

Diptera from rich fens and other habitats in eastern part of Innlandet, southeastern Norway. VII. Tipulidae (Tipuloidea)

KJELL MAGNE OLSEN & TROND ANDERSEN

Olsen, K.M. & Andersen, T. 2022. Diptera from rich fens and other habitats in eastern part of Innlandet, southeastern Norway. VII. Tipulidae (Tipuloidea). *Norwegian Journal of Entomology* 69, 36–44.

Records of 34 species of Tipulidae from eastern part of Innlandet County (Hedmark), southeastern Norway, are presented based on material collected in 2016 and 2017 during a survey of insects inhabiting rich fens in the region. One species, *Tipula (Pterelachisus) wahlgreni* Lackschewitz, 1925, is recorded for the first time in Norway, and 10 species are recorded for the first time from southern and/or northern Hedmark (Strand-regions HES and/or HEN). Most of the material was collected in eight Malaise traps situated on different rich fens and collecting continuously from early spring to late autumn 2016. A total of 386 specimens belonging to 22 species were collected in these traps. *Tipula (Savtshenkia) subnodicornis* Zetterstedt, 1838 was the most abundant species, constituting 54.2% of the material, *Tipula (Savtshenkia) gimmerthali* Lackschewitz, 1925 ranged second with 10.9%, *Prionocera pubescens* Loew, 1844 third with 9.1% and *Tipula (Savtshenkia) limbata* Zetterstedt, 1838 fourth with 6.7% of the material. There were, however, large differences in the number of species and specimens collected in the different traps.

Key words: Rich fens, Diptera, Tipuloidea, Tipulidae, new records, Hedmark, Innlandet County, Norway.

*Kjell Magne Olsen, Biofokus, Gaustadalléen 21, NO-0349 Oslo, Norway.
E-mail: kjell-magne@biofokus.no*

Trond Andersen, Department of Natural History, University Museum of Bergen, University of Bergen, P.O. Box 7800, NO-5020 Bergen, Norway. E-mail: trond.andersen@uib.no

Introduction

Four main groups of crane flies (Tipuloidea) are traditionally recognized and generally treated as separate families: Cylindrotomidae, Pediciidae, Limoniidae and Tipulidae (e.g. Starý 1992, 2021). The family Tipulidae currently comprises three subfamilies with all together about 38 genera worldwide (Oosterbroek 2018). Ten genera are known from Norway; four genera with altogether 8 species belong to the subfamily Ctenophorinae, one genus with two species to the subfamily Dolichopezinae, and five genera with altogether 97 species to the subfamily Tipulinae. The most species rich genus is *Tipula*, with altogether 75

species in 16 subgenera (Hofsvang *et al.* 2019).

The Tipulidae are medium sized to very large (7–35 mm) Nematocera with long and slender antennae, wings, legs, and abdomen. The larvae are generally semi-aquatic to terrestrial, more rarely aquatic. The larvae feed mainly on plant remains and detritus, but also on living parts of mosses, liverworts, grasses and other plants. The adults occur in a wide range of habitats from dark moist forests to semi-deserts or high alpine regions (Oosterbroek 2006).

In 2016, the project «Insects on rich fens in Hedmark, eastern Norway» was initiated, aiming to increase the knowledge of the insect fauna on rich fens in Norway (see Artsdatabanken

2016, Andersen & Hagenlund 2019). Rich fens are among our most vulnerable and threatened nature types. Five types of lowland rich fens are listed in the Norwegian Red List of Nature Types (Lindegaard & Henriksen 2011). These fens are rich in calcium and usually fed by ground water and several rare and red-listed vascular plants inhabit them. During the project, insects were collected at nearly 100 localities in Hedmark (now the eastern part of Innlandet County) (see Jonassen & Andersen 2020). The insect fauna on rich fens were the main target, but insects were also collected in several other habitats to get a better understanding of the habitat preferences of the different species. Below we present a list of the Tipulidae species from Hedmark based on the insects collected during the project.

