

A new species of *Lydella* (Diptera: Tachinidae) from Mexico with a discussion of the definition of the genus

Norman E. Woodley

Systematic Entomology Laboratory, PSI, ARS, USDA,
Washington DC, USA

Abstract

Following the discovery of *Lydella jalisco* **sp. n.** (from Jalisco, Mexico), a parasite of the Mexican rice borer, *Eoreuma loftini* (Dyar) (Lepidoptera: Pyralidae), the limits of the genus *Lydella* Robineau-Desvoidy have been widened to include *Diatraeophaga* Townsend **syn. n.**, *Metoposisyrops* Townsend **syn. n.**, and *Metagonistylum* Townsend **syn. n.** All species regarded as belonging to *Lydella* are listed, with *L. minense* (Townsend) **comb. n.**, *L. oryzae* (Townsend) **comb. n.**, *L. scirpophagae* (Chao & Shi) **comb. n.**, *L. sesamiae* (Mesnil) **comb. n.**, and *L. striatalis* (Townsend) **comb. n.**

Introduction

Members of the goniine tachinid genus *Lydella* Robineau-Desvoidy and those of several closely related genera (*Diatraeophaga* Townsend, *Metagonistylum* Townsend, and *Metoposisyrops* Townsend) have been used extensively in the biological control of stalk boring Lepidoptera, including major pests such as the European corn borer (*Ostrinia nubilalis* (Hübner)) and the sugarcane borer (*Diatraea saccharalis* (Fabricius)); Brenière *et al.*, 1967; Bennett, 1969).

Eoreuma loftini (Dyar) (Lepidoptera: Pyralidae), the Mexican rice borer, is a stem borer that has become the major pest of sugarcane in the Lower Rio Grande Valley in Texas, USA, since it was discovered there in 1980 (Johnson, 1985). A biological control programme against this pest was undertaken (Pfannenstiel *et al.*, 1990). During survey work for parasites of *E. loftini* in Mexico in 1988 in support of this programme (Rodriguez-del-Bosque & Smith, 1989b), the new species of *Lydella* described below was reared. The discovery of the new species, and examination of the other tachinid genera mentioned above, has required the widening of the generic limits of *Lydella*.

Lydella jalisco **sp. n.**
(figs 1–5)

Diagnosis. This species may be separated from congeners by having a row of strong setae on the facial ridge

