

## European species of the subgenus *Brachylimnophila* (Diptera: Limoniidae)

Jaroslav Starý & Herbert Reusch

Starý, J. & Reusch, H. 2008: European species of the subgenus *Brachylimnophila* (Diptera: Limoniidae). – Entomol. Fennica 19: 207–217.

The subgenus *Brachylimnophila* Alexander, 1966 is transferred from *Neolimnomyia* Séguy, 1937 in *Dicranophragma* Osten Sacken, 1860. The latter is elevated to genus rank. Three European species are redescribed, viz. *Dicranophragma (Brachylimnophila) nemorale* (Meigen, 1818), comb. n., *D. (B.) separatum* (Walker, 1848), comb. n. and *D. (B.) adjunctum* (Walker, 1848), comb. n. Lectotypes of *D. (B.) separatum* and *D. (B.) adjunctum* are designated. Male and female terminalia of the three species are illustrated, and their distributions are outlined.

*J. Starý, Department of Zoology and Laboratory of Ornithology, Faculty of Science, Palacký University, tr. Svobody 26., CZ-771 46 Olomouc, Czech Republic; E-mail: starý@prfnw.upol.cz*

*H. Reusch, BAL – Bureau for Applied Limnology and Landscape Ecology, Wellendorf 30, D-29562 Suhlendorf, Germany; E-mail: herbert.reusch@t-online.de*

*Received 28 June 2007, accepted 1 November 2007*

### 1. Introduction

*Brachylimnophila* was erected by Alexander (1966a) as a subgenus of *Limnophila* Macquart, 1834 for *L. brevifurca* Osten Sacken, 1860 (type species of *Brachylimnophila*), from Canada and USA, and some other species, including two occurring in Europe, *Limnophila nemoralis* (Meigen, 1818) and *L. adjuncta* (Walker, 1848). Later, Savchenko (e.g. 1979, 1983, 1986) transferred the subgenus *Brachylimnophila* in *Neolimnomyia* Séguy, 1937, which he restored as a valid genus. This shift in classification was based on some characters present in both *Neolimnomyia* and *Brachylimnophila* and absent in most other genera of the subfamily Limnophilinae. In particular, the terminal section of  $R_1$  is longer than  $R_2$  in the two taxa and in alignment with the rest of  $R_1$ , there is a tendency to re-

duction of the cell  $M_1$ , and the interbases of the male terminalia are present (cf. Savchenko 1986). *Brachylimnophila* comprises currently 11 species from the Nearctic, Palaearctic and Oriental regions (Oosterbroek 2007). The monotypic *Mixolimnomyia* Savchenko, 1979, with *N. (M.) rufula* Savchenko, 1979, from the Caucasus, has been considered another subgenus of *Neolimnomyia*.

In addition to the two European species, *Neolimnomyia (Brachylimnophila) nemoralis* and *N. (B.) adjuncta*, both commonly reported in the literature, Edwards (1921, 1938) commented on additional forms of uncertain status. Of these, *N. (B.) separata* (Walker, 1848) and *N. (B.) minuscula* (Edwards, 1921) were recently accepted as separate species, based on external characters (Stubbs 1997). However, these two names did not appear as valid species in the Brit-

ish Checklist (Stubbs 1998). *N. (B.) separata* was newly recorded in Germany by Reusch & Oosterbroek (2000) and Reusch *et al.* (2004). Previously, it was mentioned from Ukraine (Savchenko 1986: 325), with some doubts about its species status.

The aim of this paper was: (1) to check the status of the three forms, *N. (B.) nemoralis*, *N. (B.) separata* and *N. (B.) adjuncta*, and, if they are confirmed as valid species, to present their distinguishing characters, and (2) to examine the types of *N. (B.) separata* and *N. (B.) adjuncta* from the Natural History Museum, London, and to fix them accordingly to stabilise the current concept of the names.

The present examination has revealed that the three forms are specifically distinct, being distinguished by external characters, such as the body colouration, wing venation and wing pattern, and, as shown herewith, by both the male and female terminalia. The distinctions in the structure of the male terminalia are slight but constant, and are, surprisingly, supported by convincing female differences in the size of the spermathecae. The redescriptions are presented below. The lectotypes of *N. (B.) separata* and *N. (B.) adjuncta* are designated.

The type material of *N. (B.) nemoralis* was not studied, but the bicoloured appearance of the species, with a light grey thorax and pale brown abdomen, a character unique within European Limnophilinae, is clearly apparent from the original description (Meigen 1818). Other forms mentioned by Edwards (1938) and Stubbs (1997) were not revised, nor could they be recognised in the limited Scottish material available, and are here retained in the synonymy of *N. (B.) nemoralis* based on the current classification (Stubbs 1998, Oosterbroek 2007).

Acronyms of museums and collections used in the text are as follows: BMNH – The Natural History Museum [formerly British Museum (Natural History)], London, England, UK; HRS – Collection of Herbert Reusch, Suhlendorf, Germany; JSO – Collection of J. Starý, Olomouc, Czech Republic.

Colour characters of species are described from dry-mounted specimens. Unless otherwise stated in the sections on Material examined, the material under study is dry-mounted.

## 2. Systematic position of *Brachylimnophila*

The male terminalia of various species more or less closely related to *Brachylimnophila* were examined. This examination included *Limnophila (Dicranophragma) fuscovaria* Osten Sacken, 1860 (type species of *Dicranophragma* Osten Sacken, 1860), from Canada and USA, and *L. (D.) formosa* Alexander, 1920, from the Russian Far East, Japan and Taiwan. *Dicranophragma* has currently 35 Nearctic, East Palaearctic, Oriental and Afrotropic species and subspecies, with a marked concentration of the species in the Oriental region (Oosterbroek 2007). The wing pattern of these species is conspicuous, consisting of several larger markings at the anterior margin and additional spots and dots, thus resembling the condition in the nominotypical subgenus of *Limnophila* Macquart, 1834 and the genus *Eloephila* Rondani, 1856. They differ from them and other limnophilins by the presence of a supernumerary cross-vein in the cell  $R_3$ . However, the male terminalia of *Dicranophragma* are similar to those of *Brachylimnophila* to an extent that leaves no doubt that the two are congeneric despite the very different general appearance [for *formosa*, see Savchenko & Krivolutskaya 1976, Fig. 24a, b (male terminalia); other species e.g.: *dorsolineata* (Taiwan), see Alexander 1930, Fig. 26; *laetithorax* (China: Sichuan), see Alexander 1933, Fig. 32; *microspila* (Japan), see Alexander 1953, Fig. 19].

The fact that *Dicranophragma* most closely resembled *Brachylimnophila* in the hypopygial structures was stressed by Alexander (1966a). At that time, both were considered subgenera of *Limnophila*. However, after *Neolimnomyia* was restored as a valid genus by Savchenko (1983), with *Brachylimnophila* included in it as a subgenus, *Dicranophragma* and *Brachylimnophila* were inappropriately separated. The male terminalia of both have the same general plan, with some parts surprisingly similar in structure: the outer gonostylus is slender, smooth, shortly bidentate at apex; the inner gonostylus is fleshy, more or less conical; the interbase is well-developed, generally spoon-like or paddle-like. The single male genital character distinguishing the two taxa seems to be the structure of the

parameres; these are separate in *Brachylimnophila*, whereas, in *Dicranophragma*, they are fused to each other to form a shelf below the aedeagus.

