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A preliminary list of the Heteroptera, Auchenorrhyncha (Hemiptera) and Pipunculidae (Diptera) of the Réserve Naturelle du Marais de Lavours (France; Ain)

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ABSTRACT

The insect fauna of the wetland nature reserve of Marais de Lavours was sampled using pitfall traps, some Malaise trapping and haphazard direct collecting. An initial list of 130 Hemiptera and 23 Pipunculidae is presented, with comments on the assemblage recorded and the limitations of the sampling.

Keywords: *Carex elata* grassland, pitfall traps, leafhopper, big-headed fly, Rhône Valley, France

INTRODUCTION

The Reserve Naturelle du Marais de Lavours (department of Ain) is a French wetland nature reserve of 474 hectares situated in the Rhône Valley between Geneva and Lyon (Fig. 1). These wetlands are the remnant of a much larger system which developed as extensive glacial lakes that had formed at the end of the last ice age and gradually dried out. Recorded exploitation of the wetlands for grazing and hay goes back to the 12th century, but the richness of the habitat was obviously recognized long before. During the early 20th century agricultural depression in France, the wetland was more or less abandoned and started to become woodland. In the 1970s work to drain the wetland for cultivation began in earnest, and a nature reserve was proposed to conserve some of the enormous wildlife value of the remaining habitats. The reserve was finally founded in 1984.

The flora and fauna of the reserve, which lies between the Jura Mountains and the Alps, includes northern elements left behind after the ice age and Mediterranean elements penetrating northwards along the Rhône Valley. The vegetation types vary with the soil and include raised peat bogs, reed beds, fen wetland, calcareous grassland, carr and wet woodland. The management of the open areas is by grazing, cutting and winter controlled burning, and some experimental assessment of this is currently underway.

As part of this assessment of management an investigation of the invertebrate fauna has been undertaken. The principal method used has been pitfall traps with the addition of some supplementary opportunistic direct collection and limited Malaise trapping. This methodology is clearly biased towards the collection of species active on the soil surface, and will not reflect the fauna as a whole. However, the species encountered form an interesting assemblage in their own right, as well as providing

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Fig. 1. — View of the Reserve Naturelle du Marais de Lavours (department of Ain): a French wetland nature reserve situated in the Rhône Valley between Geneva and Lyon. Photo credit: Reserve Naturelle du Marais de Lavours.

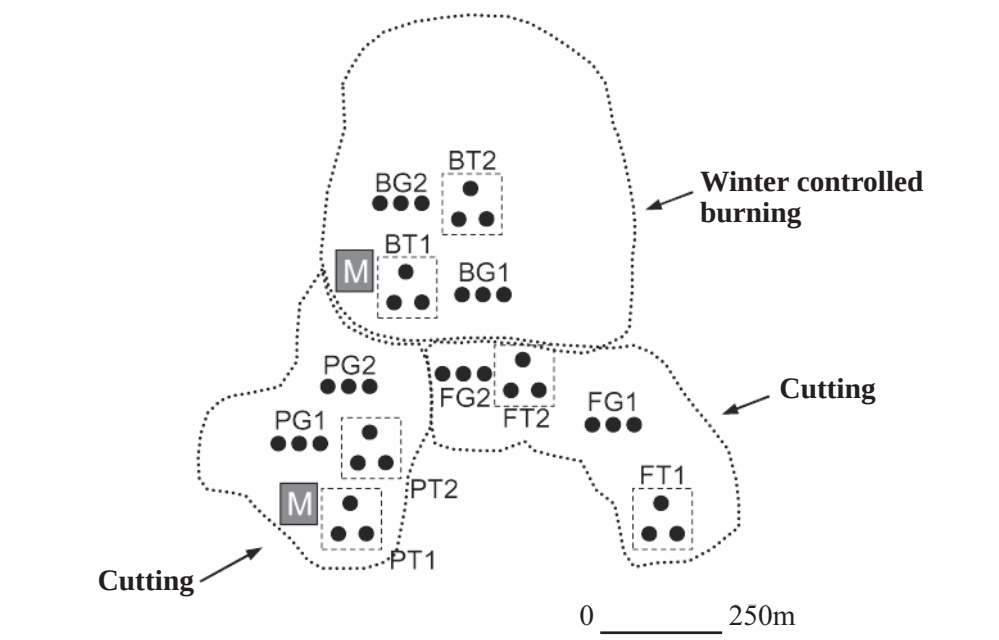

Fig. 2. — Layout of the pitfall trapping (BG burning, BT control; PG and FG cutting, PT and FT control) and Malaise traps (M).

a baseline list to which other methods can add further information. Since one of the major problems in interpreting the findings is a lack of any comparable data the publication of even partial results is clearly justified.

