NORWEGIAN JOURNAL OF ENTOMOLOGY


Norwegian Journal of Entomology publishes original papers and reviews on taxonomy, faunistics, zoogeography, general and applied ecology of insects and related terrestrial arthropods. Short communications, e.g. one or two printed pages, are also considered. Manuscripts should be sent to the editor.

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NEF web site: http://www.entomologi.no

Front cover: Syngrapha interrogationis (L., 1758) (Lepidoptera, Noctuidae). Artist: Hallvard Elven.

Printed by: Reprografisk Industri AS, Oslo
A small jubilee

With the present issue of Norwegian Journal of Entomology we have reached Volume 50. This figure, however, does not correspond to the age of the journal, which is actually 82 years. The journal was founded by The Norwegian Entomological Society in 1921 under the name of Norsk Entomologisk Tidsskrift. Initially, each volume included issues from several years. Many papers were written in Norwegian. From 1967 with Volume 13, the volumes correspond to the calendar years.

Over the years more and more papers were written in English. In order to give the journal a more international appearance, the name was changed to Norwegian Journal of Entomology with Volume 22 in 1975.

In 1979, support to the journal from The Norwegian Research Council was discontinued. The council expected taxonomic and ecological papers to be published in international Nordic journals, like Oikos, Holarctic Ecology and Entomologica Scandinavica, which they supported. One problem remained. There was no journal for publishing local, faunistic papers.

The situation changed later in the same year, when The Norwegian Research Council decided to support a series of faunistic journals. Our journal was continued as Fauna Norvegica Series B, with subtitle Norwegian Journal of Entomology. Up to 1993, Series B was published by Norsk zoologisk tidsskriftsentral at The Zoological Museum in Oslo, but from 1994 publication was taken over by Norsk institutt for naturforskning (NINA) in Trondheim.

Due to financial problems, however, NINA decided to discontinue publication of the journal from 1998. For this reason, since 1999 the journal has again been published by The Norwegian Entomological Society. The name was changed back to Norwegian Journal of Entomology, and the journal receives support from The Norwegian Ministry of Environment.

Since the Norwegian Entomological Society took over, submissions of manuscripts have been regular and satisfactory. Two issues have appeared yearly, including a large report from the 25th Nordic Baltic Congress of Entomology in 2001. We hope to continue publication of the journal at an international level with papers on all topics of entomology. The Nordic international journals have become quite specialised, and have high levels of refusals. For this reason national entomological journals are still very important.

The Editor
Dette er tittelen på den trykte katalogen over Norges sommerfugler. Her vil du finne alle norske arter listet opp med opplysninger om i hvilke fylker og regioner de er påvist. I tillegg gis det kommentarer til nesten 500 av de i alt 2123 artene. Samtidig er katalogen en sjekkliste over samtligesommervflugarter i de nordiske land. Artenes forekomst i hvert av disse landene er angitt ved hjelp av bokstavkoder.

**Leif Aarvik, Kai Berggren & Lars Ove Hansen (Auctores)**

Sigurd A. Bakke, Yngvar Berg, Øistein Berg, Kai Berggren, Bjørn M. Fjellstad, Lars Ove Hansen, Kai Myhr, Heimo O. Pöhönen, Svein Svendsen & Leif Aarvik (Contributores)

Lepidopterologisk arbeidsgruppe Zoologisk Museum, Univ. i Oslo Norsk institutt for skogforskning

194 sider (190x265 mm)  
Tekst på norsk og engelsk.  
Pris: Kr. 200,- / 250,-  
(Uinnb./innbundet)  
ISBN 82-995095-1-3

Boken kan kjøpes gjennom Norsk Entomologisk Forenings distributør ved:

Insektavdelingen, Zoologisk museum,  
Postboks 1172 Blindern,  
NO - 0318 Oslo  
Tlf. 22 85 16 82; E-mail: karsten.sund@nhm.uio.no
On the validity of the species *Exechiopsis aemula* Plassmann and *Exechiopsis pulchella* (Winnertz) (Diptera, Mycetophilidae)

Olavi Kurina


The morphological differences between the species *Exechiopsis pulchella* (Winnertz, 1863) and *E. aemula* Plassmann, 1984 are discussed, based on an analysis of the taxonomic literature and the study of type material. The validity of the second species is established. Detailed illustrations of male genitalia for both species are given.

Key words: Diptera, Mycetophilidae, *Exechiopsis*, taxonomy, Europe.

Olavi Kurina, Institute of Zoology and Botany of Estonian Agriculture University, Riia st. 181, Tartu 51014, Estonia, e-mail: olavi@zbi.ee

INTRODUCTION

When studying European material of the subgenus *Exechiopsis s. str.* Tuomikoski, 1966 a problem occurred in the identification of the species *E. (s. str.) pulchella* (Winnertz, 1863) which brought about an analysis of the literature and review of available type material.

In the Palaearctic region another two species were described, close in morphological characteristics to *E. pulchella*. Both of them have been reported subsequently as junior synonyms: *E. forciposa* (Tollet, 1955) – synonymised by Hackman (1988) with remark «questionable»; *E. aemula* Plassmann, 1984 – synonymised by Ševák (2001). During the original study two groups of specimens could clearly be distinguished and the validity of the species *E. aemula* was established by study of type material. The difference between the species appears primarily in the structure of male genitalia, which is discussed below.

METHODS AND ABBREVIATIONS

The studied material includes specimens preserved on pins and of specimens preserved in 70% alcohol. For each dry preserved specimens the genitalia were separated from the abdomen and heated in 15% KOH for maceration. The remaining chitinous parts were washed with acetic acid and distilled water for neutralisation and inserted into glycerine. The genitalia were preserved as glycerine preparations. For material preserved in alcohol there was no need for maceration of the genitalia, as the observation of their structure was possible directly.

Abbreviations of museums in which material are deposited:
IZBE – Institute of Zoology and Botany, Estonian Agriculture University, Estonia;
JSPC – Jan Ševák Personal Collection, Ostrava, Czech Republic;
MNHN – Muséum National d’Histoire Naturelle, Paris, France;
ZMAN – Zoölogisch Museum Amsterdam, Nederland;
ZSM – Zoologische Staatsammlung in München, Germany.
THE SPECIES

**Exechiopsis (Exechiopsis) aemula Plassmann**
Figures 2, 4, 6, 8.

**Exechiopsis (Exechiopsis) pulchella** (Winnertz, 1863): Krivosheina et al. (1986); Kurina (1998); SevCik (2001).

**Diagnostic characters.** Mesonotum entirely yellow or light brown with yellow shoulders. Pleural parts yellow to brownish. Head brown. Scape and pedicel and basal half of first flagellomere yellow, other segments of flagellum brown. Legs yellow, tarsi brown. Abdomen entirely brownish or with yellowish bands on hind margins of tergites. Wings clear, apical part of R5 distinctly convergent with M1. Proepisternum with one bristle.

Male genitalia: depth of ventral cavity of gonocoxite forms one third of the height of the gonocoxites; medial appendage of gonocoxite apically somewhat angled; ventral appendage of gonostylus without distinct medially directed lobe, existing only as a bump; median appendage of gonostylus curved on apical third, with two combs of spines, the apical consisting of 2-4 spines, one of them usually longer, the subapical comb located on upper third of appendage and consisting of 3-6 spines. Male genitalia are represented on Figures 1, 3, 5 and 7.

Material:
- **Italy.** 1 ♂, Aosta, Valgrisanche, Chamcon, alt. 1280 m, 12 Sept. 1974, L. Matile leg. [MNHN].
- **Germany.** 1 ♂, Freiburg, Bechtaler Wald, 20 March 1985, FVA-Abt. Ws. leg. (= Forstliche Versuchs und Forschungsanstalt Baden-Württemberg).
Figures 5–8. Ventral (Figures 5, 6) and internal (Figures 7, 8) views of gonostylus.
5, 7. Exechiopsis pulchella (Winnertz, 1863); 6, 8. Exechiopsis aemula Plassmann, 1984. Abbreviations: c = medial lobe of ventral appendage of gonostylus; d = apical comb of spines on medial appendage of gonostylus; e = subapical comb of spines on medial appendage of gonostylus; other abbreviations see Figures 1, 2.
While studying the material collected by R. Leruth from caves in Romania, R. Tollet (1955) described a new species – *Exechiopsis forciposa* (Tollet, 1955) and gave detailed figures of the male genitalia (pl. III, Figs. 10–12); however, it is apparent from his figures that it is the same species figured by Lundström (1909). According to Tollet (1955) the type material of *E. forciposa* is deposited in the Royal Museum of Natural History in Belgium but it could not be located by P. Limbourg (pers. comm.). Despite the unavailability of the types, the present study support the synonymy proposed by Hackman (1988), i.e. *E. forciposa* as a junior synonym of *E. pulchella*.

A. Zaitzev figured *E. pulchella* (Krivosheina et al. 1986) but his figure does not represent the species figured by Lundström; however, it is apparently conspecific with *E. aemula*. Ševčík (2001) had studied the holotype of *E. aemula* but he followed Zaitzev’s identification of *E. pulchella* and synonymised the species. The situation that Zaitzev’s figure does not represent the true *E. pulchella* had already been detected by L. Matile. In the Museum of Natural History in Paris I found material of *E. pulchella* determined by L. Matile and separated into two groups with handwritten labels: «Exechiopsis. (E.) pulchella Winnertz» and «Exechiopsis (E.) pulchella Zaitzev non Winnertz».

Study of the type material of *E. aemula* reveals that the two species differ mainly on the basis of male genitalia, which is discussed in Table 1 with reference to the respective figures.

**Acknowledgements.** I am much obliged to Dr. M. Baylac (Muséum National d’Histoire Naturelle Paris, France), Dr. H. de Jong (Zooligisch Museum Amsterdam, Nederland) and Dr. W. Schacht (Zoologische Staatssammlung in München, Germany) for an opportunity to work with the collections. My very special thanks are due to Dr. J. Ševčík (Ostrava, Czech Republic) for the loan of material, to Dr. B. Økland (Ås, Norway) for the permission to use his unpublished data and to Dr. A. Polevoi (Petrozavodsk, Russia) for the valuable comments. I am very grateful to Dr. P. Chandler (Meksham, United Kingdom) for his help and critical perusal of the manuscript. The study was financially supported by grant 4990 of Estonian Science Foundation.
Table 1. Morphological differences of male genitalia between *Exechiopsis aemula* Plassmann, 1984 and *Exechiopsis pulchella* (Winnertz, 1863).

<table>
<thead>
<tr>
<th></th>
<th>Exechiopsis aemula Plassmann, 1984</th>
<th>Exechiopsis pulchella (Winnertz, 1863)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>dorsal apical appendage of gonocoxite (gc ap)</strong></td>
<td>with distinct hump (Figure 4)</td>
<td>without such a hump (Figure 3)</td>
</tr>
<tr>
<td><strong>cerci</strong></td>
<td>slender, without cavity on basal margin (Figure 4)</td>
<td>bold, with cavity on basal margin (Figure 3)</td>
</tr>
<tr>
<td><strong>ventral cavity of gonocoxite</strong></td>
<td>relatively deep, half height of gonocoxites (Figure 1: a)</td>
<td>relatively shallow, about one third height of gonocoxites (Figure 2: a)</td>
</tr>
<tr>
<td><strong>ventral medial appendage of gonocoxite (gc med)</strong></td>
<td>rounded at apex (Figure 2)</td>
<td>somewhat angled at apex (Figure 1)</td>
</tr>
<tr>
<td><strong>ventral appendage of gonostylus</strong></td>
<td>without distinct medially directed lobe, existing only as a bump (Figures 6, 8: c)</td>
<td>with distinct medially directed lobe (Figures 5, 7: c)</td>
</tr>
<tr>
<td><strong>dorsal appendage of gonostylus (gst dors)</strong></td>
<td>basal width about half of its apical width (Figures 6, 8)</td>
<td>basal width about three-quarters of its apical width (Figures 5, 7)</td>
</tr>
<tr>
<td><strong>medial appendage of gonostylus</strong></td>
<td>curved only on apical third; apical comb consisting of two spines; subapical comb consisting of 10–13 spines and located on upper third of appendage (Figures 6, 8: d, e)</td>
<td>curved; apical comb consisting of 3–4 spines; subapical comb consisting of 3–6 spines and located on middle of appendage (Figures 5, 7: d, e)</td>
</tr>
<tr>
<td><strong>internal appendage of gonostylus (gst int)</strong></td>
<td>apex tapering (Figure 6)</td>
<td>apex blunt (Figure 5)</td>
</tr>
</tbody>
</table>

REFERENCES


arctischen Region, 8. E. Schweizbart'sche Verlagsbuchhandlung. Stuttgart.


Received 5 December 2002, accepted 10 March 2003.
Distribution and ecology of the water spider, *Argyroneta aquatica* (Clerck) (Araneae, Cybaeidae), in Norway

Kjetil Aakra & Dag Dolmen


The distribution of the water spider *Argyroneta aquatica* in Norway is presented with a list of all known localities. The species is common in eastern parts of South Norway but absent from Western Norway. This absence may be due to topological constraints to dispersal and is unlikely to be caused by climate. The species is also known from Finnmark while it has not been found in most parts of Nordland and is apparently absent from Troms. Barriers formed by the mountains chains along the Norwegian/Swedish/Finnish border may be the cause of this. Notes on the ecology of the species are provided. *A. aquatica* may be found in both oligotrophic/dystrophic and eutrophic ponds and small lakes. It has also been observed in running water. The most important prerequisite appears to be vegetation such as *Sphagnum* where it can spin its egg sacs.

Key words: *Argyroneta aquatica*, Araneae, distribution, ecology, Norway.

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INTRODUCTION

The water spider *Argyroneta aquatica* (Clerck, 1757) is unique among the spiders in that it lives a wholly aquatic life. Its distribution is Palaearctic (Platnick 2002). In Norway the species was first reported from Ringerike, Buskerud, by Strand (1899), and other early records were published from various localities in the vicinity of Oslo (Strand 1900, 1904). It took more than 60 years before the next records were published, this time from the vicinity of Oslo (Brun et al. 1965) and from Finnmark (Cooke 1967, Waaler 1970). Dolmen (1977) provided an extensive review of all known and previously unpublished records from the Trøndelag counties as well as several unpublished records from southeastern and southern Norway. This information was not fully included in the Norwegian checklist (Hauge 1989) which indicated that the water spider could be found throughout Norway with the possible exception of western Norway. Only two records have subsequently been published, from Nordland (Arneklev 1982) and from Tjøme (Andersen & Hauge 1995), but the species has been briefly dealt with in several semi-official reports (Dolmen 1990, 1991, 1996) as well as in Limnofauna Norvegica (Aagaard & Dolmen 1996). A comparatively large number of unpublished records from Trøndelag and southeastern parts of Norway have subsequently been made by the second author and others (see Acknowledgements) and a few previously undetermined specimens were found in the collections of the Museum of Natural History and Archaeology by the first author. The aim of this paper is to present all known Norwegian records of *A. aquatica* and provide some comments on the ecology and distribution of the species in Norway.