Material and methods

Fieldwork was conducted during 2016 and 2017. The main part of the material was collected in Malaise traps, but adult Diptera were also collected with other methods, like sweep-nets, window traps, light traps, and yellow pan traps. A total of 94 localities in Hedmark were visited during the project. Each locality is given a HeLoc number, which is used in the species list below. Although the fieldwork was focused on rich fens, several other habitats were also explored. In the species list, rich fen localities are marked with an asterisk after the HeLoc number. All localities including HeLoc numbers are listed in Jonassen & Andersen (2020: Table 1).

The Malaise traps were situated on eight different rich fens in 2016 and were emptied bi-weekly from the snow melted in April–May until winter started in late October. The fens are of different sizes and structure and a gradient from lowland fens to upland fens were strived for. Several of the fens are a mosaic of different nature types, with areas varying from comparatively poor to extremely rich. The fens may include both firm substrate and areas with fen carpet and mud bottom, and some are to a various degree covered with shrubs and forest. In some of the fens there are springs and spring-brooks, others have streams

or brooks running through, and some have pools or ponds of various sizes and shapes.

During the fieldwork, the material was preserved in 75–80% ethanol, then brought to the Department of Natural History, University of Bergen, and sorted to family level. The material from the project is stored in 75–80% ethanol and housed in the entomological collection at the Department of Natural History, University Museum of Bergen (ZMBN).

The former counties Oppland and Hedmark were merged into Innlandet County on the 1 January 2020. None of the municipalities in Hedmark were, however, altered or merged, and the municipality boundaries are still as before 2020. All fieldwork was performed in the eastern part of Innlandet, i.e. the former Hedmark County, and we have used the biogeographical regions southern Hedmark (HES) and northern Hedmark (HEN) following the "Strand-system" (Endrestøl 2021).

The Malaise trap localities

The different fens were selected using Naturbase (Miljødirektoratet 2017), which includes a thorough descriptions of the different fens.

HeLoc17*, Northern Hedmark (HEN), Åmot, Kildesaga, 61.178778°N 11.402167°E, 290 m a.s.l. (Malaise trap no. 1). Small (6.8 daa), extremely rich wood and scrub-covered lowland fen with firm substrate (<https://faktaark.naturbase.no/?id=BN00075142>).

HeLoc32*, Northern Hedmark (HEN), Stor-Elvdal, Nabbtjern, 61.378417°N 11.191750°E, 251 m a.s.l. (Malaise trap no. 2). Medium large (117 daa), intermediate to rich carpet / mud bottom lowland fen with interspersed flarks (<https://faktaark.naturbase.no/?id=BN00026540>).

HeLoc45*, Northern Hedmark (HEN), Rendalen, Jøgåsmyra, 61.774556°N 11.593472°E, 640 m a.s.l. (Malaise trap no. 3). Large (694 daa), rich to extremely rich fen with a mosaic of firm substrate and loose mats (<https://faktaark.naturbase.no/?id=BN00026324>).

HeLoc47*, Northern Hedmark (HEN), Rendalen, Sekserbua NE, 61.556056°N

11.168556°E, 520 m a.s.l. (Malaise trap no. 4). Medium large (64 daa), intermediate to rich wood and scrub-covered fen with firm substrate (<https://faktaark.naturbase.no/?id=BN00026412>).

HeLoc71*, Northern Hedmark (HEN), Engerdal, Ulvåkjølen–Sundsetra, 61.836556°N 11.791250°E, 660 m a.s.l. (Malaise trap no. 5). Large (2403 daa) fen complex with poor to rich fens. The Malaise trap was situated in one of the richest parts, with gently sloping terrain (<https://faktaark.naturbase.no/?id=BN00026842>).

HeLoc74*, Northern Hedmark (HEN), Engerdal, Åsen, 61.885861°N 11.782833°E, 700 m a.s.l. (Malaise trap no. 6). Small (18 daa), fragmented, extremely rich fen in upland area, close to a larger rich fen. At the sampling site the fen is gently sloping with a mix of scattered conifers and deciduous trees (see Løvhuskjølen: <https://faktaark.naturbase.no/?id=BN00026820>).