The results presented here are for the Heteroptera and Auchenorrhyncha (Hemiptera), and the Pipunculidae (Diptera), almost all of the latter group being parasitoids of Auchenorrhyncha.

METHODS

Three pitfall traps were placed in two replicate plots of *Carex elata* grassland in blocks managed by winter controlled burning (BG) or cutting (FG, PG) and their respective control plots (BT, FT and PT). The traps were operated for 20 weeks in 2008 (15 April–5 August and 24 September–7 October) and emptied weekly. In 2010 they operated for 12 weeks (22 April–27 May, 17 June–1 July and 22 September–6 October) (Michaud, 2011). The Hemiptera were sorted from the catch and stored in 75% alcohol until identification. Two Malaise traps were operated between 15 June and 7 August 2013, emptied fortnightly, and the Hemiptera sorted and stored in 75% alcohol. A few specimens of Hemiptera collected using other methods were also stored in 75% alcohol. The layout of the traps in the 3 blocks is given in Fig. 2.

Specimens of adult Heteroptera and Auchenorrhyncha were identified to species where possible (for some genera the females cannot be reliably distinguished). Most of the specimens were left in alcohol, but some that had been dissected were glued to card mounts and conserved dry. Most of the material studied is deposited in the Musée des Confluences in Lyon, although voucher specimens of the more abundant species are deposited in the Muséum d'histoire naturelle de Genève. Pipunculidae were identified as part of the Malaise trap campaign reported on more extensively in Withers (2014). A representative collection is deposited in the Musée des Confluences; other material is in collection PW.

RESULTS

A total of 130 species of Hemiptera have been identified (Appendix 1), a list which includes many species associated with wetlands, but also habitat generalists and three introduced species. Of these, 55 were represented amongst the 2211 specimens identified from the 283 pitfall trap samples (combined catch for each treatment/week) containing Hemiptera examined. The most abundant Heteroptera species for each block are listed in Table 1 and the most abundant Auchenorrhyncha species in Table 2. Although there was some variation in the number of traps successfully operated each week because of flooding or disturbance, these numbers are a broadly accurate measure of relative abundance. In addition, 23 species of Pipunculidae have been identified (Appendix 2).

DISCUSSION

As might be expected, the assemblages captured in the pitfall traps were overwhelmingly composed of species associated with wetlands. Of the abundant species the exceptions are the grass feeding *Stenodema calcarata* and *Recilia coronifera*, and it is suggestive that both were abundant in the same blocks (see

TABLE 1. — HETEROPTERA FROM PITFALL TRAPS IN THE THREE EXPERIMENTAL BLOCKS

	Block B	Block F	Block P
Chartoscirta elegantula (Fallén, 1807)	227	89	147
Hebrus ruficeps Thomson, 1871	121	56	299
Hebrus pusillus (Fallén, 1807)	30	10	25
Pachybrachius fracticollis (Schilling, 1829)	27	5	6
Agramma laetum (Fallén, 1807)	6	5	2
Microvelia reticulata (Burmeister, 1835)	3	1	2
Hydrometra gracilenta Horvath, 1899	1	0	1
Halticus apterus (L., 1758)	1	0	2
Eysarcoris aeneus (Scopoli, 1763)	1	1	1
Scolopostethus puberulus Horvath, 1887	1	0	0
Chartoscirta cocksii (Curtis, 1835)	0	24	6
Stenodema calcarata (Fallén, 1807)	0	41	6
Chartoscirta cincta (Herrich-Schaeffer, 1841)	0	1	5
Acalypta carinata (Panzer, 1806)	0	2	28
Ceratocombus coleoptratus (Zetterstedt, 1819)	0	1	0
Drymus sylvaticus (F., 1775)	0	1	1
Scolopostethus pictus (Schilling, 1829)	0	1	0
Nabis ferus (L., 1758)	0	0	1
Acalypta playtcheila (Fieber, 1844)	0	0	2
Total	418	238	534

Tables 1 and 2). The Heteroptera assemblages were dominated by predatory (or scavenging) species of Saldidae and Hebridae. This is not unexpected; Ford *et al*. (2013) found that *Saldula littoralis* made up 67% of the Heteroptera caught in pitfall traps in coastal marshes. Less expected is the fact that only one genus of Saldidae was represented, and that the most abundant species, *Chartoscirta elegantula*, is the least widespread and rarest species of the genus in France (Péricart, 1990). The most abundant herbivore is different in each block (see Table 1), and although *Pachybrachius fracticollis* and *Acalypta carinata* tend to be associated with wetlands, *Stenodema calcarata* has much more generalist habitat requirements.