Hence, practically as a by-product, the following change in classification is proposed: *Dicranophragma*, formerly a subgenus of *Limnophila*, is elevated to genus rank, with the subgenera *Dicranophragma* s. str. and *Brachylimnophila* (possibly also *Mixolimnomyia*). *Neolimnomyia*, apparently related to *Dicranophragma*, is retained as a separate genus, without subgeneric division.

### 3. Redescriptions

#### 3.1. Genus *Dicranophragma* Osten Sacken, 1860, stat. nov.

*Dicranophragma* Osten Sacken 1860: 240 (as subgenus of *Limnophila*; original description). Type species: *Limnophila fuscovaria* Osten Sacken, 1860 (Nearctic), by monotypy. – Alexander 1943: 378, 382 (reprinted 1966b) (as subgenus of *Limnophila*; key, diagnoses of North American species); Alexander 1965: 65 (as subgenus of *Limnophila*; Nearctic catalogue); Alexander & Alexander 1973: 159 (as subgenus of *Limnophila*; Oriental catalogue); Hutson 1980: 74 (as subgenus of *Limnophila*; Afrotropical catalogue); Savchenko *et al.* 1992: 223 (as subgenus of *Limnophila*; Palaearctic catalogue); Oosterbroek 2007 (as subgenus of *Limnophila*; electronic World catalogue).

#### 3.2. Subgenus *Brachylimnophila* Alexander, 1966

*Brachylimnophila* Alexander 1966a: 119 (as subgenus of *Limnophila*; original description). Type species: *Limnophila brevifurca* Osten Sacken, 1860 (Nearctic), by original designation. – Alexander & Alexander 1973: 159 (as subgenus of *Limnophila*; Oriental catalogue); Savchenko 1986: 318, 323 (as subgenus of *Neolimnomyia*; key, diagnosis); Savchenko 1989: 94, 95 (as subgenus of *Neolimnomyia*; key, diagnosis); Savchenko *et al.* 1992: 224 (as subgenus of *Neol-*

*imnomyia*; Palaearctic catalogue); Oosterbroek 2007 (as subgenus of *Neolimnomyia*; electronic World catalogue).

#### 3.3. *Dicranophragma* (*Brachylimnophila*) *nemorale* (Meigen, 1818), comb. n. (Figs 1a, d, g)

*Limnobia nemoralis* Meigen 1818: 126 (original description).

*Limnophila nemoralis*: de Meijere 1921: 77 (redescription), Text-fig. 14 (wing), Pl. 7, Fig. 114 (male terminalia); Edwards 1921: 224 (diagnosis); Pierre 1924: 124, 127 (key, diagnosis), Figs 492 (wing), 499 (male terminalia); Nielsen 1925: 85 (diagnosis), Fig. 80 (wing); Czižek 1931: 135, 137 (key, diagnosis), Figs 78a–b (male terminalia, wing); Edwards 1938: 89 (as subgenus “*Pilaria?*”; diagnosis), Pl. 3, Fig. 17 (wing).

*Neolimnomyia* (*Brachylimnophila*) *nemoralis*: Savchenko 1978: 65 (note), Fig. 2 (male terminalia); Savchenko 1986: 324 (redescription), Figs 162/3 (wing), 166/3 (male terminalia); Savchenko *et al.* 1992: 225 (Palaearctic catalogue); Stubbs 1997: 8–9 (in error as *Neolimnophila*; key), Figs (wing); Podenas *et al.* 2006, Figs XVI.b (wing), 54.3 (wing), 54.4 (male terminalia); Oosterbroek 2007 (electronic World catalogue).

*Limnobia leucophaea* Meigen 1818: 127 (original description).

*Limnobia plebeia* Meigen 1818: 127 (original description).

*Limnobia inclusa* Walker 1848: 41 (original description).

*Limnophila nemoralis* var. *collina* Edwards 1921: 224 (original diagnosis).

*Limnophila nemoralis* var. *minuscula* Edwards 1921: 224 (original diagnosis).

*Limnophila* (*Pilaria?*) *nemoralis* var. *minuscula*: Edwards 1938: 90 (diagnosis).

*Neolimnomyia* (*Brachylimnophila*) *minuscula*: Stubbs 1997: 8–9 (in error as *Neolimnophila*; key), Fig. (wing).

*Limnophila nemoralis* var. *quadrata* Edwards 1921: 224 (original diagnosis).

*Limnophila* (*Pilaria?*) *nemoralis* var. *quadrata*: Edwards 1938: 90 (diagnosis).