MATERIAL & METHODS

Material present in the Museum of Natural History and Archaeology (abbreviated MNHA in the list below) has been examined. Older material has
proved untraceable, e.g. Strand’s records, but has nevertheless been included in the locality list as the species is easily identified. These older records have not been included in the map, however, because the locality information provided is not accurate enough. In our overview, dates, legator and other information are only provided for records not previously published. All new records are leg. D. Dolmen unless otherwise stated.

Grothendieck & Kraus (1994) transferred *A. aquatica* to the subfamily Cybaeinae within the Agelenidae based on comparison of genital characters. Cybaeinae is given familial rank by Platnick (2002).

**RESULTS**

**Published localities**

- BV Flå: Lille Damjtjern (EIS 44) (Dolmen 1977).
- Ringerike (Strand 1899).
- AAI Åmli/AAY Vegårdshøi: Selåsvatnet (14 July 1977) (mentioned by Dolmen 1977, but no date provided).
- NSY Brønnøysund: 5 localities at Lomtjønna and pond 233, Lomsdalvassdraget (EIS 114) (Arnekleiv 1982).
- MRI Rindal: Gåstjønna (EIS 85) (Dolmen 1977).
- Surnadal: 210cs at Høglivatnet and ponds on Fagermyran, Nordmarka (EIS 85) (Dolmen 1977).
- NTY Namsskogan: Kjelmosetra (EIS 107) (Dolmen 1977).
- Ørland: pond at Vardeheia (EIS 96) (Dolmen 1977).

**New localities**

Figure 1. Distribution of the water spider *Argyroneta aquatica* (Clerck) in Norway. The thick line indicates the probable limit of distribution in Norway. The question marks indicate uncertainties with regard to occurrence.
region (indicated by question marks in Figure 1) is not known with certainty, but appears to be abrupt, especially in the north.

The explanation for the absence of *A. aquatica* from western Norway may in part be a matter of time, i.e. the species has not had enough time since the retreat of the ice sheet to colonize this region of the country. In view of the extensive distribution of the species in the rest of Europe and the presence of suitable habitats in Western Norway (see above and below), however, the existence of serious barriers must have prevented its distribution further west in Norway. Such barriers could be the topography itself, whereby the steep mountainsides, extensive fjord systems and large tracts of alpine mountain plateaus make effective dispersal difficult. Climatic factors such as heavy precipitation levels, relatively warm winters and cool summers prevailing in the oceanic west, probably do not affect the distribution of *A. aquatica*.

We also believe that saltwater represent a serious barrier to the species and it is thus unlikely to appear on coastal islands, including larger islands like Hitra and those in the Lofoten archipelago in the North. *A. aquatica* was not found during a recent survey of the invertebrate fauna on Hitra and other coastal island in Trøndelag (Grenstad et al. 2000).

Unlike many other spiders, which use «ballooning» during the dispersal phase, *A. aquatica* has not been reported to use this kind of anemochore dispersal. Accordingly, it cannot cross fjords and mountains or large dry areas of land as easily as other species.

As Figure 1 shows, there is a very large gap between the locality in Nordland (Arnekleiv 1982) and the record by Cooke (1967) from Porsangerfjord. The water spider may actually be absent from most of this region, as the mountains and alpine plateaus between Norway and Sweden/Finland probably constitute significant barriers to the species. Palmgren (1977) for instance, noted the absence of *A. aquatica* from the Kilpisjärvi area. If this is the case, the species may be absent from the majority of Troms county and northern-most parts of Nordland, although the record from Abisko (Holm 1945) must be noted. The species seems to be more widespread in Finnmark, however.

All in all, the distribution of the water spider in Norway is distinctly eastern, (cf. Aagaard & Dolmen 1996: p. 24, map D). Only future records can reveal the true distribution of the water spider in Norway, but present knowledge hints at some interesting patterns.

Ecology and habitat preferences

In Norway the water spider has been found in a wide range of limnic habitats. In Trøndelag a typical *Argyroneta*-locality is represented by oligotrophic/dystrophic bog ponds and small lakes dominated by *Sphagnum* and surrounded by pine and spruce forest (Dolmen 1977). Most of these ponds are small, and their altitude ranges between 150 to 750 m.a.s.l.

The species has a very wide ecological amplitude in Norway, however. In eastern parts of southeastern-Norway it has been reported from eutrophic lakes and ponds and it has even been sighted in running water (Hans A. Olsvik pers. comm.). It thus seems able to utilize almost any kind of standing water bodies, as long as there is some vegetation present.

*A. aquatica* prefers the shallow parts of the ponds, where it spins its characteristic and shiny white egg sacs which may be located just below the water surface within the *Sphagnum*. The other silk constructs of the water spider are harder to discover and are usually placed in somewhat deeper water (Bristowe 1971). The species is active throughout the ice-free season. The earliest observations are from early May whereas it is active until at least October in southern Norway.

**Acknowledgements.** Thanks to Hans A. Olsvik, Noralf Frengen, Jon K. Skei, Hilde Åseth and Jan Seland for information on localities and observations of *Argyroneta* and to Richard Binns for checking the language.
REFERENCES


Received 30 October 2002, accepted 7 February 2003
On the Norwegian thrips fauna (Thysanoptera)

Sverre Kobro


The number of thrips species presently known to Norway is 125 of which 11 are imported or intercepted greenhouse species. A reference collection at The Norwegian Crop Research Institute, Plant Protection Centre, contains 109 of these species of which 22 are not reported from Norway previously.

Key words: Thrips, new species, reference collection, Norway.

INTRODUCTION

As thrips (Thysanoptera) are very small and easily overlooked insects, they have not gained much attention. The first extensive work on thrips in Norway was made by Herstad (1960) who reported 24 species. Olsen & Solem (1982) performed a more comprehensive study. Based on data collected from other entomologists and from several museums in northern Europe, in addition to their own collecting effort, they listed 88 species from Norway. Later papers (Olsen 1987, Selnes 1988, Olsen & Midtgaard 1996) increased the number of species to 96. Based on these data and on records from nearby countries the expected total number of thrips species in Norway was estimated to 120 (Ottesen 1993).

MATERIAL AND METHODS

An investigation on thrips was initiated in 1995 at The Norwegian Crop Research Institute, Plant Protection Centre, where a reference collection is compiled. Thrips were collected mostly by one of two methods:

1) Green plant material, in some cases with flowers, was collected and washed (Kobro 1996).

2) Bark or debris from beaten branches of dead trees was collected and incubated in Berlese funnels (Kobro 2001).

Collecting of live plant material took place from April to September, but bark and branches from dead trees could be sampled throughout the year. All specimens, except some larvae, were macerated with alkali and mounted in Canada balsam.

Collecting has only been carried out systematically in the vicinity of the author's residence at Nesodden, Fagerstrand (EIS 28). Otherwise the sampling has been more random in connection with duty travels and vacations.

The specimens presented below are deposited at The Norwegian Crop Research Institute, Plant Protection Centre, and they were collected and identified by me unless otherwise stated. Forty-four of the identifications were verified by zur Strassen. Four of the species mentioned have been presented recently as new to Norway: Stenothrips graminum (Kobro et al. 2000), Hoplothrips polysticti and H. unicolor (Kobro 2001) and H. carpathicus (Kobro & Solheim 2002). Species not reported previously from Norway are marked with an asterisk.

Records for each biogeographic region (K.A. Økland 1981), municipality and EIS square (J. Økland 1976) are given. As the sampling methods used were not standardised to give quantitative results, the number of collected specimens is not given. Because the reproduction of thrips is arrhenotok or thelytok parthenogenetic (Lewis 1973), and the sex ratio varies a lot between species.
(Olsen 1984), the sex of the recorded specimens is therefore given.

The nomenclature follows Schliephake & Klimt (1979), with some recent corrections (zur Strassen pers. com.). Information of ecological interest is also noted (Ahlberg 1926, Maltebæk 1932, Mound et al. 1976, Qvick 1977, Schliephake & Klimt 1979 and own notes). Presence in the Nordic countries is shown in brackets (N = Norway, S = Sweden, F = Finland, D = Denmark, I = Iceland).

LIST OF SPECIES

Aeolothripidae

*Aeolothrips albicinctus* Haliday, 1836


*Aeolothrips ericae* Bagnall, 1920


*Aeolothrips fasciatus* (Linnaeus, 1758)


In flowers of many plant species, both imagoes and larvae are predators. Common. (NSFD).

*Aeolothrips manteli* Titschack, 1962

VE Tjøme: Mostranda (EIS 19) ♯.

On *Anchusa officinalis*. Previously recorded only a few times in Dutch marine areas on the same plant. (N).

*Aeolothrips melaleucus* Haliday, 1852


On deciduous trees, predatory on thrips, mites and probably other small arthropods. (NS).

*Aeolothrips versicolor* Uzel, 1895

AK Frogn: Lågøy (EIS 28) ♯, Nesodden: Fagerstrand (EIS 28) ♯. TEY Kragerø: Bråtøy (EIS 11) ♯.

On deciduous trees, predatory on thrips and other small arthropods. (NSFD).

*Aeolothrips vittatus* Haliday, 1836


On *Pinus* and *Picea*, probably predacious. (NSFD).

*Rhipidothrips niveipennis* Reuter, 1899

AK Nesodden: Fagerstrand (EIS 28) ♯. VE Larvik (Brunlanes): Hummerbakken (EIS 19) ♯. AAI Evje & Hornes: Evje (EIS 5) ♯.

On grasses. (NSF).
Thripidae

Anaphothrips badius (Williams, 1913)
Ø Fredrikstad (Borge): Torsnes (EIS 20) Q. VE Tjøme: Mostranda (EIS 19) Q.
On Carex or Phragmites, on marshy ground, probably rare. (NSD).

Anaphothrips obscurus (Müller, 1776)
On grasses and cereals, common. (NSFD).

Apterothrips secticornis (Trybom, 1896)
On grasses and in flowers in the mountains up to the snowline, Q very rare (Kjellsen 1973). (NSFI).

Aptinothrips elegans Priesner, 1924

Aptinothrips rufus Haliday, 1836

Aptinothrips stylifer Trybom, 1894
On several grass species, particularly Deschampsia and Dactylis, common, often together with A. rufus, Q very rare. (NSFDI)

Baliothrips dispar (Haliday, 1836)
On Gramineae in wet areas. (NSFD).

Belothrips acuminatus Haliday, 1836
AK Nesodden: Fagerstrand (EIS 28) Q. BV Flå: Stavn (EIS 35) Q. VE Larvik (Brunlanes): Hummerbakken (EIS 19) Q.
On Galium verum, not common. (NSFD).

Ceratothrips ericae (Haliday, 1836)
**Chirothrips hamatus** Trybom, 1895


On grasses, not common. (NSFD).

**Chirothrips manicatus** Haliday, 1836


On grasses, very common. (NSFD).

*Chirothrips saltat­rix* Uzel, 1895


On leaves of *Tilia cordata*. (N).
Frankliniella intonsa (Trybom, 1895)


In many flowers, very common. (NSFD).

*Frankliniella occidentalis* (Pergande, 1895)

Ø Moss: Jeløy (EIS 20) ♀. AK Nesodden: Fagerstrand (EIS 28) ♀. TEI Gvarv: Gvarv (EIS 18) ♀. RY Ombo (EIS 14) ♀, Stavanger: Stavanger (EIS 8) ♀♂.

Serious pest in greenhouses, also collected on free land. (NSFD).

Frankliniella tenuicornis (Uzel, 1895)


On grasses and cereals, potential as pest, common. (NSFD).

*Hemianaphothrips articulosus* Priesner, 1925

Ø Fredrikstad (Borge): Torsnes (EIS 20) ♀. VE Larvik (Brunlanes): Hummerbakken (EIS 19) ♀. Probably on Carex and grasses in moist areas. (ND).

*Hercinothrips femoralis* (Reuter, 1891)

AK Ås: Ås (EIS 28) ♀. ON Nord-Fron: Vinstra (EIS 62) ♀ leg. B. Lilleeng.

Long known as a greenhouse species (Ahlgberg 1922), also collected outdoors. (NSFD).

Iridothrips iridis (Watson, 1924)

AAI Arendal: Nedenes (EIS 6) ♀♂.

On Iris pseudacorus. (NSFD).

Kakothrips robustus (Uzel, 1895)

Ø Fredrikstad (Onsøy): Slevik (EIS 20) ♀. HEN Tynset: Tynset (EIS 80) ♀. TEI Tinn: Austbygda (EIS 34) ♀♂. HOI Etne: Frette (EIS 23) ♀.

Was previously a pest in Pismum, Lathyrus and Viciae, but apparently less common at present. Collected on Vicia cracca. (NSFD).

Limothrips cerealium Haliday, 1836

Ø Fredrikstad (Borge): Torsnes (EIS 20) ♀. AK Frogna: Sæbø (EIS 28) ♀. VE Borre: Langgrunn (EIS 19) ♀. Sem: Oseberg (EIS 19) ♀♂.

On grasses and cereals, not common. (NSFD).

Limothrips denticornis Haliday, 1836

Halland (EIS 87) ♀, Trondheim: Gaulosen (EIS 92) ♀. NTI Stjørdal: Hell (EIS 92) ♀.
On grasses, common. Regarded as pest in cereals. (NSFD).

**Mycterotrichos latus** (Bagnall, 1912)

On Betula leaves. (NSFD).

**Mycterotrichos salicis** (Reuter, 1879)

On Salix leaves. (NSFD).

**Neohydatothrips abnormis** (Karny, 1910)

TEI Tinn: Austbygda (EIS 34) ♀.
In flowers of Fabacea. (N).

**Neohydatothrips gracilicornis** (Williams, 1916)

In flowers of Fabacea, particularly in *Vicia cracca*, common. (NSF).

**Odontothrips biuncus** John, 1921

On *Vicia* and *Lathyrus*. Common. (NSFD).

**Odontothrips intermedius** (Uzel, 1895)

On *Lathyrus montanus*. (NSFD).

**Odontothrips loti** (Haliday, 1852)

On *Vicia* and *Lathyrus*. Common. (NSFD).
*Odontothrips phaleratus* (Haliday, 1836)

Ø Fredrikstad (Borge): Torsnes (EIS 20) ♀. BØ Hurum: Holmsbu (EIS 28) ♀. VE Horten: Horten (EIS 19) ♀.

On *Lathyrus montanus* and *L. pratensis*. (NSFD).

*Oxythrips ajugae* Uzel, 1895


On *Avena sativa*, not common. (NSFD).

*Oxythrips bicolor* (Reuter, 1879)


On ♀ cones of *Pinus*, often together with *O. bicolor*, very common. (NSFD).