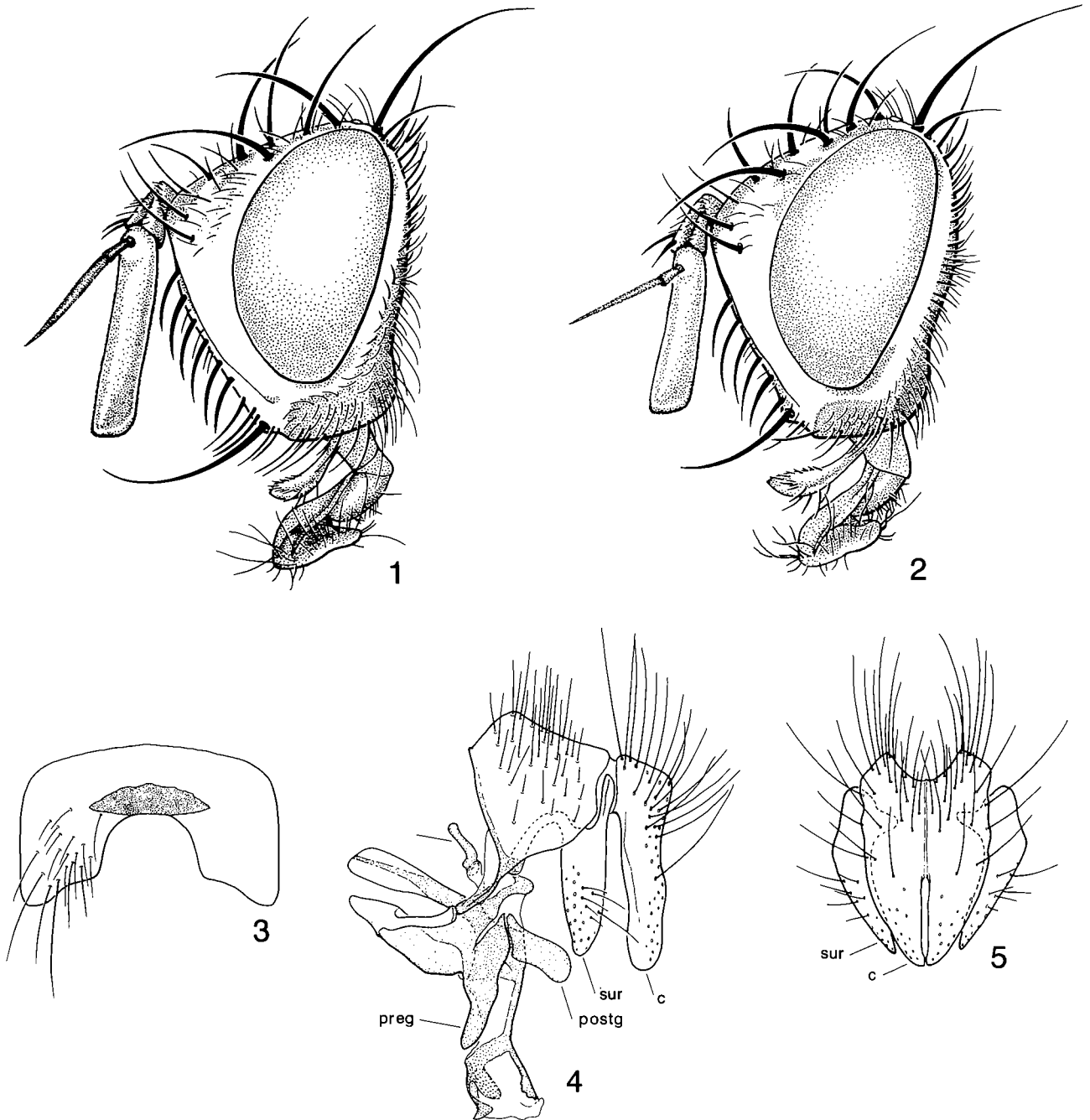
extending two-thirds or more to the antennal bases (figs 1, 2). It differs from other *Lydella* spp. in the strict sense by lacking discal setae on abdominal tergites 3 and 4, having reduced lappets of the posterior thoracic spiracle, and having wing cell r_{4+5} closed well before the wing margin.

Description. *Male.* Length 4.9–7.2 mm. Head (fig. 1) ground color black, uniformly densely silvery-grey tomentose, less dense on vertex and occiput that appear darker but not shiny, all setae (including bristles) black except for some white occipital pilosity; length of head at antennal insertion longer than at vibrissal level, face therefore strongly receding; face deeply concave, lower margin not visible in profile; facial ridge slightly convex in lateral view, with row of stout, equal setae extending dorsally nearly to level of arista, sometimes with a few shorter hairs interspersed; genal dilation small; parafacial narrowed ventrally, bare, about width of first flagellomere at widest point; frontal setae uniserial, extending ventrally approximately to level of arista; one strong proclinate orbital seta and usually one, occasionally two, reclinate orbitals; outer vertical seta about one-half length of strong inner vertical; ocellar seta stout, proclinate; eye with very short, sparse hairs, appearing bare at lower magnifications; first flagellomere long, 4–5 times length of pedicel; arista with first aristomere short, inconspicuous, second longer, 0.20–0.25 times length of third, third thickened nearly to apex; palpus short, dark, becoming dull yellowish apically. Thorax black, largely greyish-white tomentose, mesonotum with four faint vittae; prosternum with 2–3 setae on each lateral margin; one anterior and three

Correspondence: Norman E. Woodley, Systematic Entomology Laboratory, PSI, ARS, USDA c/o National Museum of Natural History, NHB 168, Washington, DC 20560, USA.

basal postpronotal setae, anterior and innermost basal setae sometimes reduced, basals in a straight row; acrostichal and dorsocentral setae 3+3, posteriormost dorsocentral significantly larger, others uniform in size; first postsutural supraalar seta longer and stouter than first postsutural dorsocentral; scutellum with basal and subapical setae well developed, laterals sometimes fine, apicals weak, slightly to distinctly divergent; depressed part of proepisternum bare;

anatergite bare; katepisternum usually with three major setae, the two dorsal setae strongest, the third seta smaller, arising directly ventral to the anterodorsal seta, sometimes with a weaker, fourth seta nearly equidistant from and level with the dorsal pair; posterior spiracle small, with anterior lappet enlarged and posterior lappet reduced, posterior lappet thus only slightly larger than anterior; tarsal claws and pulvilli shorter than last tarsomeres; middle tibia with



