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Faunistical records of Caddis flies (Trichoptera) from Buskerud, South Norway

TROND ANDERSEN, LARS OVE HANSEN, KJELL ARNE JOHANSON & BJØRN A. SAGVOLDEN

Records of a total of 111 Trichoptera species from Buskerud are given, 92 species are taken in eastern Buskerud, and 70 in western Buskerud. The total number of species until now recorded from eastern Buskerud is 102, while the number from western Buskerud is 80.

One species, *Lype reducta* (Hagen, 1868) is previously not recorded from Norway. Further, eight of the species are considered as rare in Norway. Four of these, *Rhycopophilus fasciata* Hagen, 1859, *Ironoquia dubia* (Stephens, 1837), *Limnephilus fuscinervis* (Zetterstedt, 1840) and *Athripsodes albifrons* (Linnaeus, 1758) were taken only in eastern Buskerud, one species, *Ceratopsyche silfvenii* (Ulmer, 1906) only in western Buskerud, while three species, *Hydropsyche simulans* Mosely, 1920, *Hydropsyche contubernalis* McLachlan, 1865 and *Ylodes simulans* (Tjeder, 1929) were taken in both regions.

INTRODUCTION

Buskerud is one of the larger counties in South Norway, ranging from the eastern parts of the Hardangervidda mountain plateau in the west to the lowlands along the Oslofjord in the east. Several large rivers like Numedalslågen, Hallingdalselva, Simoa, Begna and Drammenselva flow through Buskerud, and there are a high number of lakes; the largest being Tyrifjorden with a surface of 133 km².

Freshwater localities are among our most threatened habitats. In Buskerud, many of the river systems are subjected to hydroelectric exploitation, and the larger rivers are dammed at several locations. Many of the rivers, like the lower reaches of Drammenselva, are strongly polluted due to industrial waste and housing sewer. Seepage from farming land adds to this pollution. Recently, acid rain has also led to an increased acidity in many ponds and lakes in Buskerud.

Deterioration of freshwater habitats often leads to an impoverished fauna. As maintenance of the biodiversity is considered to be one of the most important tasks in nature conservation, it is essential to get a better knowledge of the distribution and occurrence of freshwater insects. Although Trichoptera is considered to be one of the better studied insect groups in Norway (Aagaard & Hägvar 1987), the Trichoptera fauna in many districts is still very superficially known. The present study aims to add to the knowledge of this fauna in Buskerud.

STUDY AREA, MATERIAL AND METHODS

The material comprises approximately 18.320 imagines; in addition a few larvae have been identified. Most of the material was collected between 1986 and 1990, but a few specimens collected in the 1960th, 1970th and early 1980th are also included. 39 localities in eastern Buskerud and 23 in western Buskerud have been sampled, Fig. 1. The exact localities, with UTM- and EIS-re-
Fig. 1. Localities in eastern and western Buskerud; the numbers refer to the locality numbers in Tables 1 and 2.

Lokaliteter i Buskerud øst og vest; numrene henviser til lokaltiets numre i Tabell 1 og 2.

References are listed in Table 1 & 2. The biogeographical provinces follow Strands' system as revised by Økland (1981).

Most of the material has been taken in light traps, but some specimens were also caught in malaise traps. In addition caddis flies have been collected with sweepnets or have been searched for on stones and vegetation along lakes and rivers. The larvae are mostly picked from stones and submerged vegetation in streams and rivers. Most of the material have been taken by the authors, but some specimens taken by Per Andersen, Yngvar Berg, David W. B. Johansen, Sverre Kobro, Tom Kleppaker, Deveg Ruud and Per Tallaksrud are also included. In addition, a few specimens collected by the VANDA project have been identified, as well as a few specimens deposited in the entomological collection at the Zoological Museum, University of Bergen.

Capture date and number of males and females caught are only given for species which are considered as rare.

SPECIES

Family Rhyacophilidae


Family Glossosomatidae


*Agapetus ochripes* Curtis, 1834. BØ, Dram-
Table 1. Localities in eastern Buskerud, with UTM- and EIS-references.

<table>
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<th>No.</th>
<th>LOCALITY</th>
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Table 2. Localities in western Buskerud, with UTM- and EIS-references.

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**Family Hydroptilidae**


**Family Philopotamidae**

Philopotamus montanus (Donovan, 1813). BØ, Kongsberg: Komnes.

Wormaldia subnigra Mccl.achlan, 1865. BØ, Kongsberg: Hvittingfoss, Labru kraftverk, Saggrenda; Øvre Eiker: Dokka, Steinbrølva; Nedre Eiker: Miletjern; Røyken: Hotvet.

**Family Psychomyiidae**

Lype phaeopa (Stephens, 1836). BØ, Kongsberg: Hvittingfoss, Labru kraftverk, Saggrenda; Øvre Eiker: Sunnegrenda; Nedre Eiker: Miletjern; Røyken: Mortensrud.

**Family Economiidae**


**Family Polycentropodidae**


**Family Hydropsychidae**


**Family Arctopsychidae**


**Family Hydropsychidae**


**Family Brachycentridae**


**Family Lepidostomatidae**

*Crunoecia irrorata* (Curtis, 1834). BØ, Røyken: Kinnartangen. *Lepidostoma hirtum* (Fabricius, 1775). BØ, Kongsberg: Hvittingfoss, Labru kraftverk, Sommerstad; Nedre Eiker; Miletjern. BV,
Nes: Nesbyen; Hol: Egilstølen; Rollag: Rollag.

**Family Limnephilidae**


*Chaetopteryx villosa* (Fabricius, 1798). BØ, Kongsberg: Saggrenda; Ringerike: Norderhov.


*L. arcula* Curtis, 1834. BØ, Røyken: Kinnartangen.

*L. binotatus* Curtis, 1834. BØ, Nedre Eiker: Miletjern.


*L. centralis* Curtis, 1834. BØ, Nedre Eiker: Miletjern; Røyken: Kinnartangen. BV, Hol: Hagafossen; Rollag: Rollag.


*L. decipiens* (Kolenati, 1848). BØ, Kongsberg: Sommerstad; Ringerike: Norderhov; Øvre Eiker: Fiskum; Nedre Eiker: Miletjern; Røyken: Kinnartangen.


*L. femoralis* Kirby, 1837. BV, Rollag: Rollag.


*L. fenestratus* (Zetterstedt, 1840). BV, Hol: Egilstølen; Rollag: Rollag.

*L. flavicornis* (Fabricius, 1787). BØ, Drammen: Underlia; Nedre Eiker: Miletjern; Røyken: Kinnartangen.


*L. ignavus* McLachlan, 1865. BØ, Nedre Eiker: Miletjern; Røyken: Kinnartangen.

*L. marmoratus* Curtis, 1834. BØ, Nedre Eiker: Miletjern; Røyken: Kinnartangen.


*L. sparsus* Curtis, 1834. BØ, Nedre Eiker: Miletjern; Røyken: Kinnartangen. BV, Nore: Nesbyen; Rollag: Rollag.

*L. stigma* Curtis, 1834. BØ, Drammen: Underlia; Nedre Eiker: Miletjern; Røyken: Kinnartangen. BV, Nes: Nesbyen; Hol: Egilstølen; Rollag: Rollag.

*L. subcentralis* Brauer, 1857. BØ, Drammen: Underlia; Nedre Eiker: Miletjern; Røyken: Kinnartangen.

*L. vittatus* (Fabricius, 1798). BØ, Kongsberg: Sunnegrenda; Ringerike: Norderhov. BV, Rollag: Rollag.

*Phacopteryx brevipennis* (Curtis, 1834). BV, Nes: Nesbyen; Rollag: Rollag.


*Halesus digitatus* (Schrank, 1781). BØ, Røyken: Kinnartangen.


*Potamophylax cingulatus* (Stephens, 1837). BØ, Drammen: Underlia; Nedre Eiker: Mi-
letjern; Røyken: Kinnartangen. BV, Nes: Nesbyen; Rollag: Rollag.


P. nigricornis (Pictet, 1834). BØ, Nede Eiker: Miletjern; Røyken: Kinnartangen. BV, Nes: Nesbyen; AI: Torpo; Rollag: Rollag.

P. nigricornis (Pictet, 1834). BØ, Nede Eiker: Miletjern; Røyken: Kinnartangen. BV, Nes: Nesbyen; AI: Torpo; Rollag: Rollag.

Family Goeridae

Goera pilosa (Fabricius, 1775). BØ, Hole: Garntangen; Øvre Eiker: Tørrbekk; Nede Eiker: Miletjern; Røyken: Kinnartangen.

Silo pallipes (Fabricius, 1781). BØ, Kongsberg: Reineelva; Øvre Eiker: Miletjern, Skarud.

Family Beraeidae

Beraea pullata (Curtis, 1834). BØ, Ringerike: Sokna.

Family Sericostomatidae

Sericostoma personatum (Spence in Kirby & Spence, 1826). BØ, Kongsberg: Reineelva; Røyken: Kinnartangen.

Family Molannidae

Molanna albicans (Zetterstedt, 1840). BV, Hole: Hagafossen.


Molannodes tinctus (Zetterstedt, 1840). BØ, Kongsberg: Sommerstad; Ringerike: Sokna; Øvre Eiker: Kjennerudvann, Tryterud; Nede Eiker: Miletjern. BV, Hol: Åsbergtjønn; Rollag: Rollag.

Family Leptoceridae


DISCUSSION

Brekke (1946) recorded 33 Trichoptera species from eastern Buskerud. Brittain et al. (1985) and Sæter et al. (1988) recorded thirteen Trichoptera species from the rivers Sna­rumselva and Drammenselva, of which eight species were not recorded from eastern Bu­skerud by Brekke (1946). Andersen & Han-
Lype reducta (Hagen, 1868) is not previously recorded from Norway. The species has a palaearctic distribution; taken in most parts of Europe including Denmark, Sweden and Finland (Botosaneanu & Malicky 1978, Andersen & Wiberg-Larsen 1987). In England it is restricted to the southern regions: Skåne, Halland, Småland, Öland and Västergötland (Forslund & Tjeder 1942, Forslund 1953). The larvae live in streams and rivulets (Hickin 1967, Lepneva 1970). The present male was taken in a light trap situated at a small pond rich in vegetation.

Eight of the species recorded here are considered as rare in Norway (Aagaard & Hågvar 1987). Rhyacophila fasciata Hagen, 1859 was recorded for the first time in Norway from Fagerøys in Ramfjord in outer Troms (Forslund 1932). The species has later been recorded from Østfold, Akershus, Vestfold and outer Telemark (Andersen 1975, Andersen, Liggaard et al. 1990, Andersen, Johanson et al. 1993), and has also been taken in southern Hedmark (see Aagaard & Hågvar 1987). According to Lepneva (1970) the species inhabits rapidly running brooks and rivulets. The present male was taken in a light trap situated at a small pond rich in vegetation.

Hydropila simulans Mosely, 1920 was recorded as new to Norway from Lillevann in Agdenes in outer Sør-Trøndelag (Solem 1966). Later the species has been taken in Østfold, Akershus and outer Hordaland (Andersen 1976, Andersen, Johanson et al. 1993, Andersen & Tyssø 1985). The species inhabits rivers and streams (Marshall 1978). The present specimens were all taken in light traps situated close to large rivers.

Ceratopsyche silifvenii (Ulmer, 1906) was recorded for the first time in Norway from Rena in northern Hedmark and Namdalen in inner Nord-Trøndelag (Brekke 1943). Later the species has been taken in outer and inner Sør-Trøndelag (Bongard 1990). The species inhabits streams and small rivers (Botosaneanu & Malicky 1978).

Hydropsyche contubernalis McLachlan, 1865 is in Norway previously recorded from Østfold, Akershus and Vestfold (Andersen 1975, Andersen & Hansen 1990, Andersen, Johanson et al. 1993). In Denmark the species inhabits larger, slow flowing rivers (Wiberg-Larsen 1980); in England it is a typical inhabitant of the lower, slow flowing parts of the larger river systems (e.g. Hildrew & Morgan 1974, Badcock 1976). The present specimens have all been taken in light traps close to large rivers.

Ironoquia dubia (Stephens, 1837) has previously been taken in Østfold, Akershus, Vestfold and outer Telemark (Andersen 1975, Andersen & Hansen 1990, Andersen, Johanson et al. 1993). In England the species inhabits small, shallow streams in deciduous woods (Wallace et al. 1990). The present male was taken in a light trap situated at a small pond rich in vegetation.