*Rubiothrips silvarum* (Priesner, 1920)

Ø Fredrikstad (Onsøy): Slevik (EIS 20) ♀. AK Nesodden: Fagerstrand (EIS 28) ♀. BV Gol: Rotheim (EIS 43) ♀. VE Borre: Lovøya (EIS 19) ♀.

On *Gallium verum*, locally abundant. (NSFD).

*Scirtothrips longipennis* (Bagnall, 1909)

AK Oslo (EIS 20) larvae leg. & det T. H. Schøyen. In greenhouses. Has been a pest (Fjeldalen 1953), but the pest status is more doubtful at present (Mound, in litt.). (NSFD).

*Selenothrips rubrocinctus* (Giard, 1901)


*Stenothrips graminum* Uzel, 1895

AK Nesodden: Fagerstrand (EIS 28) ♀. On grasses and *Avena sativa*, not common. (NSFD).

*Taeniothrips inconsequens* (Uzel, 1895)


Previously well known as a serious pest on pear, but at present collected mainly from *Sorbus aucuparia*. A similar change of host plant has probably occurred on the American continent (Kobro 1999). (NSDI).

*Taeniothrips picipes* (Zetterstedt, 1828)


*Parthenothrips dracaenae* (Heeger, 1854)


Long known as a pest on ornamental plants in greenhouses (Ahlberg 1922). Collected once outdoors and once hibernating in bark of *Picea*. (NSFD).
Thrips dilatatus Uzel, 1895

**BV** Hol: Dagali (EIS 34) Q. **HEN** Tynset: Kvikne (EIS 80) Q. **STY** Hitra: Kvenvær (EIS 90) Q. On *Rhinanthus*, not common. (NSFD).

**Thrips flavus** Schrank, 1776


**Thrips fuscipennis** Haliday, 1836


In flowers. (NF).

**Thrips brevicornis** Priesner, 1920


In flowers. (NF).

**Thrips calcaratus** Uzel, 1895

**AK** Nesodden: Fagerstrand (EIS 28) Q. On *Tilia* at bud burst. (NFD).
On leaves and in flowers of many plant species, very common. Regarded as a pest in apple and strawberries. Often together with *T. major* (NSFD).

*Thrips juniperinus* Linnaeus, 1758

**BV** Hol: Dagali (EIS 34) ♂♀. On *Juniperus communis* (NS).

*Thrips linaiae* (Priesner, 1928)

**BV** Gol: Gol (EIS 43) ♀♂ det R. z. Strassen. **VE** Borre: Løvøya (EIS 19) ♀. **VAY** Kristsiansand: Hamresand (EIS 5) ♀.

On *Linaria vulgaris* (NS).

*Thrips major* Uzel, 1895


Often found together with *Thrips fuscipennis*, very common. (NSFD).

*Thrips menyanthidis* Bagnall, 1923

**AK** Nesodden: Fagerstrand (EIS 28) ♀. **VE** Tjøme: Mostranda (EIS 19) ♀.

On *Menyanthes trifoliata* (NF).

*Thrips minutissimus* Linnaeus, 1758


On woody Rosaceae. Not common. (NSFD).

*Thrips nigropilosus* Uzel, 1895

♀ Oslo larvae leg. & det T. H. Schøyen.

In greenhouses. (NSFD).

*Thrips physapus* Linnaeus, 1758


In flowers of Compositae, common. (NSFD).

*Thrips pini* (Uzel, 1895)


On leaves of *Picea abies*, not common. (NSFDI)

Norw. J. Entomol. 50, 17–32. 2003
Thrips robustus Priesner, 1920

NSY Bode: Saltstraumen (EIS 130) Q♂.
Collected once on Lotus corniculatus. (N).

Thrips tabaci Lindeman, 1889


land (EIS 16) Q, VAY Kristiansand: Hamresand (EIS 5) Q. HOI Etne: Frette (EIS 23) Q, Kvam: Svevatn (EIS 31) Q Q leg. J. Skartveit & K. H. Thunes, Eid-

Polyphagous in greenhouses and outdoors. (NSFDI)

Thrips trehernei Priesner, 1927

Fron: Fjellhøi (EIS 62) Q. BO Kongsvinger: Hvit-

In flowers of Compositae, very common. (NSFDI)

Thrips validus Uzel, 1895


In flowers of Compositae, very common. (NSFDI)

Thrips viminalis Uzel, 1895

BV Hol: Dagali (EIS 34) Q.

In catkins and leaf buds of Salix. (NSF).

Thrips vulgarissimus Haliday, 1836


In flowers of many plant species, very common, even in the mountains and farthest to the north. *Phlaeothripidae*

*Phlaeothripidae*

*Acanthothrips nodicornis* (Reuter, 1880)


Found on dead branches of *Betula*, in the bark of a dead *Betula* and from the canopy of *Pinus*, not common. (NSFD).

*Bolothrips dentipes* (Reuter, 1880)

VE Tjome: Mostranda (EIS 19) Q. In grass tussocks in wet areas. (NSFD).

*Bolothrips icarus* (Uzel, 1895)

AK Frogn: Nesset (EIS 28) Q. Grass. (NSFD).

*Bolothrips bicolor* (Heeger, 1852)

TEY Kragerø: Bråtøy (EIS 11) Q. Grass. (N).

*Cephalothrips monilicornis* (Reuter, 1880)


*Cryptothrips nigripes* (Reuter, 1880)


*Haplothrips acanthoscelis* (Karny, 1910)

VE Tjome: Mostranda (EIS 19) Q. In flowers in dry meadows, rare. (NSFD)

*Haplothrips aculeatus* (Fabricius, 1803)


In grasses. (NSFD).

*Haplothrips alpester* Priesner, 1914


In Compositae and other flowers. (NSF).

*Haplothrips alpicola* Priesner, 1950

*Haplothrips distinguendus* (Uzel, 1895)


In flowers of *Thistles*, probably common. (NSFD).

*Haplothrips leucantheri* (Schrank, 1781)


In flowers of *Chrysanthemum leucanthemum*, very common. (NSFD).

*Haplothrips minutus* (Uzel, 1895)

Ø Fredrikstad (Borge): Torsnes (EIS 20) Q. AK Nesodden: Fagerstrand (EIS 28) Q. OS Lillehammer: Lillehammer (EIS 54) Q.

On dead trees, on branches and in the bark. (ND).

*Haplothrips niger* (Osborn, 1883)


In flowers of *Trifolium pratense*, very common. (NSFD).

*Haplothrips propinquus* Bagnall, 1933


In flowers of *Achillea millefolium*, very common. (NS).

*Haplothrips senecionis* Bagnall, 1932

HOI Etne: Frette (EIS 23) Q.

In flowers of *Senecio jacobaea*, not common. (N).

*Haplothrips setiger* Priesner, 1921

Ø Fredrikstad (Onsøy): Slekvik (EIS 20) Q. VE Larvik (Brunlanes): Hummerbakken (EIS 11) Q. Tjome: Modstranda (EIS 19) Q. TEY Kraga: Bråtøy (EIS 11) Q. AAY Tvedestrand: Lyngør (EIS 6) Q.

In flowers on dry places. (NSD).

*Haplothrips statices* (Haliday, 1835)

Ø Hvaler: Kirkøy (EIS 12) Q. VE Tjome: Modstranda (EIS 19) Q.
Haplothrips subtilissimus (Haliday, 1852)
**TEY** Kragere: Skåtøy (EIS 11) larva det R. z. Strassen.
On leaves of trees. (NSFD).

*Haplothrips tritici* (Kurdjumov, 1912)
**VE** Larvik (Brunlanes): Hummerbakken (EIS 11) Q det R. z. Strassen.

In cereals. (NS).

*Haplothrips utae* Klimt, 1969
**VE** Tjome: Mostranda (EIS 19) Q. **BV** Hol: Dagali (EIS 34) Q det R. z. Strassen.
In *Aster tripolium* and *Juncus*. (N).

Hoplothrips bidens (Bagnall, 1910)
**AK** Vestby: Tannum (EIS 28) larva det R. z. Strassen.
On dead branches of *Betula*. (N).

Hoplothrips williamsianus Priesner, 1923
From *Pinus* canopy, and twigs of *Betula*. (NS).

Hoplothrips carpathicus Pelikán, 1961
**AK** Frogn: Håøya (EIS 28) Q. **BV** Nesodden: Fagerstrand (EIS 28) Q. **HEN** Stor Elvdal: Messelt (EIS 64) Q. **BO** Kongsberg: Kongsberg (EIS 27) Q. **VE** Borre: Horten (EIS 19) Q, Stokke: Melsomvik (EIS 19) Q. **TEI** Notodden: Tinnfoss (EIS 27) Q. **AAV** Birkenes: Senumstad (EIS 6) Q, Grimstad: Grimstad (EIS 6) Q.
Forage on fungus in bark of dead *Betula*, probably common (Kobro & Solheim 2002). (NSF).

Hoplothrips corticus (De Geer, 1773)
**Ø** Eidsberg: Slitu (EIS 29) Q. **AK** Frogn: Lågøy (EIS 28) Q, Nesodden: Fagerstrand (EIS 28) Q. **BO** Ringerike: Skarrud (EIS 46) Q. **VE** Stokke: Melsomvik (EIS 19) Q, Tjome: Mostranda (EIS 19) Q. AAY Grimstad: Grimstad (EIS 6) Q. **HOI** Kvam: Tørvik (EIS 31) Q, Eidfjord: Sima (EIS 41) Q. **NTI** Stjørdal: Hell (EIS 92) Q.
On dead wood infested with *Hymenochaete tabacina*, probably common. (NSFD).

Hoplothrips fungi (Zetterstedt, 1828)
**AK** Frogn: Havsjødalen (EIS 28) Q, Nesodden: Agnor (EIS 28) Q. **TEY** Kragere: Bråtøy (EIS 11) Q. **AAV** Grimstad: Grimstad (EIS 6) Q. **STI** Trondheim: Gaulosen (EIS 92) Q.
On dead wood of Angiosperms. (NSD)

Hoplothrips pedicularius (Haliday, 1836)
On dead wood infested with several *Stereum* species, very common. (NSFD).

Hoplothrips polysticti (Morison, 1949)
**Ø** Rakkestad: Rakkestad (EIS 20) Q. **AK** Nesodden: Fagerstrand (EIS 28) Q, Rælingen: Tappenbergvann (EIS 29) Q. **HEN** Kongsvinger: Lier.
(EIS 37) Ø, Stange: Malungen (EIS 46) Ø, Åsnes: Basknappen (EIS 46) Ø. HEN Åmot: Deset-Østseter (EIS 64) Ø, Tynset: Brydalen (EIS 73) Ø. OS Øyer: Øyer (EIS 54) Ø. ON Nord-Fron: Tagestad (EIS 62) Ø. BØ Kongesberg: Hvettingfoss (EIS 19) Ø, Flesland: Lampeland (EIS 27) Ø, Ringerike: Katnosa (EIS 36) Ø. BV Hol: Dagali (EIS 34) Ø. AAY Birkenes: Senumstad (EIS 6) Ø, Grimstad: Grimstad (EIS 6) Ø. AAI Bygland: Moi (EIS 9) Ø. HOI Ullensvang: loft-hus (EIS 32) Ø, Eidjford: Sima (EIS 41) Ø. MRY Frei: Rensvik (EIS 84) Ø. STI Oppdal: Oppdal (EIS 79) Ø, Rennebu: Merk bru (EIS 86) Ø, Halland (EIS 87) Ø, Orkdal: Vormstad (EIS 91) Ø, Lefstad (EIS 91) Ø.

On lying dead Picea abies infested with Trichaptum abietinum, very common. (Kobro 2001). (NS).

Hoplothrips ulmi (Fabricius, 1781)

 Ø Halden: Kråkegullåsen (EIS 20) Ø. AK Nesodden: Agnor (EIS 28) Ø, Toppen (EIS 28) Ø, Rælingen: Tappenbergvann (EIS 29) Ø. HEN Stor Elvdal: Messelt (EIS 64) Ø. OS Øyer: Øyer (EIS 54) Ø. BV Sigdal: Heimsetteråsen (EIS 35) Ø leg. J. Skartveit & K. H. Thunes. VE Sandefjord: Haukerød (EIS 19) Ø.

On dead wood of Angiosperms. (NSFD).

Hoplothrips unicolor (Vuillet, 1914)

AK Frogn: Holt (EIS 28) Ø, Nesodden: Fagerstrand (EIS 28) Ø. HEN Åmot: Deset-Østseter (EIS 64) Ø. VE Tjome: Mostranda (EIS 19) Ø. AAI Bygland: Moi (EIS 9) Ø, Valle: Besteland (EIS 9) Ø.

On dead Pinus silvestris infested with Trichaptum fusciobiolaeus, found in large numbers only once. (NS).

Liothrips setinodis (Reuter, 1880)


Maderothrips longisetis (Bagnall, 1910)

AK Nesodden: Fagerstrand (EIS 28) Ø, Rælingen: Tappenbergvann (EIS 29) Ø. HES Ånes: Basknappen (EIS 46) Ø. HEN Åmot: Deset (EIS 64) Ø. ON Nord-Fron: Tagestad (EIS 62) Ø. VE Stokke: Melsonvik (EIS 19) Ø. AAY Grimstad: Grimstad (EIS 6) Ø.

On branches and in bark of dead trees, probably predacious and common. (NS).

Megathrips lativentris (Heeger, 1852)

AK Nesodden: Fagerstrand (EIS 28) Ø. On fungus spores in litter, widespread but infrequently collected. (NSFD).

Phlaeothrips annulipes Reuter, 1880

AK Nesodden: Fagerstrand (EIS 28) Ø. HES Grue: Skasenden (EIS 47) Ø.

On dead branches and in bark of dead trees. (NSFD).

Phlaeothrips coriaceus Haliday, 1836

AK Nesodden: Fagerstrand (EIS 28) Ø.

On dead branches and in bark of dead trees. (NSFD).

Xyloptlothrips fuliginosus (Schille, 1910)


On twigs and under bark of dead trees, quite common. (NSFD).

DISCUSSION

The reference collection of the Plant Protection Centre presently includes 109 species of which 22 are not published from Norway previously.

In addition Olsen & Solem (1982), Olsen (1987), Olsen & Midtgård (1996) and zur Strassen (pers. com.) reported the following species from Norway: Aeolothrips intermedius Bagnall, 1934 (NSF), Aurantothrips orchidaceus Bagnall, 1909 (NSD), Heliothrips haemorrhoidalis (Bouche, 1833) (NSFD), Oxythrips ulmifoliorum Haliday, 1836 (NSF), Pezothrips frontalis (Uzel, 1895)
Thus the number of thrips species known to Norway is at present 125, which is exceeding the "Ottesen estimate" (Ottesen 1993). Of these, 114 species are naturally occurring in Norway and 11 are intercepted or imported greenhouse species. For comparison, the number of species known from Iceland is 11 (Lindroth et al. 1973, Kobro & Nitterus 1999, Vasiliu-Oromulu & al. 2001). The total number of species known from the Nordic countries is 176.