Figs 1-5. *Lydella jalisco*; 1, male head, left lateral view; 2, female head, left lateral view; 3, male fifth sternite, ventral view; 4, male terminalia, left lateral view; 5, male terminalia, posterior view. Abbreviations: *c*, cercus; *ea*, ejaculatory apodeme; *preg*, pregonite; *postg*, postgonite; *sur*, surstylus.

one strong anterodorsal seta; wing hyaline, tegula and basicosta black; cell r_{4+5} closed before wing margin, petiole longer than $r-m$; bifurcation of R_{2+3} and R_{4+5} with a single long seta both dorsally and ventrally; calypters white, slightly yellowish marginally. Abdomen black, moderately shiny, anterior one-third to one quarter of tergites 3, 4, and 5 with dense, silvery grey tomentose bands; ventral portions of all tergites without dense hair patches; syntergite 1+2 with middorsal depression extended to posterior margin; median marginal setae present on tergites 3 and 4, discal setae absent. Male terminalia (figs 3–5) with sternum 5 (fig. 3) short, wider than long, with medial U-shaped posterior emargination; ejaculatory apodeme (fig. 4, *ea*) small, not expanded dorsoventrally; postgonite (fig. 4, *postg*) broadly rounded apically; pregonite (fig. 4, *preg*) elongate, slightly tapered toward apex; surstylus in lateral view (fig. 4, *sur*) straight, shorter than cercus, rounded apically, bowed inwardly in posterior view (fig. 5); cercus straight, narrow and parallel-sided in profile (fig. 4, *c*), cerci together nearly ovate in posterior view (fig. 5), fused on basal half.

Female. Length 5.1–7.2 mm. Differing from male as follows: Head (fig. 2) with setae on facial ridge not extending as far dorsally as in male, sometimes only about one-half of facial ridge setose; two strong proclinate orbital setae; pedicel slightly longer than that of male, first flagellomere shorter; third aristomere not quite as thickened, more gradually tapered toward apex. Thorax and abdomen as in male. Female terminalia not examined in detail.

Puparium. Brownish, finely shagreened; posterior spiracles raised from surrounding surface on short processes, each with 4 slightly bent slits.

Material examined. Holotype ♂, MEXICO: Jalisco, Ameca, 12–14.ix.1988 (L.A. Rodriguez) ex: *Eoreuma loftini* in sugarcane (USNM). Allotype ♀, 4♂, 2♀ paratypes, MEXICO: same data as holotype (USNM); 1♂, 3♀ paratypes, MEXICO: same data as holotype, but 30.v.1988 (USNM, TAM); 25♂, 10♀ paratypes, MEXICO: same data as holotype, but 12–14.vii.1988 (USNM, CNC, TAM). The holotype, allotype, and a number of paratypes have associated puparia.

Etymology. The specific name, a noun in apposition, refers to the Mexican state in which the type locality is found. I have also chosen this name because this species has been referred to as the 'Jalisco fly' in some biological control literature mentioned below.

Discussion. *Lydella jalisco* is most similar to another undescribed species of *Lydella* from Mexico and Honduras that parasitizes *Diatraea* spp., hereafter referred to as *Lydella* sp. This species is not being described at present because only a few, poorly preserved, specimens are at hand. Both species have a proclinate orbital in males and the posterior spiracle of the thorax has similar-sized lap-pets. *Lydella* sp. has weaker setae on the facial ridge, extending only about half way to the antennal bases, and cell r_{4+5} is open at the wing margin. *Lydella striatalis* (Townsend) (formerly in *Diatraeophaga*) is also similar

(see discussion below), but differs from *L. jalisco* in having only a few fine setae on the lower part of the facial ridge, and in males having the second aristomere elongate, nearly as long as the third. *Lydella breviseria* (Pandellé), a rare species from France, has some setae on the lower half of the facial ridge, but they are much shorter and finer than those found in *L. jalisco*, and it also has cell r_{4+5} open at the wing margin and strong discal setae on abdominal tergites 3 and 4.

