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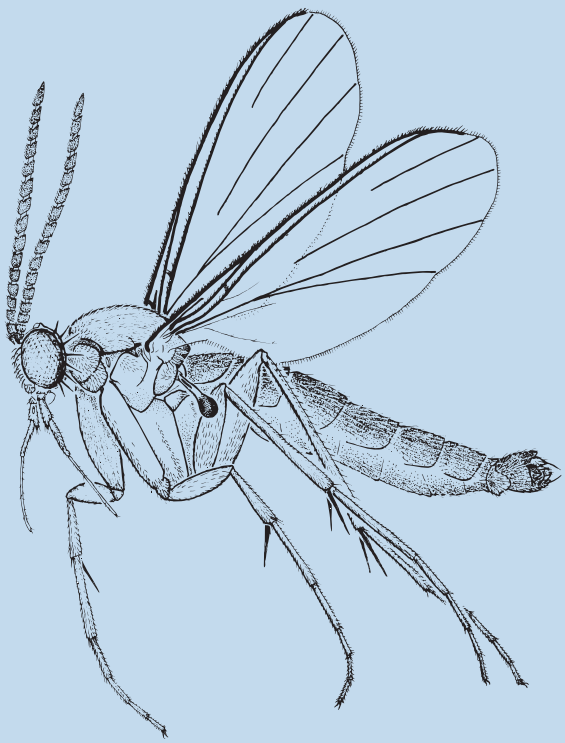

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Front cover: Fungus gnat (*Manota mazumbaiensis* Søli, 1993) (Drawing by G. Søli).

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The first record of a male of *Aeolothrips manteli* Titschack (Thysanoptera) and some characters of the Norwegian species of the genus.

Sverre Kobro

Kobro, S. 2005. The first record of a male of *Aeolothrips manteli* Titschack (Thysanoptera) and some characters of the Norwegian species of the genus. Norw. J. Entomol. 52, 65-68.

The male of *Aeolothrips manteli* is recorded for the first time. The species can easily be distinguished from the other Norwegian *Aeolothrips* species by characters on the antennae and on the eyes.

Key words: Thysanoptera, characters, *Aeolothrips manteli* male.

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INTRODUCTION

Compared to other insect orders thrips is a poorly studied group in Norway. More species are expected to be found (Kobro 2003), and species that originally were believed to be rare have proven to be more common, particularly when their habitats are closer studied (Kobro 2001, Kobro & Solheim 2002). Still, our understanding of the biology of thrips remains fragmentary (Mound 2005). Even basic relations like sex ratio appear variable. In field populations of thrips females are usually dominating. The females of many species live longer than the males and the dominance is only apparent. In some species only the females hibernate, and no males are present in the spring population. In other species the males are wingless and restricted to the host plant, while females can be found on other plants as well. On the other hand, a number of species reproduce partly or wholly parthenogenetically and the males are rare or even unknown. The sex ratio may also have geographic variations. Males of Thrips tabaci Lindeman are common in the eastern Mediterranean regions and extremely rare in many other parts of the world (Lewis 1973).

Eight species of *Aeolothrips* have been recorded in Norway (Olsen & Solem 1982, Kobro 2003). *Aeolothrops ericae* Bagnall and *Aeolothrips fasciatus* (L.) are the most common species, as they are reported from 25 and 15 EIS squares respectively. *Aeolothrips albicinctus* Haliday is probably also common, as it previously was recorded from three EIS squares, and it was recently collected together with *A. ericae* and *A. fasciatus* from EIS square 168 (Kobro unpublished). *Aeolothrips intermedius* Bagnall, *Aeolothrips melaleucus* Haliday, *Aeolothrips versicolor* Uzel and *Aeolothrips vittatus* Haliday are regarded as rare as they are reported from one or two EIS squares only. However, *A. vittatus* may be more common, as it was recorded once in numbers from canopies of Scots pine (*Pinus sylvestris*), a habitat extremely poorly investigated (Thunes et al. 2004).