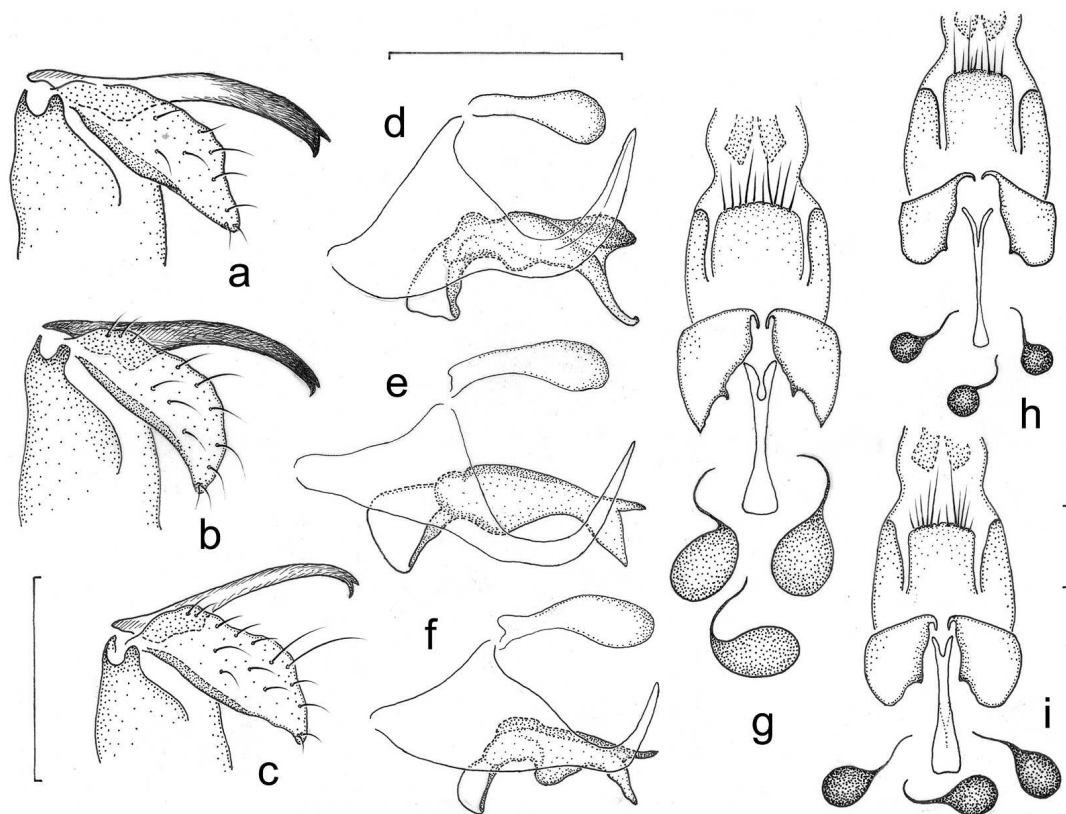


Fig 1. Male and female terminalia of *Dicranophragma (Brachylimnophila) nemorale* (Meigen, 1818), *D. (B.) separatum* (Walker, 1848) and *D. (B.) adjunctum* (Walker, 1848). – a–c. Male terminalia, gonostyli, dorsal: *D. (B.) nemorale* (a), *D. (B.) separatum* (b), *D. (B.) adjunctum* (c). – d–f. Male terminalia, aedeagal complex, lateral: *D. (B.) nemorale* (d), *D. (B.) separatum* (e), *D. (B.) adjunctum* (f). – g–i. Female terminalia, internal structures, ventral: *D. (B.) nemorale* (g), *D. (B.) separatum* (h), *D. (B.) adjunctum* (i). Scale bars 0.25 mm. *D. (B.) nemorale*, Czech Republic; *D. (B.) separatum*, Czech Republic; *D. (B.) adjunctum*, Great Britain, England.

**Diagnosis.** General colouration light grey on thorax, pale brown on abdomen. Wing narrow, with poorly distinct stigma.  $M_1$  and  $M_2$  much shorter than their petiole. Male terminalia with distal lower part of aedeagus long and sinuous. Female terminalia with large spermethecae. Body length 6.0–8.5 mm, wing length 6.0–9.5 mm.

**Redescription.** Male. Head light grey. Antenna moderate in length, reaching to about mid coxa, yellow at base, from flagellomere 2 darkened towards tip. Flagellomeres generally ovoid, progressively narrower. Longest verticils about three times as long as their respective flagellomeres.

Thorax light grey with slight bluish tinge,

sometimes with four poorly distinct longitudinal stripes on prescutum. Wing comparatively narrow, almost four times as long as broad, tinged yellowish, with poorly distinct stigma; other markings only indicated by somewhat darker veins. Venation:  $R_2$  more than twice its length beyond origin of  $R_{2+3}$ ;  $M_1$  and  $M_2$  much shorter than their petiole, half length of the latter or less (exceptionally cell  $M_1$  lacking on one wing). Legs yellow.

Abdomen generally pale brown, with setosity moderate; segment 8 darkened. Male terminalia (Figs 1a, d): Gonocoxite comparatively long and slender, cylindrical. Outer gonostylus generally slender, yet stouter than in other two species, moderately and more or less evenly arched, pale

proximally, darkly pigmented in distal half, apex shortly bidentate. Inner gonostylus fleshy, conical. Interbase generally spoon-like or paddle-like. Paramere moderately long, rather stout. Aedeagus bipartite distally in lateral view; upper part generally rounded, lower part much longer and more slender, slightly sinuous.

Female resembling male in general appearance. Verticils shorter, about twice as long as their respective flagellomeres. Abdominal segment 8 not darkened. Female terminalia with internal structures as in Fig. 1g. Vaginal apodeme (genital fork) moderately long and rather broad. Spermathecae large, pale, ovoid.

*Material examined.* Bulgaria: Sandanski env., 3.v.1989, 1 ♂, 5.V.1989, 1 ♂, 1 ♀; Pirin Mts, Banderica (1,200 m a.s.l.), 5.VI.1968, 2 ♂; Bansko env., 23.VII.1987, 1 ♂; Michurin, 1.VI.1968, 1 ♂ (all J. Starý leg.) (JSO). Czech Republic: Bohemia: Doksy env., Břežský brook, 25.IX.2003, 1 ♂ (J. Starý leg.) (JSO). Moravia: Jeseníky Mts, Branná, "Dembrauda" (900 m a.s.l.), 21.VII.1999, 1 ♂ (at light); Nový Dvůr nr. Opava, 12.VI.1967, 1 ♂; Rešov, waterfall, 17.VI.1969, 1 ♂; Hrubá Voda nr. Olomouc, 8.VI.1971, 1 ♀; Daskabát nr. Olomouc, 11.VII.1979, 1 ♂, 1 ♀; Kletné nr. Suchdol nad Odrou, 11.VIII.1978, 1 ♂; Štramberk, Kotouč – quarry, "Mokřadlo", 28.VI.2004, 3 ♂, 1 ♀; Hrobice nr. Zlín (Gottwaldov), 3.VIII.1982, 1 ♂, 17.VII.1984, 1 ♂, 23.VII.1985, 1 ♂ (at light); Náměšť nad Oslavou, Oslava valley, 26.V.1983, 1 ♀; Brno – Hády, 6.VIII.1967, 1 ♂; Bítov, Vranov reservoir, 16.VI.1971, 1 ♂; Popice nr. Znojmo, 11.VI.1967, 2 ♂; Nejdeč nr. Lednice, 17.IX.1997, 1 ♂, 2.VI.2005, 1 ♂; Rohatec nr. Hodonín, "Pánov", 18.V.1977, 1 ♂, 21.VI.2005, 1 ♂ (at light), "Hrubý Závidov", 30.VIII.1977, 1 ♂; Radějov, Radějovka valley, 13.VII.1982, 1 ♂, 1 ♀, 16.VI.1984, 1 ♂; Radějov, Lučina, 25.VI.1980, 1 ♂, 1.VII.1981, 1 ♂, 3.VII.1981, 1 ♂, 6.VII.1982, 2 ♂; Bílé Karpaty Mts, Súchovské Mlýny, Jamný, 7.VII.1994, 2 ♂; Bílé Karpaty Mts, Javorník, "Machová", 20.VII.1993, 1 ♂, 1 ♀ (all J. Starý leg.) (JSO). Germany: Baden-Württemberg: Rot nr. Rot (590 m a.s.l.), 12.VI.1997, 2 ♂ (R. Brinkmann leg.) (HRS, in ethanol); Greffern, Rheinaue, 23.VI.1995, 1 ♂ (J. Starý leg.) (JSO). Bayern: Benninger Ried nr. Memmingen (600 m a.s.l.), 6.VIII.2003, 1 ♂, 6 ♀