Rodriguez-del-Bosque & Smith (1989a) provided a brief summary of the biology of *L. jalisco*, which is briefly reviewed here. The species is apparently highly host-specific to *Eoreuma loftini*, as laboratory attempts at rearing it on *Diatraea* spp. have been unsuccessful. Females incubate eggs in an ovisac until ready to hatch, and it is most likely that they are ovularviparous, not larviparous as stated by Rodriguez-del-Bosque & Smith (1989a; see Wood (1987) for a general discussion of tachinid biology, which addresses this question). Adult females, like those of other *Lydella* spp., are attracted to frass produced by the stem-boring hosts.

Generic definition of *Lydella*

Much to the chagrin of those studying the group, newly discovered and undescribed tachinids frequently are difficult to assign to a recognized genus. Many genera in the family are defined by variable chaetotaxy, and often by combinations of attributes rather than by unique character states of a single character. As new combinations of attributes are discovered, a continued proliferation of genera results. *Lydella jalisco* is no exception to this conundrum.

Lydella jalisco keys to couplet 65 in the generic key of Wood (1987), where it cannot be traced further. It is most similar to *Erynnia* Robineau-Desvoidy at this point, but differs from it in having the arista thickened nearly to its apex, and *Erynnia* has two or more setae on the basal fork of the radial sector. *Lydella jalisco* does not trace anywhere near *Lydella* which exits at couplet 88, because of its strong row of setae on the facial ridge and the presence of cell r_{4+5} closed before the wing margin.

Reexamination of taxa similar to *Lydella* during this study has resulted in evidence for expanding the definition of the genus. Figure 6 presents a cladogram of species groups of *Lydella*. Names of genera newly placed in synonymy with *Lydella* (see table 1) are enclosed in quotation marks. The character evidence that supports it is presented below, with the apomorphic character state given at the beginning of each treated character. Polarity of characters has been determined by general comparison with other taxa in the Eryciini, as determining a specific outgroup for *Lydella* is presently impossible. This analysis must be considered a preliminary estimate of relationships until an outgroup can be determined. No attempt has been made to find autapomorphic character states to support the monophyly of the *Lydella sensu stricto* and 'Metoposisyrops' terminal taxa on the cladogram. The species in each are grouped together based on overall similarity to show the distribution of the character states being discussed here. While the species in each group are very similar, a more extensive study might show that *Lydella sensu stricto* and

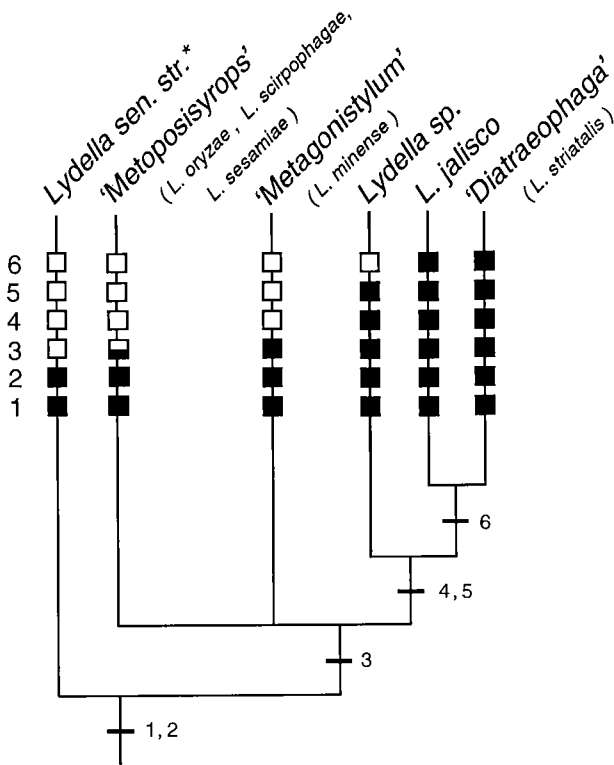


Fig. 6. Cladogram of some species of *Lydella*. Names in quotation marks refer to previously used generic names now in synonymy. See text for discussion of characters by number. Symbols: □, plesiomorphic character states; ■, apomorphic character states.

**Lydella sensu stricto* includes the species *Lydella breviseria*, *L. columbina*, *L. deckeri*, *L. grisescens*, *L. lacustris*, *L. parasitica*, *L. radialis*, *L. ripae*, *L. stabulans*, and *L. thompsoni*.