Limnephilus fuscinervis (Zetterstedt, 1840) was recorded from eastern Buskerud...
by Brekke (1946), but no exact locality was given. Later the species has been recorded from Østfold, Akershus, eastern Buskerud and Vestfold (Andersen 1975, Andersen & Hansen 1990, Andersen, Johanson et al. 1993). The species inhabits lakes and ponds (Botosaneanu & Malicky 1978). The present female was taken in a light trap situated at a small pond rich in vegetation.

*Athripsodes albifrons* (Linnaeus, 1758) was recorded for the first time in Norway from Skjeveland in Klepp in outer Rogaland (Jensen 1942). The species has later been recorded from Østfold, Akershus, eastern Buskerud and Vestfold (Andersen 1975, Andersen & Hansen 1990, Andersen, Johanson et al. 1993). The species inhabits lakes and ponds (Botosaneanu & Malicky 1978). The present specimen was either netted or taken in light traps not far from larger rivers.

*Ylodes simulans* (Tjeder, 1929) was recorded for the first time in Norway from Fiskevann in Sør-Varanger (Tobias & Tobias 1971), and has later been recorded from the river Numedalslågen in Vestfold (Andersen 1975, Andersen & Solli 1990). The species inhabits lotic and lentic waters (Botosaneanu & Malicky 1978). The present specimens were either netted or taken in light traps or netted close to the river Numedalslågen.

Andersen, Johanson et al. (1993) suggested that among others *Rhyacophila fasciata*, *Hydropsyche contubernalis* and *Limnephilus fuscinervis* ought to be deleted from the list of rare species in Norway (Aagaard & Hagvar 1987). The present records of these species strengthen this suggestion. In addition, the records of *Hydroptila simulans*, *Ironoquia dubia* and *Athripsodes albifrons* implicate that none of these species should be included in the list. *Ylodes simulans* is now recorded from several localities along the river Numedalslågen, where it seems to be rather common. But, at the present we consider that the species should be retained on the list until records from other river systems are reported. *Lype reducta* must be added to the list.

The present contribution more or less doubles the number of species known from both eastern and western Buskerud. However, more comprehensive studies on the Trichoptera fauna in the region ought to be initiated. Our knowledge of the fauna of the larger rivers in South Norway is still very scanty. A detailed study on the distribution and relative abundance of the species along one of these rivers would be of great interest.

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**REFERENCES**


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Geographical distribution of the riparian species of the tribe Bembidiini (Col., Carabidae) in South and Central Norway

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The geographical distribution of the riparian species of Bembidiini in South and Central Norway is presented. The species may be divided into five groups: 1. Ubiquitous species. The group has ten species. 2. Southern species with their northernmost reaches in Nordland county. The group consists of *Bembidion nitidulum* (Marsham) and *B. lunatum* (Duftschmid). 3. More strictly southern species not present north of about 65° N latitude. Eight species belong to this group. 4. South-western species consisting of *B. tibiale* (Duftschmid). 5. Northern species not occurring south of 59° latitude in Northern Europe. Five species belong to this group. The county Sør-Trøndelag and the northern parts of the river Gudbrandsdalslågen have the highest number of species whilst southernmost and western parts of Norway have the lowest one. Stenotopic or oligotopic river bank species dependent upon sand or fine sand/silt are absent from the southernmost and western parts of Norway, whereas most lithophilous species (dependent on gravel/stones) are present within at least one of these two areas. The main reason for this difference in distribution between the two groups seems to be the availability of suitable habitats.

INTRODUCTION

The basic knowledge about the distribution of the Fennoscandian riparian Bembidiini species is given by the work of Lindroth (1945 a, b, 1949). Finds published in these works were made before 1949 and much collecting has been done in South Norway since that time. The known records of the riparian species in northern Norway up to 1979 have been published (Andersen 1980). The present paper gives the present-day known distribution of the species in South and Central Norway. This knowledge is based on Lindroth (1945 a, b, 1949), Fjellberg (1972), Hanssen & Olsvik (1982), our own collecting and an unpublished catalogue made by Andreas Strand. This catalogue has been brought more up to date (to about 1981) by Torstein Kvamme (T. Kvamme pers. comm.).

MATERIAL AND METHODS

Altogether 158 localities have been investigated by us in South and Central Norway (Table 1, Fig. 1). Apart from locality 50 and 57, all these localities are situated in the lowland, in the boreal (coniferous) or boreone-moral zones (cf. Gjerevoll 1973). Roadsides, arable land, sand and clay pits and seashores were investigated at several localities, although most effort was used to investigate banks and shores of freshwaters. The present paper, however, does not deal with species absent or only occasionally occurring at freshwater fringes. The beetles were collected by hand, with or without time notion (see Andersen 1983 a). The collecting has been made in the years 1965—1991. The localities at the bank of river Gaula (loc. 38—40) and at Trondheim (loc. 35) have been investigated in the period 1962—90, so the fauna here is very well known. Localities 15—17 and 133—137 have also been investigated several times, whereas most of the other localities have been visited only once. During the investigations temperatures have usually been >12° C and, in most cases, there has been no precipitation.


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New records according to the district division of Økland (1981) are marked with an asterix. Some other records of special interest regarding the distributional pattern of the species are also presented in the text.

The nomenclature follows Lindroth (1985—86).

**THE DISTRIBUTION OF THE SPECIES**

The geographical distribution in South and Central Norway of most of the riparian species of the tribe Bembidiini is shown in Figs. 2—6.
55. MRI, Rauma; Fira (EIS 77). At the river Rauma.
56. MRI, Rauma; Horgheim (EIS 77). At the river Rauma.
57. MRI, Rauma; Ulvdalen (EIS 77). On moving soil in a scree 850 m a. s. l. (subalpine).
58. MRI, Rauma; Bjønneklev (EIS 78). At the river Rauma.
59. MRI, Norddal; Ør near Valldal (EIS 77). At a river.
60. MRI, Norddal; Eide bru (EIS 69). At the outlet of a brook.
61. MRI, Røros; Runde (EIS 75). At the outlet of a brook.
62. SFI, Stryn; Hjelle (EIS 69). At the outlet of a middle sized river.
63. MRI, Norddal; Ulvldalen (EIS 77). At the river Røros.
64. SFI, Stryn; Stryn (EIS 68). For the river originating from the lake Strynsvatn.
65. MRI, Rauma; Horghelm (EIS 77). At the river Rauma.
66. MRI, Rauma; Ulvldalen (EIS 77). On moving soil in a scree 850 m a. s. l. (subalpine).
67. MRI, Rauma; Bjønneklev (EIS 78). At the river Rauma.
68. MRI, Norddal; Ør near Valldal (EIS 77). At a river.
69. MRI, Norddal; Eide bru (EIS 69). At the outlet of a brook.
70. MRI, Røros; Runde (EIS 75). At the outlet of a brook.
71. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
72. SFI, Stryn; Hjelle (EIS 69). At the outlet of a middle sized river.
73. MRI, Norddal; Ør near Valldal (EIS 77). At a river.
74. MRI, Rauma; Horghelm (EIS 77). At the river Rauma.
75. MRI, Rauma; Ulvldalen (EIS 77). On moving soil in a scree 850 m a. s. l. (subalpine).
76. MRI, Rauma; Bjønneklev (EIS 78). At the river Rauma.
77. MRI, Norddal; Ør near Valldal (EIS 77). At a river.
78. MRI, Norddal; Eide bru (EIS 69). At the outlet of a brook.
79. MRI, Røros; Runde (EIS 75). At the outlet of a brook.
80. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
81. MRI, Norddal; Ør near Valldal (EIS 77). At a river.
82. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
83. MRI, Norddal; Ør near Valldal (EIS 77). At a river.
84. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
85. MRI, Norddal; Ør near Valldal (EIS 77). At a river.
86. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
87. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
88. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
89. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
90. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
91. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
92. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
93. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
94. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
95. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
96. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
97. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
98. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
99. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
100. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
101. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
102. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
103. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
104. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
105. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
106. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
107. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
108. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
109. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
110. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
111. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
112. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
113. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
114. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
115. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
116. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
117. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
118. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
119. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
120. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
121. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
122. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
123. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
124. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
125. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
126. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
127. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
128. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
129. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
130. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
131. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
132. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
133. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
134. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
135. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.
136. MRI, Norddal; Elde bru (EIS 69). At the outlet of a brook.

Asaphidion pallipes (Duftschmid) (Fig. 2 A) is distributed throughout the continental parts of South and Central Norway. There is no reason to regard the distribution in Northern Norway as separated from that further south (Andersen 1980). In Trondheim (loc. 35) and at Sjoa (loc. 135) the species was found in sandpits or on fallow land (vide also Andersen 1970). All other finds in South and Central Norway have been made on river banks. The distribution south of 59° N latitude is somewhat scattered (Lindroth 1945 b).

A. flavipes (L.) which is a southern species, was found on two localities (loc. 114, 149) situated within the previously known geographic range of the species in Norway (vide Lindroth 1945 b).
Fig. 2. Distribution of Asaphidion pallipes (A), Bembidion velox (B), B. lapponicum (C), B. litorale (D), in South and Central Norway. Squares: finds made before 1949; filled circles: finds made before and/or after 1949.

bution of the species in the central and northern parts (Troms and Finnmark counties) of Norway. However, the two areas are linked together via the occurrences in Sweden and Finland (Lindroth 1945 b). B. velox is widely distributed in Central and Northern Europe (Turin et al. 1977).

B. lapponicum Zetterstedt (Fig. 2 C) seems to have its southernmost occurrence in Norway at Støren (loc. 40). The species has a northern, circumpolar distribution (Lindroth 1985).

B. litorale (Olivier) (Fig. 2 D) obviously has a discontinuous distribution in Norway. One area is at the larger rivers in SE Norway, whereas a second area is at the large rivers in Sør-Trøndelag and Nord-Trøndelag counties. The northernmost record in Norway is NTI: Bergsmo (Andersen 1970). All the records from the first area is of old origin, except for that from Gjerdrum (loc. 113). The distribution of the species in the rest of Fennoscandia and Denmark is rather discontinuous (Lindroth 1945 b, 1985).

B. argenteolum Ahrens (Fig. 3 A). OS*: Frya (loc. 133, leg. J. Andersen). The species is continuously, although somewhat scatterly distributed along the large water courses in SE and Central Norway. The northernmost find in Norway is NTI: Stjørdal (near loc. 18) (Lindroth 1945 a, b). There is a large hiatus between the distribution range in Norway-Sweden and that further south and east (Lindroth 1945 b).

B. bipunctatum (L.) (Fig. 3 B) is distributed in all parts of South and Central Norway, although somewhat scatterly in some parts, e.g. in south-east. The species is continuously distributed from the southernmost to the northernmost parts of Norway (Andersen 1980). The species is widely distributed in Europe (Turin et al. 1977).

B. dentellum (Thunberg) (Fig. 3 C). HEN*: Koppong and Stai (loc. 144, 145, leg. J. Andersen). The species is densely distributed in SE Norway. When Lindroth (1945 a, b) published his work occurrences in Central Norway seemed to be quite isolated from the distributional area further south. The new finds in HEN makes this isolation less obvious. In Western Norway there are a few old, rather isolated records. The species is distributed throughout central and southern parts of Northern Europe.
Fig. 3. Distribution of B. argenteolum (A), B. bipunctatum (B), Bembidion dentellum (C) and B. semipunctatum (D) in South and Central Norway. For further explanation see Fig. 2.

B. semipunctatum (Donovan) (Fig. 3 D). MRI*: Skei, Honnstad and Rindal (loc. 29, 30 and 33, leg. J. Andersen). The species is continuously distributed along the large rivers in SE and Central Norway with the northernmost occurrence at Grong (loc. 10). South of about 59° N latitude there are some accidental finds of the species in Denmark and southernmost parts of Sweden (Lindroth 1985). However, B. semipunctatum is widely distributed in Central and South Europe.

B. obliquum Sturm. ON*: Kvam (loc. 134, leg. J. Andersen); MRY*: Meisingset (loc. 47, leg. O. Hanssen). The species is rather densely distributed in South Norway north to Kvam (loc. 134) in Gudbrandsdalen. A second area is situated in Central Norway with the northernmost occurrence at Verdalsøra (loc. 15, leg. J. Andersen). This last area is more closely associated with the area in Sweden (Jämtland) than with that further south in Norway. From Northern Norway there is one accidental record from Troms county (Andersen 1980).