As the limited effort based on occasional collection by one person only has given 22 species new to Norway, of which several also are new to the Nordic countries, there is reason to believe that the number of species present is higher. The distribution presented here is not representative for the occurrence of these species, and further investigation is needed.

REFERENCES

Received 16 January 2003,
accepted 15 March 2003
Distribution and ecology of harvestmen (Opiliones) in the Nordic countries

Ingvar Stol


Occurrences of the twenty-four Nordic Opiliones species in coniferous-, deciduous-, mixed-wood, heather, grazing land, garden and beach are presented. Three harvestmen are taken in all these types of biotopes; Oligolophus tridens (C.L. Koch, 1836), Lacinius ephippatus (C.L. Koch, 1835) and Mitopus morio (Fabricius, 1779). Densities of most of the species throughout the year are given in detailed curves. Two Opiliones species are certainly present throughout the whole year; Nemastoma bimaculatum (Fabricius, 1775) and Nemastoma lugubre (Müller, 1776). The earliest species appears with a maximum abundance in June and the latest with a top in November. The distributions in the Nordic countries are illustrated in 24 maps. Three harvestmen species; Lacinius ephippatus (C.L. Koch, 1835), Mitopus morio (Fabricius, 1779) and Rilaena triangularis (Herbst, 1799) live in the whole region, whereas five species; Trogulus tricarinatus (L., 1758), Paroligolophus meadii (Pickard-Cambridge, 1890), Lacinius horridus (Panzer, 1794), Platybunus bicephalus (C.L. Koch, 1835) and Leiobunum limbatum L. Koch, 1861 are very rare in the Nordic countries.

Key words: Opiliones, Nordic countries, ecology, distribution.

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INTRODUCTION

There exists no summarizing survey of the ecology and distributions of the Nordic Opiliones. Comments to their ecology have previously been given by a few authors, for instance Henriksen (1938), Thydsen Meinertz (1964a), Martens (1978), Stol (1982, 2002a) and Hillyard & Sankey (1989). Fieldwork carried out by the author during 1997-1998 has thrown new light on the ecology of several species and has resulted in a detailed insight of biotope preferences and yearly densities of the animals. Compared to previous investigations the distribution is presently much better known. New species have been discovered and the distribution of others are better known. The limits of northern distribution are still little studied, but may be predictable as one roughly knows the vertical distributions of most species (Stol 2000). A survey of the entire distribution of the Nordic Opiliones in Europe has recently been published by Stol (2002b).

MATERIAL AND METHODS

The present study is based on material from Zoological Museum of Bergen (ZMB), Zoological Museum of Oslo, fieldwork carried out in 1982, 1994, 1997-1998 and relevant literature. The material from the fieldwork is deposited at ZMB and some at the University of Tottori, Japan. Sampling was carried out in coniferous-, deciduous-, and mixed forests, heather, grazing land, gardens and beaches with average of 5 pitfall traps per locality and an average of half an hour hand-picking in each locality throughout the year from Southern Norway. Plant communities typical for West Norwegian biotopes are discussed in Stol (1982, 1997, 1999a, 2002a). Ecological investigations are mainly performed on the island RY: Karmøy (EIS 13) in Western Norway. Biotope results are presented in Table 1, and population densities are shown by curves in Figures 1-6. The curves are based on adult animals only. No. of individuals in Figures 1-5 are summarized and adjus-
RESULTS AND DISCUSSION

Biotope preferences

The biotopes are divided into seven different types: deciduous wood, coniferous wood, mixed wood, heather, grazing land, garden and beach. A list of the species and their occurrences in these biotopes are presented in Table 1.

Species no. 1 and 4 prefer coniferous wood, whereas deciduous wood is the main biotope of no. 1, 2, 3, 5, 9, 11, 15, 17, 20, 21, 22, 23 and 24. Species 1, 16 and 19 are preferably found in mixed wood, whereas two species mainly live in heather; no. 8 and 18. Grazing land is preferred by no. 7, 10 and 12, whereas no. 6, 7, 12, 13, 20 and 21 preferably exist in garden. In the extreme biotope beach, with unorganic sand, high light intensity and high salinity, species 5, 8, 9, 11 and 14 are present, and is in fact preferred by no. 14. The species 5, 9 and 11 are very euryecious and are thus found in all these types of biotopes.

Few data are available on the distribution of 1, 4, 8, 10, 15, 19 and 24 which are rather rare in the Nordic countries. Available information about these harvestmen is partly found in Martens (1978) and

<table>
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<tr>
<th>SPECIES</th>
<th>CONIFER.</th>
<th>DECID.</th>
<th>MIXED</th>
<th>HEATHER</th>
<th>GRAZING</th>
<th>GARDEN</th>
<th>BEACH</th>
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<td>1. Trogulus tricarinatus (L., 1758)</td>
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<td>2. Nenastoma bimaculatum (Fabricius, 1775)</td>
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<td>3. Nenastoma lugubre (Müller, 1776)</td>
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<td>4. Mitostoma chrysomelas (Hermann, 1804)</td>
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<td>5. Oligolophus tridens (C.L.Koch, 1836)</td>
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<td>6. Oligolophus hanseni (Kraepelin, 1896)</td>
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<td>8. Paroligolophus meadli (Pickard-Cambridge, 1890)</td>
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<td>9. Lacinius ephippatus (C.L.Koch, 1835)</td>
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<td>10. Lacinius horridus (Panzier, 1794)</td>
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<td>11. Mitopus morio (Fabricius, 1779)</td>
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<td>12. Phalangium opilio L., 1758</td>
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<td>13. Opilio parietinus (De Geer, 1778)</td>
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<td>14. Opilio saxatilis C.L.Koch, 1839</td>
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<td>16. Megabunus diadema (Fabricius, 1779)</td>
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<td>17. Rilaena triangularis (Herbat, 1799)</td>
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<td>18. Lophophilo palpinale (Herbst, 1799)</td>
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<td>19. Platybunus bucephalus (C.L.Koch, 1835)</td>
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<td>20. Nelima gothica Lohmander, 1945</td>
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<td>24. Leiothrum limbatum L.Koch, 1861</td>
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Figure 1. No. of individuals caught during the year of the following two species: 2. *Nemastoma bimaculatum* and 3. *N. lugubre*.

Figure 2. No. of individuals caught during the year of the following four species: 5. *Oligolophus tridens*, 6. *O. hanseni*, 7. *Paroligolophus agrestis* and 9. *Lacinius ephippiatus*. 
**Figure 3.** No. of individuals caught during the year of the following four species: 11. *Mitopus morio*, 12. *Phalangium opilio*, 13. *Opilio parietinus* and 14. *O. saxatilis*.

**Figure 4.** No. of individuals caught during the year of the following three species: 16. *Megabunus diadema*, 17. *Rilaena triangularis* and 18. *Lophopilio palpinalis*. 
Figure 5. No. of individuals caught during the year of the following four species: 20. *Nelima gothica*, 21. *Leiobunum rotundum*, 22. *L. rupestre* and 23. *L. blackwalli*.

Figure 6. No. of individuals caught during the year of the following three species: 1. *Troglus tricarinatus*, 4. *Mitostoma chrysomelas* and 8. *Paroligolophus meadii*. 
Hillyard & Sankey (1989). Species no. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 and 18 are ground living, while species no. 5, 6, 7, 9, 10, 11, 12, 14, 17, 18, 20, 21, 22 and 23 are found in the herbaceous layer. In the bush-, tree- and stone wall-layer the species 6, 7, 11, 12, 13, 15, 16, 19, 21, 22 and 23 are found. Highly synanthropic harvestmen are species no. 7, 10, 12, 13, 15, 21 and 23.

**No. of individuals per month**

Information about the life cycles is found in Thysen Meinertz (1964b), Martens (1978) and Stol (1982, 1999a, 2002a). Juveniles are not included in the present study. It is known, however, that they almost always appear earlier than the adults. Adults of the well-known species no. 2 and 3 are found throughout the year. This is, however, not clearly shown by the curves in Figure 1.

Species 16 and 17 are Opiliones with a top of density in month 6, and species 9, 11, 12, 13 and 21 in month 8. Species 3, 5, 6, 7, 14, 20, 22 and 23 are mainly present in month 9, and harvestman 18 reaches a maximum in month 10. Species 2 on the other hand, dominates in month 11 (Figure 1). Opiliones which need more investigations are species 1, 4, 8, 10, 15, 19 and 24. Only few individuals of these species were collected (Figures 6 and 7). In Figure 7 only the monthly occurrences of the animals are given without the exact numbers.

**Distribution**

In the Nordic countries 24 different species of harvestmen are found, of which 17 live in Norway, 20 in Sweden, 18 in Denmark, 12 (?) in Finland, 7 in the Faroe Islands and 7 (?) in Iceland, Stol (1993, 1999b). The Nordic countries are here defined as; Iceland, the Faroe Islands, Norway, Denmark, Sweden and Finland. The distributions of the species are shown in Maps 1-24. Occurrences in Scotland and Northern England are also shown in the maps according to Stol (2002b).


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1944, Hippa 1975, Martens 1978). Thydsen Meinertz (1962) mentions no. 9 from Iceland, but it is not reported from this country in the literature of recent date. Only species 9 (?), 11 and 17 exist in all Nordic countries. Species 1, 8, 10, 19, and 24 are very rare harvestmen in this region.

Acknowledgements. I am very grateful to Dr. Jürgen Gruber, Naturhistorisches Museum Wien, Austria, Dr. Vincent Lee, California Academy of Sciences, San Francisco, USA and Dr. Nobuo Tsurusaki, Faculty of Education, Tottori, Japan for valuable discussions and communications.

REFERENCES


Received 1 November 2002, accepted 10 March 2003.
Pholcus phalangioides (Fuesslin, 1775) (Araneae, Pholcidae) first record from Norway.

Oscar Ingebrigtsen & Erling Hauge


The species here recorded from the first time in Norway, was catched in a private house on the island of Stord, Western Norway.

Oscar Ingebrigtsen, Ålandsv. 140, NO-5416 Stord, Norway

Erling Hauge, Bergen Museum, University of Bergen, NO-5007 Bergen, Norway

During the last years several spider nests disorderly spread out in the corner of rooms of a private residence have been observed in Western Norway at HOY: Stord, Åland (EIS 23). Spiders were present in several nets. In November 2002 one male spider was collected by one of the authors (O.I.) and identified to belong to the species Pholcus phalangioides (Fuesslin, 1775), confirmed by E.H. During last winter several active specimens have been observed in the heated rooms of the house (especially in the basement). The species is here reported for the first time in Norway. However, this is probably not surprizing, as the species previously has been reported from Iceland (Agnarsson 1996) and rather recently from the Faroe Islands (Hauge et al. 2002); in both cases indoors only.

References

Agnarsson, Í. 1996. Íslenskar kóngulær Fjöllrit Náttúrufræðistofnunar 31, 1–175.


Received 31 January 2003, accepted 20 February 2003.
Life history, egg cold hardiness and diapause of *Argyresthia retinella* (Lepidoptera: Yponomeutidae)

Frode Elverum, Tor J. Johansen & Arne C. Nilssen

During the first half of the 1990-ies, the microlepidopteran *Argyresthia retinella* Zeller (Lepidoptera: Yponomeutidae) had an outbreak in mountain birch (*Betula pubescens* Ehrh. ssp. *czerepanovii* (Orlova) Hämét-Ahti) forests along the coast of northern Norway. In these regions, *A. retinella* has a univoltine life history and passes the winter as diapausing eggs, contradictory to previous reports from more southern latitudes of Europe, where newly hatched larvae overwinter. Eggs were deposited under lichen, mainly on branches and twigs, and avoided freezing by their ability to supercool. The mean supercooling points (SCPs) from October to March ranged between -35.5 and -36.5 °C (lowest in January), and the eggs did not survive exposure below these temperatures. Diapause was terminated in the middle of February, and in April and May the SCP rose to about -30 °C. Pre-freeze mortality was evident and had a significant impact on survival when eggs were exposed to temperatures above the SCP.

Key-words: Egg diapause, cold hardiness, life cycle, pre-freeze mortality, *Argyresthia retinella*, Yponomeutidae

INTRODUCTION

Reports from continental Europe state that larvae of *A. retinella* mine buds and shoots of *Salix caprea* L., *Betula* and *Quercus* from April to June (Schütze 1931, Werner 1958, Agassiz 1987, 1996). In Britain, Robbins (1992) has observed it feeding in buds of *Betula* in May, causing wilting of the developing leaves. He also added the species to the list of British gall-causers due to swollen bases of the leaf petioles.

Pupation normally takes place on the trunk of trees (Agassiz 1987, 1996). In continental Europe, swarming moths are observed in June and the first half of July (Frieze 1969) and in southern Scandinavia mainly in July and the first half of August (Petersen 1924, Svensson 1993). According to Werner (1958) and Agassiz (1996), eggs hatch in
the autumn and the young larvae overwinter in buds or shoots.

The reasons for population growth and outbreak of *A. retinella* in northern Norway are not known. However, Tenow et al. (1999) have discussed a possible role of recent high temperature deviations. The impact of winter temperatures is dependent on the ability of the over-wintering stage to survive at low temperatures, or its cold hardiness (Salt 1961). This is most easily determined by observing the temperature at which the organism freezes, the supercooling point (SCP). Another aspect of insect cold hardiness, the pre-freeze mortality, is based on the many reports of high mortality in insects not frozen when they are exposed to sub-zero temperatures above their SCP for varying periods (Salt 1961, Bale 1993, 1996).

The objectives of this study were therefore to establish: (1) the life history of *A. retinella* in the outbreak area, (2) its overwintering strategy by determining the SCP and the impact of pre-freeze mortality, and (3) the occurrence of diapause in field-collected samples of the overwintering stage.

**MATERIALS AND METHODS**

**Sites**

Field studies were carried out on the island of Kvaløya (69°41′ N, 18°47′ E), near Tromsø, northern Norway, from May 1994 until September 1995. In both years, the moth damaged parts of the birch forest on the southern part of the island. Observations and material in this study originated from a site of about 400 m², 20 m above sea level, on birches of four to six metres height.

Standard temperature data for the area were recorded at Tromsø Airport Langnes (Figure 1), four km from the study area, by The Norwegian Meteorological Institute. Laboratory work was carried out at Holt Research Centre (Norwegian Crop Research Institute) and at the Phytotron at the University of Tromsø.

**Life history**

Egg-laying sites were located by studying samples of branches, twigs and bark collected in September 1994. At that time, the outbreak of *A. retinella* was at its peak. In the middle of August large

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**Figure 1.** Daily minimum temperatures (°C) from October 1994 to May 1995 in Tromsø.
numbers of adult moths were observed in the study area, indicating the period of mating and egg deposition.