Aeolothrips manteli Titschack was collected for the first time in The Netherlands in 1961 by Wim Mantel (Titschack 1962). He collected more than 70 female specimens, mostly from *Anchusa officinalis* through the years 1961 to 1964, in a small coastal area within a distance of a hundred

meters (Franssen & Mantel 1963, Vierbergen in litt.). No male has been recorded (zur Strassen 2003). Outside The Netherlands *A. manteli* was recorded for the first time in Norway in 2001 on *A. officinalis* (Kobro 2003). Here I report the first record of a male of *A. manteli* and give some notes on characters for distinguishing the aeolothripses known from Norway.

MATERIALS AND METHODS

Plant material was collected in the field and brought to the laboratory in plastic bags. The bags were filled with water and a drop of detergent. After at least 10 minutes the plant material was carefully removed and the water filtered. The remaining material was stored in a mixture of ethanol, glycerol and acetic acid and the specimens of Thysanoptera were prepared individually in Canada balsam.

Identification was performed according to Schliephake & Klimt (1979) and zur Strassen (2003). The Norwegian specimens are kept in the reference collection of The Norwegian Crop Research Institute, Plant Protection Centre, Norway, as well as at The Plant Protection Service, Wageningen, The Netherlands and The Senckenberg Museum, Frankfurt, Germany.

The specimens studied were selected randomly from reference collection of the Plant Protection Centre, Norway.

European Insect Survey (EIS) square is given according to Økland (1976).

Duncan´s Multiple Range Test was used for statistical analyses.

RESULTS

A. manteli has been collected repeatedly at three different localites: Anvik, Brunlanes, TEY, Fynstranda and Mostranda, Tjøme, VE, all in EIS 19. Thirty-five specimens were collected of which one specimen is a male.

The length of the antennal segments and the sensoria of the species studied here varied a lot (Table 1), but the length of the sensoria in relation to the length of their antennal segment showed distinct differences between some of the species (Table 2).

Table 1. Length of antennal segments and their sensoria in μm (mean ± SD) in Norwegian species of *Aeolothrips.*

Species	Sex	n	3. segment	Sensorium	4. segment	Sensorium	5. segment	Sensorium
A. manteli	m	1	77	43	74	56	61	26
	f	10	95 (3)	58 (5)	82 (3)	65 (4)	68 (5)	37 (4)
A. erica	m	10	100 (7)	42 (2)	91 (6)	53 (6)	81 (5)	5 (1)
	f	10	110 (11)	53 (6)	95 (7)	60 (6)	81 (6)	7 (1)
A. fasciatus	m	7	110 (9)	35 (7)	101 (14)	44 (7)	84 (8)	7 (1)
	f	10	111 (9)	35 (5)	94 (9)	47 (7)	72 (6)	7 (1)
A. vittatus	f	10	85 (5)	30 (5)	73 (5)	33 (4)	65 (3)	5 (0)
A. melaleucus	f	10	120 (18)	34 (7)	95 (7)	48 (8)	70 (3)	5 (1)
A. versicolor	f	10	96 (7)	26 (6)	70 (5)	35 (3)	57 (3)	5 (0)
A. albicinctus	f	10	148 (8)	30 (8)	113 (9)	40 (5)	97 (5)	5 (2)

Table 2. Length of sensoria relative to length of segment in Norwegian species of *Aeolothrips.* Figures followed by the same letter within each column are not significantly different (f < 0.05).

Species	Sex	3. Segment	4. Segment	5. Segment
A. manteli	m	0.56	0.76	0.42
	f	0.61 a	0.79 a	0.54 a
A. ericae	m	0.42 b	0.58 b	0.06 b
	f	0.48 c	0.65 c	0.06 b
A. fasciatus	m	0.31 d	0.44 d	0.07 b
	f	0.30 d	0.51 e	0.10 b
A. vittatus	f	0.35 e	0.45 d	0.04 b
A. melaleucus	f	0.28 d	0.50 e	0.06 b
A. versicolor	f	0.27 d	0.50 e	0.02 b
A. albicinctus	f	0.20 d	0.35 f	0.03 b

