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Notes on the Tribe Rhotalini (Homoptera, Achilidae) with Analysis of the Hind-Wing Venation and Redescription of the Genus *Taractellus* Metcalf from Chile

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Abstract—The genus *Taractellus* Metcalf is redescribed based on new material; its position in the family Achilidae and in the tribe Rhotalini is confirmed. The evolutionarily labile anastomosis of the medial and anterocubital veins of the hind wing in the representatives of Achilidae and in the other Fulgoroidea is analyzed.

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Prior to Fennah (1950) showing their true identity, the representatives of the tribe Rhotalini Fennah, 1950 belonging to the family Achilidae had been described in the families Tropiduchidae (*Hebrotasa* Melichar, 1914, *Chiotasa* Melichar, 1914, and *Siebererella* Schmidt, 1926) and Lophopidae (*Ridesa* Schumacher, 1914); the genus *Siebererella* had also been placed in the family Issidae (Fennah, 1982). Earlier, *Rhotala valdiviana* Fennah, 1965 was attributed by me to the genus *Hebrotasa*, based on the figures in Fennah's (1965) publication. Fennah described this species from a single subbrachypterous male. As the result of the trip to Southern Chile with a group of entomologists of the Paleontological Institute of the Russian Academy of Sciences, K.Yu. Eskov and I collected material of the larvae and brachypterous and macropterous adults of *Rhotala valdiviana* Fennah. Examination of the material has shown that *Rh. valdiviana* should be attributed to a genus of its own. Analysis of the images of a type (holotype?) of *Cixius chilensis* Spinola, 1852, posted on the Internet by Ch. Bartlett (http://ag.udel.edu/research/delphacid/dictyopharidtypes.html), has shown that *Rh. valdiviana* is a junior synonym of this species which, in turn, is the type species of the genus *Taractellus* Metcalf, 1948 (= *Taracticus* Berg, 1881, n. pr.). There are two incompatible points of view on this genus in the literature. Berg and Metcalf attributed the genus *Taracticus-Taractellus* to the family Achilidae (Berg, 1881; Metcalf, 1938, 1948). Fennah (1965), based only on the original description, considered that the figure signed as *Cixius gayi* Spinola actually concerned *C. chilensis* Spinola. He attributed *C. gayi* to the genus *Catonia* Uhler (Achilidae) and *S chilensis* Spinola, to the genus *Chondrodera* Melichar (Dictyopharidae). The photographs of the type specimens on the Internet (Bartlett http://ag.udel.edu/research/delphacid/dictyopharidtypes.html) do not confirm Fennah's point of view: *C. gayi* Spinola undoubtedly belongs to the genus *Chondrodera* Melichar and it is identical to the species *Ch. chilensis* Melichar (non *Cixius chilensis* Spinola!), and *Cixius chilensis* Spinola belongs to the genus *Rhotala* s. lato, instead of to *Catonia* Uhler.

Taractellus Metcalf, 1948

Taracticus Berg, 1881 nomen, praeoccupatum.

Type species *Cixius chilensis* Spinola, 1852 (Fig. 1).

The coryphe is short, similarly to that in the genus *Hebrotasa* Mel.; the metope is narrow and elongate, similarly to that in the genus *Errada* Walk.; an arcuate depression on the surface of the metope is similar to that in the genus *Hebrotasa*, but it is not outlined by a sulcus and resembles a smooth depression in some species of the genus *Rhotala* Walk. sensu stricto. The pronotal disc projects slightly forward.