Twigs, with damaged buds, shoots or leaves, were collected weekly in June and July 1994 and in May to July 1995. Buds and shoots were dissected for observation of development of mining larvae. Buds with fully developed larvae were collected at the end of June 1994 for rearing and adult moth identification. These buds were kept in cardboard boxes, 20 in each, and stored at room temperature (20-22 °C). S. Kobro and L. Aarvik at the Crop Protection Centre, Norwegian Crop Research Institute, identified emerged moths.

From July 1994, we searched for pupae in crevices in the bark and the lichen cover on birches in the study area. In addition we took samples from humus and litter under attacked trees to collect any pupated larvae. From this material 2-3 dm$^3$ was gathered and stored in ventilated plastic bags at room temperature.

The study area was visited twice weekly in August 1994 and 1995 to observe any swarming or egg-depositing moths. Adult individuals were collected at Alta (69°57'N, 23°10'E) and at the main study area Kvaløya for species identification.

Throughout the field study, we also collected possible parasitoids of the larvae. Material gathered during the summer of 1995 with suspicious eggs and larvae alongside dead or paralysed larvae of *A. retinella* were placed in ventilated plastic boxes and stored at room temperature for rearing. K. J. Hedqvist at the Swedish Natural History Museum, Stockholm, identified the emerged parasitoids.

### Cold hardiness

The supercooling points (SCPs) of individual eggs were determined by using an ultra-freezer with cooling at a constant rate of 1°C min$^{-1}$. Eggs were carefully removed from branch samples from a selection of trees and placed in petri dishes. Handling time for eggs, from sampling until the onset of tests, ranged from three to four hours.

In each SCP-test, at approximately monthly intervals from October 1994 to May 1995, an average of 48 eggs (range 38-68) was used. The whole batch of eggs was attached with silicon paste to the end of a 0.2 mm copper-constantan thermocouple. This thermocouple was inserted into a hollowed cylindrical aluminium core, which in turn was placed in the ultra-freezer. The decreasing temperature was continuously recorded graphically and the SCPs were discerned in the falling temperature curve as upward «spikes», caused by the heat of crystallisation as each egg froze. By using a paper feed of 2 cm min$^{-1}$ the resolution was sufficient to separate the SCPs of at least 60 eggs at each test. A detailed description of the instruments and technique is given in Kaurin (1985) and Nilssen & Tenow (1990). The lethal effect of freezing was controlled after each SCP-test.

Pre-freeze mortality was studied on eggs collected on 9 March 1995. The eggs were placed in petri dishes, twenty in each. The dishes were kept in polystyrene boxes and exposed to temperatures of -18 and -27 °C in two different freezers. Survival was recorded by transferring one dish from each freezer to room temperature (20-22 °C) at intervals of 2, 4, 8, 12, 14 and 21 days.

### Diapause

At monthly intervals, from 10 October 1994 until 9 May 1995, 30 eggs on pieces of lichen from the field samples were reared at room temperature (20-22 °C). The lichens with eggs were kept in petri dishes placed on moist filter paper in a plastic boxes to secure high humidity. The boxes were kept in darkness. Every 24 hours, emerged larvae were removed and percentage cumulative hatching as a function of time was calculated. Also the final mortality and the presence of diapause were evaluated from the same data.

### RESULTS

#### Life history

Eggs of *A. retinella* were found almost exclusively on lichens, mainly on *Parmelia olivacea* (L.) Nylander. This species of lichen is common in the study area and covers all trees exceeding a certain age. When deposited, the eggs were wedged be-
Elverum et al.: Argyresthia retinella (Lep.: Yponomeutidae) life history

tween the lichen and the rind of the branches and twigs. Some eggs seemed attached with glue or a string while others lacked any attachment. Considerably more eggs were found on the branches and twigs than on the stems. On young trees and bushes where no lichen had settled, eggs were only found in cavities formed by previous years’ attacked buds. These buds appeared with swollen cracks.

The eggs had not hatched by the onset of frost (end of September 1994) and were therefore considered to be the overwintering stage. These findings and the availability of large numbers of eggs made it possible to test cold hardiness and diapause status.

In 1995, the larvae appeared in the buds on 18 May. The leaves started to unfold on 27 May. Newly hatched larvae were bright yellow with a marked black head capsule. After hatching they immediately started a search for suitable buds, which were entered through the scales or preferably through cracks between scales. Many larvae were found dead or stuck, unable to move, on the sticky resin covering the buds.

After entering the buds, the larvae fed extensively. Frequently, the leaves and shoots were unable to sprout or only partly sprouted before withering. About a week after entrance, buds were frequently found empty with only faeces and spun silk left. Along with these observations, about two mm long larvae, now with a light grey-green colour, were also found in sprouting buds with only small amounts of faeces and silk spin, indicating a recent entrance. The possibility of such re-entrance of buds was experimentally shown by moving larvae from infested buds to new un-attacked twigs. In this case, new shoots were entered within 24 hours at the base of the leaf stalk (petiole) of the growing shoot. Larvae were also observed hanging by the silk threads from branches.

At high larval population density, as during the summer of 1994, cannibalism was evident and common among larvae that entered the same buds or shoots. Often remnants (head capsules) of killed (possibly also eaten) larvae were found together with a single surviving larva in the bud.

The larvae completed their development by the end of June. At this stage they were almost white with a light brown head capsule and about six mm long. Adults reared from this larval material were identified as A. retinella. Pupae, covered by a light spun cocoon, were found between old leaves in the topmost part of the forest floor litter. From such litter kept at room temperature, adult moths identified as A. retinella appeared after 14 days. No pupae were found on branches or stems.

In the middle of August 1994 large numbers of A. retinella were observed swarming on evenings between 20:00 and 22:00 h. During the same period in 1995, only a few individuals were observed. Moths were never observed while laying eggs.

After 18-27 June we found several dead or paralysed A. retinella larvae with white, translucent, curved eggs on their body. After approximately 24 hours at room temperature these eggs hatched and the larvae immediately started feeding on the A. retinella larvae. Thus, ecto-parasitoids were present. Among 317 A. retinella larvae inspected on 21-22 June, 27 (9%) were parasitised. In another sample from 26 June, 49 out of 78 individuals (63%) were parasitised.

The ecto-parasitoid larvae left the shoots before pupating in a light spun cocoon. Within a week, a total of 17 parasitic wasps emerged from these pupae. Sixteen individuals (four ♀♀ and 12 ♂♂ males) were identified as Bracon intercessor Nees 1834 (Hymenoptera, Braconidae). According to Tobias (1986) and Achterberg et al. (1990) this species parasitises a wide spectrum of larvae belonging to Coleoptera (Curculionidae and Atelabidae), Lepidoptera (Momphidae and Tortricidae) and Hymenoptera (Eurytomidae). A. retinella has until now been an unrecorded host. One individual was identified as Dicladocerus euryalus (Haliday 1834) (Hymenoptera, Euolophidae), a known parasitoid of Argyresthia spp. (Hedqvist, pers. comm.).

**Supercooling points**

The supercooling points (SCPs) of eggs collected monthly are shown in Figure 2. There was a slight lowering of SCPs from October to January ($p=0.03,$...
Tukey’s test following ANOVA). After January, the SCPs rose slightly until March, and between March and April (and May), the SCPs rose rapidly.

**Pre-freeze mortality**

Mortality of eggs increased with time of cold exposure. No eggs hatched after 21 and 14 days at -18 and -27°C, respectively (Figure 3). In unhatched eggs exposed to -18°C, black head-capsules of developed larvae could clearly be seen through the chorion, indicating that some development had occurred. On the other hand, in eggs exposed to -27°C, no such larval development was apparent, indicating that death had occurred shortly after the start of the cold exposure.

**Diapause**

Eggs from field samples collected in October and November did not hatch at all (held at 90 days at room temperature), *i.e.* mortality = 100 percent. For eggs collected in December, the mortality was 13 percent and the median incubation period 32 days (Figure 4). In the following months, the median incubation period gradually decreased from 19 days in January to two days in May. The mortality remained below 10 percent throughout this period. The hatching curves in Figure 4, with no hatching or long incubation time and prolonged hatching time in autumn or early winter, are indicative of diapause.

![Figure 2](image-url)  
*Figure 2.* Distribution (means, SE and ranges) of the supercooling points of *A. retinella* eggs tested at monthly intervals. *p*-values: Tukey’s test after ANOVA; ns: not significantly different (*p* > 0.05).
Figure 3. Percentage mortality of *A. retinella* eggs (collected 8 March 1995) following exposure to -18 °C and -27 °C at different lengths of cold exposure.

Figure 4. Cumulative hatching curves for field-collected eggs (*n=30*) transferred to room temperature in December (1994), January, February, March, April and May (1995). Eggs collected in October and November (1994) did not hatch at all.
Because there is no easy way to establish directly when diapause development ends and post-diapause development begins, an indirect method was used. In eggs, it is an accepted fact that no ordinary development (embryogenesis) will take place before the diapause development is finished (e.g. Danks 1987), and the observed incubation period therefore consists of two separate parts in the following order: diapause development and post-diapause development (= embryogenesis). The average date for completed diapause development was estimated on the basis of the total incubation time (see above and Figure 4). In this calculation the post-diapause period (= embryogenesis) was assumed to be 14 days at room temperature [a common incubation time for insect eggs if there is no diapause (Levine 1988, Nilssen & Tenow 1990)]. The model is based on a polynomial regression of the median incubation periods as a function of date (Figure 5).

In the regression equation

\[ y = -0.335x + 0.000987x^2 + 32.86 \]

\( y \) is the remaining diapause period + a post-diapause period (in days) and \( x \) is number of days after 1 December. When \( y = 14 \) days (i.e. no diapause development left), \( x = 69 \). This result indicates that 50 percent of the eggs in the field have completed their diapause development 69 days after 1 December, i.e. 7 February.

**DISCUSSION**

Mountain birch forms the upper and northern border of the boreal forest in Scandinavia, and is the dominant natural ecosystem in northern Norway (Tenow et al. 1999). In addition to the fact that this birch forest is exposed to severe climatic restraints, it has many important defoliators and other herbivores (Tenow 1996). Some of these, e.g. the geometrids *Epirrita autumnata* (Borkhausen) and *Operophtera brumata* (L.), have outbreaks at more or less regular intervals, but such outbreaks are known to occur only in northern and mountainous parts (Tenow 1972). The reason why outbreaks only occur in these areas, is poorly understood, but is often assumed to be affected by climate (e.g. Ruohomäki et al. 1997). Presently, the mountain birch is confronted with another pest insect, *A. retinella*, which so far has had one documented outbreak.

**Life history**

The present study in northern Norway shows that *A. retinella* has a univoltine life history (Figure 6). The winter is passed in the egg stage, in contrast to the situation in continental Europe where the larva is the over-wintering stage (Werner 1958, Agassiz 1996). Also the pupation site seems to differ. In northern Norway, *A. retinella* larvae entered the litter under trees to pupate in late June, whereas previous reports from continental Europe
describe pupation on the tree trunks (e.g. Agassiz 1996). According to our observations of the swarming, the eggs of *A. retinella* are most likely deposited at the end of August. They were deposited under thallus lobes of lichen, mainly *P. Olivacea*. Most eggs were found under lichen on branches and twigs, close to buds and shoots. During the study, also eggs of other moth species, e.g. *Epirrita autumnata* and *Operophtera brumata* (Geometridae), were found under lichen, indicating that it is generally advantageous to overwinter in this habitat (Tammaru et al. 1995). Bylund (1997) argued that eggs under lichens could be less liable to fall off the tree, more protected from predation and less subjected to extreme temperatures. In the published literature (Werner 1958, Agassiz 1996), *Salix caprea* and *Quercus* species are also listed as host plants of *A. retinella*. In the outbreak area, *S. caprea* is not covered by lichen and seemed un-attacked by this moth, whereas *Quercus* spp. is not present in northern Norway. Overwintering in the egg stage requires diapause to prevent the eggs from hatching in the event of an unusually warm autumn. Other studies in moths show that the most common cue for entering diapause is photoperiod, in some cases interacting with temperature (Young 1997). Therefore, the shorter photoperiod and/or lower temperatures, experienced by the eggs in August and September (or earlier in a previous stage, e.g. Sato 1977) may be cues for entering diapause. The diapause may also be obligate as a consequence of a genetic adaptation.

*A. retinella* has adopted an egg diapause similar to other northern populations of moth species, e.g. *E. autumnata* (Nilssen & Tenow 1990) and *O. brumata* (Nilssen & Tenow, unpublished). A common feature is that the eggs enter diapause shortly after egglaying but there may first be a short pre-diapause embryogenesis, see Nilssen & Tenow (1990), and that the diapause lasts until mid-winter. It is often impossible to rear such eggs in autumn, and if they hatch, they do so after a long time with considerable mortality. Another typical feature is that the hatching is extended (asynchronous), often over several weeks. *A. retinella* eggs brought in for rearing in December hatched after 25 to 40 days (Figure 4), probably because the individual eggs were in various states of diapause. When diapause is terminated, as in April and May (Figure 4), the hatching occurs almost synchronously, which is considered as another advantageous effect of diapause.

The previously known biology of the species (Agassiz 1996) is obtained from temperate areas where the climate is warmer than in our subarctic study area. Generally, eggs have a better cold hardiness than larvae (Somme 1982), and switching of overwintering stage from larvae to eggs may therefore have an adaptive significance in areas with long and cold winters. If *A. retinella* lacks egg diapause in continental Europe we may suspect a clinal increase in diapause incidence with latitude. This has been found in the beetle *Atrachya menetriesi* in Japan (Ando 1983), and it has been shown that insects display a great variety of geographical adaptations in voltinism and seasonal regulation of growth and dormancy (Wipking 1988, Goto et al. 2001). In temperate or cold areas, cold hardiness and winter diapause are essential for survival in most overwintering insects, and different ecotypes of widely distributed species may have different diapause and cold hardiness characteristics as an adaptation to the climate (Goto et al. 2001).

**Cold hardiness**

Tests after the measurements of SCPs showed that eggs do not withstand freezing, and the SCPs are therefore the absolute minimum temperatures for the overwintering stage. The pre-freeze mortality was tested in March, and at the pre-freeze temperature of -27 °C, the survival of eggs gradually decreased, and maximum time of survival was about 14 days (Figure 3). Pre-freeze mortality at this temperature may well be caused by freezing, which is shown to occur when insects are maintained in a super-cooled state close to their «normal» supercooling point for extended periods (Salt 1961, Bale 1993) (a better term would therefore be pre-SCP-freeze mortality). Therefore, pre-freeze mortality had a significant impact on survival of *A. retinella*, also when exposed to temperatures well above the supercooling point. When
kept at -18 °C, no eggs survived more than 21 days. This indicates that the ability to supercool is most important in order to protect the eggs from freezing during shorter periods of extreme temperatures. Unfortunately, we have no data on pre-freeze mortality of diapausing eggs (e.g., eggs from December and January), but according to Sømme (1999) it is assumed that diapausing eggs withstand pre-freeze temperature better than eggs in later stages.