B. articulatum Panzer is a southern species. It was found at lake Eikeren (loc. 110) which is situated within the previously known norwegian area of the species (Lindroth 1945 b).

B. schuppelii Dejean (Fig. 4 A). ON*: Kvam (loc. 134, leg. J. Andersen); Otta (loc. 136, leg. J. Andersen); HEN*: Koppang (loc. 144, leg. T. Kvaamme); SFI*: Lærdalsøyri (leg. T. Kvaamme); MRI*: Near Sunndalsøra (loc. 51, leg. O. Hanssen); Gjøra (loc. 53, leg. O. Hanssen); Skei, Honnstad, Donnem and Rindal (loc. 29, 30, 32, 33, leg. J. Andersen); STY*: Skau (loc. 20, leg. J. Andersen). These recent records indicate that B. schuppelii has a rather continuous distribution in Norway from OS: Gausdal (Lindroth 1945 b) to Finnmark (Andersen 1980). South of 59° N latitude there is a gap in the distribution to some occurrences in SE Jutland in Denmark (Lindroth 1945 b).

B. quadrimaculatum (L.) is distributed throughout most parts of Europe (Turin et al. 1977). It has a continuous distribution in SE and Central Norway, whereas it seems to be absent in the whole part of Western Norway south of MRI: Sunndalen (Hanssen & Olsvik 1982). The species occurs frequently on fallow land, in sand pits and in fields.

B. guttula (Fabricius) has a southern distribution in Norway. It was found on river
banks or lake shores at a few localities (loc. 110, 111, 115, 118) within the previously known geographic range of the species in our country (Lindroth 1945 b).

*B. mannerheimii* Sahlberg which has a southern distribution in Norway, was found on a lake shore (loc. 92) and a river bank (loc. 119). These localities are situated within the previously known distribution of the species (Lindroth 1945 b).

*B. difficile* (Motschulsky) (Fig. 4 B). NTI*: near Harbekkvollen, Limannvika and Hestkjølelva (loc. 1, 2 and 5, leg. O. Hanssen). This is a northern, boreomontane (alpine) species (Lindroth 1945 b) with the southernmost occurrence in Fennoscandia at Kongsvinger. It is relative evenly distributed in northernmost part of South and Central Norway.

*B. fellmanni* (Mannerheim) (Fig. 4 C). MRI*: Near Naustådalssetra (loc. 50, leg. O. Hanssen); Horgheim (loc. 56, leg. J. Andersen); Ulvådalen (loc. 57, leg. O. Hanssen). In South and Central Norway this is a subalpine-alpine species. The only place where it has been found abundantly in the lowland is at Horgheim. The species is boreo-alpine in Europe (Lindroth 1945 b).

*B. virens* Gyllenhal (Fig. 4 D). MRI*: Eidebru (loc. 60, leg. J. Andersen); Uri (loc. 59, leg. J. Andersen); Todalen (loc. 49, leg. O. Hanssen); Skei (loc. 29, leg. J. Andersen); STY*: Agdenes (loc. 21, leg. J. Andersen). *B. virens* is one of the most evenly distributed species of the genus in South and Central Norway. Outside Fennoscandia, however, the distribution is highly discontinuous: Russia, Scotland, Lake Geneva (Lindroth 1985).

*B. hastii* Sahlberg (Fig. 5 A) is a mountain species in South and Central Norway and only few records are from the coniferous zone: SFY: Egge (loc. 64), ON: Brennhaug (loc. 138), NTI: Grøndalselv bru (loc. 8). The species has a northern, circumpolar distribution (Lindroth 1985).

*B. prasinum* (Duftschmid) (Fig. 5 B). MRI*: Skei and Rindal (loc. 29, 33, leg. J. Andersen); Todalen (loc. 49, leg. O. Hanssen); Furugrenda (loc. 52, leg. O. Hanssen); Horgheim (loc. 56, leg. J. Andersen); STY*: Skau (loc. 20, leg. J. Andersen, O. Hanssen). The species is distributed over larger parts of South and Central Norway, but in contrast to
B. virens it seems to be absent in large parts of Western Norway. The species is boreomontane in Europe (Lindroth 1945 b).

B. tibiale (Duftschmid) (Fig. 5 C). HOY*: Ølen (loc. 74, leg. O. Hanssen, S. Ligaard, F. Ødegaard). B. tibiale obviously has a very restricted distribution in the counties of Rogaland and southern part of Hordaland. The species is comparatively common within the area (observed 1972 and 1991). The area is isolated from the nearest occurrences in Germany (south of 52° N latitude) and The British Isles.

B. nitidulum (Marsham). (Fig. 5 D). OS: Lillehammer (loc. 129, leg. J. Andersen); Borgen (loc. 131, leg. J. Andersen); ON: Sjøa (loc. 135, leg. J. Andersen); MRY*: Kalland (loc. 26, leg. O. Hanssen); STY*: Lensvik (loc. 23, leg. J. Andersen); NTY*: Hovika (loc. 12, leg. O. Hanssen). The species is rather scattered, but probably continuously distributed in South and Central Norway. Somewhat isolated from this area are some occurrences in the county of Nordland, Northern Norway (Lindroth 1945 b). The species has more often been found in clay pits and on roadsides than on river banks. The species is widely distributed in Europe (Turin et al. 1977).

B. lunatum (Duftschmid) (Fig. 6 A). SFI*: Hjelle and Egge (loc. 62 and 64, leg. J. Andersen); STY: Agdenes (loc. 21, leg. J. Andersen). The species is rather densely distributed in SE and Central Norway whereas it seems to be absent on Sørlandet (AA and VA) and most parts of Western Norway. South of 59° N latitude there are very scattered and probably accidental occurrences in Scandinavia (Lindroth 1985). However, the species is established in Denmark. B. lunatum also occurred in secondary habitats at several places.

B. tetracolum Say is scatterly distributed in South and Central Norway north to Trondheim (loc. 35). The species occurs in most parts of Europe south of about 64° N latitude (Turin et al. 1977).

B. femoratum Sturm. SFI: Hjelle (loc. 62, leg. J. Andersen); MRY*: Runde (loc. 61, leg. O. Hanssen); NTI: Stiklestad (loc. 16, leg. J. Andersen); Gröndalselv bru (loc. 8, leg. J. Andersen). The species seems to be continuously distributed throughout South and Central Norway and the new finds in NTI
as well as earlier ones (Andersen 1980) show that the distribution throughout Norway is continuous. This species as well as the preceding and the following ones occur frequently in secondary habitats. *Bembidion femoratum* is widely distributed throughout Europe (Turin et al. 1977).

*B. bruxellense* Wesmael is the most densely distributed of all species of the genus in the actual area. The same applies to Nordland and Troms counties of Northern Norway whereas it is more scatterly distributed in Finnmark county (Andersen 1980). The species occurs in most of Europe, except for the southernmost parts (Turin et al. 1977).

*B. petrosum siebkei* Sparre Schneider (Fig. 6B) has its southernmost occurrences in Norway at Kongsvinger, at the river Glomma. From this place it is rather evenly distributed along the large rivers in eastern parts of South and Central Norway north to Bergsmo (loc. 11). There is no hiatus between this area and the area in Northern Norway (Andersen 1980). The species has a northern, circumpolar distribution (Lindroth 1985).

*B. saxatile* Gyllenhal (Fig. 6 C). AAI*: Syrtveitfoss (loc. 97, leg. J. Andersen). The distribution of the species within the actual area is very similar to that of *B. virens*. This area is connected both with the area further south and north (Andersen 1980). The species has a northern distribution in Europe (Lindroth 1945).

**DISCUSSION**

There are many new records of several species within the areas of concern. This especially applies to *B. schuppelii, B. prasinum, B. lunatum* and *B. petrosum*. Much of this is obviously due to investigations of a number of new localities, especially in the counties Møre and Romsdal (previously hardly investigated at all), Sør-Trøndelag, Nord-Trøndelag and parts of the valleys Gudbrandsdalen and Østerdalen. Lindroth (1945 a) regarded one record of *B. schuppelli* from OS: Gausdal as isolated from the rest of the area further north. Several new finds in the area in between (Fig. 4 A) suggests that this hardly is more legitimate than for any other species. Lindroth (1945 a, 1949) was of the opinion that *Asaphidion pallipes, Bembidion femoratum, B. lapponicum, B. lunatum, B. petrosum* and *B. fellmanni* are bisentric or have a hiatus between the distribution in Central and Northern Norway. As is evident from the present paper and Andersen (1980) this hiatus does not exist for the five mentioned species, whereas it still is an open question regarding *B. fellmanni*.

There are some areas in South Norway with several old records, but few more recent ones. This especially applies to the southeastern parts of Norway between about 59° and 61° N latitude from Larvik and lake Tyrifjorden in the west to the river Glomma in the east. Some of the reason for this is certainly that a limited number of localities within the actual area have been investigated more re-
recently. It is noteworthy, however, that al­
though several collectors have visited the ri­
ver Glomma between Kongsvinger and Rena
no recent records of *B. litorale* have been
made there, whereas the species previously
was known from four localities within that
area. *B. dentelum*, on the other hand, has
recently been found within the same area as
well as on new localities further north. *B.
litorale* prefers open, sparsely vegetated spots
(Andersen 1970) and at the river Gaula it has
repeatedly been observed how sensitive the
species is to vegetational successions. At sev­
eral places at this river where the species
previously was abundant, it has now com­
tpletely disappeared whereas other species, e.g.
*B. schuppellii, B. lunatum* and *B. dentelum*
have established (vide also Andersen 1970).
The reason is obviously that the sites have
become too densely vegetated and shady. At
some places at the bank of Gaula new habi­
tats suitable for *B. litorale* are created, but at
other places the natural erosion and deposi­
tion of fluvial material seem to be prevented
e.g. by the construction of stone walls. *B.
dentellum, B. schuppellii* and *B. lunatum*, on
the other hand, prefer later successional sta­
ges, i.e. habitats with a developed, often tall
vegetation and/or shaded by bushes or trees.
It is possible, therefore, that the conditions at
the river Glomma has changed in the direc­
tion described above, i.e. in disfavour of *B.
litorale*, but in favour of *B. dentellum*. If real,
these changes most likely is due to some type
of human activity, albeit the exact causes are
obscure.

According to their distribution in South
and Central Norway the species may be di­
vided in the following groups:

1. Ubiquitous species. Present both in South,
Central and Northern Norway including
Finnmark county. Some of them are more or
less continental (C), i.e. they are absent in
most parts of Western Norway and western
parts of North Norway. For two species the
Fennoscanian areas are isolated from those
further south (I). *Asaphidion pallipes* (C),
*Bembidion velox* (C), *B. bipunctatum, B.
schuppellii* (C), *B. quadriraculatum* (C), *B.
prasinum* (I), *B. virens* (I), *B. bruxellense, B.
femoratum, B. saxatile*.

2. Southern species with their northernmost
reaches in Nordland county. *B. nitidulum, B.
lunatum*.

3. More strictly southern species with their
northernmost occurrences in Nord-Trønde­
lag (NTI) or further south. The distribution of
a majority of the species has a continental
pattern (C), i.e. they are absent in most parts
of Western Norway. *Asaphidion flavipes* (C),
*Bembidion litorale* (C), *B. argenteolum* (C),
*B. dentellum, B. semipunctatum* (C), *B. ar­
ticulatum* (C), *B. abliquum, B. tetracolum*.


5. Northern species. At least in Western Eu­
rope not occurring south of 59° N latitude.
Two of the species, however, have isolated
occurrences in the mountains of Central-
South Europe (I). *B. lapponicum, B. fell­
manni* (I), *B. difficile* (I), *B. hastii, B. petro­
sum*.