(light trap) (O. König et al. leg.) (HRS, in ethanol). Brandenburg: Geuenbach nr. Köpernitz (62 m a.s.l.), VIII.1992, 1 ♂ (R. Brinkmann leg.); Siepgraben nr. Wulkow/Kyritz (42 m a.s.l.), 9.VI.2006, 1 ♂ (T. Berger leg.) (HRS, in ethanol). Mecklenburg-Vorpommern: Gingst/Rügen (10 m a.s.l.), 9.VI.1989, 1 ♂; Ralswiek/Rügen (30 m.a.s.l.), 13.VI.1989, 2 ♂ (all R. Heiss leg.) (HRS, in ethanol). Niedersachsen: Ilmenau nr. Bad Bevensen (25 m a.s.l.), 5.VI.1993, 2 ♂ (R. Heiss leg.); Lutter nr. Bargfeld (62 m a.s.l.), 20.VII.–29.VIII.1990, 5 ♂ (light trap) (T. Meineke leg.); Eisenbach nr. Wrestedt (40 m a.s.l.), 28.V.1999, 1 ♂ (H. Reusch leg.) (HRS, in ethanol). Sachsen-Anhalt: Havelberg (27 m a.s.l.), 9.VIII.99, 1 ♂ (light trap) (H. Reusch leg.) (HRS, in ethanol). Schleswig-Holstein: Unterer Schierenseebach nr. Hohenhude (7 m.a.s.l.), 10.VII.1987, 2 ♂; 6.VI.–29.VII.1988, 12 ♂, 7 ♀; Ratzeburg (10 m a.s.l.), 14.VI.1992, 1 ♂, 24.V.1994, 1 ♂, 18.VII.1004, 3 ♂; Barnitz nr. Kretholz (30 m a.s.l.), 4.VII.1994, 1 ♂; Lake-outlet nr. Groß Tremmerup (5 m a.s.l.), 13.VII.1994, 1 ♂; Friedeholz nr. Bockholm (10 m a.s.l.), 13.VII.1994, 1 ♂, 1 ♀; Mühlenu nr. Altmühlendorf (20 m a.s.l.), 14.VII.1994, 1 ♂; Treene nr. Frörup (30 m a.s.l.), 21.VII.1998, 2 ♂, 2 ♀ (all R. Brinkmann leg.) (HRS, in ethanol). Thüringen: Vesserbach nr. Schmiedefeld (600 m a.s.l.), 18.VIII.1987, 2 ♂ (emergence trap) (W. Joost & W. Zimmermann leg.); Emse nr. Winterstein (390 m a.s.l.), 8.VIII.1997, 1 ♂; Hörsel nr. Hörselgau/Gotha (295 m a.s.l.), 14.VI.1998, 3 ♂ (all R. Bellstedt leg.) (HRS, in ethanol). Luxembourg: Bech-Kleinmacher (200 m a.s.l.), 11.–12.VIII.1998, 12 ♂ (light trap) (M. Meyer leg.) (HRS, in ethanol). Slovakia: Šaštín (distr. Senica), 23.VI.1979, 1 ♂; Závod nr. Malacky, "Abrod", 6.V.1999, 1 ♂, 1 ♀, 30.VI.1999, 1 ♂; Nová Vieska nr. Štúrovo, 12.IX.1981, 1 ♂, 26.IX.1983, 1 ♂, 15.V.1984, 1 ♂; Kamenný Most nr. Štúrovo, 19.VII.1983, 1 ♂, 24.IX.1983, 1 ♂; Kamenica nad Hronom, Hron, 15.V.1984, 1 ♂; Bajtava nr. Štúrovo, 1.VI.1982, 1 ♂; Podhradie nr. Topoľčany, 21.VIII.1984, 1 ♂; Stankovany, mineral spring, 16.VII.1985, 1 ♂, 12.VI.1987, 1 ♂; Zuberec, Pálenica Mt., 25.VI.1998, 1 ♀; Kvetnica nr. Poprad, 1.VII.1979, 1 ♂; Belianske Tatry Mts, Tatranská Kotlina, Belá valley (750 m a.s.l.), 30.VI.1979, 2 ♂ (all J. Starý

leg.); Giraltovec, 14.VII.1951, 1 ♀ (J. Slípka leg.); Remetské Hámre, Okna valley, 13.VII.1967, 1 ♂; Ubřa, Stežná shores, 23.VI.1983, 1 ♂; Nová Sedlica, "Bahno", 7.VII.1993, 1 ♂ (all J. Starý) (JSO).

*Discussion.* *D. (B.) nemorale* is distinctive by its bicoloured appearance, having a light grey thorax and a pale brown abdomen, and having narrow wings. In the structure of the male terminalia, it is characterised, above all, by the outer gonostylus (stouter than in *separatum* and *adjunctum*, moderately arched, pale proximally) and the aedeagus (lower distal part long and sinuous) (Figs 1a, d). The female terminalia have large, ovoid spermathecae (Fig. 1g). Although the external characters show closer affinities of *D. (B.) nemorale* to *D. (B.) separatum*, placing *D. (B.) adjunctum* somewhat apart based on the wing venation and wing pattern, genital features indicate a somewhat more isolated position of *D. (B.) nemorale*.

*Distribution.* *D. (B.) nemorale* appears to be widely distributed in the Palaearctic region, including Europe, North Africa, Middle Asia, West and East Siberia, Mongolia and the Russian Far East (for details, see Oosterbroek 2007). In contrast to *D. (B.) separatum*, it is mostly associated with lower altitudes, but the two species largely overlap in this respect (see also under *separatum*). Occurrence of *D. (B.) nemorale* at 1,200 m a.s.l. in the Bulagian Pirin Mts should be emphasised (see Material examined).

### 3.4. *Dicranophragma (Brachylimnophila) separatum* (Walker, 1848), comb. n. (Figs 1b, e, h)

*Limnobia separata* Walker 1848: 56 (original description).

*Limnophila (Pilaria?) nemoralis* var. *separata*: Edwards 1938: 90 (diagnosis).

*Neolimnomyia (Brachylimnophila) separata*: Stubbs 1997: 8–9 (in error as *Neolimnophila*; key), Fig. (wing); Oosterbroek 2007 (electronic World catalogue).

*Diagnosis.* General colouration dark greyish brown. Wing comparatively broad, with poorly distinct stigma.  $M_1$  and  $M_2$  much shorter than their petiole. Male terminalia with both distal

parts of aedeagus short. Female terminalia with very small spermathecae. Body length 5.0–7.5 mm, wing length 5.5–8.5 mm.

*Redescription.* Male. Head dark grey. Antenna moderate in length, reaching to about mid coxa, mostly dark brown throughout. Flagellomeres generally ovoid, progressively narrower. Longest verticils about three times as long as their respective flagellomeres.

Thorax dark greyish brown, sometimes with four poorly distinct longitudinal stripes on prescutum. Wing rather broad, about three times as long as broad, tinged greyish, without any pattern except for poorly distinct stigma. Venation:  $R_2$  more than twice its length beyond origin of  $R_{2+3}$ ;  $M_1$  and  $M_2$  much shorter than their petiole, half length of the latter or less (exceptionally cell  $M_1$  lacking on one wing). Legs obscure yellow, with tips of femora infuscated.

Abdomen generally dark greyish brown, sometimes more brownish, with conspicuous setosity, long and suberect. Male terminalia (Figs 1b, e): Gonocoxite comparatively long and slender, cylindrical. Outer gonostylus more slender than that of *D. (B.) nemorale*, arched rather in distal half, darkly pigmented throughout, apex shortly bidentate. Inner gonostylus fleshy and conical. Interbase generally spoon-like or paddle-like. Paramere moderately long, more slender than that of *D. (B.) nemorale*. Aedeagus bipartite distally in lateral view, both parts short and subacute at tips, lower one broader than upper one.