The fore wing (Fig. 1, *1*, *2*) lacks an oblique vein (characteristic of Rhotalini) which runs toward the wing margin more distally than the so-called achilid cross-vein and forms anteriorly consecutive branches

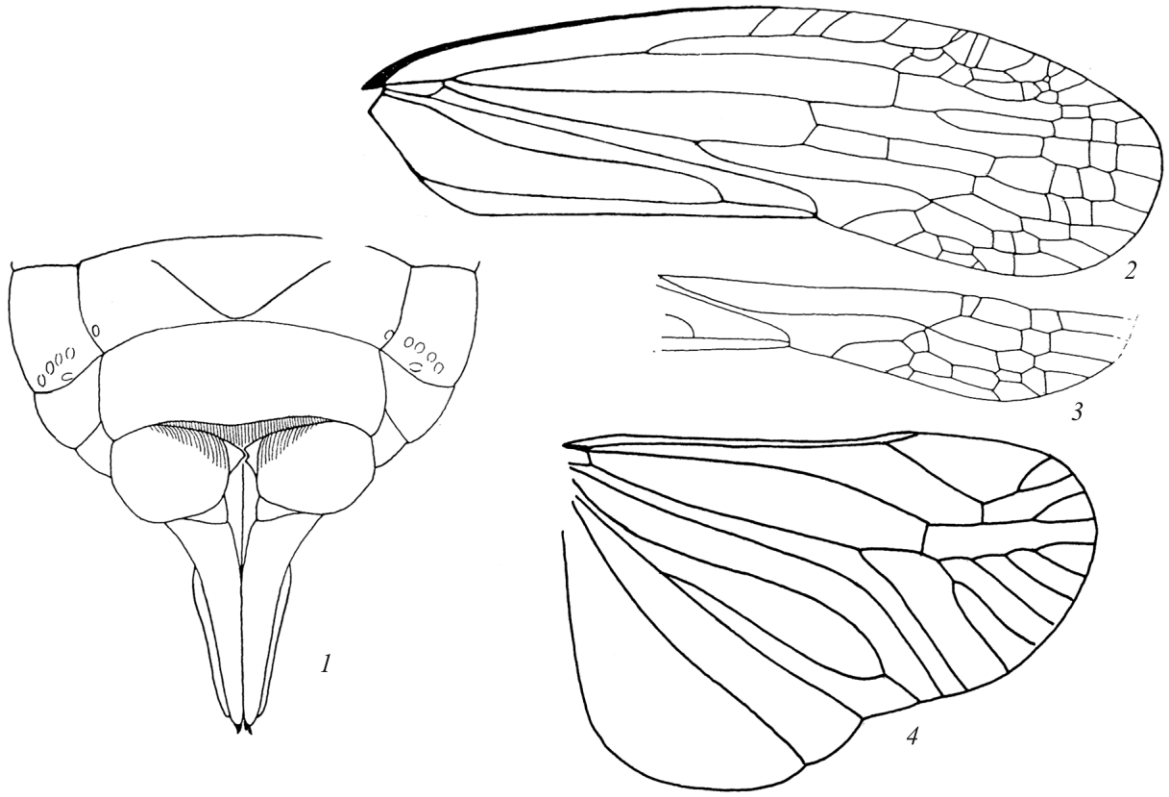

Fig. 1. *Taractellus chilensis* Spinola: (*1*, *2*) fore wing, macropterous form [(*1*) right wing, general view; (*2*) posterior part of membrane of left wing, reverse-reading]; (*3*) hind wing; (*4*) apex of female abdomen, ventral view.

(an anterior pecten); instead of this, *CuA2* forms a rather distinctive branching similar to that in Achilini and many other tribes.

The hind wing (Fig. 2, *5–9*) in all the members of the tribe Rhotalini is characterized by the stem of *CuA* breaking the posterior branch of *M* (this is at least an apomorphy of the superfamily Fulgoroidea, see below), which resulted from the intermediate anastomosis of branches of *MP* and *CuA1* formed in place of the cross-vein *m-cua*. After that, the primary base of *CuA1* turns into a cross-vein and then disappears. Traces of the primary state are observed in *Errada nawae* Matsumura (Fig. 2, *4*; see also the figure in Ishihara, 1954). The branching of the combined apex of *MP*+*CuA1* in the majority of the representatives of the tribe Rhotalini forms the configuration of an anterior pecten (Fig. 1, *4–7*). In contrast, in *Taractellus* (Fig. 2, *9*), the branching follows the type of a posterior pecten; in addition, *Taractellus* is characterized by the apical anastomosis of *Pcu*+*A1*, by the absence of an emargination of the wing margin opposite the apex of *CuP*, and by complete development of vein *A2* reaching the wing margin; in all the other cases described in the tribe, vein *A2* does not reach the wing margin (Fig. 2, *4–8*) (a plesiomorphy).