HeLoc75*, Northern Hedmark (HEN), Tolga, Bjørvollan, 62.387028°N 11.118861°E, 770 m a.s.l. (Malaise trap no. 7). Medium large (335 daa), intermediate to extremely rich fen in upland area. The fen is partly covered with mixed forest and has mostly firm substrate, in some places with exposed stones, but there are also smaller areas with fen carpet and mud bottom (<https://faktaark.naturbase.no/?id=BN00099251>).

HeLoc78*, Northern Hedmark (HEN), Tynset, Brydalskjølen, 62.255444°N 10.907250°E, 780 m a.s.l. (Malaise trap no. 8). Large (990 daa), intermediate to extremely rich fen complex in upland area. Mostly open fen with firm substrate, but also areas with fen carpet and some areas are covered with mixed forest (<https://faktaark.naturbase.no/?id=BN00100041>).

Results

FAMILY TIPULIDAE

SUBFAMILY CTENOPHORINAE

Tanyptera (Tanyptera) atrata (Linnaeus, 1758)

Material. HeLoc32*, 23 June–11 July 2016, 1♂, Malaise trap; HeLoc71*, 23 June–11 July 2016, 1♂, Malaise trap.

SUBFAMILY TIPULINAE

Prionocera pubescens Loew, 1844

Material. HeLoc02, 5 June 2017, 2♂♂, sweep net; HeLoc32*, 14–26 May 2016, 10♂♂; 26 May–9 June 2016, 16♂♂, Malaise trap; 31 May 2016, 1♂, sweep net; HeLoc45*, 26 May–6 June 2016, 9♂♂, Malaise trap; 1 June 2016, 2♂♂, sweep net; HeLoc80*, 2 June 2016, 2♂♂, sweep net.

Remarks. Recorded for the first time from southern and northern Hedmark (HES & HEN).

Prionocera subsericornis (Zetterstedt, 1851)

Material. HeLoc32*, 9–23 June 2016, 1♂, Malaise trap.

Prionocera turcica (Fabricius, 1787)

Material. HeLoc02, 5 June 2017, 2♂♂, sweep net; HeLoc32*, 9–23 June 2016, 2♂♂; 23 June–11 July 2016, 1♂, Malaise trap; HeLoc86, 25 July 2017, 1♂, sweep net.

Remarks. Recorded for the first time from southern Hedmark (HES).

Nephrotoma aculeata (Loew, 1871)

Material. HeLoc25, 20 August–16 September 2016, 1♂4♀♀, light trap; HeLoc34, 21 June–20 July 2017, 1♂, light trap.

Nephrotoma analis (Schummel, 1833)

Material. HeLoc34, 21 June–20 July 2017, 1♂, light trap.

Remarks. Recorded for the first time from northern Hedmark (HEN).

Nephrotoma appendiculata (Pierre, 1919)

Material. HeLoc34, 21 June–20 July 2017, 1♂, light trap.

Nephrotoma cornicina Linnaeus, 1758

Material. HeLoc28, 29–31 July 2016, 1♂, sweep net.

Nephrotoma flavescens (Linnaeus, 1758)

Material. HeLoc34, 21 June–20 July 2017, 2♂♂, light trap.

***Nephrotoma lunulicornis* (Schummel, 1833)**

Material. HeLoc34, 21 June–20 July 2017, 30 ex., light trap.

Remarks. Recorded for the first time from northern Hedmark (HEN).

***Nephrotoma scurra* (Meigen, 1818)**

Material. HeLoc34, 21 June–20 July 2017, 1♂, light trap.

***Nephrotoma tenuipes* (Riedel, 1910)**

Material. HeLoc34, 21 June–20 July 2017, 1♂, light trap; HeLoc58, 23–25 July 2016, 7♂♂1♀, sweep net; HeLoc71*, 11–21 July 2016, 1♂; 21 July–4 August 2016, 1♂, Malaise trap; HeLoc75*, 21 July–4 August 2016, 1♂, Malaise trap; HeLoc86, 25 July 2017, 1♀, sweep net.