Female resembling male in general appearance. Verticils shorter, about twice as long as their respective flagellomeres. Wing slightly narrower. Female terminalia with internal structures as in Fig. 1h. Vaginal apodeme (genital fork) longer and more slender than that of *D. (B.) nemorale*. Spermathecae very small, darkly pigmented, nearly spherical.

*Type material examined.* In describing *Limnobia separata*, Walker (1848: 56) only stated: "Hammerfest, Finmark. From Mr. Walker's collection." Lectotype ♂ (present designation): Norway (Province of Finnmark), Hammerfest (F. Walker leg.) (BMNH), labelled "Hammerf / Finmark", with reverse side "F. / Walker /... 37. / 11." (illegible where dotted) (circular label, handwritten), "Limnobia / separata / Walk." (handwritten), with printed inscription on reverse side

“One of Walkers / series so named. / Edw”, “*Limnobia / separata*, ♂ / Walker. / (Type).” (hand-written), “Holotype of / *Limnobia separata* / Walker 1848” (hand-written), “BMNH(E) # / 247770” (printed), “Type” (green-margined circular label, printed), “HOLO- / TYPE.” (red-margined circular label, printed). Labelled by the present authors as the lectotype (“LECTOTYPE / *Limnobia / separata* Walker ♂ / J. Starý & H. Reusch 2006”, printed red label) and identified as *Dicranophragma (Brachylimnophila) separatum*. The specimen is micro-pinned on a stage (white matter), with right antenna broken off (except for basal segments), only femur and tibia of mid right leg present, and with distal halves of both wings missing; apex of abdomen cut off. Terminalia dissected by the present authors and placed in a sealed plastic tube with glycerine, pinned with the specimen. According to N. Wyatt (e-mail comm.) this is the only type of *Limnobia separata* in BMNH, which seems to be confirmed by Edwards (1938: 90) who likewise commented on the single “Walker’s type of *separata*...” (erroneously “from Finland”; Finnmark is a province of Norway). On the other hand, the note by Edwards on the reverse side of one label (see above) suggests that more specimens were available (or the printed note was intended for a different purpose, and only misused by Edwards). There is no statement about the number of specimens in the description by Walker (1848). Hence, the type specimen examined is designated here as the lectotype to maintain the concept of the name in case additional specimens may be found to exist (cf. Recommendation 73F of ICZN 1999).

*Other material examined.* Bulgaria: Pirin Mts, Banderica (over 2,000 m), 21.VII.1987, 4 ♂, 1 ♀, 22.VII.1987, 2 ♂, 3 ♀ (J. Starý leg.) (JSO). Czech Republic: Bohemia: Šumava Mts, Horská Kvilda, 5.VII.1992, 1 ♂, 10.VII.1992, 1 ♂ (at light); Šumava Mts, “Jezerní slat”, 7.VII.1992, 2 ♂; Šumava Mts, Borová Lada, 17.VIII.1968, 1 ♂; Šumava Mts, Pěkná, Vltava shores (750 m a.s.l.), 4.VI.2004, 1 ♂, 1 ♀; Radostín, Malé Dařko (620 m a.s.l.), 23.VIII.1981, 1 ♂ (all J. Starý leg.) (JSO). Moravia: Jeseníky Mts, Rejvíz (750 m a.s.l.), peat-bog, 5.VI.1967, 1 ♂, 4.VIII.2004, 1 ♂ (at light); Jeseníky Mts, Dětrichov nr. Jeseník, 27.V.1969, 1 ♂; Jeseníky Mts, Velký Kotel, 23.VI.1967, 1 ♂; Jeseníky

Mts, Praděd, Bílá Opava valley (900–1,050 m a.s.l.), 14.VII.1994, 1 ♂, 1 ♀, 26.VII.1994, 1 ♂; Jeseníky Mts, Kouty nad Desnou, Divoká Desná valley, “Zámčisko” (970 m a.s.l.), 14.VI.2004, 1 ♂ (at light), 8.VII.2004, 2 ♂ (at light), 27.VII.2006, 4 ♂ (at light); Dlouhá Loučka, “Valšovský žleb”, 8 km N, 18.V.1989, 1 ♂; Jívová nr. Olomouc, 14.VIII.1968, 1 ♂; Krčmaň nr. Olomouc, 5.VII.1977, 1 ♂; Lazníky nr. Přerov, 17.V.1992, 1 ♂, 9.VI.1992, 1 ♂; Moravskoslezské Beskydy Mts, Prostřední Bečva (600 m a.s.l.), 30.VII.1992, 1 ♂ (all J. Starý leg.) (JSO). Germany: Baden-Württemberg: Rohnbachtal nr. Enzklösterle/Schwarzwald (700 m a.s.l.), 24.VI.1992, 1 ♂ (R. Heiss leg.); Echaz nr. Honau (470 m a.s.l.), 12.VIII.1998, 1 ♂ (R. Brinkmann leg.) (HRS, in ethanol). Bayern: Röthenbach, Hoher Trauchberg nr. Halblech/Ostallgäu (1,100 m a.s.l.), 30.VI.2000, 2 ♂ (A. Dorn & A. Weinzierl leg.); Benninger Ried nr. Memmingen (600 m a.s.l.), 15.–20.VI.2003, 3 ♀ (emergence trap) (S. Wiedenbrug leg.) (HRS, in ethanol). Mecklenburg-Vorpommern: Puttbus/Rügen (20 m a.s.l.), 16.VI.1989, 3 ♂, 1 ♀; Lietzow/Rügen (30 m a.s.l.), 19.VI.1989, 1 ♂ (all R. Heiss leg.) (HRS, in ethanol). Niedersachsen: Aschau nr. Beedenbostel (50 m a.s.l.), 31.VII.1991, 1 ♂; Örtze nr. Müden (55 m a.s.l.), 2.VI.1993, 1 ♂; Steinkuhlenbergbach nr. Salzgitter-Osterlinde (130 m a.s.l.), 6.VII.1994, 1 ♂ (all H. Reusch leg.); Örtze nr. Poitzen (58 m), 7.VI.1999, 3 ♂, 2 ♀ (R. Brinkmann leg.) (HRS, in ethanol). Sachsen-Anhalt: Selke nr. Straßberg/Harz (450 m), 30.VII.2001, 2 ♂, 1 ♀ (R. Bellstedt leg.) (HRS, in ethanol). Schleswig-Holstein: Unterer Schierensee nr. Hohenhude (7 m a.s.l.), 1.VII–24.VIII.1987, 22 ♂; 23.V.–19.VIII.1988, 47 ♂, 30 ♀; 29.VI.–27.VII.1989, 6 ♂, 1 ♀; Bille nr. Aumühle (11 m a.s.l.), 24.VI.1994, 1 ♂; Bille nr. Sachsenwaldau (20 m a.s.l.), 24.VI.1994, 2 ♂, Mühlenau nr. Altmühlendorf (20 m a.s.l.), 14.VII.1994, 1 ♂, 1 ♀; Ratzeburg (10 m a.s.l.), 18.VII.1994, 2 ♂; Vosskaten (50 m a.s.l.), 18.VII.1994, 1 ♂; Barnitz nr. Kretholz (30 m), 28.VII.1994, 1 ♂; Fuhlenau nr. Himmelreich (20 m a.s.l.), 14.VII.1999, 2 ♂, 2 ♀, 28.VI.2003, 1 ♂ (all R. Brinkmann leg.) (HRS, in ethanol). Thüringen: Friedrichsroda (425 m a.s.l.), 17.VII.1991, 1 ♂ (R. Heiss leg.); Schweina-Oberlauf nr. Schweina