Based on these results, eggs of *A. retinella* belong to the chill tolerant group (according to the definition of Bale (1993)). Characteristic for this group

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**Figure 6.** The life history of *Argyresthia retinella* in northern Norway. The eggs hatch and the larvae appear in birch buds and shoots in mid-May. The larvae mine one or more buds or shoots before leaving to pupate towards the end of June. After pupating in the litter the individuals eclose and the adult moths appear at the end of July. The moths swarm on evenings in August. The eggs are laid under lichen on the branches of birch trees from the end of August. The eggs enter diapause and are the overwintering stage of *A. retinella* in northern Norway. Diapause is terminated in February. The SCPs are below -35 °C from October to March; in April and March the SCPs rise to approximately -30 °C.
is the occurrence of non-freezing mortality above the SCP and the ability to survive for long periods of time at the low or subzero temperatures encountered in the winter microhabitat (Bale 1993). In our test the temperature in the freezers was kept constant and we did not test pre-freeze mortality at higher temperatures than -18 °C. When the beech leaf mining weevil, \textit{Rhynchaenus fagi} L. (Coleoptera: Curculionidae), was exposed to a constant sub-zero temperature of -15 °C mortality was 75% after 84 days. In cycling treatments between +2 and -15 °C, the mortality was lower (Coulson & Bale 1996).

In our studies, the effect of pre-freeze mortality was only studied in post-diapause eggs. In \textit{Choristoneura fumiferana} (Clem.) (Lepidoptera: Tortricidae), survival after 20 days of exposure to -15 °C was 80% in mid-diapausing larvae and 20% in late-diapausing larvae (Han & Bauce 1995). The effect was caused by a lower glycerol content in the late-diapausing larvae. The pre-freeze mortality of diapausing \textit{A. retinella} eggs remains unknown, but the species seems well adapted to coastal winter temperatures (a typical year is shown in Figure 1) in the outbreak area. Temperatures in \textit{continental} parts of northern Norway, on the other hand, will regularly drop below -20 °C, sometimes reaching extremes of -30 to -40 °C, for varying periods during the winter. This would affect survival of overwintering eggs as pre-freeze mortality at -18 and -27 °C was 100% after 14 and 21 days, respectively (Figure 3), and explains why the outbreak only affected coastal areas. In other words, winter climate may restrict the geographic distribution of \textit{A. retinella} within northern Norway.

A further discussion of the causes of the outbreak should be based on knowledge of both biotic and abiotic factors that interact with the populations, most of which remain to be studied. One of the population regulators, however, seems to be identified. In 1995, the braconid ectoparasitoid \textit{B. intercessor} had a significant effect on survival of last instar larvae of \textit{A. retinella} on Kvaloya. Normally, parasitoid rates of 40-90 percent in a generation are associated with a decline of lepidopteran populations (Berryman 1996). In the latest of our samples, 63 percent of the larvae were parasitized.

The outbreak of \textit{A. retinella} resulted in many individuals that could be utilized as hosts by parasitoids. \textit{B. intercessor}, which can use a wide spectrum of hosts, has obviously benefited from this and increased its own population size to high levels, and might, at least locally, have contributed significantly to the observed decline of \textit{A. retinella}.

\textbf{REFERENCES}


Han, E.N. & Bauce, E. 1995. Non-freeze survival of

52


Tammaru, T., Kaitaniemi, P. & Ruohomäki, K. 1995. Oviposition choices of *Epirrita autumnata* (Lepi-
**Acrometopia wahlbergi** (Zetterstedt, 1846) (Diptera, Chamaemyiidae) in Norway

Lita Greve


One male of *Acrometopia wahlbergi* (Zetterstedt, 1846) (Diptera, Chamaemyiidae) was collected at Moutmarka, Vik (VE Tjome), three females were netted in Iglatjødn Nature Reserve (HOY Stord) and one female was netted in the Svevatn area (HOI Kvam). The three females from Iglatjødn have been listed in a previous report (Greve & Hauge 1989).

Key words: *Acrometopia wahlbergi*, Diptera, Chamaemyiidae, Norway.

Lita Greve, Zoological Museum, University of Bergen, PO. Box 7800, N-5020 Bergen, Norway.

The genus *Acrometopia* is a distinctive genus in the family Chamaemyiidae. The elongation of the head in *Acrometopia* compared to other genera in the family is characteristic. The genus *Acrometopia* was revised by Cogan (1978).

One species, *Acrometopia wahlbergi* (Zetterstedt, 1846), has been recorded from Denmark, Finnland and Sweden (Hackman 1980; Petersen & McLean 2001, Tanasijtshuk 1984). *A. wahlbergi* has hyaline wings, and is distinguished from the other species within the genus on account of the pale, grey dusting of most parts of the body. The yellow legs are also evenly dusted with grey. *A. wahlbergi* is the type species of the genus, and is outside Fennoscandia and Denmark widely distributed in Europe.

Three females of *A. wahlbergi* were netted in a Nature Reserve at Stord HOY Stord: Iglatjødn (EIS 23), 21 July 1988. Two Malaise traps were operated from April to October, but no more specimens were caught (Greve & Hauge 1989). One male specimen from VE Tjome: Moutmarka at Vik (EIS 19), 20 July 1983, leg. A. Fjeldså, was recently discovered among undetermined flies in the collections of Zoological Museum. A female specimen was netted on a bog in HOI Kvam: The Svevatn area (EIS 31), 1 July 1997, leg. J. Skarveit.

A considerable material of Chamaemyiidae has been sorted out during the last decade, but the five specimens noted here are the only specimens of *A. wahlbergi*. The material is deposited in Zoological Museum, University of Bergen.

References


Received 15 March 2003, Accepted 24 April 2003.
**Synodites lineiger** (Thomson, 1893) (Hymenoptera: Ichneumonidae) new to Svalbard, with an updated list of ichneumonid species from the archipelago

Stephen J. Coulson, Reijo Jussila, Ian D. Hodkinson* & Nigel R. Webb

INTRODUCTION

The ichneumonid fauna of Svalbard (excluding Bjørnøya), including the species newly recorded here, comprises 15 species (Table 1) (see also Coulson et al. 2001, Coulson & Refseth in press). As part of a detailed survey of invertebrate community assembly on glacier forelands, yellow sticky traps were operated at seven sites along a chronosequence across the pro-glacial region of Midtre Lovénbreen adjacent to Ny-Ålesund, Kongsfjord, Svalbard from 17 July to 6 August 2001. These traps caught large numbers of flying insects, including many Ichneumonidae.

RECORDS AND DISCUSSION

Seven species of Ichneumonidae were caught of which six, *Plectiscidea hyperborea* (Holmgren, 1869), *Atractodes pusillus* Förster, 1876, *Atractodes bicolor arcticus* Holmgren, 1872, *Aclastus borealis* (Boheman, 1866), *Gelis glacialis* (Holmgren, 1869) and *Stenomacerus groenlandicus* Jussila, 1996 are already known from Svalbard (Coulson et al. 2001, Coulson & Refseth in press). A seventh species, *Synodites lineiger* (Thomson, 1893) (Ctenopelmatinae), however, is new for the archipelago. Two males were trapped at the «oldest» site along the chronosequence, on a low limestone ridge with complete plant cover (54% moss and 46% vascular plants) lying beyond the terminal moraines (Hodkinson et al. submitted).

The Ctenopelmatinae is a large, mainly north temperate subfamily (Gauld & Bolton 1988) and *S. lineiger* has previously been recorded from Northern and Central Europe (Yu 1999 and references therein). The majority of species are endoparasitoids of tenthredinoid or megalodontoid sawfly larvae (Gauld & Bolton 1988). Tenthredinidae (e.g. *Amauronematus* sp.) are relatively abundant at this one trapping location (S.J. Coulson & I.D. Hodkinson pers. obs.) and provide likely potential hosts.

The specimens of *S. lineiger* collected from Svalbard are held by R. Jussila (Zoological Museum, Zoological Museum, Section for Biodiversity and Environmental Sciences, Department of Biology, University of Turku, 20014 Finland.}

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* Corresponding author
Table 1. Ichneumonidae recorded from Svalbard. Note that Plectiscus sp.? is probably Plectisidea hyperborea (Holmgren, 1869).

<table>
<thead>
<tr>
<th>Sub-family</th>
<th>Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ctenopelmatinae</td>
<td>Hypamblys leucopygus (Holmgren, 1869)</td>
</tr>
<tr>
<td></td>
<td>Synodites lineiger (Thomson, 1893)</td>
</tr>
<tr>
<td>Cryptinae</td>
<td>Aclastus borealis (Boheman, 1866)</td>
</tr>
<tr>
<td></td>
<td>Atractodes bicolor arcticus Holmgren, 1872</td>
</tr>
<tr>
<td></td>
<td>Atractodes pusillus Förster, 1876</td>
</tr>
<tr>
<td></td>
<td>Gelis glacialis (Holmgren, 1869)</td>
</tr>
<tr>
<td></td>
<td>Phygadeuon sp.</td>
</tr>
<tr>
<td>Mesochorinae</td>
<td>Mesochorus palanderi Holmgren, 1869</td>
</tr>
<tr>
<td>Orthocentrinae</td>
<td>Orthocentrus nigricornis Boheman, 1866</td>
</tr>
<tr>
<td></td>
<td>Plectisidea hyperborea (Holmgren, 1869)</td>
</tr>
<tr>
<td></td>
<td>Plectiscus sp.?</td>
</tr>
<tr>
<td></td>
<td>Stenomacrus groenlandicus Jussila, 1996</td>
</tr>
<tr>
<td></td>
<td>Stenomacrus pedestris (Holmgren, 1869)</td>
</tr>
<tr>
<td></td>
<td>Stenomacrus validicornis (Boheman, 1866)</td>
</tr>
<tr>
<td>Diplazontinae</td>
<td>Tymmophorus obscuripes (Holmgren, 1858)</td>
</tr>
</tbody>
</table>

REFERENCES


Received 7 February 2003, accepted 28 February 2003
New records of Coleoptera from Northern Norway

Johan Andersen & Stefan Olberg


New data on the distribution of 71 species of Coleoptera in Northern Norway are given. Nine species are reported new to Northern Norway. 41 of the species are new to coastal parts of Troms (TRY), where the total number of recorded species now is 685. The species richness in some of the provinces is discussed. It is concluded that continental parts of Troms (TRI) probably has an extraordinarily rich beetle fauna comprising 1132 known species.

Key words: Coleoptera, Northern Norway, faunistics, biogeography

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INTRODUCTION

The climatical and vegetational conditions in Northern Norway are extraordinary on a global scale. Due to the mild climate, the southern and middle boreal vegetational zones are displaced further north than in any other part of the world (Moen 1999). At the same time there is a sharp east-west gradient in climate and vegetation over short distances. High mountains in the southwestern parts, but low relief in the northeastern parts constitute barriers of a very different magnitude. This makes Northern Norway an interesting area for ecological and biogeographical studies of insects.

Coleoptera have been collected in Northern Norway since the first part of the eighteen century (Strand 1946). Strand (1946) gave all known localities of Coleoptera in Northern Norway at the actual time. Later all provincial records of Coleoptera in Norway were given by Lindroth (1960). This catalogue was supplemented with additions and corrections by Strand (1970, 1977). Later Vik (1991) published a catalogue of all the known provincial records of Coleoptera in Norway. The most recent contributions to the faunistics of Coleoptera in Northern Norway are those by Nilssen (1993), Vik (1995), Hanssen & Olsvik (1998), Fossli & Andersen (1998), Andersen et al. (2000), Ødegaard & Ligaard (2000), Olberg et al. (2001), Ødegaard (2001) and Olsvik et al. (2001). Despite these investigations, the knowledge about the distribution of Coleoptera in Northern Norway is still fragmentary. The present paper is a contribution to the faunistics of beetles in Northern Norway.

Several of the records were made in connection with projects on saproxylic beetles in different parts of Northern Norway (NSI, NNØ, TRY, TRI and FO) (see Figure 1 for position of provinces). Other finds result from studies of ground-living beetles in various types of habitats. Faunistic surveys of the saproxylic beetles from TRI Målselv: Dividalen have been given previously (Andersen et al. 2000, Olberg et al. 2001). Riparian beetles and the saproxylic beetle fauna of FO Sørvaranger: Pasvik will be dealt with separately. The present paper reports new records of non-saproxylic beetles from Dividalen and Pasvik as well as new finds of beetles from other provinces in Northern Norway. The following abbreviations and symbols have been used in the text: FO: Frode Ødegaard, JA: Johan Andersen, LH: Lisbeth Haugen, ØH: Øystein Huse, SO: Stefan Olberg, TF: Tor Erik Fossli, *: Species not previously published from Northern Norway. The material collected by JA,
LH, TF and ØH is deposited at the Department of Ecology/Zoology, University of Tromsø, whereas the material collected by FØ and SO is deposited in their private collections.

LIST OF SPECIES

Carabidae

Leistus terminatus (Hellwig, 1793)

Trechus secalis (Paykull, 1790)

*Agonum dolens* (Sahlberg, 1827)
FI Kautokeino: Kautokeino (EIS 157) 12 June 1999. 4 specimens on moist, muddy soil in *Carex* vegetation at the river Kautokeinoelva (leg. & coll. SO). Previous northernmost record in Norway was NTI (Andersen et al. 1984). However, the locality in Kautokeino is closely connected with the species distributional area in Finland (Lindroth 1945).

Harpalus affinis (Schrank, 1781)
TRY Målselv: Høgskardhus (EIS 147) August 1995. 1 specimen in a window trap in dense forest of aspen (*Populus tremula*) and birch (leg. & coll. 1995.)

**Figure 1.** The provinces of Northern Norway.
This is not a natural habitat for the species, since it is a typical member of open, more or less dry, often anthropogenic places (Lindroth 1986). The open areas in the vicinity of the forest have been intensively explored (both by hand collecting and with pitfall traps), but no further specimens have been found. It can not be taken for granted therefore, that the species has been established in Troms County. Nearest Norwegian record is NSI, whereas the northernmost occurrence in Sweden is Nb Pajala (Lundberg 1995, Vik 1991).

**Histeridae**

Gnathoncus buyssoni Auzat, 1917

FØ Sørvaranger: Vaggatem (EIS 160) June/July 1999. 1 specimen in a window trap in a mixed forest (leg. & coll. SO & JA). The species lives in bird's nests (Koch 1989a). The other records from Northern Norway are from TRI Målselv: Rundhaug (Strand 1946) and Dividalen (Huse 1997). In the southern part of the country it has been recorded north to HEN.