***Tipula (Lunatipula) circumdata* Siebke, 1863**

Material. HeLoc47*, 17 August–2 September 2016, 1♂, Malaise trap; HeLoc71*, 2–16 September 2016, 1♂, Malaise trap.

***Tipula (Savtshenkia) gimmerthali* Lackschewitz, 1925**

Material. HeLoc47*, 2–16 September 2016, 6♂♂, Malaise trap; HeLoc71*, 16–29 September 2016, 4♂♂, Malaise trap; HeLoc74*, 17 August–2 September 2016, 1♂; 16–29 September 2016, 22♂♂, Malaise trap; HeLoc78*, 2–16 September 2016, 4♂♂; 16–29 September 2016, 5♂♂, Malaise trap.

***Tipula (Savtshenkia) grisescens* Zetterstedt, 1851**

Material. HeLoc71*, 26 May–9 June 2016, 1♂; 9–23 June 2016, 1♂, Malaise trap; HeLoc74*, 26 May–9 June 2016, 9♂♂, Malaise trap; HeLoc75*, 14–26 May 2016, 1♂; 26 May–9 June 2016, 1♂, Malaise trap; HeLoc78*, 26 May–9 June 2016, 1♂, Malaise trap.

Remarks. Recorded for the first time from northern Hedmark (HEN).

***Tipula (Savtshenkia) interserta* Riedel, 1913**

Material. HeLoc32*, 2–16 September 2016, 3♂♂; 16–29 September 2016, 1♂, Malaise trap.

Remarks. Recorded for the first time from northern Hedmark (HEN). The species was

recently recorded as new to Norway based specimens from Akershus and outer Vest-Agder (Hofsvang *et al.* 2019). The species inhabits mires, rich fens, springs, and swamps (Oosterbroek 2018).

***Tipula (Pterelachisus) irrorata* Macquart, 1826**

Material. HeLoc17*, 23 June–11 July 2016, 1♂, Malaise trap.

***Tipula (Yamatotipula) lateralis* Meigen, 1804**

Material. HeLoc90*, 30 June 2016, 1♂, sweep net.

***Tipula (Savtshenkia) limbata* Zetterstedt, 1838**

Material. HeLoc25, 20 August–16 September 2016, 1♂; 16 September–5 October 2016, 9♂♂, light trap; HeLoc32*, 2–16 September 2016, 1♂; 16–29 September 2016, 3♂♂; 29 September–13 October 2016, 1♂, Malaise trap; HeLoc45*, 17 August–2 September 2016, 1♂, Malaise trap; HeLoc47*, 2–16 September 2016, 1♂; 16–29 September 2016, 3♂♂, Malaise trap; HeLoc71*, 16–29 September 2016, 1♂, Malaise trap; HeLoc74*, 16–29 September 2016, 2♂♂3♀♀, Malaise trap; HeLoc75*, 2–16 September 2016, 1♂, Malaise trap; 16 July–19 September 2016, 2♂♂, window trap; HeLoc78*, 17 August–2 September 2016, 2♂♂; 2–16 September 2016, 5♂♂; 16–29 September 2016, 1♂, Malaise trap.

***Tipula (Lunatipula) limitata* Schummel, 1833**

Material. HeLoc58, 23–25 July 2016, 1♂, sweep net.

***Tipula (Pterelachisus) luridorostris* Schummel, 1833**

Material. HeLoc71*, 9–23 June 2016, 2♂♂, Malaise trap; HeLoc78*, 21 July–4 August 2016, 1♂, Malaise trap.

***Tipula (Platytipula) luteipennis* Meigen, 1830 (Figure 1)**

Material. HeLoc25, 16 September–5 October 2016, 1♂, light trap; HeLoc32*, 17 September 2016, 2♂♂, sweep net; HeLoc45*, 16–29 September 2016, 1♂, Malaise trap.