(480 m a.s.l.), 14.VII.2001, 1 ♂ (light trap) (R. Bellstedt leg.) (HRS, in ethanol). Great Britain: Scotland: Angus: nr. Kirriemuir, Glen Uig, 3.VII.1977, 2 ♂; nr. Kirriemuir, by Mile Hill, 5.VII.1977, 3 ♂; nr. Kirriemuir, Glen Cally, 5.VII.1977, 5 ♂; nr. Kirriemuir, Loch of Kinnordy, 6.VII.1977, 2 ♂; nr. Dundee, Barry Links, 3.VII.1977, 1 ♂; R. Isla, Den of Airlie, 4.VII.1977, 1 ♂; nr. Newtyle, Pitnappie, 6.VII.1977, 1 ♂; Perth: nr. Blairgowrie, Myreside, 4.VII.1977, 2 ♂ (all A. M. Hutson leg.) (JSO). Slovakia: Suchá Hora, peat-bog, 9.VII.1988, 1 ♂; Západné Tatry Mts, Juráňova dolina [valley], "Tiesňavy" (880 m a.s.l.), 14.VI.2000, 1 ♂; Západné Tatry Mts, Spálená dolina [valley] (1,300 m a.s.l.), 13.VI.2000, 1 ♂; Západné Tatry Mts, Ráčková dolina [valley], 18.VII.1967, 1 ♀; Západné Tatry Mts, Jamnícka dolina [valley], 20.VII.1967, 1 ♂, 1 ♀; Vysoké Tatry Mts, Hrebienok, 19.VII.1969, 1 ♂; Vysoké Tatry Mts, Veľká Studená dolina [valley], 23.VII.1969, 1 ♂, 1 ♀; Vysoké Tatry Mts, Veľické pleso [lake] (1,665 m a.s.l.), 18.VII.2001, 1 ♂, 24.VI.2002, 1 ♂; Belianské Tatry Mts, Dolina Sedmich prameňov [valley], 30.VII.1974, 1 ♂; Belianské Tatry Mts, Skalné Vratá, 24.VII.1969, 3 ♂; Belianské Tatry Mts, Tatranská Kotlina, Šarpanec, 19.VI.1977, 1 ♂; Belianské Tatry Mts, Tristárska dolina [valley] (1,100 m a.s.l.), 24.VII.1975, 1 ♂, 22.VI.1977, 2 ♂; Poľana Mts, Hronček valley (700–800 m a.s.l.), 26.V.2005, 1 ♂; Sloveské Rudohorie Mts, Úhorná, 11.VII.1970, 1 ♂; Nová Sedlica, "Stužica", 13.VI.1986, 1 ♂, 6.IX.1989, 1 ♂, 1 ♀, 9.VII.1993, 1 ♂ (all J. Starý leg.) (JSO). Switzerland: Canton Graubünden: Zernez (1,500 m a.s.l.), 4.VII.1979, 1 ♂ (C. Dufour leg.) (JSO).

*Discussion.* As compared to *D. (B.) nemorale*, *D. (B.) separatum* is generally darker, with the antennae dark throughout and the tips of femora infuscated, and it has broader wings. The redescription above is based on the specimens from the mountainous regions of the Czech Republic and Slovakia. Generally, *D. (B.) separatum* is somewhat variable in some external characters, such as the body colouration and the outline of the wings, most probably due to ecological conditions. In the series of the specimens from the Pirin Mts, Bulgaria (see Material examined), the body colouration is distinctly paler, rather pale greyish brown. The Scottish specimens (see Ma-

terial examined) vary in both the body colouration and the outline of the wings. Some have the wings narrower (yet broader than those of *nemorale*), and the body shows a difference between the dark grey thorax and predominantly brown abdomen (the latter sometimes banded with dark brown), resembling thus somewhat darker specimens of *D. (B.) nemorale*. The antennae of all these specimens are more or less uniformly dark (occasionally, the first flagellomere is slightly paler than both the following flagellomeres and the basal segments), and the tips of the femora are infuscated. In the structure of the male terminalia, *D. (B.) separatum* is somewhat similar to *D. (B.) adjunctum*, but the outer gonostylus is darker and less curved before the apex, the parameres are longer and the two distal parts of the aedeagus unequal in shape (Figs 1b, e). The female terminalia have very small spermathecae, nearly spherical (Fig. 1h), thus clearly distinct from the other two species.

*Distribution.* So far the species was only recorded in Great Britain, Germany and, somewhat questionably, in the Ukraine (Oosterbroek 2007). The record from the Ukraine is most probably right, and the species is here newly recorded for Bulgaria, Czech Republic, Slovakia and Switzerland. *D. (B.) separatum* has been considered a mountainous form, but a number of lowland records are known from Germany, as well as the syntopic occurrence of *D. (B.) nemorale* and *D. (B.) separatum* (see Material examined).

### 3.5. *Dicranophragma (Brachylimnophila) adjunctum* (Walker, 1848), comb. n. (Figs 1c, f, i)

*Limnobia adjuncta* Walker 1848: 40 (original description).

*Limnophila (Pilaria?) adjuncta*: Edwards 1938: 90 (diagnosis), Pl. 3, Fig. 16 (wing).

*Neolimnomyia (Brachylimnophila) adjuncta*: Savchenko 1986: 326 (redescription), Figs 162/4 (wing), 166/4 (male terminalia); Savchenko et al. 1992: 225 (Palaeartic catalogue); Stubbs 1997: 8–9 (in error as *Neolimnophila*; key), Fig. (wing); Podenas et al. 2006, Figs XVI.f (male terminalia), 54.1 (wing), 54.2 (male terminalia); Oosterbroek 2007 (electronic World catalogue).



*Limnophila axillaris* Strobl 1906: 413 (original description).

*Limnophila axillaris* var? *brevifurcata* Strobl 1906: 414 (original diagnosis).

*Limnophila dimidiata* de Meijere 1918: 132 (original description).

*Limnophila dimidiata*: de Meijere 1921: 72 (redescription), Text-fig. 8 (wing), Pl. 6, Figs 109a–b (male terminalia); Pierre 1924: 128 (diagnosis), Figs 506 (wing), 511 (male terminalia).

*Limnophila nemoralis* var. *noscibilis* Edwards 1921: 225 (original diagnosis).

*Diagnosis.* General colouration greyish brown. Wing narrow, with distinct stigma and other spots or seams.  $M_1$  and  $M_2$  subequal in length to their petiole. Male terminalia with both distal parts of aedeagus short. Female terminalia with spermathecae moderately large. Body length 5.0–9.0, wing length 5.5–9.5 mm.