Fig. 7 shows a map of South-Central Nor­
way with the number of riparian *Bembidion*
species within selected areas. The species
*Bembidion articulatum, B. quadriraculatum*,
*B. bruxellense, B. nitidulum, B. femoratum*,
*B. gilvipes, B. guttula* and *B. mannerheimii*
were not considered since they hardly can be
regarded as riparian. The areas with the high­
est number of species are those covering the
large rivers in Sør-Trøndelag county (area nr.
4 in Fig. 7) and the northern part of the river
Gudbrandsdalslågen (area nr. 7). Nord-
Trøndelag (area nr. 1 and 2), Østerdalen
(area nr. 8 and 9) and the areas around Tyri­
fjorden and Oslofjorden (area nr. 13 and 14)
also have a fairly high number of species,
whereas the southernmost and western parts of Norway have the lowest number. A partial explanation of these differences in species-richness between areas may be given by dividing the species in two ecological groups: a) lithophilous species dependent upon a gravelly/stony substratum, consisting of B. prasinum, B. virens, B. hastii, B. tibiale, B. saxatile and B. petrosum (Andersen 1970, 1983 a, b, Andersen et al. 1989). b) stenotopic or oligotopic river bank species dependent upon sand or fine sand/silt, consisting of Asaphidion pallipes, Bembidion lapponicum, B. littorale, B. argenteolum, B. semipunctatum, B. schuppelii and B. lunatum.

Contrary to the other lithophilous species, B. petrosum has a clear preference to fine sand/silt underlying gravel/stones (Andersen 1983 a).

The species of group b) are absent from the southernmost and south-western parts of Norway, whereas the first group, B. petrosum excepted, are present within at least one of these two areas. As stated previously (Andersen 1983 b) the most reasonable explanation for these differences in distributional patterns is the absence or scarcity of river banks with sand or fine sand/silt in the southernmost and western parts of Norway, whereas lake shores and river banks with gravel/stones are frequent within the same areas (Fig. 8). Lindroth (1949) discussed the reasons for the absence of Asaphidion pallipes, Bembidion littorale and B. semipunctatum in Western Norway. Although he was aware of the scarcity of suitable substratum within the actual areas he emphasized lack of sunshine, insufficienlty high summer temperatures and high precipitation as equally important limiting factors. That the whole group b) and B. petrosum are absent in the southernmost part of Norway can not be due to climatic factors, however. Thus, especially the eastern part of Sørlandet (AAY) has a favourable climate with high summer temperatures and a relatively high number of sun hours although the precipitation is quite high (Lindroth 1949, Bruun 1967, Hultén 1971). A high precipitation, however, can hardly be ascribed any negative influence at all since a majority of the species occur in Namdalen (loc. 10—11), which has equally as high or even higher precipitation as the district AAY (Lindroth 1949, Hultén 1971).

The lithophilous species, B. saxatile excepted, are absent in most parts of the lowland of North and Central Europe. Such distributional patterns are general among lithophilous beetles and the reason seems to be that suitable habitats for this ecological group are absent or scarce in the above mentioned areas (for discussion see Andersen 1983 b). Several species preferring fine substratum (e. g. B. argenteolum, B. semipunctatum, B. schuppe-
lii and B. lunatum) are absent in Denmark and/or Sweden south of 59° N latitude, but present further south. This is also, at least in part, due to differences in the availability of suitable habitats within the areas of concern (Andersen 1983 b).

**SAMMENDRAG**


**REFERENCES**


Received 5 June 1992
Melanistic variation in *Nemastoma bimaculatum* (Fabricius, 1775) (Opiliones)

INGVAR STOL


The probability of finding a fully black specimen of *Nemastoma bimaculatum* in Norway is as low as 0,00287. Expected binominal probability distributions for sample sizes of 5, 10, and 50 individuals and expected frequencies for 100 samples in each case are calculated. Observed frequencies of black individuals in Norway fit perfectly with the Poisson expected frequencies. The observations are found to be random and independent. Reasons for marked deviation from the expected values are briefly mentioned, and a model for future observations is given. A reported case of fully black *N. bimaculatum* from France is stated as extremely unnormal.


INTRODUCTION

Normally *N. bimaculatum* has dorsally two light spots which may vary somewhat in size. Occasionally the spots are greatly reduced or totally absent. Such fully black specimens are reported from several parts of Europe, for instance England (Gruber & Martens, 1968, Sankey & Savory, 1974, Martens, 1978), France (Gruber & Martens, 1968, Martens, 1978), Belgium (Martens, 1978) and Norway (Meidell & Stol, 1990). A specimen in which the dorsum was almost entirely white, is reported from England (Hillyard & Sankey, 1989). This variation of spot size can be a continuous, individual, genetical variation. Here, however, only the extreme end of the scale of variation, where both spots are absent, will be discussed. The frequencies of fully black specimens from European areas may vary somewhat. Sankey & Savory (1974) mention a collection (Roewer's) consisting of 300 normally specimens and 5 of the variety *unicolor*. However, the taxonomic status of this collection may be doubted, as Roewer (1914) incorrectly treated *N. bimaculatum* and *N. lugubre* (Müller, 1776) as the same species. He separated his «species» into two subspecies *N. lugubre-bimaculatum* (Fabricius) and *N. lugubre-unicolor* Roewer. Absence of spots may also occur within *N. lugubre* as mentioned by Gruber & Martens (1968) and Martens (1978). Fully black specimens of *N. lugubre* has not been reported from Norway. The main aim of the following discussion will be to present a frequency model, by which the number of fully black specimens of *N. bimaculatum* in an observed sample could be stated to be normal or unnormal.

MATERIAL, METHODS AND APPROXIMATIONS

The total material comprises 1046 adults of which 2 are fully black (Meidell & Stol, 1990). An empirical value of p, the probability that a specimen will be fully black, can be obtained from the data. If a third specimen with scarcely visible spots is included, the (maximum) value will be p = 0,00287. And q, the probability that a specimen has one or two spots, will thus be q = 0,99713.

The expected probability distributions for Y, the number of black specimens in a sample of size k = 5, 10 and 50 individuals, are calculated. This is done by expanding the binominal \((p + q)^k\) where individuals in theory occur independently in the two classes. In each of the three cases, the expected frequency for 100 samples, is calculated, Tab. 1a, 1b, 1c and Fig. 1.

Considering the observed Norwegian (Scandinavian) material, the most convenient way for a statistical treatment is to use the Poisson distribution. This is possible because of fulfilment of the criterion p<0,1. The
Poisson distribution is calculated in two different ways, either with 1 trap over 1 autumn or 1 locality over 1 autumn as the sampling unit. The number of traps in which specimens were taken is 114, and the number of localities where *N. bimaculatum* was found is 36, randomly scattered throughout the main distributional area (Norway south of 64° N).

The three black individuals were taken at three different sites (Hordaland: Fantoft, Rogaland: Tau, Vest-Agder: Fjellså).

**RESULTS AND DISCUSSION**

In a sample size (k) of 5 individuals, the relative expected frequency of not finding black specimens, is high (0.98573). The probability of finding 1 black is 1.42%, and the chances of finding two or more decrease to infinitesimal values, Tab. 1a.

In a sample size of 10 individuals, the probability that all have spots has decreased to 97.17%, and the chance of finding 1 black is nearly doubled (2.80%). It is still improbable to find 2 or more black ones, Tab. 1b.

Finally, if the sample size is 50 individuals, the chance that all specimens in a sample have spots, has decreased to 86.61%. The chance is markedly higher, 12.47%, of finding a black specimen, and the probability of finding two black specimens, 0.88%, is more realistic, Tab. 1c.

How expected frequencies change within 100 samples, with k = 5, 10 and 50, are illustrated in a bar diagram, Fig. 1.

The p-value observed is a good estimate, indeed, for several reasons. It is based on

---

**Tab. 1a. Binominal expected frequencies, sample size (k) is 5 individuals. Last column shows the expected distribution if 100 samples were taken. Symbols: k = sample size, Y = number of black specimens, \( \mu \) = expected mean of black specimens per sample, \( \sigma \) = expected standard deviation, \( f_{rel} \) = relative expected frequency, \( f \) = absolute expected frequency.**

<table>
<thead>
<tr>
<th>No. black ones in a sample of size k = 5</th>
<th>Y</th>
<th>Powers of ( p = 0.00287 )</th>
<th>Powers of ( q = 0.99713 )</th>
<th>Binomial coefficients</th>
<th>Relative expected frequency ( f_{rel} )</th>
<th>Absolute expected frequencies if 100 samples ( f )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1,00000</td>
<td>0.98573</td>
<td>1</td>
<td>0.98573</td>
<td>98.6</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0.00287</td>
<td>0.98857</td>
<td>5</td>
<td>0.01419</td>
<td>1.4</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>8.24 \cdot 10^{-4}</td>
<td>0.99141</td>
<td>10</td>
<td>8.17 \cdot 10^{-3}</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>2.40 \cdot 10^{-4}</td>
<td>0.99427</td>
<td>10</td>
<td>2.39 \cdot 10^{-7}</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>6.78 \cdot 10^{-11}</td>
<td>0.99713</td>
<td>5</td>
<td>3.38 \cdot 10^{-9}</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>1.95 \cdot 10^{-13}</td>
<td>1.00000</td>
<td>1</td>
<td>1.95 \cdot 10^{-13}</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>( \Sigma )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.00000</td>
<td>100.0</td>
</tr>
</tbody>
</table>

\( \mu = 0.01435 \quad \sigma = 0.11962 \)

**Tab. 1b. Binominal expected frequencies, sample size (k) is 10 individuals. Symbols as in text and Tab. 1a.**

<table>
<thead>
<tr>
<th>No. black ones in a sample of size k = 10</th>
<th>Y</th>
<th>Powers of ( p = 0.00287 )</th>
<th>Powers of ( q = 0.99713 )</th>
<th>Binomial coefficients</th>
<th>Relative expected frequency ( f_{rel} )</th>
<th>Absolute expected frequencies if 100 samples ( f )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1,00000</td>
<td>0.97167</td>
<td>1</td>
<td>0.97167</td>
<td>97.2</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0.00287</td>
<td>0.97446</td>
<td>10</td>
<td>0.02797</td>
<td>2.8</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>8.24 \cdot 10^{-4}</td>
<td>0.97727</td>
<td>45</td>
<td>3.62 \cdot 10^{-4}</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>2.40 \cdot 10^{-4}</td>
<td>0.98008</td>
<td>120</td>
<td>2.82 \cdot 10^{-4}</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>( \vdots )</td>
<td>\vdots</td>
<td>\vdots</td>
<td>\vdots</td>
<td>\vdots</td>
<td>\vdots</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>3.79 \cdot 10^{-26}</td>
<td>1.00000</td>
<td>1</td>
<td>3.79 \cdot 10^{-26}</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>( \Sigma )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.00000</td>
<td>100.0</td>
</tr>
</tbody>
</table>

\( \mu = 0.02870 \quad \sigma = 0.16917 \)

72
Tab. 1c. Binominal expected frequencies, sample size (k) is 50 individuals. Symbols as in text and Tab. 1a.

<table>
<thead>
<tr>
<th>No. black ones in a sample of size k = 50</th>
<th>Powers of $p = 0.00287$</th>
<th>Powers of $q = 0.99713$</th>
<th>Binomial coefficients</th>
<th>Relative expected frequency $f_{rel}$</th>
<th>Absolute expected frequencies if 100 samples $f$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1.00000</td>
<td>0.86614</td>
<td>1</td>
<td>0.86614</td>
<td>86.6</td>
</tr>
<tr>
<td>1</td>
<td>0.00287</td>
<td>0.86864</td>
<td>50</td>
<td>0.12465</td>
<td>12.5</td>
</tr>
<tr>
<td>2</td>
<td>8.24 $\cdot 10^{-4}$</td>
<td>0.87114</td>
<td>1225</td>
<td>0.00879</td>
<td>0.9</td>
</tr>
<tr>
<td>3</td>
<td>2.40 $\cdot 10^{-4}$</td>
<td>0.87364</td>
<td>19600</td>
<td>4.11 $\cdot 10^{-4}$</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>2.31 $\cdot 10^{-69}$</td>
<td>0.93603</td>
<td>1.08 $\cdot 10^{14}$</td>
<td>2.34 $\cdot 10^{-53}$</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>7.84 $\cdot 10^{128}$</td>
<td>1.00000</td>
<td>1</td>
<td>7.84 $\cdot 10^{128}$</td>
<td>0.0</td>
</tr>
<tr>
<td>$\Sigma$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.99999</td>
</tr>
</tbody>
</table>

$\mu = 0.14350 \quad \sigma = 0.37827$

Fig. 1. Frequencies of black specimens in 100 samples when the sample size (k) is 5, 10 and 50 individuals.
Tab. 2. Poisson distribution. Black specimens in 114 traps in the course of 1 autumn. Symbols: \( f \) = observed frequency, \( \hat{f} \) = Poisson expected frequency, \( Y \) = number of black specimens, \( \bar{Y} \) = sample mean of black specimens per trap, \( s^2 \) = sample variance, \( CD \) = coefficient of dispersion \((s^2/Y)\).