The hind tibia only bears apically four large teeth and one smaller underdeveloped tooth. The first and second segments of the hind tarsus bear five apical teeth each.

The male genitalia are similar to those in the other representatives of Rhotalini; they are described and illustrated by Fennah (1965).

The female genitalia (Fig. 1, *5*) sharply differ from those in the other representatives of the tribe in the absence of a strong subgenital plate concealing ventrally the entire ovipositor or its basal half. The valves of the ovipositor are elongate and narrow, similar to those in the genera *Hebrotasa* and *Rhotala*.

According to the structure of the ovipositor, the representatives of Rhotalini except *Taractellus* can be divided into three groups. (1) A rounded ovipositor concealed with a subgenital plate only in its basal part, a plesiomorphic state typical of all the Fulgoroidea. (2) A rounded ovipositor entirely concealed ventrally with an elongate subgenital plate. (3) An elongate

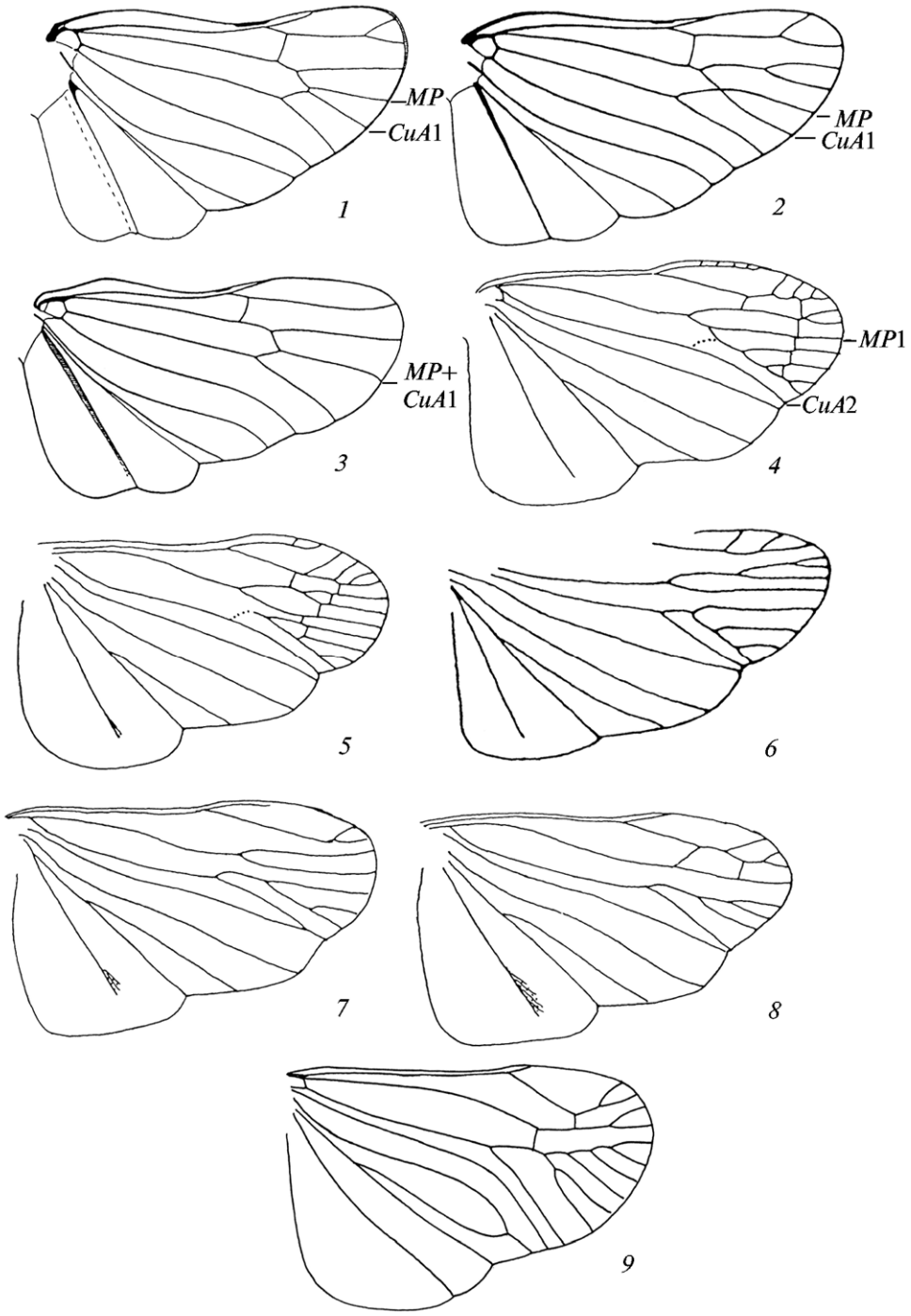

Fig. 2. Hind wing of Fulgoroidea: (*1–3*) family Cixiidae, Pentastirini; (*4–9*) family Achilidae, Rhotalini [(*1*) *Hyalesthes obsoletus* Sign.; (*2*) *Pentastiridius leporinus* L.; (*3*) *Oliarellus fulvus* Kusn.; (*4*) *Errada nawae* Mats.; (*5*) *Rhotala formosana* Mats.; (*6*) *Rh. delineata* Walk.; (*7*) *Rh. jiangxiensis* Xu et Liang; (*8*) *Hebrotasa fanjingshana* Chen et Yang; (*9*) *Taractellus chilensis* Spin.]; (*1–4*) orig.; (*5*) after Yang and Yeh, 1994; (*6*) after Walker, 1857; (*7*, *8*) after Xu and Liang, 2011; (*9*) orig.].