Species apparently rare or local in France include *Ceratocombus coleoptratus* (Heiss & Péricart, 2007) and *Acalypta platycheila* (Péricart, 1983) which are associated with mosses and may simply be under-recorded because of under sampling, although it is notable that another moss species, *Acalypta carinata* is widely distributed in Switzerland while *A. platycheila* is not yet known from the country (Hollier, unpublished data). *Megalotomus junceus* is also relatively scarce, and although it has a range of host plants has been closely associated with *Carex elata* grassland (Moulet, 1995).

The Auchenorrhyncha assemblages were more equitable than the Heteroptera and only two of the fifteen most abundant species are not associated with wetlands (see Table 2). The status of the Auchenorrhyncha fauna of France is less well known than that of the Heteroptera because there are fewer specialists working on the group, and interpretation of the fauna relies more heavily on information from Central Europe. The most abundant leafhopper in the pitfall traps, *Stroggylocephalus livens*, is apparently rare; there are only two localities mentioned by Ribaut (1952) with none added by Giustina (1989), and the species is uncommon in Germany (Nickel, 2003) and only recently reported for the Swiss fauna (Mühlethaler *et al*., 2009).

Other rare or local species include *Kelisia confusa* known from only a few localities and *Megamelodes lequesnei* with only scattered records in Europe

TABLE 2. — AUCHENORRHYNCHA FROM PITFALL TRAPS IN THE THREE EXPERIMENTAL BLOCKS

	B	F	P
Stroggylocephalus livens (Zetterstedt, 1840)	84	65	62
Cicadula flori (Sahlberg, 1871)	50	51	67
Metalimnus formosus (Boheman, 1845)	32	16	5
Cicadella viridis (L., 1758)	23	14	58
Muellerianella extrusa (Scott, 1871)	23	85	6
Euconomelus lepidus (Boheman, 1847)	21	50	0
Paradephacodes paludosus (Flor, 1861)	12	53	11
Macrosteles septemnotatus (Fallén, 1806)	12	0	0
Megamelus notulus (Germar, 1830)	10	4	4
Stroggylocephalus agrestis (Fallén, 1806)	9	21	44
Neophilaenus lineatus (L., 1758)	4	11	0
Florodelphax leptosoma (Flor, 1861)	4	9	0
Oncodelphax pullulus (Boheman, 1852)	3	8	1
Cosmotettix aurantiacus (Forel, 1859)	2	2	0
Aphrophora major Uhler, 1896	1	1	2
Stenocranus fuscovittatus (Stal, 1858)	1	6	2
Philaenus spumarius (L., 1758)	1	0	0
Macropsis infuscata (Sahlberg, 1871)	1	0	0
Macustus grisescens (Zetterstedt, 1828)	1	1	1
Zyginidia scutellaris (Herrich-Schaeffer, 1838)	1	2	1
Kelisia confusa Linnavouri, 1957	1	2	0
Megamelodes lequesnei Wagner, 1963	1	2	0
Notus *flavipennis* (Zetterstedt, 1828)	0	6	1
Recilia coronifera (Marshall, 1866)	0	26	0
Stenocranus major (Kirschbaum, 1868)	0	0	1
Arboridia parvula (Boheman, 1845)	0	1	0
Cicadula persimilis (Edwards, 1920)	0	4	0
Cicadula quadrinotata (F., 1794)	0	0	3
Edwardsiana flavescens (F., 1794)	0	0	1
Idiocerus vicinus Melichar, 1898	0	2	0
Jassargus sursumflexus (Then, 1902)	0	1	0
Limotettix striola (Fallén, 1806)	0	1	0
Macropsis marginata (H.-S., 1836)	0	1	0
Delphax pulchellus (Curtis, 1833)	0	0	1
Laodelphax striatellus (Fallén, 1826)	0	1	0
Total	297	446	271

(Holzinger, Kammerlander & Nickel, 2003), *Aphrophora major* which is an apparently boreo-alpine species (Holzinger *et al*., 2003) and *Cosmotettix aurantiacus*, which is apparently not yet reported from France (Giustina, 1989), but which was described from the Lake Geneva region not far upriver from Lavours (see Hollier, 2006).