Remarks. Recorded for the first time from



FIGURE 1. *Tipula (Platytipula) luteipennis* Meigen, 1830 was collected both on rich fens and in other habitats in northern Hedmark. Photo: Kjell Magne Olsen.

northern Hedmark (HEN).

***Tipula (Platytipula) melanoceros* Schummel, 1833**

Material. HeLoc74*, 18 August 2016, 1♂, sweep net; HeLoc45*, 4–17 August 2016, 1♂; 17 August–2 September 2016, 5♂♂4♀♀, Malaise trap.

***Tipula (Yamatotipula) montium* Egger, 1863**

Material. HeLoc32*, 11–21 July 2016, 1♂, Malaise trap.

***Tipula (Vestiplex) nubeculosa* Meigen, 1804**

Material. HeLoc47*, 23 June–11 July 2016, 1♀, Malaise trap; HeLoc74*, 23 June–11 July

2016, 1♂1♀, Malaise trap; 1–15 July 2016, 1♂, window trap; HeLoc75*, 1–16 July 2016, 47♂♂; 16 July–19 September 2016, 5♂♂, window trap.

***Tipula (Tipula) paludosa* Meigen, 1830**

Material. HeLoc28, 29–31 July 2016, 1♂, sweep net; HeLoc35, 29–31 July 2016, 11♂♂, light trap; HeLoc59, 24 July 2017, 1♂, light trap.

***Tipula (Vestiplex) scripta* Meigen, 1830**

Material. HeLoc25, 20 August–16 September 2016, 1♂, light trap; HeLoc34, 21 June–20 July 2017, 4 ex., light trap; HeLoc35, 29–31 July 2016, 1♂, light trap; HeLoc43, 24 July 2017, 1♀, sweep net; HeLoc87, 26 July 2016, 1♂, sweep net.

***Tipula (Savtshenkia) signata* Staeger, 1840**

Material. HeLoc25, 16 September–5 October 2016, 2♂♂, light trap; HeLoc32*, 16–29 September 2016, 1♂, Malaise trap.

Remarks. Recorded for the first time from northern Hedmark (HEN).

***Tipula (Tipula) subcunctans* Alexander, 1921**

Material. HeLoc25, 20 August–16 September 2016, 3♂♂; 16 September–5 October 2016, 1♂, light trap; HeLoc72, 15–18 September 2016, 1♂, light trap; HeLoc75*, 2–16 September 2016, 2♂♂2♀♀, Malaise trap.

Remarks. Recorded for the first time from northern Hedmark (HEN).

***Tipula (Savtshenkia) subnodicornis* Zetterstedt, 1838**

Material. HeLoc14*, 26 June 2016, 2♂♂, sweep net; HeLoc21*, 6 June 2016, 1♂, sweep net; HeLoc32*, 26 May–9 June 2016, 2♂♂, Malaise trap; 31 May 2016, 4♂♂, sweep net; HeLoc45*, 26 May–9 June, 15♂♂; 23 June–11 July 2016, 1♂; 11–21 July 2016, 1♂, Malaise trap; 1 June–15 July 2016, 1♂, window trap; 1 June 2016, 1♂; 7 June 2016, 1♂, sweep net; HeLoc47*, 26 May–9 June 2016, 30♂♂1♀; 9–23 June 2016, 28♂♂; 23 June–11 July 2016, 5♂♂2♀♀, Malaise trap; 7 June 2016, 2♂♂2♀♀, sweep net; HeLoc49*, 7 June 2016, 3♂♂, sweep net; HeLoc60*, 7 June 2016, 1♂, sweep net; HeLoc71*, 26 May–9 June 2016, 3♂♂; 9–23 June 2016, 17♂♂; 23 June–11 July 2016, 5♂♂, Malaise trap; 7 June 2016, 3♂♂, sweep net; HeLoc74*, 26 May–9 June 2016, 3♂♂; 9–23 June 2016, 13♂♂1♀; 23 June–11 July 2016, 4♂♂1♀, Malaise trap; HeLoc75*, 14–26 May 2016, 2♂♂; 26 May–9 June 2016, 9♂♂; 9–23 June 2016, 11♂♂1♀, Malaise trap; HeLoc78*, 26 May–9 June 2016, 2♂♂; 9–23 June 2016, 43♂♂1♀; 23 June–11 July 2016, 5♂♂3♀♀, Malaise trap; HeLoc82*, 8 June 2016, 3♂♂, sweep net; HeLoc83*, 8–27 June 2016, 2♂♂, sweep net.

