and distribution. The tribe includes the genus *Colpoptera*, distributed in the Bahama Islands, Mexico, Central America, the Greater and Lesser Antilles, and the North-Eastern part of South America (Metcalf, 1958). According to published data (Dozier, 1931; Caldwell & Martorell, 1950), the genus *Neocolpoptera* Dozier, 1931 distributed in Puerto Rico and the Virgin Islands (Metcalf, 1958) also belongs to this tribe.

***Colpoptera carlota* Myers, 1928**
(Figs 1-4)

Material. 2 ♀. Cuba, Sierra Maestra Prov., Alcarrata, Santiago de Cuba, 2.II.1989 (N. Kluge), deposited at the Zoological Institute, St. Petersburg.

Description. Female. Hind margin of sternum VII with broad invagination bearing median comb; hind margin of this invagination with a process. Anal tube long and narrow, narrowing to apex (in dorsal view) and curved (in lateral view). Anal column narrow and long (1/3 of anal tube length). Gonoplares convex, more or less triangular, strongly narrowed apically, fused medially along almost entire length. Posterior connective laminae of gonapophyses IX more or less horseshoe-shaped (Fig. 2). Proximal part of posterior connective lamina short. Distal parts of posterior connective lamina nearly parallel to each other. Lateral fields flat. Median field proximally in shape of a pair of large lobes perpendicular to longitudinal body axis. Gonospiculum bridge in shape of broad tube, fused with proximal part of posterior connective laminae. Gonocoxa VIII with simple not lobed margin. Anterior connective lamina of gonapophyse VIII and endogonocoxal process of gonocoxa VIII very similar in structure, with short setae. Endogonocoxal process narrow and pointed, flattened laterally, with a comb of setae on dorsal margin, lateral sides with more short setae, and ventral

margin with setae only in apical part; apical lobe simple; subapical lobe indistinct. Anterior connective lamina narrow, flattened laterally, without teeth, entirely covered with setae.

Key to tribes of the subfamily Issinae (imago)

- 1(6). Hind wing normally developed or rudimentary. Anal lobe of hind wing small, often not separated by incision of wing margin.
- 2(3). Fore wing strongly convex, with longitudinal veins weak or sinuous, claval suture indistinct. **Hemisphaeriini** Melichar
- 3(2). Fore wing, as a rule, moderately convex, with straight and strong longitudinal veins, claval suture distinct (if claval suture indistinct then female anal tube elongated).
- 4(5). Hind wing bilobed; claval fold more or less distinct **Parahiraciini** Cheng & Yang, *stat. n.*
- 5(4). Hind wing without lobes; claval fold indistinct. **Issini** Spinola
- 6(1). Hind wing always normally developed. Anal lobe of hind wing large, distinctly separated by incision of wing margin.
- 7(8). Distal part of fore wing with strongly branched longitudinal veins. In hind wing, lobes not distinct. Second branch of Cubitus anterior (*CuA*₂) + Cubitus posterior (*CuP*) weakened, running into weak incision of wing margin. Postcubitus (*Pcu*) and 1st anal vein (*A*₁) not fused. Female gonoplares fused medially along almost entire length. . . . **Colpopterini** trib. n.
- 8(7). Venation of fore wing more uniform. Hind wing with remigium, fore part of vannus and anal part in shape of three subequal wing lobes. Second branch of Cubitus anterior (*CuA*₂) + Cubitus posterior (*CuP*) thickened, running into a deep incision of wing margin. Postcubitus (*Pcu*) and 1st anal vein (*A*₁) fused. Female gonoplares fused only in base **Thioniini** Melichar