The status of the Pipunculidae recorded is almost certainly an under-representation of the fauna at the Marais de Lavours. Given that there are nearly 60 species of *Eudorylas* known from Europe, the total of three at the site is probably not a true indication of the species richness; traps were not run in spring or late summer/autumn, so it is possible that early or late activity was not accurately registered. The presence of all three European species of *Nephrocerus* is unusual, but the wetland has a rich list of Tipuloidae, with 85 species recorded. As this genus is associated with adult crane-flies in America, the probability is that this is also true for the genus in Europe, although no rearing records have yet been documented.

Koenig & Young (2007) in their observation of this phenomenon noted that over 40% of female tipulids were parasitized, but far fewer males (not even 1%). Many of the host-species of Pipunculidae are still unknown. However, it is probably unsurprising that at least one host species for each of the Pipunculidae with a known host range was recorded from the reserve. All *Chalarus* species for which the host is known are specialist parasites of typhlocybine leafhoppers, some of which are pest species; their use as biological control agents has been considered in both North America and New Zealand.

CONCLUSION

The Hemiptera identified in the survey clearly belong to a specialised wetland assemblage. The faunistic associations are with northern Europe rather than the Mediterranean, and a number of the species recorded are rare in France or more generally. The Pipunculidae include at least one species not known from anywhere else in France, and it is by no means certain that the list is complete; additional effort in collecting in spring and autumn could augment this considerably. The taxonomy of the genus *Pipunculus* is still problematic and several specimens collected could not be determined to species, so the likelihood is that there are more members of this genus represented than recorded to date. It is, however, gratifying to be able to correlate the pipunculids with their hosts, and to note that there are no major omissions. Although the survey methods under-record some elements of the fauna, the data available highlight the importance of the reserve, an importance which can only be increased by further study.

ACKNOWLEDGEMENTS

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Appendix 1

130 HEMIPTERA SPECIES RECORDED FROM THE RESERVE NATURELLE DE LA MARAIS DE LAVOURS. SPECIES MARKED WITH AN ASTERISK ARE AQUATIC, AMPHIBIOUS OR ASSOCIATED WITH OPEN WETLAND HABITATS. (NOMENCLATURE FOLLOWS AUKEMA & RIEGER (1995; 1996; 1999; 2001; 2006) FOR THE HETEROPTERA AND HOLZINGER *ET AL.* (1997) FOR THE AUCHENORRHYNCHA)

HETEROPTERA

Acanthosomatidae
Elasmostethus interstinctus (L., 1758)

Alydidae
**Megalotomus junceus* (Scopoli, 1763)

Anthocoridae
Anthocoris amplicollis Horvath, 1893
Anthocoris nemorum (L., 1761)
Orius laticollis (Reuter, 1884)

Aradidae
Aradus depressus (F., 1794)

Ceratocombidae
**Ceratocombus coleoptratus* (Zetterstedt, 1819)

Coreidae
Coreus marginatus (L., 1758)
Gonocerus acuteangulatus (Goeze, 1778)
Leptoglossus occidentalis Heidemann, 1910

Corixidae
**Cymatia coleoptrata* (Fabricius, 1777)

Gerridae
**Gerris lacustris* L., 1758

Hebridae
**Hebrus pusillus* (Fallén, 1807)
**Hebrus ruficeps* Thomson, 1871

Hydrometridae
**Hydrometra gracilenta* Horváth, 1899

Lygaeidae
Aphanus rolandri (L., 1758)
**Cymus claviculus* (Fallén, 1807)
Drymus sylvaticus (F., 1775)
**Kleidocerys privignus* (Horváth, 1894)
Oxycarenus modestus (Fallén, 1829)
**Pachybrachius fracticollis* (Schilling, 1829)
Peritrechus gracilicornis Puton, 1887
Rhyparochromus vulgaris (Schilling, 1829)
Scolopostethus pictus (Schilling, 1829)
**Scolopstethus puberulus* Horváth, 1887
Taphropeltus contractus (Herrich-Schaeffer, 1835)