Dendrophilus pygmaeus (L., 1758)


Hister unicolor L., 1758


**Leiodidae**

Hydnobius septentrionalis Thomson, 1874


*Leiodes inordinata* (J. Sahlberg, 1898)

TRI Målselv: Frihetsli (EIS 147) July 2002. 1 specimen in a pitfall trap in a fallow field (leg. & coll. JA & SO). *L. inordinata*, which in Norway previously was known from NTI Lierne and Mosvik (Ødegaard & Ligaard 2000), is probably a northeastern species. It is known from Finland, Russia and in Sweden from Värmland (Vr) to Torne Lappmark (To) (Lundberg 1995). The pitfall trap where the specimen was caught, was situated in a xeric-mesic, open area. The substrate consisted of gravel-mixed sand and was covered by a very scattered vegetation of Emeptrum sp., Antennaria dioica and Omalotheca supina. *L. inordinata* was collected together with *Patrobus assimilis* Chaudoir, 1844, *Calathus melanocephalus* (L., 1958) and *Pterosticus adstrictus* Eschscholtz, 1823. The species has mostly been collected in traps in dense forest (Ødegaard & Ligaard 2000). It is therefore possible that it mainly is a forest species.

Leiodes punctulata (Gyllenhal, 1810)


Agathidium seminulum (L., 1758)


Agathidium atrum (Paykull, 1798)

TRY Tromsø: Tromsøya (EIS 162) June 2000. Some specimens in pitfall traps in mixed forest (leg. & coll. SO). In Northern Norway previously recorded from the continental parts of Nordland, Troms and Finnmark (Vik 1991).

Agathidium nigrinum Sturm, 1807

TRY Tromsø: Tromsøya (EIS 162) June 2000. Several specimens in pitfall traps in spruce (*Picea abies*) plantation and in birch forest (leg. & coll. SO). The other records from Northern Norway
are from the inner provinces (NSI, TRI and FØ) (Vik 1991).

*Colon latum* Kraatz, 1850


**Scydmaenidae**

*Stenichnus bicolor* (Denny, 1825)


**Staphylinidae**

*Pselaphaulax dresdensis* (Herbst, 1792)


*Philonthus succicola* Thomson, 1860

**TRY** Tromsø: Tromsøya (EIS 162) May 2002. 1 specimen (leg. & coll. SO). The species is distributed throughout the country north to Troms county (Vik 1991).

*Euryopus picipes* (Paykull, 1800)


*Quedius plagiatus* (Mannerheim, 1843)

**TRY** Tromsø: Oldervikdalen (EIS 163) August 1995. Some specimens in window traps in birch forest (leg. & coll. JA). The species has been found in most of the provinces in Northern Norway (Strand 1946, Vik 1991).

*Lithocharis nigriceps* Kraatz, 1859

**FØ** Sørvanganger: Svanvik (EIS 168) 29 June 1997. 1 specimen sweep-netted on a warm evening (leg. & coll. JA & SO). The only other record from North Norway is from TRI Nordreisa: Biltro (Strand 1953). This synanthropic species, which is a typical inhabitant of compost heaps, is a recent immigrant in Scandinavia and has expanded very rapidly northwards (Odegaard 1999).

*Stenus geniculatus* Gravenhorst, 1806


*Stenus nitens* Stephens, 1833


*Proteinus crenulatus* Pandelle, 1867

**TRY** Tromsø: Tromsøya (EIS 162) July 2001. 1 σ in a pitfall trap in a bog (leg. & coll. SO). The occurrence is very isolated from the rest of the distributional area since it previously has been found north to STY in Norway (Lindroth 1960, Vik 1991) and to Ångermanland (Ång) in Sweden (Lundberg 1995).

*Hapalaraea sahlbergi* (Luze, 1906)


*Trichophya pilicornis* (Gyllenhal, 1810)


*Gyrophaena affinis* Mannerheim, 1830

Gyrophaena pseudonana Strand, 1939

**FO** Sarvaranger: Lyngmo (EIS 160) July 1967. 1 specimen sweep-netted on a warm evening (leg. & coll. JA). This rare species, which is red-listed both in Sweden and Norway (Gärdenfors 2000, Direktoratet for Naturforvaltning 1999), seems to have a highly discontinuous distribution in Fennoscandia. Besides the new record, the other known Norwegian provinces of the species are **ON** and **TRI**. In Sweden, however, the northernmost published province is Jämtland (Jä) (Lundberg 1995), which is situated much further south (south of 65°N) than the two northernmost localities in Norway (about 69°N). The few available descriptions of the bionomic of *G. pseudonana* in Scandinavia (Strand 1946, Palm 1968) suggest that it may be confined to mushrooms growing in fluvial forests and meadows. Fluvial forests also have some other beetle species with a highly discontinuous distribution in Fennoscandia e.g. *Gyrophaena transversalis* Strand 1939 and *Anthobium fusculum* (Erichson, 1840) (Andersen & Hanssen 1994).

**Oxypoda lugubris** Kraatz, 1856


**Oxypoda spectabilis** Märkel, 1844


**Aloconota insecta** (Thomson, 1856)

**TRY** Tromsø: Tromsøya 20 June 2001. 1 specimen caught swarming (leg. & coll. SO). Previously reported from the continental parts of Northern Norway north to **FI** (Vik 1991).

**Aloconota sulcifrons** (Stephens, 1832)


**Liogluta granigera** (Kiesenwetter, 1850)

**TRY** Tromsø: Tromsøya, Håkøybotn (EIS 162) and Breivikeidet (Flalmo) (EIS 163) July/August 2002. Some specimens in pitfall traps, both in birch forest and on open ground (leg. & coll. JA & SO). The other North Norwegian records are from **NSI**, **NNV**, **TRI** and **FØ** (Vik 1991).

**Liogluta microptera** (Thomson 1867)


**Atheta ebenina** (Mulsant & Rey, 1873)


* *Atheta paracrassicornis* Brundin, 1954

**TRY** Tromsø: Laukslett (EIS 162) June/July 2002. 2 cr in pitfall traps in a sandpit (leg. & coll. JA & SO). Previous records from Norway were from the southern parts of the country (Vik 1991), but it is more widespread in Sweden and recorded north to the province most adjacent to Troms, i.e. Torne lappmark (To) (Lundberg 1995).

**Clambidae**

**Clambus armadillo** (De Geer, 1774)


**Elmidae**

**Elmis aenea** (Müller, 1806)

**TRY** Harstad: Møkklandsvatn (EIS 145) 1 September 1994. 2 specimens in gut content of

**Cantharidae**

*Absidia rufotestacea* (Leitzner, 1845)

**TRY Tromsø:** Oldervikdalen (EIS 163) August 1995. 2 specimens in window traps (leg. & coll. JA). The species has otherwise been found in the continental parts of Northern Norway north to FØ (Strand 1946, Vik 1991).

*Malthodes marginatus* (Latreille, 1806)


*Malthodes brevicollis* (Paykull, 1798)

**TRY Tromsø:** Sommarøy (EIS 162) June 2002. 1 specimen in a pitfall trap (leg. & coll. JA & SO). In Northern Norway otherwise found in TRI and FI (Vik 1991).

**Elatéridae**

*Neohypdonus arcticus* (Candeze, 1860)

**TRY Tromsø:** Håklebytn (EIS 162) June 2002. Several specimens in pitfall traps in a fallow field (leg. & coll. JA & SO). This Northern species has previously been found in the continental parts of the country from NTI to FI (Strand 1946, Vik 1991). *N. arcticus* is reported from more or less moist habitats such as swamps, lake shores and flotsam on river banks, but it should also occur on dry ground in birch forest (Strand 1946). However, our finds from Troms have been made in open, mesic-dry habitats with heterogeneous moraine soil, whereas we never have collected the species in wet or moist habitats.

*Ascoliocerus hyperboreus* (Gyllenhal, 1827)

**TRY Målselv:** Frihetsli (EIS 147) 18 June 1993 and July 1997 (leg. & coll. SO & JA). The species was abundant under stones on dry, open moraine soil. In Norway previously found in Nordland (NSI, NSY) and Finnmark (FV, FI, FN) (Vik 1991).

*Orithales serraticornis* (Paykull, 1800)

**NSY Bodø:** Heggmoen (EIS 130) 23 June 2003. 1 specimen caught flying (leg. & coll. JA). Previously recorded from most of the North Norwegian provinces (Vik 1991).

**Byrridae**

*Byrrhus arietinus* Steffahny, 1842

**TRY Tromsø:** Fløya (EIS 162) July 1999. 2 specimens in pitfall traps (leg. & coll. SO). The species has now been reported from most provinces in Northern Norway (Vik 1991).

**Dermestidae**

*Anthrenus museorum* (L., 1761)


**Anobiidae**

* Xyletinus hansenii* Jansson, 1947

**TRY Målselv:** Dividalen (EIS 147) July 1994, July/August 1996. 3 specimens in window traps (leg. JA, LH & ØH, coll. JA). X. hansenii has previously been found in the southernmost part of Norway (AK, BØ, VE), but it is distributed throughout Sweden north to To (Vik 1991, Lundberg 1995). As most other species of the genus, X. hansenii is regarded as xylophagous in Central Europe (Koch 1989b). However, in Scandinavia its larvae develop in dry faeces, preferably of hare (Lepus sp.) (O. Hanssen pers. comm.). Whether this difference reflects a real habitat shift is uncertain.

* Caenocara bovistae* (Hoffmann, 1803)

**TRY Målselv:** Frihetsli (EIS 147) August 1996. 1 specimen in a window trap (leg. LH & JA, coll. JA). The species lives in puffballs (Fungi: Lycomycetidae) (Koch 1989b). Previously recorded north to ON in Norway (Vik 1991), but it occurs north to To in Sweden (Lundberg 1995).
Nitidulidae

_Epuraea angustula_ Sturm, 1844


*Omosita depressa* (L., 1758)


The species, which lives on bones and in dry carcasses (Koch 1989b), has previously been recorded north to NTI (Vik 1991), but it occurs north to To in Sweden (Lundberg 1995).

*Thalycra fervida* (Olivier, 1790)

**TRI** Målselv: Frihetsli (EIS 147) July 1994. 1 specimen (leg. OH, coll. JA); **FØ** Sørvaranger: Noatun (EIS 160) July 1999. 1 specimen (leg. JA & SO, coll. SO). On both places collected in window traps. _T. fervida_ is mycetophilous and the larvae develop in various species of ground living Gastromycetes (Koch 1989b). Otherwise only recorded from South Norway (AA, VA, ON, BO) (Vik 1991), but it is present north to Lule lappmark (Lu) in Sweden (Lundberg 1995).

Aspidiphoridae

_Aspidiphorus orbiculatus_ (Gyllenhal, 1808)


Corticariidae

_Enicmus fungicola_ Thomson, 1868

**TRY** Tromsø: Oldervikdalen (EIS 163) August 1995. Some specimens in window traps in birch forest (leg. & coll. JA). The species has previously been found north to NTI, and in **TRI**, **FI** and **FØ** (Vik 1991).

*Stephostethus lardarius* (De Geer, 1775)


*Corticaria impressa* (Olivier, 1790)


*Corticaria orbicollis* Mannerheim, 1853


Ciidae

_Cis hispidus_ (Paykull, 1798)

**NNØ** Narvik: Skjomdal (EIS 139) November 1996. Several specimens in sporocarps of _Trametes_ sp., which is the host of the species (Fossli & Andersen 1998) (leg. TF, coll. JA). The species has been found in most of the provinces in Northern Norway (Vik 1991).

_Cis punctulatus_ Gyllenhal, 1827

**NNØ** Narvik: Skjomdal (EIS 139) November 1996. The species was common in sporocarps of _Trichaptum fusco-violaceus_, which is the preferred host of the species (Fossli & Andersen 1998) (leg. TF, coll. JA). _C. punctulatus_ has been recorded in the continental parts of Norway north to **TRI** (Vik 1991).

_Ennearhron cornutum_ (Gyllenhal, 1827)

**Sulcasis affinis** (Gyllenhal, 1827)


**Ooctotemnus glabriculus** (Gyllenhal, 1827)


**Octotemnus glabriculus** (Gyllenhal, 1827)


**Octotemnus glabriculus** (Gyllenhal, 1827)


**Oedemeridae**

**Oedemera virescens** (L., 1767)

FØ Sørvaranger: Vaggetem (EIS 160) July 1999. 1 specimen in a window trap in mixed forest (leg. & coll. SO & JA). Most finds of the species from Norway are made above the timber line (Strand 1946).

**Oedemeridae**

**Oedemera virescens** (L., 1767)

FØ Sørvaranger: Vaggetem (EIS 160) July 1999. 1 specimen in a window trap in mixed forest (leg. & coll. SO & JA). Most finds of the species from Norway are made above the timber line (Strand 1946).

**Anthicidae**

**Omanodus floralis** (L., 1758)


**Meloidae**

**Meloe violaceus** Marsham, 1802

NNØ Evenes: Østervik (EIS 139) 2 specimens on the ground (leg. E. Rise, coll. JA). The species is distributed throughout Northern Norway to FI (Strand 1946, Vik 1991).

**Chrysomelidae**

**Donacia aquatica** (L., 1758)

TRY Tromsø: Tromsøya (EIS 162) 12 and 17 June 1994. 4 specimens on vegetation in a lake (leg. & coll. SO). In Northern Norway previously recorded from NSY, NSI and TRI (Vik 1991).

**Chrysomelidae**

**Donacia aquatica** (L., 1758)

TRY Tromsø: Tromsøya (EIS 162) 12 and 17 June 1994. 4 specimens on vegetation in a lake (leg. & coll. SO). In Northern Norway previously recorded from NSY, NSI and TRI (Vik 1991).

**Clytra quadripunctata** (L., 1758)


* Cryptoccephalus pini* (L., 1758)

TRI Målselv: Frihetsli (EIS 147) July 1994. 1 specimen in a window trap (leg. ØH, coll. JA); Alappmoen (EIS 154) July 1999. 1 specimen in a window trap (leg. JA & SO, coll. SO). Previous northernmost records in Norway were STY and STI (Vik 1991), but it occurs north to To in Sweden (Lundberg 1995). The host plant of *C. pini* is various species of conifers, e. g. *Pinus sylvestris* (Koch 1992).

**Phratora polaris** (Sparre Schneider, 1886)

FØ Sørvaranger: Vaggetem (EIS 160) July 1999. 1 specimen in a window trap in mixed forest (leg. & coll. SO & JA). Most finds of the species from Norway are made above the timber line (Strand 1946).

**Longitarsus holsaticus** (L., 1758)


**Curculionidae**

**Sitona lineellus** (Bonsdorff, 1785)

NSI Saltal: Bleiknes (EIS 127) 10 June 2002. 4 specimens on dry sand at the base of *Astragalus alpinus* at the river Saltdalselva (leg. & coll. JA); FN Tana: Tana bru (EIS 176) 6 July 1998. 1 specimen on *A. alpinus* (leg. & coll. FØ). The species has now been recorded in most provinces in Northern Norway (see Vik 1991).