Remarks. Recorded for the first time from northern Hedmark (HEN).

***Tipula (Pterelachisus) truncorum* Meigen, 1830**

Material. HeLoc34, 21 June–20 July 2017, 3

ex., light trap.

***Tipula (Schummelia) variicornis* Schummel, 1833**

Material. HeLoc34, 21 June–20 July 2017, 1♂1♀, light trap; HeLoc59, 24 July 2017, 1♀, light trap; HeLoc71*, 23 June–11 July 2016, 1♂, Malaise trap; HeLoc74*, 23 June–11 July 2016, 5♂♂; 11–21 July 2016, 4♂♂1♀; 21 July–4 August 2016, 3♂♂1♀, Malaise trap; HeLoc75*, 4–17 August 2016, 1♂, Malaise trap; HeLoc78*, 23 June–11 July 2016, 1♂, Malaise trap.

***Tipula (Pterelachisus) varipennis* Meigen, 1818**

Material. HeLoc34, 21 June–20 July 2017, 1♂, light trap; HeLoc74*, 9–23 June 2016, 3♂♂, Malaise trap.

***Tipula (Pterelachisus) wahlgreni* Lackschewitz, 1925** (Figure 2)

Material. HeLoc17*, 23 June–11 July 2016, 1♀, Malaise trap.

Remarks. New to Norway. The species is known from Sweden, Finland, the Baltic region and Russia (Salmela 2009, Hofsvang *et al.* 2019). In Finland it is present in the southern and middle boreal regions. The species is quite rare and most often collected from moist heath forest, herb-rich forest and spruce mires (Salmela 2009).

The Malaise trap catches

A total of 386 specimens of Tipulidae belonging to 22 species were collected in the Malaise traps. There are large differences in the number of specimens and species collected in the different traps. Most specimens, 79, belonging to eight species were collected in the Malaise trap at Åsen. At Jøgåsmyra, 78 specimens belonging to five species were collected, at Brydalskjølen 75 specimens belonging to six species, and at Ulvåkjølen-Sundsetra 60 specimens belonging to eleven species. In the remaining traps, less than 50 specimens were collected.

Nine species constituted more than 1% of the Malaise trap material, Table 1. The most abundant species, *T. subnodicornis*, was taken in



FIGURE 2. *Tipula (Pterelachisus) wahlgreni* Lackschewitz, 1925 female collected on the rich fen Kildesaga in northern Hedmark. Photo: Kjell.Magne Olsen.

TABLE 1. Number of specimens of the most abundant Tipulidae species collected in the Malaise traps. Malaise trap no. 1 = Kildesaga, no. 2 = Nabbtjern, no. 3 = Jøgåsmyra, no. 4 = Sekserbua NØ, no. 5 = Ulvåkjølen-Sundsetra, no. 6 = Åsen, no. 7 = Bjørvollen, no. 8 = Brydalskjølen.

Species / Trap no.	1	2	3	4	5	6	7	8	Total	Percent
<i>Tipula subnodicornis</i>	–	2	66	17	25	22	23	54	209	54,15%
<i>Tipula gimmerthali</i>	–	–	6	–	4	23	–	9	42	10,88%
<i>Prionocera pubescens</i>	–	–	–	13	21	1	–	–	39	9,07%
<i>Tipula limbata</i>	–	5	4	1	1	5	1	9	26	6,74%
<i>Tipula variicornis</i>	–	–	–	–	1	14	1	1	17	4,40%
<i>Tipula grisescens</i>	–	–	–	–	2	9	2	1	14	3,63%
<i>Tipula melanoceros</i>	–	–	–	10	–	–	–	–	10	2,59%
<i>Tipula interserta</i>	–	4	–	–	–	–	–	–	4	1,04%
<i>Tipula subcunctans</i>	–	–	–	–	–	–	4	–	4	1,04%