<table>
<thead>
<tr>
<th>Number of black ones found per trap, ( Y )</th>
<th>Observed frequency, ( f )</th>
<th>Poisson expected frequency, ( \hat{f} )</th>
<th>Deviation from expectation, ( f-\hat{f} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>111</td>
<td>111,039108310</td>
<td>-</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
<td>2,922105174</td>
<td>+</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>0,038449060</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>0,000337275</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>0,000002219</td>
<td>-</td>
</tr>
<tr>
<td>5+</td>
<td>0</td>
<td>0,000000012</td>
<td>-</td>
</tr>
<tr>
<td>( \Sigma )</td>
<td>114</td>
<td>114,000002050</td>
<td>-</td>
</tr>
</tbody>
</table>

\( \bar{Y}=0,026316 \)  \( s^2=0,025850 \)  \( CD=0,98229 \)

Tab. 3. Poisson distribution. Black specimens in 36 localities in the course of 1 autumn. Symbols as in text and Tab. 2.

<table>
<thead>
<tr>
<th>Number of black ones found per locality, ( Y )</th>
<th>Observed frequency, ( f )</th>
<th>Poisson expected frequency, ( \hat{f} )</th>
<th>Deviation from expectation, ( f-\hat{f} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>33</td>
<td>33,121611833</td>
<td>-</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
<td>2,760123279</td>
<td>+</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>0,11504677</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>0,003194562</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>0,000066553</td>
<td>-</td>
</tr>
<tr>
<td>5+</td>
<td>0</td>
<td>0,000001109</td>
<td>-</td>
</tr>
<tr>
<td>( \Sigma )</td>
<td>36</td>
<td>36,000002013</td>
<td>-</td>
</tr>
</tbody>
</table>

\( \bar{Y}=0,083333 \)  \( s^2=0,078571 \)  \( CD=0,94286 \)

individuals from greater parts of the distributional area. The three rare events occurred independently at three scattered localities. The localities were randomly chosen and included deciduous-, mixed-, coniferous woods, gardens, parks, grazing land and heather. However, if a case arrived locally where 20 out of 50 individuals lacked spots, the occurrence of so many events at the same time would strongly indicate that they occurred dependently of each other. Causes might be intake of special substances, inheritance of factors coding for absence of spots, mutations and so on.

The p-value and frequencies presented here, primarily bear on Norway and should be regarded as indicative only for other parts of Europe. The case mentioned by Gruber & Martens (1968) and Martens (1978) concerning a locality in France, seems to be extremely unusual. 27 out of 30 specimens were fully black. The locality lies in a valley near Lourdes (Middle-Pyrenean) in a coniferous wood near an energy producing factory ("Kraftwerk Aste"). Even in a larger sample (Tab. 1c) the chance for observing such a result lies close to impossibility. The relative expected frequency \((f_{rel})\) is so low as \(2,34 \times 10^{-55}\). Chance can't account for this rare event observed in France. Investigations are needed to discover the causes concealed within the environment, genetical material or both. It seems quite unlikely that the p-value in France differs enough from the Norwegian one letting chance alone explain it.

Observed frequencies from Norway, fit perfectly with the expected Poisson distributions, Tab. 2 and 3.

The purpose of testing against a Poisson distribution is because this can indicate randomness or independence (Sokal & Rohlf, 1981). The coefficient of dispersion \((CD)\) should then be near 1. The CD-values here found, 0,98229 and 0,94286, are near enough to 1, to be described as random, Tab. 2 and 3.

A model for observation

To decide whether a local occurrence of fully black specimens of \( N. bimaculatum \) in Nor-
way is normal or unnormal the following criteria may be used:

1. Normal case: Only one specimen is fully black in a sample. Chance may account for this alone.

2. Transitional case: Two specimens are fully black in a sample. Chance may account for this in a large sample (k>50). However, most likely not in a very small sample. Thorough examination of the locality is needed.

3. Unnormal case: Three or more black specimens in a sample (k<<1000). Extraordinary causes at the locality are responsible for the events (environmental, genetical or both).

ACKNOWLEDGEMENTS
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Received 28 Aug. 1992.
Check-list of North European Opiliones

INGVAR STOL


A check-list of North European Opiliones is given. Totally 24 species are reported whereof one species has newly invaded Denmark (and Sweden). Notes on distribution and nomenclature are also given.

The distribution of some species are yet uncertain. Six species may be designated as rare in North Europe. Three species are typically western distributed, and nine species are eastern distributed. Only three species are reported from all countries in the region.

Nomenclatorial notes concern changes of names, dates and author names of species.


INTRODUCTION

A check-list of North European Opiliones is presented.

The list includes Finland (Fi), Sweden (S), Denmark (D), Norway (N), The Faroes (Fa) and Iceland (I).

The number of species totally reported is 24, whereof 12 in Fi, 20 in S, 18 in D, 15 in N, 7 in Fa and 6 in I. A few changes have occurred within the fauna list during the recent times.

Notes are given to the distributions and nomenclature. Regarding the distributions the most rarest species seem to be Trogulus tricarinatus (L., 1758), Mitostoma chrysomelas (Hermann, 1804), Paroligolophus medii (Pickard-Cambridge, 1890) Lacinius horridus (Panzer, 1794), Platymbus bucephalus (C. L. Koch, 1835) and Leiobunum limbatum L. Koch, 1861.

Western distributed species (N, Fa, I) are Nemastoma bimaculatum (Fabricius, 1775), Paroligolophus medii and Megabunus diadema (Fabricius, 1779).

Eastern distributed species (Fi, S, N) are Nemastoma lugubre (Müller, 1776), Lacinius horridus, Phalangium opilio L., 1758, Opilio parietinus (De Geer, 1778), Lophopilio palpinalis (Herbst, 1799), Platymbus bucephalus, Leiobunum rupestre (Herbst, 1799), Neolima gothica Lohmander, 1945 and Leiobunum limbatum.

Only Lacinius ephippatus (C. L. Koch, 1835), Mitopus morio (Fabricius, 1779) and Rilaena triangularis (Herbst, 1799) are reported from all countries in the North European region.

Remarks on nomenclature concern changes of names, dates and author names of species.

CHECK-LIST OF NORTH EUROPEAN OPILIONES

Order OPILIONES Sundevall, 1833
Suborder Palpatores Thorell, 1876
Superfamily Trogiuloidea Sundevall, 1876
Family Trogiulidae Sundevall, 1876
Trogulus tricarinatus (L., 1758) 1 S D M — —
Family Nemastomidae Simon, 1872
Nemastoma bimaculatum (Fabricius, 1775) 2 — — — Fa I
N. lugubre (Müller, 1776) 3 Fi S D M — —
Mitostoma chrysomelas (Hermann, 1804) 4 — S D — Fa —
Superfamily Phalangioidae Sundevall, 1833
Family Phalangiidae Latreille, 1802
Subfamily Oligolophinae Banks, 1893
Oligolophus tridens (C. L. Koch, 1836) 5 Fi S D M — I
O. hanseni (Kraepelin, 1896) 6 — S D M — —
Paroligolophus agrarius (Neade, 1855) 7 — S D M — —
P. medii (Pickard-Cambridge, 1890) 8 — — — Fa —
Lacinius ephippatus (C. L. Koch, 1835) 9 Fi S D M Fa I
L. horridus (Panzer, 1794) 10 Fi S — — — —
Mitopus morio (Fabricius, 1779) 11 Fi S D M Fa —
Subfamily Phalangiidae Latreille, 1802
Phalangium opilio L., 1758 12 Fi S D M — —
Opilio parietinus (De Geer, 1778) 13 Fi S D — —
O. saxatilis C. L. Koch, 1819 14 — S D — — —
O. canestrinii (Thorell, 1876) 15 — S D — — —
Megabunus diadema (Fabricius, 1779) 16 — — — Fa I
Rilaena triangularis (Herbst, 1799) 17 Fi S D M Fa I
Lophopilio palpinalis (Herbst, 1799) 18 Fi S D M — —
Platymbus bucephalus (C. L. Koch, 1835) 19 Fi — — — —
Subfamily Leiobuninae Banks, 1893

Mellisia gothica Lohmander, 1945
Leiobunus rotundus (Latreille, 1798)
L. rupestris (Herbst, 1799)
L. blackvalli Keade, 1861
L. limbatus L. Koch, 1861

DISTRIBUTIONAL NOTES

1. Sparsely found in S and D (Meinertz, 1962, Martens, 1978) and in N (Solhøy, 1982).
Published from S (Tullgren, 1906, Meinertz, 1962),
16. Most probable males are never found in Norway. In addition this parthenogenetic species is found in Britain, France and Spain (Martens, 1978, Hillyard & Sankey, 1989).
17. Also published from Fa and I (Henriksen, 1938), although not mentioned by Martens (1978).
20. Published from Fi (Ilvessalo, 1981), S and D (Meinertz, 1962, Martens, 1978) and N (Stol, 1982).
24. Martens (1978) mentions a single report from S. The main distributional area lies north of Italy. Scattered finds in North-Central Europe.

NOMENCLATORIAL NOTES
The classification of superfamily Phalangioidea is very poorly understood (Shear, 1982). The same is true for even higher taxa. I follows Martens (1978).

Comments on species level:

3. Species name Nemastoma lugubre-bimaculatum (Fabricius) as used by Heiniijoki (1944) and Meinertz (1962) is incorrect (Meidell & Stol, 1990). Hippa (1975) used an incorrect author name of the species.
4. The species has changed genus name. Meinertz (1962) used the name Nemastoma chrysomelas.
8. The species has changed genus name. Kauri (1980) used the name Oligolophus meadii.
11. Author date of species name is incorrect in Martens (1978) and Hillyard & Sankey (1989). They use the date 1799. Enghoff (1988) used the date 1798. Correct date is 1779 (Fabricius, 1779, Starega, 1976, Stol, 1982).
12. Author date of species name in Martens (1978), Stol (1982) and Enghoff (1988) is 1761. I have here adopted 1758 as the correct date as done by Starega (1976) and Hillyard & Sankey (1989). These authors refer to Linnaeus, Systema Naturae, 10th edition.
13. Author name of species is incorrectly written in Hillyard & Sankey (1989).
15. Species name here used is a senior syno-
nym (Gruber, 1984) for *Opilio ravenae* Spoek, 1962 which is found in Martens (1978).

17. The species has changed genus name. Heinäjoki (1944), Meinertz (1962), Koponen (1968) and Hippa (1975) used the name *Platybunus triangularis*.

18. The species has changed genus name. Meinertz (1962) and Hippa (1975) used the name *Odiellus palpinalis*.

20. The species name *Nelima silvatica* as used by Meinertz (1962) is incorrect.

21. The species name incorrectly written in Meinertz (1962).

22. Species name incorrectly written in Meinertz (1962) and Enghoff (1988).

23. Species name *Liobunum hassiae* Muller, 1914 as used by Meinertz (1962) is a junior synonym.

ACKNOWLEDGEMENTS
Bjarne A. Meidell (Museum of Zoology, Bergen) and Henrik Enghoff (Museum of Zoology, Copenhagen) read critically through the manuscript. Torbjørn Kronestedt (Swedish Museum of Natural History, Stockholm) and Seppo Koponen (Museum of Zoology, Turku) contributed with valuable information.

SAMMENDRAG
Sjekkliste over nord europeiske Opiliones med kommentarer til utbredelse og nomenklatur


Nomenclatoriske kommentarer omfatter forandringer av artsnavn samt forfatter datoer og navn.

REFERENCES


Received 24 June 1992.
Flight periods of Tipulidae (Diptera) from 22 Norwegian localities

TROND HOFSVANG, LARS OVE HANSEN AND FRED MIDTGAARD


During the years 1984—1988 Tipulidae (Diptera) were collected from 22 Norwegian localities in Malaise traps and in light traps. The flight periods and abundance of males of 41 species are given.

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Lars Ove Hansen, Sparavollen 23, N-3021 Drammen, Norway.

Fred Midtgaard, Department of Biology, Division of Zoology, University of Oslo, P. O. Box 1050, Blindern, N-0316 Oslo, Norway.