References

- Boulard, M.** 1987. Contribution à l'étude des Issidae. L'oothèque terrestre des "Hysteropterum", un problème évolutif [Hom. Fulgoroidea]. *Bull. Soc. entomol. Fr.*, 92(1-2): 5-17.
- Bourgoin, T., Steffen-Campbell, J.D. & Campbell, B.C.** 1997. Molecular phylogeny of Fulgoromorpha (Insecta, Hemiptera, Archaeorrhyncha). The enigmatic Tettigometridae: evolutionary affiliations and historical biogeography. *Cladistics*, 13: 207-224.
- Caldwell, J.S. & Martorell, L.F.** 1951. Review of the Auchenorrhynchous Homoptera of Puerto Rico. II. The Fulgoroidea except Kinnaridae. *J. agr. Univ. Puerto Rico*, 34(2): 133-269.
- Chan, M.L. & Yang, Ch.T.** 1994. *Issidae of Taiwan (Homoptera: Fulgoroidea)*. Taichung: ROC. 188 p.
- Cheng, Ch.L. & Yang, Ch.T.** 1991. Nymphs of Issidae of Taiwan (IV) (Homoptera). *Plant Protect. Bull.*, 33: 334-343.
- Dlabola, J.** 1980. Tribus – Einteilung, neue Gattungen und Arten der subf. Issinae in der eremischen Zone (Homoptera, Auchenorrhyncha). *Acta Mus. nat. Pragae*, 36 B(4): 173-247.
- Dozier, H.L.** 1931. New and interesting West Indian Homoptera. *Amer. Mus. Nov.*, 510: 1-24.
- Emeljanov, A.F.** 1979. The problem of family distinction between the Fulgoridae and the Dictyopharidae (Homoptera, Auchenorrhyncha). *Proc. Zool. Inst. Acad. Sci. SSSR*, 82: 3-22. (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 with English summary).
- Emeljanov, A.F.** 1999. 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). *Zoosyst. Ross.*, **8**(1): 61-72.
- Fennah, R.G.** 1954. The higher classification of the family Issidae (Homoptera: Fulgoroidea) with descriptions of new species. *Trans. Roy. entomol. Soc. Lond.*, **105**(19): 455-474.
- Fennah, R.G.** 1978. The higher classification of the Nogodinidae (Homoptera, Fulgoroidea) with the description of a new genus and species. *Entomol. mon. Mag.*, **113**, 1977: 113-119.
- Fennah, R.G.** 1982. A tribal classification of the Tropiduchidae (Homoptera: Fulgoroidea), with the description of a new species on tea in Malaysia. *Bull. entomol. Res.*, **72**(4): 631-643.
- Gnezdilov, V.M.** 2002. Morphology of the ovipositor in the subfamily Issinae (Homoptera, Cicadina, Issidae). *Entomol. Obozr.*, **81**(3): 605-626. (In Russian with English summary).
- Haupt, H.** 1929. Neueinteilung der Homoptera-Cicadina nach phylogenetisch zu wertenden Merkmalen. *Zool. Jb. (Jena)*, **58**: 173-286.
- Melichar, L.** 1906. Monographie der Issiden (Homoptera). *Abh. zool. bot. Ges. Wien*, **3**(4): 1-327.
- Metcalf, Z.P.** 1938. The Fulgoroidea of Barro Colorado and other parts of Panama. *Bull. Mus. comp. Zool. Harvard Coll.*, **82**(5): 277-423.
- Metcalf, Z.P.** 1954. Homoptera from the Bahama Islands. *Amer. Mus. Nov.*, **1698**: 1-46.
- Metcalf, Z.P.** 1958. Fulgoroidea. Issidae. *General catalogue of the Homoptera*, **4**(15). Baltimore: Waverly Press. 561 p.
- Muir, F.** 1930. On the classification of the Fulgoroidea. *Ann. Mag. natur. Hist.*, Ser. 10, **6**: 461-478.
- O'Brien, L.B. & Wilson, S.W.** 1985. Planthopper systematics and external morphology. In: Nault, L.R. & Rodriguez, J.G. (Eds.). *The leafhoppers and planthoppers*: 61-102. New York: J. Wiley & Sons.
- Shcherbakov, D.E.** 1982. Diagnostics of the families of Auchenorrhyncha (Homoptera) on wings. II. Hind wing. *Entomol. Obozr.*, **61**(3): 528-536. (In Russian with English summary).
- Yang, C.-T. & Chang, T.-Y.** 2000. The external male genitalia of Hemiptera (Homoptera-Heteroptera). Taichung: Shih Way Publ. 746 p.
- Yeh, W.-B., Yang, C.-T. & Hui, C.-F.** 1998. Phylogenetic relationships of the Tropiduchidae-group (Homoptera: Fulgoroidea) of planthoppers inferred through nucleotide sequences. *Zool. Stud.*, **37**(1): 45-55.

Received 3 February 2003