'*Metoposisyrops*' are not monophyletic lineages. These two groups also tend to grade together as *Lydella breviseria* and *Lydella lacustris* Herting show some features which are intermediate between *Lydella sensu stricto* and '*Metoposisyrops*'.

Character analysis

1. Female attracted to host frass, laying eggs at host entrance hole, first instar larva searching out host. This oviposition behaviour has been confirmed for *Lydella sensu stricto* (Baker et al., 1949), '*Metagonistylum*' (Bartlett, 1941), '*Diatraeophaga*' (Bennett, 1969), and *L. jalisco* (see above). This behaviour is inferred here for '*Metoposisyrops*' because it parasitizes stalk boring pyralids and noctuids (known hosts are *Scirpophaga incertulas* (Walker) and *Chilo suppressalis* (Walker) for '*M.* *scirpophagae* Chao & Shi and *Sesamia orialula* Tams & Bowden for '*M.* *sesamiae* (Mesnil)). In the Goniinae, as far as known, this behaviour is unique to this group and to the genus *Lixophaga* Townsend (Wood, 1987). *Lixophaga* belongs to the tribe Blondeliini (Wood, 1985), clearly unrelated to *Lydella*, so that this behaviour appears to have evolved twice in the Goniinae.

2. Fork of radial sector with a single seta. All members of the *Lydella* group have a single seta on the base of the radial

sector. The only exception I have seen is the one specimen of *Lydella breviseria* (considered a member of *Lydella sensu stricto* here) that I have examined. It has one large seta at the fork of the radial sector, followed by a second, shorter one. This was mentioned by Mesnil (1956) in his redescription of *L. breviseria*, but I suspect that he was looking at the same specimen I examined, which was from his collection. He does not mention two setae in his characterization of *Lydelloxenis* Mesnil just above the redescription of *L. breviseria*, a genus he proposed based on this species, but states 'Flügel mit einem starken Einzelborsten an der Basis von r_{4+5} '. It seems likely that this is merely an aberrant specimen, but this needs confirmation based on examination of more material of this rare species. This character state is speculatively considered a synapomorphy, but as it occurs in other Eryciini (e.g. *Drino* Robineau-Desvoidy and *Ametadoria* Townsend) and the sister group to *Lydella* is not known, it cannot be excluded that the synapomorphy of this character state is more inclusive.

3. Apical setae of scutellum reduced in size, not cruciate. The taxa above this point in the cladogram have small apical scutellar setae which are parallel-sided to slightly divergent. Most Eryciini, including *Lydella sensu stricto*, have larger apicals that are crossed. *Lydella breviseria* has very small apical setae, but they are crossed at their approximate midpoints. Herting (1959) also mentions weak, but crossed, apical setae in *Lydella lacustris*, a species he regarded as intermediate between *Lydella sensu stricto* and *L. breviseria* which at the time was placed in the genus *Lydelloxenis* Mesnil. Herting therefore regarded *Lydelloxenis* as a synonym of *Lydella*. This character is somewhat ambiguous in '*Metoposisyrops*', in which the apicals are variably reduced, and are often crossed at their extreme apices. The setae are largest in Chinese material I have examined, and were characterized as 'moderately strong' for '*M.* *scirpophagae* in its original description (Chao & Shi, 1982; this may be a synonym of '*M.* *oryzae* Townsend, as three of the four supposedly diagnostic characters for '*M.* *scirpophagae* are also found in the holotype of '*M.* *oryzae*, and the fourth, 'apical scutellar setae moderately strong', appears to be variable).

4. Male with proclinate orbital seta. *Lydella jalisco*, *Lydella sp.*, and '*Diatraeophaga*' all have a proclinate orbital seta in males. Other *Lydella* group taxa have only reclinate orbitals in males, a condition much more common in the Goniinae in general.

5. Posterior thoracic spiracle with lappets small, subequal in size. The species that have this character state have lappets that are more nearly equal in size than that found in what is believed to be the plesiomorphic spiracular closure, which consists of a narrow anterior lappet and a large, nearly circular posterior lappet that performs most of the closing function.