INTRODUCTION

Ninety three species of Tipulidae have been reported from Norway (Hofsvang 1992). However, only a few studies of systematic sampling of adult Tipulidae throughout the flight season are known from Norwegian localities (Hofsvang 1974, Hofsvang et al. 1987). The distribution of Tipulidae to different parts of the country is also insufficiently known. A few publications have summarized records of Tipulidae from Norway (Siebke 1877, Lackschewitz 1933, 1935, Tjeder 1965). In his study of the western palaearctic species in the genus Nephrotoma, Oosterbroek (1978, 1979a,b,c), mapped the distribution, including Norway.

The present study summarizes data of 41 species of adult Tipulidae collected from 22 localities in Norway during the years 1984—1988.

MATERIAL AND METHODS

Only males of Tipulidae were identified to species level, because females of several subgenera are insufficiently described. The insects were collected in Malaise traps, except in five localities (Killingholmen, Langøy, Mølen, Ramvikholmen and Tofteholmen), where a light trap was used. Table 1 gives information of all localities. A detailed description of the localities on the islands in the Oslofjord is given by Greve & Midtgaard (1986) (Håøya and Østøya) and Hauge & Hansen (1991) (Killingholmen, Langøy, Mølen, Ramvikholmen and Tofteholmen).

RESULTS

Tables 2—22 show the number of male Tipulidae recorded during the different collecting periods in all localities. The generic, subgeneric and specific names and the author's name and date are given in Hofsvang (1992).

DISCUSSION

The species in the genus Nephrotoma were dominant in localities along the coast in southern Norway (Håøya, Østøya, Langøy, Ås, Hesnes and Oppdølsstranda) where the trap had been placed in deciduous woods, in meadows with a rich herb layer or close to agricultural fields. Oosterbroek (1978, 1979a, b, c) gives an overview of the distribution and the flight period of the western palaearctic species in Nephrotoma. Sixteen species are reported from Norway (Hofsvang 1992). Six of these species have a southern distribution, however, in the present recordings N. analys and N. flavescens are found more to the north (Oppdølsstranda) than earlier reported (Oosterbroek 1978, 1979c). The flight period of the nine Nephrotoma species found in this
Table 1. The position, the sampling year, and main vegetation of the localities. Prov. = provinces given by Økland (1981).

<table>
<thead>
<tr>
<th>LOCALITY</th>
<th>MUNICIPALITY</th>
<th>PROV.</th>
<th>EIS</th>
<th>YEAR</th>
<th>VEGETATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Håøya A+B</td>
<td>Frogn</td>
<td>AK</td>
<td>28</td>
<td>1984</td>
<td>Deciduous forest</td>
</tr>
<tr>
<td>Østøya A</td>
<td>Bærum</td>
<td>AK</td>
<td>28</td>
<td>1984</td>
<td>Meadow</td>
</tr>
<tr>
<td>Østøya B+C</td>
<td>Bærum</td>
<td>AK</td>
<td>28</td>
<td>1984</td>
<td>Deciduous forest</td>
</tr>
<tr>
<td>Djønno A+B</td>
<td>Ullensvang</td>
<td>HOI</td>
<td>41</td>
<td>1984</td>
<td>Deciduous forest</td>
</tr>
<tr>
<td>Flitvet</td>
<td>Hurum</td>
<td>BØ</td>
<td>28</td>
<td>1985</td>
<td>Spruce forest</td>
</tr>
<tr>
<td>Tofte</td>
<td>Hurum</td>
<td>BØ</td>
<td>28</td>
<td>1985</td>
<td>Deciduous forest</td>
</tr>
<tr>
<td>Mjølfjell</td>
<td>Voss</td>
<td>HOI</td>
<td>41</td>
<td>1985</td>
<td>Pine forest, heather</td>
</tr>
<tr>
<td>Oppdølstranda A</td>
<td>Sunndal</td>
<td>MRI</td>
<td>85</td>
<td>1985</td>
<td>Deciduous forest</td>
</tr>
<tr>
<td>Oppdølstranda B</td>
<td>Sunndal</td>
<td>MRI</td>
<td>85</td>
<td>1988</td>
<td>Deciduous forest</td>
</tr>
<tr>
<td>Ås, NLH</td>
<td>Ås</td>
<td>AK</td>
<td>28</td>
<td>1986</td>
<td>Agricultural field</td>
</tr>
<tr>
<td>Prestbakke</td>
<td>Halden</td>
<td>Ø</td>
<td>12</td>
<td>1986</td>
<td>Spruce forest</td>
</tr>
<tr>
<td>Sennumstad</td>
<td>Birkenes</td>
<td>AAY</td>
<td>6</td>
<td>1986</td>
<td>Spruce forest</td>
</tr>
<tr>
<td>Nordmoen</td>
<td>Nannestad</td>
<td>AK</td>
<td>37</td>
<td>1986</td>
<td>Spruce forest</td>
</tr>
<tr>
<td>Langtjern, Gulsvik</td>
<td>Flå</td>
<td>BV</td>
<td>35</td>
<td>1986</td>
<td>Spruce forest</td>
</tr>
<tr>
<td>Naustdal</td>
<td>Naustdal</td>
<td>SFY</td>
<td>58</td>
<td>1986</td>
<td>Spruce forest</td>
</tr>
<tr>
<td>Granhei</td>
<td>Rana</td>
<td>NSI</td>
<td>123</td>
<td>1986</td>
<td>Spruce forest</td>
</tr>
<tr>
<td>Sletetta, Dividalen</td>
<td>Målselv</td>
<td>TRI</td>
<td>154</td>
<td>1986</td>
<td>Spruce forest</td>
</tr>
<tr>
<td>Svanhovd</td>
<td>Sør-Varanger</td>
<td>FØ</td>
<td>178</td>
<td>1986</td>
<td>Pine forest</td>
</tr>
<tr>
<td>Killingholmen</td>
<td>Sande</td>
<td>VE</td>
<td>19</td>
<td>1987</td>
<td>Deciduous forest</td>
</tr>
<tr>
<td>Langøya</td>
<td>Våle</td>
<td>VE</td>
<td>19</td>
<td>1987</td>
<td>Meadow</td>
</tr>
<tr>
<td>Mølen</td>
<td>Hurum</td>
<td>BØ</td>
<td>19</td>
<td>1987</td>
<td>Deciduous forest</td>
</tr>
<tr>
<td>Ramvikholmen</td>
<td>Hurum</td>
<td>BØ</td>
<td>19</td>
<td>1987</td>
<td>Spruce forest</td>
</tr>
<tr>
<td>Tofteholmen</td>
<td>Hurum</td>
<td>BØ</td>
<td>19</td>
<td>1987</td>
<td>Spruce forest</td>
</tr>
<tr>
<td>Hesnes</td>
<td>Grimstad</td>
<td>AAY</td>
<td>6</td>
<td>1988</td>
<td>Deciduous forest</td>
</tr>
</tbody>
</table>

Table 2. Tipulidae from locality A and B, Håøya (Frogn) 1984.

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Nephrotoma aculeata</td>
<td>A B</td>
<td>5 1</td>
<td>34 1</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nephrotoma flavescens</td>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nephrotoma tenuipes</td>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tanyptera atrata</td>
<td></td>
<td>2</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tipula (Lunatipula) fascipennis</td>
<td>1</td>
<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Tipula (Pterelachinus) irrata</td>
<td>1</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Tipula (Pterelachinus) submarinata</td>
<td>1</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Tipula (Savshenkia) confusa</td>
<td></td>
<td>7</td>
<td>4</td>
<td>11</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tipula (Schummelia) variicornis</td>
<td>1</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Tipula (Tipula) paludosa</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

study are in accordance with the previous reports from west-palaearctic (Oosterbroek 1978, 1979a,b,c).

*D. bimaculata* has not been recorded in Norway north of Dovre, however, the present record from Målselv are in accordance with Swedish records, where the species has been found north to Torne Lappmark (Tjeder 1955).

*T. (T.) paludosa*, a well-known pest in agricultural fields in Norway, is reported from several localities in the present study within its known distribution area (Hofsvang 1981). The flight period of this species and the late autumn flight period of the closely related species *T. (T.) subcuntans* were within the range reported by Hofsvang (1981). Only a few specimens of *T. (V.) hortorum* are known from Norway (BV, HOY, HOI). The present record of this species from Naustdal and Oppdølstranda are new localities farther to the north.
Table 3. Tipulidae from three localities (A, B, C), Ostøya (Frogn) 1984. No males were collected during the period 14—28 April and 28 April—12 May.

<table>
<thead>
<tr>
<th>Dates</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>12-30</td>
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<td></td>
<td></td>
<td>7</td>
<td>7</td>
<td>4</td>
<td>15</td>
<td>25</td>
<td>10</td>
<td>5</td>
<td>18</td>
<td>4</td>
</tr>
<tr>
<td>30 May—10 June</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 June—1 July</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>5</td>
<td>4</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-24</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>24 July—12 Aug.</td>
<td>1</td>
<td>3</td>
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<tr>
<td>12 Aug.—1 Sept.</td>
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<tr>
<td>1 Sept.—Sept.</td>
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</tr>
</tbody>
</table>

Nephrotoma aculeata  
Nephrotoma analis  
Nephrotoma cornicina  
Nephrotoma flavescens  
Nephrotoma tenuipes  
Nigrotipula nigra  
Prinocera turcica  
Tanyptera atrata  
Tipula (Lunatipula) laetabilis  
Tipula (Lunatipula) vernalis  
Tipula (Pterelachis) pabulinis  
Tipula (Pterelachis) varipennis  
Tipula (Savtshenkia) limbata  
Tipula (Savtshenkia) obsoleta  
Tipula (Savtshenkia) pagana  
Tipula (Tipula) subcuntans

Table 4. Tipulidae from locality A and B, Djønno (Voss) 1984. No males were collected during the period 26 June—10 July and 28 September—6 October.

<table>
<thead>
<tr>
<th>Dates</th>
<th>A</th>
<th>B</th>
<th>A</th>
<th>B</th>
<th>A</th>
<th>B</th>
<th>A</th>
<th>B</th>
<th>A</th>
<th>B</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>26 Apr.—22 May</td>
<td></td>
<td></td>
<td>1</td>
<td>3</td>
<td>14</td>
<td>16</td>
<td>3</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 June—27 July</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>31 Aug.—28 Sept.</td>
<td></td>
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</tr>
</tbody>
</table>

Dietendia bimaculata  
Tipula (Pterelachis) varipennis  
Tipula (Savtshenkia) confusa  
Tipula (Schummelia) varicornis  
Tipula (Vestiplex) nubeculosa  
Tipula (Vestiplex) scripta

Table 5. Tipulidae from Filtvet (Hurum) 1985.

<table>
<thead>
<tr>
<th>Dates</th>
<th>2-17</th>
<th>17 June</th>
<th>17 July</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tanyptera atrata</td>
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<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Tipula (Lunatipula) fascipennis</td>
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</tr>
<tr>
<td>Tipula (Pterelachis) irrorata</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Tipula (Schummelia) varicornis</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tipula (Vestiplex) scripta</td>
<td>1</td>
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<td></td>
</tr>
</tbody>
</table>

Table 6. Tipulidae from Tofte (Hurum) 1985.

<table>
<thead>
<tr>
<th>Dates</th>
<th>18 May—2 June</th>
<th>2-17</th>
<th>17 June—17 July</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tanyptera atrata</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Tipula (Pterelachis) pabulinis</td>
<td>3</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Tipula (Pterelachis) varipennis</td>
<td>13</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Tipula (Yamatotipula) lateralis</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 7. Tipulidae from Mjølfjell (Voss) 1985. No males were collected during the periods 21 September—12 October and 12 October—9 November.

<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Tipula (Savtshenkia) limbata</td>
<td>1</td>
</tr>
<tr>
<td>Tipula (Schummelia) varicornis</td>
<td>1</td>
</tr>
<tr>
<td>Tipula (Vestiplex) excisa</td>
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</tbody>
</table>
Table 8. Tipulidae from locality A, Oppdølstranda (Sunndal) 1985.

<table>
<thead>
<tr>
<th>Species</th>
<th>10 June</th>
<th>9 July</th>
<th>26 Aug</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tanyptera atrata</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tipula (Schummelia) varicornis</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tipula (Savtshenkia) confusa</td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Tipula (Pterelachius) varipennis</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 9. Tipulidae from locality B, Oppdølstranda (Sunndal) 1988. No males were collected during the periods 29 April—6 May, 6—12 May, 12—25 May, 25 May—1 June, 24 July—14 August, 14—27 August.