Miridae
Adelphocoris seticornis (Fabricius, 1775)
Amblytylus nasutus (Kirschbaum, 1856)
Blepharidopterus angulatus (Fallén, 1807)
Coniortodes salicellum (Herrich-Schaeffer, 1841)
Deraeocoris flavilinea (Costa, 1862)

Deraeocoris lutescens (Schilling, 1837)
Deraeocoris ruber (L., 1758)
Halticus apterus (L., 1758)
Lygus pratensis (L., 1758)
Orthops campestris (L., 1758)
Phytocoris varipes Boheman, 1852
Pilophorus clavatus (L., 1767)
Plagiognathus arbustorum (Fabricius, 1794)
Psallus salicis (Kirschbaum, 1856)
Stenodema calcarata (Fallén, 1807)
**Trigonotylus ruficornis* (Geoffroy, 1785)

Nabidae
Himacerus apterus (F., 1798)
Nabis ferus (L., 1758)
Nabis punctatus Costa, 1847

Naucoridae
**Ilyocoris cimicoides* (L., 1758)

Nepidae
**Nepa cinerea* L., 1758

Pentatomidae
Arma custos (F., 1794)
Eysarcoris aeneus (Scopoli, 1763)
Graphosoma lineatum (L., 18758)
Palomena prasina (L., 1761)
Pentatoma rufipes (L., 1758)

Pleidae
**Plea minutissima* Leach, 1817

Reduviidae
Peirates hybridus (Scopoli, 1763)
Pygolampis bidentata (Goeze, 1778)

Rhopalidae
**Rhopalus maculatus* (Fieber, 1837)
Stictopleurus punctatonervosus (Goeze, 1778)

Saldidae
**Chartoscirta cincta* (Herrich-Schaeffer, 1841)
**Chartoscirta cocksii* (Curtis, 1835)
**Chartoscirta elegantula* (Fallén, 1807)
**Saldula saltatoria* (L., 1758)

Tingidae
**Acalypta carinata* (Panzer, 1806)
**Acalypta platycheila* (Fieber, 1844)
**Agramma laetum* (Fallén, 1807)
Derephysia foliacea (Fallén, 1807)
Dictyla convergens (Herrich-Schaeffer, 1835)

Veliidae
**Microvelia reticulata* (Burmeister, 1835)

AUCHENORRHYNCHA
Aphrophoridae
Aphrophora alni (Fallén, 1805)
**Aphrophora major* Uhler, 1896
Neophilaenus lineatus (L., 1758)
Philaenus spumarius (L. 1758)

Cicadellidae
Alebra albostriella (Fallén, 1826)
Allygus mixtus (F., 1794)
Alnetoidea alneti (Dahlbom, 1850)
Anoscopus serratulae (F., 1775)
Aphrodes makarovi Zachvatkin, 1948
Arboridia parvula (Boheman, 1845)
Arthaldeus pascuellus (Fallén, 1826)
**Cicadella viridis* (L., 1758)
**Cicadula albigenesis* Wagner, 1940
**Cicadula flori* (Sahlberg, 1871)
Cicadula persimilis (Edwards, 1920)
**Cicadula quadrinotata* (F. 1794)
**Cosmotettix aurantiacus* (Forel, 1859)
Edwardsiana flavescens (F., 1794)
**Edwardsiana geometrica* (Schrank, 1810)
Errastunus ocellaris (Fallén, 1806)
Errhomenus brachypterus Fieber, 1866
Eupteryx cyclops Matsumura, 1906
Eupteryx urticae (Fabricius, 1803)
Eupteryx vittata (L., 1758)
Eurhadina pulchella (Fallén, 1806)
Eurhadina saageri (Wagner, 1937)
Idiocerus vicinus Melichar, 1898
Japananus hyalinus (Osborn, 1900)
**Jassargus sursumflexus* (Then, 1902)
Kybos calyculus (Cerutti, 1939)
Kybos smaragdulus (Fallén, 1806)
Kybos virgator (Ribaut, 1933)
**Limotettix striola* (Fallén, 1806)
**Linavuoriana sexmaculata* (Fallén, 1806)
Macropsis infuscata (Sahlberg, 1871)
Macropsis marginata (H.-S., 1836)
**Macrosteles septemnotatus* (Fallén, 1806)
Macustus grisescens (Zetterstedt, 1828)
**Metalimnus formosus* (Boheman, 1845)
**Notus flavipennis* (Zetterstedt, 1828)
Ossiannilssonia callosa (Then, 1886)
Recilia coronifera (Marshall, 1866)
Ribautiana tenerrima (Herrich-Schaeffer, 1834)
**Stroggylocephalus agrestis* (Fallén, 1806)
**Stroggylocephalus livens* (Zetterstedt, 1840)
Zyginidia scutellaris (Herrich-Schaeffer, 1838)