6. Wing with cell r_{4+5} closed before wing margin. *Lydella jalisco* and '*Diatraeophaga*' both have cell r_{4+5} closed before the wing margin with a petiole that is longer than crossvein r-m. It is possible that this has arisen independently in these two species, because *L. jalisco* and *Lydella sp.* are so similar in general appearance that it seems likely that they are sister species. Further character evidence is required to substantiate this speculation, however.

Table 1. List of species included in the genus *Lydella* Robineau-Desvoidy, with new generic synonyms.

LYDELLA Robineau-Desvoidy, 1830: 112. Type species, *L. griseascens* Robineau-Desvoidy (by designation of Robineau-Desvoidy, 1863: 855).
 DIATRAEOPHAGA Townsend, 1916b: 320. Type species, *D. striatalis* Townsend (by original designation). **Syn. n.**
 METOPOSISYROPS Townsend, 1916b: 320. Type species, *M. oryzae* Townsend (by original designation). **Syn. n.**
 METAGONISTYLUM Townsend, 1927: 379. Type species, *M. minense* Townsend (by original designation). **Syn. n.**
 SCHISTOCHILUS Aldrich, 1932: 18. Type species, *S. aristatum* Aldrich [= *Diatraeophaga striatalis* Townsend] (by original designation).

breviseria Pandellé, 1896: 46. (*Roeselia*). Palaearctic.
columbina Richter, 1976: 542. Palaearctic.
deckeri Curran, 1929: 12. (*Erycia*). [Holotype ♀ examined; probably=*radicis* Townsend].
griseascens Robineau-Desvoidy, 1830: 112. Palaearctic. [for synonymy see Herting, 1984].
jalisco **sp. n.** Mexico.
lacustris Herting, 1959: 424. Palaearctic.
minense Townsend, 1927: 381. (*Metagonistylum*). [Holotype ♀ examined]. Neotropical. **Comb. n.**
myersi Townsend, 1939: 343. (*Metagonistylum*).
oryzae Townsend, 1916b: 321. (*Metoposisyrops*). Oriental. [Holotype ♂ examined]. **Comb. n.**
parasitica Mesnil, 1959: 39 (as *griseascens* ssp.). Pacific.
radicis Townsend, 1916a: 19. (*Andrina*). Nearctic. [Holotype ♀ examined]. [for synonymy see Sabrosky & Arnaud, 1965]
ripae Brischke, 1885: 18. (*Tachina*). Palaearctic. [for synonymy see Herting, 1984]
scirpophagae Chao & Shi, 1982: 71. (*Metoposisyrops*). Oriental. [probably=*oryzae* Townsend]. **Comb. n.**
sesamiae Mesnil, 1968: 4. (*Metagonistylum*). Afrotropical. [Holotype ♀ examined]. **Comb. n.**
stabulans Meigen, 1824: 306. (*Tachina*). Palaearctic. [for synonymy see Herting, 1984]
striatalis Townsend, 1916b: 320. (*Diatraeophaga*). Oriental. [Holotype ♀ examined]. **Comb. n.**
aristatum Aldrich, 1932: 19. (*Schistochilus*). [Holotype ♀ examined].
thompsoni Herting, 1959: 427. Palaearctic, Nearctic.

The taxa discussed above thus appear to be united by morphological and biological evidence. Crosskey (1976) has previously discussed the similarity of *Metagonistylum*, *Metoposisyrops*, and *Diatraeophaga*, calling them 'very obviously closely related' and 'very distinctive among the Eryciini'. Mesnil (1968) also believed that these genera were similar, and remarked that they were near *Lydella*. It is clear that these taxa are all very similar. Furthermore, I have not found any clear autapomorphic features that would warrant continued recognition of *Lydella sensu stricto*, *Metoposisyrops*, or *Metagonistylum*. I am therefore widening the generic limits of *Lydella* to include all the taxa listed in table 1, defined by characters 1 and 2 discussed above. All the taxa now considered members of *Lydella* are listed in table 1. For Palaearctic and Nearctic species already in *Lydella sensu stricto* of previous authors, only the currently valid species name is given. The established species-level synonyms can be found in recent Palaearctic (Herting, 1984) and Nearctic (Sabrosky & Arnaud, 1965) catalogues. Palaearctic generic synonyms already established in *Lydella* are also omitted, as these can also be found in Herting's (1984) catalogue.

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prepared figs 1, 2, and 6, and T. Britt Griswold prepared figs 4 and 5.

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