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Nephrotoma analis</td>
<td>1</td>
<td>3</td>
<td>6</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Nephrotoma flavescens</td>
<td>1</td>
<td>6</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Nephrotoma tenuipes</td>
<td>1</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tanyptera atrata</td>
<td>3</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tipula (Savtshenkia) signata</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tipula (Vestiplex) hortorum</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 10. Tipulidae at NLH-Ås (Ås) 1986. Period of trapping: 15 May—9 October. The trap was checked once a week. The table shows the dates when the trap was emptied. No Tipulidae was recorded on 22 May, 29 May, 5 June, 12 June, 26 June, 25 September and 9 October.

<table>
<thead>
<tr>
<th>Species</th>
<th>June 19</th>
<th>10</th>
<th>17</th>
<th>24</th>
<th>31</th>
<th>30 June</th>
<th>4</th>
<th>7</th>
<th>14</th>
<th>21</th>
<th>28</th>
<th>September 18</th>
<th>Oct. 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nephrotoma aculeata</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>2</td>
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<td>4</td>
<td>1</td>
<td>14</td>
<td>27</td>
<td>13</td>
<td>13</td>
<td>12</td>
</tr>
<tr>
<td>Nephrotoma appendiculata</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td></td>
<td>2</td>
<td>1</td>
<td>14</td>
<td>27</td>
<td>13</td>
<td>13</td>
<td>12</td>
</tr>
<tr>
<td>Nephrotoma cornicina</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>8</td>
<td>13</td>
<td>14</td>
<td>13</td>
<td>14</td>
<td>27</td>
<td>13</td>
<td>13</td>
<td>12</td>
</tr>
<tr>
<td>Nephrotoma flavescens</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>14</td>
<td>27</td>
<td>13</td>
<td>13</td>
<td>12</td>
</tr>
<tr>
<td>Nephrotoma scurra</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>14</td>
<td>27</td>
<td>13</td>
<td>13</td>
<td>12</td>
</tr>
<tr>
<td>Tipula (Lunatipula) fascipennis</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>14</td>
<td>27</td>
<td>13</td>
<td>13</td>
<td>12</td>
</tr>
</tbody>
</table>

Table 11. Tipulidae from Prestbakke (Halden) 1986. No males were collected during the period 6 May—9 June.

<table>
<thead>
<tr>
<th>Species</th>
<th>9-30 June</th>
<th>30 June-28 July</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tipula (Dendrotipula) flavolineata</td>
<td>1</td>
<td>18</td>
</tr>
<tr>
<td>Tipula (Pterelachius) irrorata</td>
<td>2</td>
<td>13</td>
</tr>
<tr>
<td>Tipula (Pterelachius) pseudoirrorata</td>
<td>22</td>
<td>1</td>
</tr>
<tr>
<td>Tipula (Schummelia) varicornis</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Tipula (Vestiplex) subcuntans</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

Table 12. Tipulidae from Svennumstad (Birkenes) 1986. No males were collected during the period 1 September—27 October.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tipula (Pterelachius) irrorata</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tipula (Pterelachius) pseudoirrorata</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tipula (Savtshenkia) confusa</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tipula (Savtshenkia) limbata</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tipula (Savtshenkia) signata</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tipula (Schummelia) varicornis</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tipula (Vestiplex) nubeculosa</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Species</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tipula (Lunatipula) fascipennis</td>
<td>2</td>
</tr>
<tr>
<td>Tipula (Pterelachisus) irrorata</td>
<td>6</td>
</tr>
<tr>
<td>Tipula (Pterelachisus) pseudoirrorata</td>
<td>2</td>
</tr>
<tr>
<td>Tipula (Vestiplex) nubeculosa</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 14. Tipulidae from Langtjern, Gulsvik (Flå) 1986. No males were collected during the period 21 July—31 August.

<table>
<thead>
<tr>
<th>Species</th>
<th>1-29 June</th>
<th>29 June—21 July</th>
<th>28 Aug.—28 Sept.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tanyptera atrata</td>
<td>1</td>
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<td></td>
</tr>
<tr>
<td>Tipula (Pterelachisus) pseudoirrorata</td>
<td>1</td>
<td>1</td>
<td>164</td>
</tr>
<tr>
<td>Tipula (Savtshenkia) limbata</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tipula (Vestiplex) excisa</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Tipula (Vestiplex) nubeculosa</td>
<td></td>
<td>1</td>
<td>4</td>
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</table>

Table 15. Tipulidae from Naustdal (Naustdal) 1986.

<table>
<thead>
<tr>
<th>Species</th>
<th>28 May—28 July</th>
<th>1-28 July</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tipula (Pterelachisus) irrorata</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Tipula (Pterelachisus) pseudoirrorata</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Tipula (Pterelachisus) submarmorata</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Tipula (Pterelachisus) varipennis</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Tipula (Savtshenkia) alpium</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Tipula (Savtshenkia) griseiscens</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Tipula (Savtshenkia) subnodicornis</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Tipula (Schumella) varicornis</td>
<td>64</td>
<td>26</td>
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<td>Tipula (Vestiplex) hortorum</td>
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<td></td>
</tr>
<tr>
<td>Tipula (Vestiplex) nubeculosa</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

Table 16. Tipulidae from Granhei (Rana) 1986.

<table>
<thead>
<tr>
<th>Species</th>
<th>11-29 June</th>
<th>29 June—27 July</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tipula (Pterelachisus) pseudoirrorata</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Tipula (Pterelachisus) submarmorata</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Tipula (Pterelachisus) truncorum</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Tipula (Savtshenkia) subnodicornis</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 17. Tipulidae from Sletta, Dividalen (Målselv) 1986.

<table>
<thead>
<tr>
<th>Species</th>
<th>14-29 June</th>
<th>29 June—3 Aug.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dicteniida bimaculata</td>
<td>1</td>
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</tr>
<tr>
<td>Tipula (Savtshenkia) subnodicornis</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Tipula (Vestiplex) excisa</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Table 18. Tipulidae from Svanhovd (Sør-Varanger) 1986.

<table>
<thead>
<tr>
<th>Species</th>
<th>20 June—4 Aug.</th>
<th>4 Aug.—1 Sept.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tanyptera atrata</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Tipula (Savtshenkia) benesignata</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Tipula (Vestiplex) excisa</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
Table 19. Tipulidae from Langøya (Våle) 1987.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Dictenidia bimaculata</td>
<td></td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nephrotoma aculeata</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nephrotoma analis</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Nephrotoma appendiculata</td>
<td>2</td>
<td>11</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nephrotoma flavescens</td>
<td>7</td>
<td>42</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Nephrotoma guariscaria</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nephrotoma tenuipes</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tipula (Acutipula) fulvipennis</td>
<td></td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tipula (Acutipula) fascipennis</td>
<td></td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tipula (Savtshenkia) confusa</td>
<td></td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tipula (Savtshenkia) obsoleta</td>
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<td>1</td>
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<td></td>
</tr>
<tr>
<td>Tipula (Savtshenkia) pagana</td>
<td>3</td>
<td>47</td>
<td>11</td>
<td>17</td>
<td></td>
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<td>Tipula (Tipula) paludosa</td>
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<td>4</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Tipula (Tipula) paludosa</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Tipula (Vestiplex) scripta</td>
<td></td>
<td></td>
<td>1</td>
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<td></td>
</tr>
</tbody>
</table>

Table 20. Tipulidae from Mølen (Hurum) 1987.

<table>
<thead>
<tr>
<th>Species</th>
<th>Ultimo May</th>
<th>June</th>
<th>July</th>
<th>Aug.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dictenidia bimaculata</td>
<td>1</td>
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<td></td>
</tr>
<tr>
<td>Nephrotoma flavescens</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tipula (Lunatipula) lunata</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tipula (Pterelachisus) submarmorata</td>
<td>3</td>
<td>9</td>
<td>24</td>
<td>1</td>
</tr>
<tr>
<td>Tipula (Vestiplex) scripta</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 21. Tipulidae at Killingholmen (Sande), Ramvikholmen (Hurum) and Tofteholmen (Hurum) 1987.

<table>
<thead>
<tr>
<th>Species</th>
<th>Ramvikholmen</th>
<th>Tofteholmen</th>
<th>Killingholmen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nephrotoma flavescens</td>
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<td>1</td>
<td></td>
</tr>
<tr>
<td>Tipula (Tipula) paludosa</td>
<td>7</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Tipula (Vestiplex) scripta</td>
<td>8</td>
<td>11</td>
<td></td>
</tr>
</tbody>
</table>

Table 22. Tipulidae from Hesnes (Grimstad) 1988.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Nephrotoma aculeata</td>
<td>1</td>
<td>3</td>
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<td>10</td>
<td>2</td>
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<td></td>
</tr>
<tr>
<td>Nephrotoma analis</td>
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<td>Nephrotoma dorsalis</td>
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<td></td>
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</tr>
<tr>
<td>Nephrotoma quadriphara</td>
<td>1</td>
<td>3</td>
<td>2</td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Nephrotoma scurra</td>
<td>1</td>
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<td>2</td>
<td>1</td>
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<td></td>
<td></td>
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<tr>
<td>Tipula (Lunatipula) fascipennis</td>
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<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Tipula (Lunatipula) lunata</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tipula (Pterelachisus) submarmorata</td>
<td>2</td>
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<tr>
<td>Tipula (Pterelachisus) varipennis</td>
<td>3</td>
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<td></td>
</tr>
<tr>
<td>Tipula (Savtshenkia) confusa</td>
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<td></td>
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<tr>
<td>Tipula (Savtshenkia) varicornis</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tipula (Vestiplex) scripta</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
Norwegian species of the subgenus *Savts­henkia* have a late autumn flight period with exception of a few mountain species. *T. (S.) limbata* and *T. (S.) signata* are recorded later than 27 October at Birkenes (table 11), close to the southern coast. *T. (S.) benesignata* has recently been reported new to Norway based on a single record from Oslo (Hofsvang 1987). The new record from Svanhovd indicates that this species is distributed all the way from south to north in Norway in accordance with the records from Sweden (Tjeder 1955).

*T. (P.) pseudoirrorata* has previously been reported only from Dovre in Norway (Theowald 1980). The present records show that this species is common in South Norway (Premtkakke, Nordmoen, Langtjern, Birkenes, Naustdal) and as far north as Rana (Granhei). The flight period is June-July.

**ACKNOWLEDGEMENTS**

We would like to thank Oddvar Hanssen and Liz Greve Jensen for supplying us with material.

**REFERENCES**


Received 8 Januar 1992.
Psacadina zernyi, (Mayer, 1953) is reported from Norway, Østfold province, Aremark community, Bøensætra. A female was netted on 1 June 1991. The specimen was netted among flowers close to the edge of lake BøenSætratjern. This is the first record from Norway.


Hitherto 52 species of Sciomyzidae have been recorded from Norway (Greve 1991). Rozkoň (1984) in his survey of the family in Fennoscandia and Denmark listed a total of 83 species; however, less than 60% from Norway alone. The Norwegian fauna thus is probably incompletely known. Papers and notes published in recent years (Greve & Økland 1989; Greve 1990, 1991 and Greve & Midtgaard 1992) somewhat complete the faunistic outlines in Rozkoň’s survey.

On 1 June 1991 one female Psacadina zernyi (Mayer, 1953) was netted by one of us (TJO) at BøenSætra in Aremark community (Olsen, 1992). Aremark community borders to Sweden. The locality BøenSætra is an old summer farm where no modern farming methods have been used. Old meadows are still used for grazing by sheep, horses and cows and parts of old forest border to the area. Some parts of the meadows are rich in flowering plants and the female was sweep-netted not far from the border of a small lake Bøensætratjern. The specimen was determined by Terje Jonassen, 4170 Sjernarøy.

The genus Psacadina is closely related to the genus Pherbina and both genera have clear wings with numerous dark and rounded spots. In Psacadina the mesopleuron is haired with one strong seta and pteropleuron with hair only, while in Pherbina the mesopleuron has hairs and 1–3 setae and the pteropleuron has one strong seta. Subalar setae are absent in Psacadina, present in Pherbina.

Psacadina verbekei Rozkoň, 1975 is closely related to P. zernyi (Mayer, 1953). Males can be distinguished in the genitalia see Rozkoň (1984). Female P. zernyi as a rule are without ventral setae on hind femora.