*Redescription.* Head grey. Antenna moderate in length, reaching to about mid coxa, brown at base, darkened distally. Flagellomeres generally ovoid, progressively narrower. Longest verticils about three times as long as their respective flagellomeres.

Thorax grey, sometimes with four poorly distinct longitudinal stripes on prescutum. Wing comparatively narrow, almost four times as long as broad, tinged greyish. Stigma distinct, even if not especially pronounced, with other spots or seams at origin of  $R_s$  and so-called cord, i.e. at basal section of  $R_2$ , r-m, basal section of  $M_{1+2}$  and m-cu. Venation:  $R_2$  less than twice its length beyond origin of  $R_{2+3}$ ;  $M_1$  and  $M_2$  subequal in length to their petiole. Legs obscure yellow.

Abdomen brown to dark greyish brown, with setosity moderate. Male terminalia (Figs 1c, f): Gonocoxite comparatively long and slender, cylindrical. Outer gonostylus very slender, almost straight proximally, considerably curved before apex, slightly pigmented throughout, apex shortly bidentate. Inner gonostylus fleshy, conical. Interbase generally spoon-like or paddle-like. Paramere shorter and than that of *D. (B.) separatum*. Aedeagus bipartite distally in lateral view, both parts short, subacute at tips and subequal in shape.

Female resembling male in general appearance. Verticils shorter than in male, about twice as long as their respective flagellomeres. Female

terminalia with internal structures as in Fig. 1i. Vaginal apodeme (genital fork) much as in *D. (B.) nemorale*. Spermathecae intermediate in size between those of *D. (B.) nemorale* and *D. (B.) separatum*, darkly pigmented, ovoid.

*Type material examined.* In describing *Limnobia adjuncta*, Walker (1848: 40) only stated: “England. From Mr. Walker’s collection.” Lectotype ♂ (present designation): England (F. Walker leg.) (BMNH), labelled “adjuncta” (hand-written), “Pres. by / F. Walker / 56. 50.” (hand-written), “Holotype of / Limnobia adjuncta / Walker, 1848 / England” (hand-written), “BMNH(E) # / 235032” (printed), “Type” (green-margined circular label, printed, with hand-written inscription “Limnobia adjuncta”), “HOLO- / TYPE” (red-margined circular label, printed). Labelled by the present authors as the lectotype (“LECTOTYPE / Limnobia / adjuncta Walker ♂ / J. Starý & H. Reusch 2006”, printed, red label) and identified as *Dicranophragma (Brachylimnophila) adjunctum*. The specimen is “micro-pinned” (with rather a tip of normal pin) on a triangular celluloid point, with apex of left antenna broken off, left mid leg and parts of right fore and hind legs present; apex of abdomen cut off. Terminalia dissected by the present authors and placed in a sealed plastic tube with glycerine, pinned with the specimen. According to N. Wyatt (e-mail comm.) this is the only type of *Limnobia adjuncta* in BMNH. Since, however, as usually, there is no statement about the number of specimens in the description by Walker (1848), the type specimen examined is designated here as the lectotype to maintain the concept of the name in case additional specimens may be found to exist (cf. Recommendation 73F of ICZN 1999).

*Other material examined.* Germany: Baden-Württemberg: Obere Argen nr. Harratried (595 m), 19.viii.1998, 1 ♀ (R. Brinkmann leg.) (HRS, in ethanol). Great Britain: Wales (North): Caernarvon, Aberdaron, “swarming”, 16.IX.1966, 3 ♂; Caernarvon, Llanbedrog, grassy cliff, 11.IX.1966, 3 ♀ (all R. I. Vane-Wright leg.) (JSO). Greece: Crete: Khandia Region: Nea Roumata, brook, 21.V.2004, 1 ♂ (J. Starý leg.); Prases, 4 km SW, 17.V.2004, 1 ♀ (M. Vála leg.), 18.V.2004, 1 ♂, 21.V.2004, 1 ♂, 1 ♀ (J. Starý leg.); Kavros, 19.V.2004, 2 ♂ (J. Roháček & M. Vála leg.), 24.V.2004, 10 ♂, 5 ♀; Kavros,

Delfinado brook, 11.V.2004, 2 ♂ (all J. Stary leg.). Italy: Sicily: Fiume Eleutero, 6 km SW Marineo, forest above riverbanks near lake Scanzano (600 m a.s.l.), 19.X.1993, 1 ♂ (P. Oosterbroek & C. Hartveld leg.) (JSO). Luxembourg: Bech-Kleinmacher (200 m a.s.l.), 24.VII.1998, 1 ♂ (light trap) (M. Meyer leg.) (HRS, in ethanol). Switzerland: Canton Neuchâtel: Chambrelieu, 24.IX.1994, 2 ♀ (J. Stary leg.) (JSO).

*Discussion.* This is a very distinctive species, which differs from both *D. (B.) nemorale* and *D. (B.) separatum* by a distinct wing pattern and some features in the wing venation ( $R_2$  less than twice its length beyond origin of  $R_{2+3}$ ,  $M_1$  and  $M_2$  subequal in length to their petiole). The male terminalia, generally similar to those of *D. (B.) separatum*, have a very slender outer gonostylus, considerably curved before the apex, the parameres shorter and the two distal parts of the aedeagus subequal in shape (Figs 1c, f). The spermathecae are intermediate in size between those of *D. (B.) nemorale* and *D. (B.) separatum* (Fig. 1i). The specimens from Greece (Crete) (see Material examined) have  $M_1$  and  $M_2$  somewhat shorter than their petiole, often half as long.

*Distribution.* *D. (B.) adjunctum* has atlantic-mediterranean distribution, ranging to North Caucasus and Georgia (Transcaucasia) (for details, see Oosterbroek 2007). The westernmost record is from Ireland, the northernmost from Lithuania. The species is here newly recorded for Greece (Crete) and Luxembourg.

*Acknowledgements.* For the loan of the type specimens of *Limnobia separata* Walker and *L. adjuncta* Walker, we are much indebted to N. P. Wyatt (BMNH). For the gift of specimens, we thank the following: R. Bellstedt (Gotha, Germany), T. Berger (Potsdam, Germany), R. Brinkmann (Schlesien, Germany), Antonie Dorn (Landshut, Germany), C. Dufour (Muséum d'histoire naturelle, Neuchâtel, Switzerland), R. Heiss (Frankfurt/Oder, Germany), A. M. Hutson (then BMNH), O. König (Krumbach, Germany), T. Meineke (Ebergötzen, Germany), M. Meyer (Natural History Museum of Luxembourg), A. Weinzierl (Landshut, Germany), W. Zimmermann (Weimar, Germany). The English text was checked and improved by Beate and Stephen Loftus (Wyoming, New South Wales, Australia). The work was supported by grant MSM6198959212 for the senior author.