ovipositor with elongate and narrowed third valves, entirely concealed ventrally by an elongate subgenital plate. The two former types are present in the genus *Errada*, the third one, in the genera *Rhotala* and *Hebrotasa*; the structure of the ovipositor in the genus *Errotasa* is unknown. In the genus *Taractellus*, the ovipositor valves are elongate and narrow, but the subgenital plate is nearly absent, and the ovipositor

valves are not concealed ventrally. In the structure of the head, *Taractellus* is similar to the genera *Hebrotasa* and *Rhotala*; therefore it should be considered that the subgenital plate in the new genus has vanished secondarily.

As for the anastomosis of *MP-CuA1* in the hind wing of Fulgoroidea (Fig. 2). In the lower Fulgoroidea, the hind wing is characterized by a varying anastomosis of the posterior branch of the medial vein with the anterior branch of the cubitus anterior. In macroevolution of the lower Fulgoroidea, it functions according to the mode named by me "a morphocycle" (Emeljanov, 1994, 2000, 2001; Emeljanov et al., 2001). The complete morphocycle of this anastomosis is observed in Cixiidae (Fig. 2, *1*–*3*). The primary macroevolutionary event which gave rise to formation of the morphocycle was the occurrence of a single-point anastomosis at the place of the nodal cross-vein *mcu* (Fig. 2, *2*); this single-point anastomosis passed into an extended intermediate anastomosis and, then, into a final anastomosis, a complete merging of *MP* and *CuA1* from the nodal level to the wing margin (Fig. 2, *3*). The essence of the morphocycle consists in the ability of a new apomorphic state to come back (reverse) relatively easily to the preceding state which, appearing as a plesiomorphic state, is not that in the strict sense of the plesiomorphy but is a homoplasy by reversion. In the family Cixiidae, the complete morphocycle can be observed.