209 specimens or 54.2% of the material. It ranged first at Jøgåsmyra, Sekserbua NE, Ulvåkjølen-Sundsetra, Bjørvollen, and Brydalskjølen and second at Åsen, but was not collected at Kildesaga. *Tipula gimmerthali* was the second most abundant

species, with 42 specimens or 10.9% of the material. It ranged first at Åsen and second at Jøgåsmyra and Brydalskjølen. *Prionocera pubescens* was the third most abundant species, with 39 specimens or 9.1% of the material. It

ranged second at Sekserbua NE, and Ulvåkjølen-Sundsetra. *Tipula limbata* was the fourth most abundant species, with 26 specimens or 6.7% of the material. It ranged first at Nabbtjern, second at Brydalskjølen and third at Jøgåsmyra. *Tipula variicornis*, *T. grisescens*, *T. melanoceros*, *T. interserta*, and *T. subcunctans* were each taken in 17 to four specimens and constituted from 4.4% to 1.0% of the material. The remaining 13 species were each taken in less than four specimens.

Most of the most abundant species collected in the Malaise traps had a rather wide altitudinal range, but *T. variicornis*, *T. grisescens* and *T. subcunctans* were only collected above 650 m a.s.l., while *T. melanoceros* and *T. interserta* were only collected below 520 m a.s.l. In the four traps situated below 650 m a.s.l., a total of 16 species were collected, while in the four traps situated at or above 650 m a.s.l., only 13 species were caught.

Discussion

One species, *Tipula wahlgreni*, is new to Norway. In addition, two species is recorded for the first time from southern Hedmark (HES) and 9 species for the first time from northern Hedmark (HEN), raising the number of species recorded from these regions to 32 and 51, respectively.

A total of 23 species were taken on the rich fens, of which 14 species were collected on rich fens only. The most abundant species, *T. subnodicornis*, was taken exclusively on rich fens. The species is widely distributed in Norway (Artsdatabanken 2017, Olsen *et al.* 2018). According to Autio *et al.* (2013) *T. subnodicornis* is a wetland generalist in Finland. *Tipula gimmerthali* ranged second in the Malaise trap catches and was also taken exclusively on rich fens. It is mainly distributed in the central parts of southern Norway and in northern Norway (Artsdatabanken 2017, Olsen *et al.* 2018). According to Salmela (2008), the species is an indicator species for sloping rich fens in northern Finland. *Prionocera pubescens* ranged third the Malaise trap catches; one specimen was also netted in another type of habitat. The species is recorded from a few localities in southern Norway and in Troms and Finnmark (Artsdatabanken

2017, Olsen *et al.* 2018). According to Salmela (2008), this species is also an indicator species for rich fens in northern Finland. *Tipula limbata* ranged fourth in the Malaise trap catches; a few specimens were also caught in other types of habitats during the project. The species is widely distributed in Norway (Artsdatabanken 2017, Olsen *et al.* 2018). In northern Finland, the species is associated with peatland (Salmela 2008). Of the remaining abundant species *T. grisescens* is associated with rich fens, *T. variicornis* and *T. interserta* with swamps and *T. melanoceros* with peatland in northern Finland (Salmela 2008).

It is generally assumed that species richness is higher in southern, lowland areas than in northern, upland areas. However, Salmela (2012) studied the biogeographic pattern of crane flies in Finland and found that mire dwelling species had a reversed latitudinal species richness pattern. In the Malaise trap catches from Hedmark, more species of Tipulidae were collected on the southern, lowland rich fens than on more northern, upland rich fens. However, the number of species collected in the different Malaise traps varied strongly and probably reflect local differences between the fens. The fens varied both in size, structure and vegetation, and on some of the fens there were springs, streams or ponds.