According to Rozkoň (1984) the genus Psacadina has two species in Fennoscandia and Denmark, P. verbekei Rozkoň 1975, and P. zernyi. P. verbekei is hitherto recorded as common in Denmark and recorded in Sweden from Skåne north to Uppland. P. zernyi is widespread in Denmark, recorded from southern Sweden north to Ly.Lpm., and it is not rare in southern and central Finland. Rozkoň also says that P. zernyi is clearly more common in northern Europe than P. verbekei. Both species could thus be expected to occur in Norway in the south-eastern parts where Bøensætra is located. The larvae of P. zernyi probably feed on snails like Lymnaea and Physa (Rozkoň 1984).

ACKNOWLEDGEMENTS
We wish to thank Terje Jonassen, Sjernarøy who determined the specimen.

Sammendrag

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Received 11 Nov. 1992.
FAUNISTICAL AND ZOO GEOGRAPHICAL NOTES ON SOME NORWEGIAN SPIDER SPECIES (ARANEAE)

ERLING HAUGE

Short notes are given to the distribution in Norway and elsewhere in Europe of seven spider species: *Amaurobius similis* (Blackwall, 1845), *Clubiona coerulescens* L. Koch, 1867, *C. stagnatilis* Kulczynski, 1897, *C. subsultans* Thorell, 1875, *C. germanica* Thorell, 1871, *Tetragnatha dearmata* Thorell, 1875, and *Drapetisca socialis* (Sundevall, 1832).


*Amaurobius similis* (Blackwall, 1845)
Previously in Norway known from southern and southwestern coastal areas (Kristiansand and Stavanger) (Strand 1904, Hauge 1989). The present specimen (1 male) was found indoors in Bergen in November 1990 (G. Bakkerud coll.). Perhaps the most northern record ever for this species. It is not recorded from Sweden (Bonnet 1955), nor was it included in the lists from Finland (Palmgren 1977). Unlike its close relative, *A. fenestralis* (Stroem, 1768) it seems not to have reached the most northern island in Britain (the Orkneys) and the Shetland islands (Locket & al. 1974). *A. fenestralis* has a much wider distribution (Bonnet 1955) in Europe, reaching north to the Åland islands in south-western Finland (Palmgren 1977), Shetland (Locket & al. 1974), regarded as common in Norway north to Trondheim (Strand 1904, Hauge 1989), occasionally north to Vadsø in Finnmark (Strand 1904).

*Clubiona coerulescens* L. Koch, 1867
Hitherto only one record from Norway: Ål in the Hallingdal valley (Strand 1899). The present material from malaise traps was collected (A. Bruserud coll.) in a south-faced thermophilous deciduous forest (Eiksåsen) on the island of Helgøya in July 1990. Perhaps a more eastern and northern distribution in Europe compared to *C. coerulescens* (Bonnet 1956, Locket & al. 1974), almost reaching the Polar Circle in Sweden and Norway (Strand 1904, Koponen 1975, Hauge 1989), and a little further north in Finland (Hackman 1954, Koponen 1976). In southern Sweden regarded as one of the most common *Clubiona* species, from Scania to Ångermanland, but obviously not in the western counties (Tullgren 1945). In southern Norway registered mostly in the inner parts of the eastern areas (Hedmark, southern Oppland, western Buskerud, as well as from Vestfold and Østfold, Strand 1904), and from Aust-Agder in the more southern areas: One female at Mykland, 6 Sept. 1973 (T. Solhøy coll.). Not recorded from western Norway.

*C. stagnatilis* Kulczynski, 1897
Two males together with *C. coerulescens* (see above) on the Helgøya island in July 1990. Perhaps a more eastern and northern distribution in Europe compared to *C. coerulescens* (Bonnet 1956, Locket & al. 1974), almost reaching the Polar Circle in Sweden and Norway (Strand 1904, Koponen 1975, Hauge 1989), and a little further north in Finland (Hackman 1954, Koponen 1976). In southern Sweden regarded as one of the most common *Clubiona* species, from Scania to Ångermanland, but obviously not in the western counties (Tullgren 1945). In southern Norway registered mostly in the inner parts of the eastern areas (Hedmark, southern Oppland, western Buskerud, as well as from Vestfold and Østfold, Strand 1904), and from Aust-Agder in the more southern areas: One female at Mykland, 6 Sept. 1973 (T. Solhøy coll.). Not recorded from western Norway.

*C. subsultans* Thorell, 1875
Two males together with *C. coerulescens* (see above) on the Helgøya island in July 1990. Perhaps a more eastern and northern distribution in Europe compared to *C. coerulescens* (Bonnet 1956, Locket & al. 1974), almost reaching the Polar Circle in Sweden and Norway (Strand 1904, Koponen 1975, Hauge 1989), and a little further north in Finland (Hackman 1954, Koponen 1976). In southern Sweden regarded as one of the most common *Clubiona* species, from Scania to Ångermanland, but obviously not in the western counties (Tullgren 1945). In southern Norway registered mostly in the inner parts of the eastern areas (Hedmark, southern Oppland, western Buskerud, as well as from Vestfold and Østfold, Strand 1904), and from Aust-Agder in the more southern areas: One female at Mykland, 6 Sept. 1973 (T. Solhøy coll.). Not recorded from western Norway.

*C. germanica* Thorell, 1871
One male in a malaise trap 26 June—16 July 1990 (T. Andersen coll.), together with a female *C. subsultans*, at Bolfofis (Eidskog), close to the Swedish border in Hedmark county. Habitat: A mixture of *Picea* and *Alnus* (relatively humid) close to a river. Ground covered with coarse stones, mosses and *Vaccinium myrtillus*. *C. germanica* has been previously been recorded from a few localities in south-eastern Norway (Hauge 1989) and from Klæbu (Central Norway), but not in the western areas. In Sweden and Finland registered north to Lappland (Tullgren 1945; Hackman 1954; Palmgren 1965; Koponen 1974, 1976), but also in the western areas: Bohuslän (Tullgren 1945) and Åland (Lehtinen & al. 1979). It is not recorded from the British Isles (Locket & al. 1974), there is only one record from Denmark (Brøndegaard 1966) and a few registrations in the south-eastern corner of the Netherlands (van Helsdingen 1979). Otherwise rather widely distributed in eastern -
northern parts of Europe, reaching Russia, Siberia and even Turkestan (Bonnet 1956).

**Tetragnatha dearmata** Thorell, 1875

One male and 2 females in a malaise trap (26 June—16 August 1990) at Nystuen (Eidskog), Hedmark (T. Andersen coll.). Known from most parts of Sweden and Finland and regarded as the most common species of the genus in these countries (Tullgren 1947, Palmgren 1974). In Norway, on the contrary, registered only twice: Hol (in the Hallingdal valley) as *T. punctipes* Westring, 1874 (Strand 1899) and from Sør-Trøndelag (Central Norway) (Solem & Hauge 1973). It is not recorded from the British Isles, elsewhere in Europe with a predominantly eastern/northern distribution (Bonnet 1959, Wiehle 1965). The habitat at Nystuen was a mixture of *Salix* and *Alnus* on a very humid river bank with grasses (*Carex*). According to Wiehle (1963) and Palmgren (1974) a certain preference for coniferous forests.

**Drapetisca socialis** (Sundevall, 1832)

One male in a malaise trap (18 Aug.—12 Sept. 1990) in a birch wood close to buildings at Ramfjordnes, south of Tromsø, Northern Norway, at approximately 69° 30’N (L. G. Jensen leg.). Previously there are scattered records in southern Norway, mostly in western areas, but also in the east (Vassfaret) and north to Nærøy (Northern Trøndelag). In Finland very common in southern areas, distributed north to 66°N, which was regarded as its northern limit of distribution (Palmgren 1975).

### SAMMENDRAG

For 7 edderkopparter er det gitt korte kommentarer om deres utbredelse i Norge og ellers i Europa, samt nye funn i Norge. Artene er: *Amaurobius similis* (Blackwall, 1845), *Clubiona coerulescens* L. Koch, 1867, *C. stagnatilis* Kcyzynski, 1897, *C. subsultans* Thorell, 1875, *C. germanica* Thorell, 1871, *Tetragnatha dearmata* Thorell, 1875, and *Drapetisca socialis* (Sundevall, 1832).

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Received 15 April 1992.
ENDOTHERENIA MARGINANA (HA WORTH, 1811) (LEP., TORTRICIDAE) IN NORWAY

LARS OVE HANSEN, KAI BERGGREN, RUNE CHRISTENSEN, KAI MYHR & SVEIN SVENDSEN

The tortricid moth *Endothenia marginana* is reported from the following localities in 1990 and 1991: the island Asmaløy, Hvaler, Østfold (Ø); Einarsneset, Farsund, Vest-Agder (VAY) and Skår, Haram, Møre og Romsdal (MRY). The species is previously not reported from Norway. Notes on distributed and biology are given.

Lars Ove Hansen, Sparavollen 23, N-3021 Drammen, Norway.
Kai Berggren, Bråvann terasse 21, N-4622 Kristiansand, Norway.
Rune Christensen, Hans Rustads vei 1, N-2008 Fjærdingby, Norway.
Kai Myhr, Postboks 140, N-2630 Ringebu, Norway.
Svein Svendsen, Sodefjedveien, Postkasse 28, Stangenes, N-4639 Kristiansand, Norway.

During light-trap catches at Asmaløy in Østfold (Ø Hvaler: Huser, EIS 12), a male of the tortricid moth *Endothenia marginana* was taken 3 August 1990, leg. Rune Christensen. This species is previously not reported from Norway. The trap was situated on a meadow scattered with heather (*Calluna vulgaris*) and partly surrounding by oak (*Quercus* sp.) and poplar (*Populus tremula*). On the same night as the record above, a male was captured at Lista in Vest-Agder (VAY Farsund: Einarsneset, EIS 1), leg. Kai Berggren; 28 August 1990 a female was taken at the same locality, leg. S. Svendsen, and 2 males 30 August 1991, leg. Kai Berggren and Kai Myhr. Furthermore a male and two females were captured in Møre og Romsdal at the Norwegian west-coast (MRY Haram: Skår, EIS 76) 2 July 1991, leg. Kai Myhr; the locality is open moorland with marshy areas and situated only 300 meters from the sea, and the vegetation is dominated by heather (*C. vulgaris*) and scattered with grass.

At the British Isles the larvae of *E. marginana* are found from September to June in flower — and seed-heads of *Betonica officinalis* and *Galeopsis* spp., living in silken galleries and feeding on the seeds (Bradley et al. 1979). They are also found on *Pedicularis sylvatica, P. palustris* and *Rhinanthus minor*, eating the seeds and overwintering in the seed capsule. The species inhabits rough meadows and grassland, waysides, embankments, damp woods, boggy heaths and fens (Bradley et al. 1979). The imago is on the wings from June to August. It is easily disturbed from rest amongst low-growing vegetation during the day, and flies low down about its habitat during the evening.

Svensson et al. (1987) report *E. marginana* from 16 Swedish regions, southernmost Skåne (Sk) and northernmost Torne Lappmark (To). In Denmark it is reported from 7 regions (Schnack 1985). Furthermore it is reported from Finland (Svensson et al. 1987), the British Isles, Central and Southern Europe, North Africa (Bradley et al. 1979) and eastwards through Transcaucasia, Ural, Kazakhstan, Siberian to Mongolia and China (Kutznetzov 1976).

Since the species has a wide distribution in Sweden (Svensson et al. 1987), we may suppose that the species has a wide range also in Norway. The record from Torne Lappmark may indicate that the species also is present in northern Norway. However, we hope collectors will keep their eyes open in the future for this species.

The species may be distinguished from similar species with its more white hindwings. *E. marginana* is illustrated in colour by Bradley et al. (1979), while the genitalia are figured by Kutznetzov (1976).

ACKNOWLEDGEMENTS

We are greatly indebted to Leif Aarvik who determined the specimen from Asmaløy and commented on the manuscript.

SAMMENDRAG

Vikleren *Endothenia marginana* er rapportert fra følgende norske lokaliteter i 1990 og 1991: Asmaløy, Østfold (Ø Hvaler: EIS 12); Lista, Vest-Agder (VAY Farsund: Einarsneset, EIS 1), leg. Kai Berggren; 28 August 1990 a female was taken at the same locality, leg. S. Svendsen, and 2 males 30 August 1991, leg. Kai Berggren and Kai Myhr. Furthermore a male and two females were captured in Møre og Romsdal at the Norwegian west-coast (MRY Haram: EIS 76). Arten er tidligere ikke rapportert fra Norge. Anmerknings angående utbredelse og biologi er gitt.

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