(1) Cross-vein *mcu*—a secondary loss of synapomorphy in all the Fulgoroidea—*Borysthenes* Stål (Borystheninae: see figure, e.g., in Emeljanov, 2002) is a constant character of the tribe; in the tribe Pentastirini, in *Pentastira major* Kbm. and *Hyalesthes obsoletus* Sign. (Fig. 2, *1*)—as an individual variant.

(2) A single-point anastomosis of *MP+CuA1*—Andini, Pentastirini (see figure, e.g., in Anufriev and Emeljanov, 1988; Emeljanov, 2002).

(3) An intermediate anastomosis. It is typical of many tribes of Achilidae (see figure, e.g., in Emeljanov, 2002).

(4) The final anastomosis—the tribes Oecleini, Duiliini, and Eucarpiini; it occurs in some representatives of other tribes (see figure, e.g., in Emeljanov, 2002), including *Oliarellus fulvus* Kusn. (Pentastirini; Fig. 2, *3*).

The presence of vein *mcu* and a single-point anastomosis of *MP+CuA1*, which occur in some representatives of Cixiidae, are the result of independent reversions in unrelated (not sister) and not in basal tribes; the same concerns the cases of restoration of vein *mcu*. In the tribe Pentastirini, the entire range is presented; only state 3, intermediate anastomosis, has not been found (until now?).

A number of states of the same morphocycle is also observed in the family Delphacidae; final anastomosis prevails there (*Asiraca* Latr., *Copicerus* Swartz, *Pentagramma* V.D.), but intermediate anastomosis also occurs (*Fennasiraca* Asche, *Ostama* Walk., *Eodelphax* Kirk., *Livatiella* Fenn., *Ugyops* G.-M.); in the genus *Ugyops*, both final and intermediate anastomoses occur (see figures in Asche, 1985; Emeljanov, 2002).

In the tribe Rhotalini (Fig. 2, *4*–*9*), the fans of veins *MR+CuA1* may originate from the stem of *M* in *Errada nawae* Mats. (Fig. 2, *4*) and from *CuA* (Fig. 2, *5*–*9*) in representatives of the other genera (*Rhotala* Walk., *Errotasa* Em., *Hebrotasa* Mel., *Taractellus* Metc.).

It can be assumed that the main reason for the presence of a break in the bases of vein tufts in the fulgoroid hind wing are changes in the wing folding at rest, which are caused by changes in the proportions of the body, first of all, of the abdomen, which lead to narrowing, widening, or bending of the wing plates when the wings are folded. In transition, new folds can occur, and the current folds can change their direction mainly in the distal parts when the fold crosses the branches of the longitudinal veins containing tracheae: the vein breaks, the trachea is pressed and thus does not pass through the fracture, then, by compensation, the trachea of the next stem runs through the cross-vein—the break is complete. The cross-veins readily change their transverse direction to the oblique one, which obscures their initial state. In other cases, an active trachea on the (sharp) bends of the wing plate is preserved owing to the presence of a desclerotized (membranous) spot in the area of the bend; within this spot, the trachea can smoothly bent. Such a situation is observed, e.g., in the genera *Ilva* Stål, *Sevia* Stål, *Apateson* Fowl., *Achilla* Hagl., *Olmiana* Gugl., Bueckle, Em. (see figures in: Emeljanov, 1991, 1992; Guglielmino et al., 2010).

Taractellus chilensis (Spinola, 1852) (Fig. 1)
(= *Rhotala valdiviana* Fennah, syn. n.)

Material. Chile. Parque Nac. Alerce Andino, cordón Sargaza 35 km E Puerto Montt. S 41°30′, W

72°37′, 5.I.2014, 1 ♂ subbrach. (A. Emeljanov); 8.I.2014, 1 larva of 4th instar, 1 larva of 3rd instar (A. Emeljanov); 9.I.2014, 1 ♂ macropt. (K. Eskov); 10.I.2014, 1 larva of 5th instar (K. Eskov); 11.I.2014, 1 larva of 5th instar (K. Eskov).