**Rhinoncus castor** (Fabricius, 1792)

TRY Tromsø: Oldervikdalen (EIS 163) 2 June 2000. Several specimens on dry sand in a sandpit (leg. & coll. JA). They occurred at the base of
Rumex acetosella, which is the preferred host (Koch 1992); Bergskog (EIS 162) June-August 2002. 16 specimens in pitfall traps (leg. & coll. JA & SO). Previous records of R. castor from Northern Norway: NSI, TRI, FI and FN (Vik 1991).

DISCUSSION

A majority of the new records (41) are from TRY. The total number of known beetle species from this province is now 685. By this calculation we have included a number of unpublished riparian species, but excluded five saproxylic species that have been reported from TRY. These latter five species are (with locality in brackets) Stephanopachys substriatus (Paykull, 1800) (Trondenes), Serropalpus barbatus Sellenius, 1786 (Tromsø), Monochamus urosovii (Fischer, 1806) (Tromsø), M. galloprovincialis (Olivier, 1796) (Tromsø) and Grammopera ruficornis (Fabricius, 1781) (locality unknown). The reason for excluding them is that they most likely represent introductions without establishment. Accordingly, S. barbatus and M. urosovii prefer, or are confined to, spruce (BiIQ & Mehl 1989, Koch 1992). Spruce is an introduced species in TRY and at the time of the finds of these two beetle species in Tromsø (before 1918) there were hardly any established spruce plantations in the county (Nilssen 1978). Pine (Pinus sylvestris), which is the preferred host of S. substriatus and M. galloprovincialis (BiIQ & Mehl 1989, Koch 1992), is so scatterly distributed in the district where the two beetles have been found in TRY (Benum 1958, Engelskjøn & Skifte 1995), that establishment of the beetles seems unlikely. G. ruficornis seems to be limited to the nemoral and boreonemoral zones. TRY is situated far north of these vegetational zones (Moen 1999) and we therefore find it unlikely that the species should have established in this province.

The number of recorded species from TRY is much lower than in the neighbouring province TRI where the total number of registred species now is 1132. A partial reason for this is differences in intensity of research. TRI, which constitute the continental part of Troms county, has attracted entomologists for more than a century and especially the valley Målselvdalen with tributaries, has been visited many times by several collectors (see e.g. Strand 1946, Andersen 1962, Zachariassen 1972, Andersen et al. 2000, Olberg et al. 2001) whereas Reisadalen in the northernmost part of the county is less well investigated (Strand 1953). Although the areas around the town Tromsø in TRY now are fairly well investigated other parts of the province remain nearly unexplored. This, among others, applies to some districts that are supposed to harbour a richer beetle fauna than the areas around Tromsø. One of them is the island Senja whose southern parts are covered by pine forest. A quite rich saproxylic beetle fauna may be associated with these pine forests as is suggested by the investigations by Nilssen (1993). Most other provinces in Northern Norway are also less well investigated than TRI. This especially applies to NNØ (see Andersen 1966, Nilssen & Andersen 1977) where less than 325 species have been recorded. The true number of species in this province is appreciably higher than published (Olberg in prep.).

Nevertheless, despite these differences in the investigation intensity between provinces, the real number of species in TRI is probably higher than in the other provinces in Northern Norway, perhaps except for the province FI. Circumstances supporting this are the following: In the provinces of Nordland (NSY, NSI, NNV, NNØ), which are situated south of TRI, barriers, perhaps also climate (high precipitation), may have prevented immigration of a number of saproxylic species that are present in Troms (Olberg et al. 2001). This may also apply to species reported from Troms in the present article since several of them are unknown from Nordland. In the province TRY, a less favourable summer climate with lower temperatures and higher precipitation than in TRI (Aune 1993, Moen 1999) may contribute to a lower number of species. Although continental parts of Finnmark county may have a favourable summer climate, the summer is short and the winter extremely cold (Aune 1993, Moen 1999). In accordance with this, most of Finnmark belongs to the northern boreal zone, whereas large parts
of TRI are situated in the middle boreal zone (Moen 1999). A number of plant- and animal species, including beetles, are known to be absent from the northern boreal zone (Andersen & Halvorsen 1984, Moen 1999, Andersen et al. 2000, Olberg et al. 2001). Considering its northern position (about 68.5-70°N) inner parts of Troms therefore probably have an extraordinarily high number of beetle species, comprising about 1/3 of the known Norwegian species.

Acknowledgement. We want to thank Frode Ødegaard for permission to publish some of his records of Coleoptera from Northern Norway.

REFERENCES


Entomol. 47, 7-19.

Received 8 April 2003, accepted 14 July 2003
Cheilosia chloris (Meigen) in Norway (Diptera, Syrphidae)

Ole Lønnve & Tore R. Nielsen


A new Norwegian record of Cheilosia chloris (Meigen, 1822) is reported from Bonn, Frogn, Akershus county.

Key words: Cheilosia chloris, Syrphidae, Norway.

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The occurrence of Cheilosia chloris (Meigen, 1822) in Norway has up to now been uncertain. Siebke (1877) published one male and one female from Christiania (= Oslo), but the material has not been found and may be lost. A female of C. chloris, collected by the first author, verifies its occurrence in Norway. The dates are AK Frogn: Bonn (EIS 28), some 22 km south of Oslo, 7 May 2002. The specimen is kept in the last author’s collection.

Cheilosia chloris is known from most parts of Europe, from Sweden and Denmark south to the Pyrenees, and from Belgium eastwards into European parts of Russia and on into Siberia (Speight 2001). It has an early flight period, from the beginning of April till early July. In Denmark it has been found in deciduous forests and humid meadows and bogs (Torp 1994).

The larva was found in Petasites paradoxus (Kaltenbach 1874), in Carduus and Scrophularia (Kormann 1988) and the female has been observed ovipositing on Carduus oleraceum (Doczkal 1996).

Cheilosia chloris much resembles C. fraterna (Meigen, 1830), another northern species with an early flight period. C. chloris lacks bristles on the scutellum margin (group C of Sack), scutum all yellow haired, and hind tibia in the male with a dark ring in the middle.

C. fraterna has (black) bristles on the margin of scutellum (group D of Sack), hind part of scutum black haired, and hind tibia all orange yellow (or sometimes just with a faint shadow).

References


Received 8 March 2003, accepted 3 April 2003


Litteraturlisten er svært omfattende (44 sider) og omfatter alt som er publisert om fjøre- og fingermølls taksonomi, og jeg mener også at den omfatter så å si alt om disse gruppenes biologi og fauna­sikk.


Leif Aarvik


I vol. 1 utgjør introduksjonen til serien 65 sider. Her finner vi følgende kapitler (oversatt):

1. Kort historisk oversikt og status for utforskingen av Europas målera fauna.
3. Målerne i deres livsmiljø (atferd og økologi).
5. Et naturlig system for familien Geometridae (fylgeni, taksonomi og nomenklatur).

Forfatterne har lagt vekt på å sikre stabilitet i navngivingen. For de 42 artene som behandles i bind 1, måtte identiteten til nesten 400 navn kontrolleres. Alle synonymer og viktige feilbestem­melser blir listet opp og har referanser til litteraturen.

I den systematiske delen behandles følgende punkter for hver art: Diagnose, hannlige og hunnlige genitalier, utbredelse, flyvetid, biologi, habitat, lignende arter og eventuelle kommentarer. For hver art er det utbredelseskart der hele utbredelsesområdet er vist med grå farge, og forekomsten av kontrollert materiale i tillegg er angitt ved svarte prikker. Det er ikke nøkler til slekter og arter. Bøkene er lette å finne fram i. Hver art har et nummer som går igjen både i tekstdelen og ved alle illustrasjoner av arten. I begge bind er det svært omfattende litteraturlister. Til slutt er det systematiske skjekklister som omfatter ikke bare alle Europas arter, men også arter som finnes i Europas nærhet, for eksempel i Kaukasus og Nord­Afrika.


Anmelderen finner diskusjonen under kapitlet om vern særlig interessant. I Mellom­ Europa (og i Norge) har det vært en tendens til å frede arter mot innsamling uten at man samtidig beskytter artenes levesteder. Her slås det entydig fast: «Det eksisterer intet vern av en art, uten at denne artens levested er vernet». Mange steder i Europa be­
traktes nå insektSAMling nærmest som faunakrimi-
nalitet. Meningsløs lovgivning som kun freder
arter, har bidratt til denne holdningen. Samtidig
tillater politikerne at naturen ødelegges i indu-
striell skala. Forfatteren gir noen eksempler som
belyser problemstillingen rundt innsamling av
insekter. En enkelt flaggernus spiser 1,8-3,6 kg.
insekter pr. år, og av dette utgjør nattsommer-
fuglene ca. 10 000 individer. Det vil si at noen få
flaggernus spiser flere nattsommerfugler enn alle
Europas sommerfuglsamlere til sammen klarer å
fjerne! Mange insekter blir drept ved kollisjon med
biler på Europas tette og tungt trafikkerte veinett.
På en 1-km veistrekning i Østerrike fant man ved
en undersøkelse at 3000 insekter ble drept bare
av en enkelt bil. Sterke flomlys ved et monument
i Sør-Italia tiltrekker omkring 5 millioner natt-
flyvende storsommerfugler i løpet av et år.

For øyeblikket er det under utgivelse flere serier
som behandler Europas sommerfugler: Foruten
denne målerserien er det Noctuidae Europaea og
Microlepidoptera of Europe. Alle disse seriene har
lagt seg på en høy standard både teknisk og faglig.
Det er hyggelig at nykommeren av disse, The
Geometrid Moths of Europe, ikke står noe tilbake
i forhold til de andre to.

Leif Aarvik
The division of Norway in geographical regions – «The Strand-system».

The division of Norway in geographical regions – «The Strand-system».

The division of Norway in 37 geographical regions. Each region represents part of a county (except Ø, AK and VE which are not divided). Abbreviations of counties: Ø = Østfold, AK = Akershus, HE = Hedmark, O = Oppland, B = Buskerud, VE = Vestfold, TE = Telemark, AA = Aust-Agder, VA = Vest-Agder, R = Rogaland, HO = Hordaland, SF = Sogn og Fjordane, MR = Møre og Romsdal, ST = Sør-Trøndelag, NT = Nord-Trøndelag, N = Nordland, TR = Troms, F = Finnmark. Abbreviations of subdivisions: I = interior, Y = coastal, S = southern, N= northern, V= Western, Ø = eastern.
Instructions to authors

The language is English or occasionally Norwegian with an English summary. The authors are advised to consult previous issues for lay-out and fonts. All manuscripts will be considered by referees before acceptance.

Manuscripts, «one and a half» spaced on one side of the paper, must be submitted in duplicate. Separate sheets should be used for (1) title page with authors names, (2) abstract followed by the name(s) and postal address(es) of the author(s), (3) tables, (4) numbered figures and (5) legends to figures. Acknowledgements should be gathered under a single heading at the end of the text.

Abstract should not exceed 300 words and should cover the main results and conclusions of the paper. A list of up to five key words may be added on a separate line below the abstract. Authors, year, title of paper and Norw. J. Entomol. Vol. No. should be inserted above the abstract.

Tables are typed on separate sheets and numbered consecutively. Each table must have a heading. Write «Table» in full both in the text and table heading. Avoid vertical lines in the Table.

Figures must be numbered consecutively and all figures must be referred to in the text. Write «Figure» in full. Names(s) of the author(s) should be written in the margin of each figure. The size of the figure must not exceed 210 x 290 mm (standard A4). The author should take into consideration that most figures have to be reduced. In line drawings the line thickness should not be less than 0.25 mm after reduction, and capital letters should not be smaller than 2.0 mm. Choose contrasting patterns and avoid fine tone rasters. Photographs must be of high quality with good contrasts. Maps and morphological illustrations, e.g. pictures of insects, should include a scale bar.

Nomenclature. Scientific names of genera and species should be written in italics. The name of the author and year of description (if appropriate), separated by a comma, should be included the first time the name of an insect or another terrestrial arthropod is mentioned in the text, e.g. *Rhyacophilus nubila* (Zetterstedt, 1840). Names of authors should be written in full, except L. for Linnaeus.

Localities. In faunistic papers the names of Norwegian localities should be according to K.A. Økland (1981), Fauna (Oslo) 34, 167-178, and preferably the EIS number should be added.

References. Citations in the text should be written as Black (1992), (White 1995) or (Black & White 1998). When a paper has more than two authors, it should be referred to as Smith et al. (1990). Multiple references in the text are given in chronological order (Smith 1975, Green 1980, Black & White 1998). All references (but not any that has not been cited in the text) should be listed in alphabetical order at the end of the paper. In English reference lists, Ø is equal to O and Å is equal to Aa. Names of journals are abbreviated according to international standards, e.g. as in BIOSIS (Biological Abstracts).

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CONTENTS
Norw. J. Entomol. 50 (1) 2003
ISSN 1501-8415.

Articles
Kurina, O. On the validity of the species Exechiopsis aemula Plassmann and Exechiopsis pulchella (Winnertz) (Diptera, Mycetophilidae) ................................................................. 3
Kobro, S. On the Norwegian thrips fauna (Thysanoptera) ................................................................. 17
Stol, I. Distribution and ecology of harvestmen (Opiliones) in the Nordic countries ......................... 33
Elverum, F., Johansen, T. J. & Nilssen, A.C. Life history, egg cold hardiness and diapause of Argyresthia retinella (Lepidoptera: Yponomeutidae) ................................................................. 43
Coulson, S. J., Jussila, R., Hodkinson, I.D. & Webb, N.R. Synodites lineiger (Thomson, 1893) (Hymenoptera: Ichneumonidae) new to Svalbard, with an updated list of ichneumonid species from the archipelago .... 55
Andersen, J. & Olberg, S. New records of Coleoptera from Northern Norway ..................................... 57

Short communications
Ingebrigtsen, O. & Hauge, E. Pholcus phalangioides (Fuesslin, 1775) (Araneae, Pholcidae) first record from Norway ................................................................. 42
Greve, L. Acrometopia wahlbergi (Zetterstedt, 1846) (Diptera, Chamaemyiidae) in Norway ............... 54
Lønnve, O. & Nielsen, T.R. Cheilosia chloris (Meigen, 1822) in Norway (Diptera, Syrphidae) ................ 68

Book reviews • Bokanmeldelser ........................................................................................................ 69, 70

Information
The division of Norway in geographical regions – «The Strand-system» ........................................... 72

The present journal is a continuation of Fauna norvegica Series B (Norwegian Journal of Entomology). With Volume 45 (1998) the publication of this journal by the Foundation for Nature Research and Cultural Heritage Research (NINA-NIKU) has been discontinued. Starting with Volume 46, the journal is published as Norwegian Journal of Entomology by the Norwegian Entomological Society. Editor is Professor Lauritz Sømme, University of Oslo.