## References

- Alexander, C. P. 1930: New or little-known Tipulidae from eastern Asia (Diptera), VII. — Philipp. J. Sci. 42: 507–535.
- Alexander, C. P. 1933: New or little-known Tipulidae from eastern Asia (Diptera), XV. — Philipp. J. Sci. 52: 131–166.
- Alexander, C. P. 1943: Family Tipulidae. — In: Crampton, G. C., Curran, C. H. & Alexander, C. P. (eds.), Guide to the Insects of Connecticut. Part VI. The Diptera or true flies of Connecticut. First Fascicle. — Bull. Conn. St. geol. nat. Hist. Survey 64: 196–486. [reprinted in 1966]
- Alexander, C. P. 1953: Records and descriptions of Japanese Tipulidae (Diptera), Part II. The crane-flies of Shikoku, II. — Philipp. J. Sci. 82: 141–179.
- Alexander, C. P. 1965: Family Tipulidae. — In: Stone, A., Sabrosky, C. W., Wirth, W. W., Foote, R. H. & Coulson, J. R. (eds.), A Catalog of the Diptera of America North of Mexico: 16–90. U. S. Department of Agriculture, Washington D. C., Agricultural Handbook 276. iv+1696 pp.
- Alexander, C. P. 1966a: New subgenera and species of crane-flies from California (Ptychopteridae and Tipulidae, Diptera). — Trans. Am. Entomol. Soc. 92: 103–132.
- Alexander, C. P. 1966b: Family Tipulidae. — In: Crampton, G. C., Curran, C. H. & Alexander, C. P. (eds.), Guide to the Insects of Connecticut. Part VI. The Diptera or true flies of Connecticut. First Fascicle. — Bull. Conn. St. geol. nat. Hist. Survey 64: 196–486. [reprinted]
- Alexander, C. P. & Alexander, M. M. 1973: Family Tipulidae. — In: Delfinado, M. D. & Hardy, D. E. (eds.), A Catalog of the Diptera of the Oriental Region, 1: 10–224. The University Press of Hawaii, Honolulu. 618 pp.
- Czizek, K. 1931: Die mährischen Arten der Dipterenfamilien Limoniidae und Cylindrotomidae. — Z. mähr. Landesmus. 28: 1–207.
- Edwards, F. W. 1921: British Linnobiidae: Some records and corrections. — Trans. R. Ent. Soc. Lond. 1921: 196–230.
- Edwards, F. W. 1938: British short-palped crane-flies. Taxonomy of adults. — Trans. Soc. Br. Ent. 5: 1–168.
- Hutson, A. M. 1980: Family Tipulidae. — In: Crosskey, R. W. (ed.), Catalogue of the Diptera of the Afrotropical Region: 47–91. British Museum (Natural History), London. 1437 pp.
- ICZN 1999: International Code of Zoological Nomenclature. Fourth Edition. — The International Trust for Zoological Nomenclature, c/o the Natural History Museum, London. xxix+306 pp.
- Meigen, J. W. 1818: Systematische Beschreibung der bekannten Europäischen zweiflügeligen Insekten. Erster Theil mit elf Kupfertafeln. — Beaufort Sohn, Aachen. xxxvi+333 pp.
- Meijere, J. C. H. de 1918: Neue holländische Dipteren. — Tijdschr. Entomol. 61: 128–141.

- Meijere, J. C. H. de 1921: Studien über palaearktische, vorwiegend holländische Limnobiiden, insbesondere über ihre Kopulationsorgane (Schluss). — Tijdschr. Entomol. 64: 54–118.
- Nielsen, P. 1925: Stankelben. (The craneflies) — In: Danmarks Fauna 28. G. E. C. Gads Forag, København. 165 pp. [In Danish]
- Oosterbroek, P. 2007: Catalogue of the Craneflies of the World (Diptera, Tipuloidea: Pediciidae, Limoniidae, Cylindrotomidae, Tipulidae). [www document] URL <http://ip30.eti.uva.nl/ccw/stats.php> (Last update: 11 Apr 2007).
- Osten Sacken, C. R. 1860: New genera and species of North American Tipulidae with short palpi, with an attempt at a new classification of the tribe. — Proc. Acad. Nat. Sci. Philad. 1859: 197–256.
- Pierre, C. 1924: Diptères: Tipulidae. — In: Faune de France 8. Paul Lechevalier, Paris. 159 pp.
- Podenas, S., Geiger, W., Haenni, J.-P. & Gonthier, Y. 2006: Limoniidae & Pediciidae de Suisse. — In: Fauna Helvetica 14. CSCF & SEG, Neuchâtel. 375 pp.
- Reusch, H. & Oosterbroek, P. 2000: Übersicht der aus den einzelnen deutschen Bundesländern bekannten Stelmücken (Diptera: Limoniidae et Pediciidae). — Braunsch. Naturkundl. Schr. 6: 149–164.
- Reusch, H., Bellstedt, R., Brinkmann, R. & Heiss, R. 2004: Regionale Ergänzungen zur Stelmücken-Fauna Deutschlands in verschiedenen Bundesländern. — Braunsch. Naturkundl. Schr. 7: 109–121.
- Savchenko, E. N. 1978: (The fauna of Limoniid-flies (Diptera, Limoniidae) of the North Kuriles.) — In: Systematics and biology of the freshwater-organisms of north-east Asia. Trudy biol.-pochv. Inst. DVNC AN SSSR, Vladivostok (N.S.) 49: 63–68. [In Russian]
- Savchenko, E. N. 1979: A new subgenus and a new species of Limoniid-flies from the genus *Neolimnomyia* Séguy (Diptera, Limoniidae). — Dopov. Akad. Nauk Ukr. RSR (B) 1979: 482–485. [In Ukrainian]
- Savchenko, E. N. 1983: (Limoniidae of South Primorye.) — Akad. Nauk Ukr. SSR, Kiev. 156 pp. [In Russian]
- Savchenko, E. N. 1986: (Limoniid-flies: Introduction; subfamilies Pediciinae and Hexatomiinae). — Fauna Ukrainy 14 (2). Naukova Dumka, Kiev. 380 pp. [In Russian]
- Savchenko, E. N. 1989: (Limoniid-flies of the fauna of the USSR). — Akad. Nauk Ukr. SSR, Kiev. 377 pp. [In Russian]
- Savchenko, E. N. & Krivolutsкая, G. O. 1976: (Limoniidae of the South Kuril Islands and South Sakhalin). — Akad. Nauk Ukr. SSR, Kiev. 160 pp. [In Russian]
- Savchenko, E. N., Oosterbroek, P. & Starý, J. 1992: Family Limoniidae. — In: Soós, Á., Papp, L. & Oosterbroek, P. (eds.), Catalogue of the Palaearctic Diptera 1: 183–369. Hungarian Natural History Museum, Budapest. 520 pp.
- Strobl, P. G. 1906: Spanische Dipteren, II. Beitrag (1). — Mems. R. Soc. Esp. Hist. Nat. 3(1905): 271–422.
- Stubbs, A. E. 1997: Cranefly Recording Scheme. Test Key to Subfamily Limnophilinae. — Peterborough. 17 pp.
- Stubbs, A. E. 1998: Limoniidae. — In: Chandler, P. (ed.), Checklists of Insects of the British Isles (New Series) Part 1: Diptera. Handbooks for the Identification of British Insects Volume 12: 4–9. Royal Entomological Society, London. 234 pp.
- Walker, F. 1848: List of the specimens of dipterous insects in the collection of the British Museum 1. London. 229 pp.