Description. Macropterous form differing in darker coloration. Face almost entirely blackened; row of white spots sharply projecting at sides at place of larval sensory pits; pair of oblique drop-shaped pale spots occasionally present in medial part; median carina red; lower margin of metope pale; postclypeus with vague red stripes at sides. Upper part of metope with oblong-oval pale ring-shaped spot. Fore wing hyaline with pattern of irregular medium-sized brown spots; vein on pale elements of pattern pale.

Larva of 5th instar (nymph). Body similar to that of adult in general proportions, except for wings. Head considerably differing in degree of development of carinae and intervals between them. Coryphe concave, anteriorly separated from apical callus by projection, laterally bounded by sharp carinae; border between coryphe and occiput absent, their common surface extending under anterior peak of pronotal disc. Apical callus large, rectangular, about 1.5 times as long as wide. Intermediate carinae sharp. Lateral areas of metope narrow, parallel-sided, sulciform, deflected onto sides (more strongly in upper part), bearing 2 rows of dense sensory pits; median row consisting of 12 pits; 3 dorsal pits lying opposite apical callus; pits becoming smaller from up to down; distance from lowermost pit to claval suture 3–4 times pit diameter. Pits of outer row equally small; in upper part, pits of outer and inner rows equal in size; 3 pits of outer row lying beneath lower pit of inner row. Middle areas widening toward postclypeus; median carina sharp only in upper half. Pronotal disc with 6 pits closely arranged along lateral carina, beginning with posterior margin along 2/3 of disc length; median carina double (exuvial). Paradiscal area with 2 pits at posterior margin; pits spread to carinae. Collateral carina absent (present in a nymph presumably belonging to a species of the genus *Rhotala*); area of sensory pits uniform from lateral carina to lower margin of paranotal lobes; pits arranged in 4 longitudinal rows, with 3 or 2 in each row. Mesonotum with 2 groups of pits at sides of discal carinae: 1st group consisting of 2 pits situated obliquely transversely; 2nd group consisting of 3 pits in transverse row, group shifted laterally on 2–3 pit diameter. Rudiments of wings with 2 adjacent pits on middle part and with 2 separated pits in apical part. Metathorax with approximate homological groups of pits at sides of discal carinae. Lateral carinae of mesonotal disc diverging posteriorly; lateral carinae of metanotal disc subparallel. Abdomen, beginning with tergite II, with simple median and intermediate carinae; tergite I without carinae, median carina replaced by sulcus, but sclerotization appearing non-interrupted on sulcus; tergite IV with intermediate carina bifurcate anteriorly, its posterior end lying on common line; tergites IV–VIII with sublateral carina consisting of separate arcuate carinae (with bulges turned medially) on each tergite; these carinae bordering medially lateral groups of sensory pits. Intermediate carina, beginning with tergite V, with one sensory pit on its pecten, interrupted by pit closer to its posterior end. Lateral group of pits present on tergites IV–VII, consisting of 3 pits lying closely to lateral carina; another pit present medial to anterior pit; lateral group on tergite VIII consisting of single pit; this pit and also one lying medial to it and one lying at posterior end of intermediate carina situated more closely to each other because of reduction of width of segment and thus forming transverse row of three weakly separated pits. Tergite IX with 3 pits in upper part (medially) and with 2 pits in lower part. Extralateral areas on tergites III–VII narrow, without sensory pits; those on tergite VIII large, with group of five sensory pits: 1 + 2 + 2. Hind tibia with 4 or 5 lateral teeth (8 or 9 in adults) with traces of suture between seta and socle; suture present in Cixiidae.

General coloration speckled, dark brown with pale brown spots. Face entirely brown to dark brown. Legs with pale bands similar to those in adult.

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