Cixiidae
Cixius sp.
Trigonocranus emmeae Fieber, 1875

Delphacidae
**Delphax pulchellus* (Curtis, 1833)
**Delphax* cf. *ribautianus*
**Euconomelus lepidus* (Boheman, 1847)
**Euides basilinea* (Germar, 1821)
**Florodelphax leptosoma* (Flor, 1861)
**Kelisia confusa* Linnavouri, 1957
Kelisia sp.
Laodelphax striatellus (Fallén, 1826)
**Megamelodes lequesnei* Wagner, 1963
**Megamelus notulus* (Germar, 1830)
**Muellerianella extrusa* (Scott, 1871)
**Oncodelphax pullulus* (Boheman, 1852)
**Paradephacodes paludosus* (Flor, 1861)
**Stenocranus fuscovittatus* (Stal, 1858)
**Stenocranus major* (Kirschbaum, 1868)

Flatidae
Metcalfa pruinosa (Say, 1830)

Issidae
Issus coleoptratus (F., 1781)

Appendix 2

23 PIPUNCULIDAE SPECIES RECORDED FROM THE RESERVE NATURELLE DE LA MARAIS DE LAVOURS, WITH THEIR RECORDED HOSTS. (DETAILS ON LITERATURE USED FOR DETERMINATION CAN BE FOUND IN WITHERS, 2006)

Beckerias pannonicus Aczel, 1939, (Host unknown)
Cephalops penultimus Ackland, 1993, (Probably restricted to Delphacidae)
Cephalops perspicuus (de Meijere, 1907) (Probably restricted to Delphacidae)
Chalarus fimbriatus Coe, 1966, (*Alnetoidia alneti, Eupteryx urticae, Edwardsiana* sp.)
Chalarus gynocephalus Jervis, 1992, (Host unknown)
Chalarus indistinctus Jervis, 1992, (*Ribautiana tenerrima, R. ulmi, Edwardsiana bergmani, E. geometrica, E. lethieryi, E. rosae, Erythia aureola, Empoasca vitis, Fagocyba cruenta*)
Chalarus latifrons Hardy, 1943, (*Kybos butleri, K. smaragdulus*)
Chalarus spurius (Fallén, 1816) (*Eupteryx urticae, E. melissae, E. aurata, E. cyclops*)
Dasydorylas holosericeus (Meigen, 1824) (Host unknown)
Dorylomorpha extricata (Collin, 1937) (Host unknown)
Dorylomorpha hungarica (Aczel, 1939) (*Cicadula frontalis, C. flori, C. staurata, C. albingensis, C. quadrinotata*)
Dorylomorpha lautereri Albrecht, 1990, (Host unknown)
Eudorylas fuscipes (Zetterstedt, 1844) (*Macrosteles variatus, M. laevis, Elymana sulphurella*)
Eudorylas inferus Collin, 1956, (Host unknown)
Eudorylas obliquus Coe, 1966, (*Pseudotettix subfusculus, Cicadula quadrinotata*)
Jassidophaga villosa (von Roser, 1840) (Host unknown)
Nephrocerus flavicornis Zetterstedt, 1844
Nephrocerus lapponicus (Zetterstedt, 1839)
Nephrocerus scutellatus (Macquart, 1834) (The genus is apparently associated with adult Tipulidae; there are no data for Europe)
Pipunculus campestris Latreille, 1802, (*Macrosteles laevis, Arthaldeus pascuellus, Cicadula quadrinotata*)
Tomosvaryella kuthyi Aczel, 1944, (Host unknown)
Tomosvaryella palliditarsis (Collin, 1931*)* (Host unknown)
Verrallia aucta (Fallén, 1817) (*Philaenus spumarius, Neophilaenus lineatus*)