Acknowledgements. The project was funded by a grant from the Norwegian Taxonomy Initiative. The field work was set up in cooperation with Inland Norway University of Applied Sciences, Campus Evenstad: Harry P. Andreassen, Mari E. Hagenlund and Frode Næstad. We are further indebted to all the participants in the project, particularly Linn K. Hagenlund and Steffen Roth, and to Jukka Salmela who participated on the first field trip in 2016.

References

- Andersen, T. & Hagenlund, L.K. 2019. Vårfluer på rikmyrer i nordre Hedmark. *Fauna (Oslo)* 71(1–2) (2018), 12–30.
- Artsdatabanken. 2016. *Insekter på rikmyrer i Hedmark*. Kartleggingsprosjekter. Available from: <https://www.artsdatabanken.no/Pages/197274> (1 April 2022).
- Artsdatabanken. 2017. *Artskart 2*. Artsdatabanken

- and GBIF-Norge. Available from: <https://artskart.artsdatabanken.no/> (1 April 2022).
- Autio, O., Salmela, J. & Suhonen, J. 2013. Species richness and rarity of crane flies (Diptera, Tipuloidea) in a boreal mire. *Journal of Insect Conservation* 17, 1125–1136.
- Endrestøl, A. 2021. Strand-systemet 4.0. *Insekt-Nytt* 46, 43–72.
- Hofsvang, T., Olsen, K.M., Oosterbroek, P. & Boumans, L. 2019. The Norwegian species of the genus *Tipula* Linnaeus, 1758, with ten species of Tipulidae new to Norway and an annotated list of Nordic Tipulidae, including distributional data for Norway (Diptera, Tipulidae). *Norwegian Journal of Entomology* 66, 99–150.
- Jonassen, T. & Andersen, T. 2020. Diptera from rich fens and other habitats in eastern part of Innlandet, southeastern Norway. I. Dolichopodidae (Empidoidea). *Norwegian Journal of Entomology* 67, 101–124.
- Lindgaard, A. & Henriksen, S. 2011. *Norsk rødliste for naturtyper 2011*. 112pp. Artsdatabanken, Trondheim.
- Miljødirektoratet. 2017. *Naturbase*. Available from: <http://www.miljodirektoratet.no/no/Tjenester-og-verktoy/Database/Naturbase/> (1 April 2022).
- Oosterbroek, P. 2006. *The European Families of the Diptera. Identification, diagnosis, biology*. 208 pp. KNNV Publishing, Zeist.
- Oosterbroek P. 2018. Catalogue of the Craneflies of the World (Diptera, Tipuloidea: Pediciidae, Limoniidae, Cyllindrotomidae, Tipulidae). Available from: <http://ccw.naturalis.nl>. (1 April 2022).
- Olsen, K.M., Oosterbroek, P., Boumans, L. & de Jong, H. 2018. Forty species of limoniid craneflies new to Norway, with an annotated list of Nordic Pediciidae and Limoniidae, including distributional data (Diptera, Tipuloidea). *Norwegian Journal of Entomology* 65, 127–174.
- Salmela, J. 2008. Semiaquatic fly (Diptera, Nematocera) fauna of fens, springs, headwater streams and alpine wetlands in the northern boreal ecoregion, Finland. *W-album* 6, 3–63.
- Salmela, J. 2009. The subgenus *Tipula* (*Pterelachisus*) in Finland (Diptera: Tipulidae) – species and biogeographic analysis. *Zoosymposia* 3, 245–261.
- Salmela, J. 2012. Biogeographic patterns of Finnish Crane flies (Diptera, Tipuloidea). *Psyche* 2012, 913710.
- Starý, J. 1992. Phylogeny and classification of Tipulomorpha, with special emphasis on the family Limoniidae. *Acta Zoologica Cracoviensia* 35, 11–36.
- Starý, J. 2021. Phylogeny of Tipulomorpha - an endless issue. *Acta Musei Silesiae, Scientiae Naturales* 69, 277–281.

Received: 6 April 2022
Accepted: 19 April 2022