DISCUSSION

Males are rare in the Norwegian populations of *Aeolothrips*. Males represent less than 20 % in the two most common species in Norway *A. ericae* and *A. fasciatus* as indicated in the reference collection of the Plant Protection Centre. Males of *A. manteli* are apparently rarer as the male reported here is the first out of more than a hundred specimens referred to from Norway and The Netherlands. Both the male and the females are easily distinguished from other Norwegian *Aeolothrips* species by having a long sensorium on the 5. antennal segment (Tables 1 and 2). Good figures were presented both by Titschack (1962) and zur Strassen (2003). According to Schliephake & Klimt (1979) this sensorium is present only in *A. manteli*. However, zur Strassen (2003) mentioned a sensory trichome on a short-oval base on the 5. antennal segment, and in my opinion, it is this base that is enlarged to the sensorium of *A. manteli*. A sensory trichome is present in the apical end of this sensorium on both the male and the females studied of *A. manteli*.

A. manteli can be separated from all the other Norwegian species studied here, by the relative length of the sensorium on each of the antennal segments 3, 4 and 5. *A. ericae* can be separated from the other species by this character on each of the segments 3 and 4, while *A. vittatus* and *A. albicinctus* can be distinguished from the others by the sensorium on one antennal segment only. *A. fasciatus, A. melaleucus* and *A. versicolor* cannot be separated from other aeolothripses by antennal characters only.

A. manteli can be separated from the other aeolothripses by another character as well. The ventral facets of the eyes are equally sized in *A. manteli* but are of variable size in the other species of *Aeolothrips* known to Norway.

A. manteli occurred together with *A. ericae* and *A. fasciatus*, the two most commonly distributed *Aeolothrips* species in Norway.

A. intermedius which is a rare species very similar to *A. fasciatus* is not included in this discussion.

Thrips are not good flyers; their ability to spread over large distances is limited. Some species have been recorded as air plankton, but aeolothripses are not commonly found airborne (Lewis 1973). However, distribution of thrips has

been influenced by mankind. The recent spread of greenhouse species has been an insistent problem (Kirk & Terry 2003, Vierbergen 2001). Previously, thrips species have been distributed along routes of sailing ships with hay, straw, dead palm leaves and coconuts (Mound & Palmer 1983). The distribution of *A. manteli* is astonishing. The species has been collected only in The Netherlands and Norway and in coastal areas (zur Strassen 2003) and most only on *A. officinalis*. The plant has its origin in southern Europe or western Asia (Lindeman 1964). *Aeolothrips* species pupate in silk cocoons in the soil (Lewis 1973). When plant seeds also can be transported with soil, the co-occurrence of *A. manteli* and *A. officinalis* in Norway and The Netherlands, could be explained by transport of ballast between the two maritime nations rich in traditions, but there are other explanations for the spread of the plant that are as likely (K. Bjureke, pers. com.).

Sampling on *A. officinalis* in coastal regions in other European countries would be tempting task in the coming.

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Diamesa parancysta Serra-Tosio: an East-Palearctic midge new to Europe (Diptera: Chironomidae: Diamesinae)

Endre Willassen, Oddvar Hanssen & Jan Ivar Koksvik

Willassen, E., Hanssen, O. & Koksvik, J.I. 2005. *Diamesa parancysta* Serra-Tosio: an East-Palearctic midge new to Europe (Diptera: Chironomidae: Diamesinae). Norw. J. Entomol. 52, 69-73.

We report a finding of *Diamesa parancysta* Serra-Tosio, 1983 from River Alta in the county of Finnmark, northern Norway. *D. parancysta* was previously known only from two sites in Mongolia. We also propose that *Diamesa corrupta* Makarchenko, 1988 is a new junior synonym of *D. parancysta,* because the morphology of these nominal species is very similar. The type locality of *D. corrupta* in the upper Yenisey drainage basin is not very distant from the Mongolian sites with *D. parancysta*.

Key words: Chironomidae, Diamesinae, *Diamesa parancysta, Diamesa corrupta,* new synonym, rare species.

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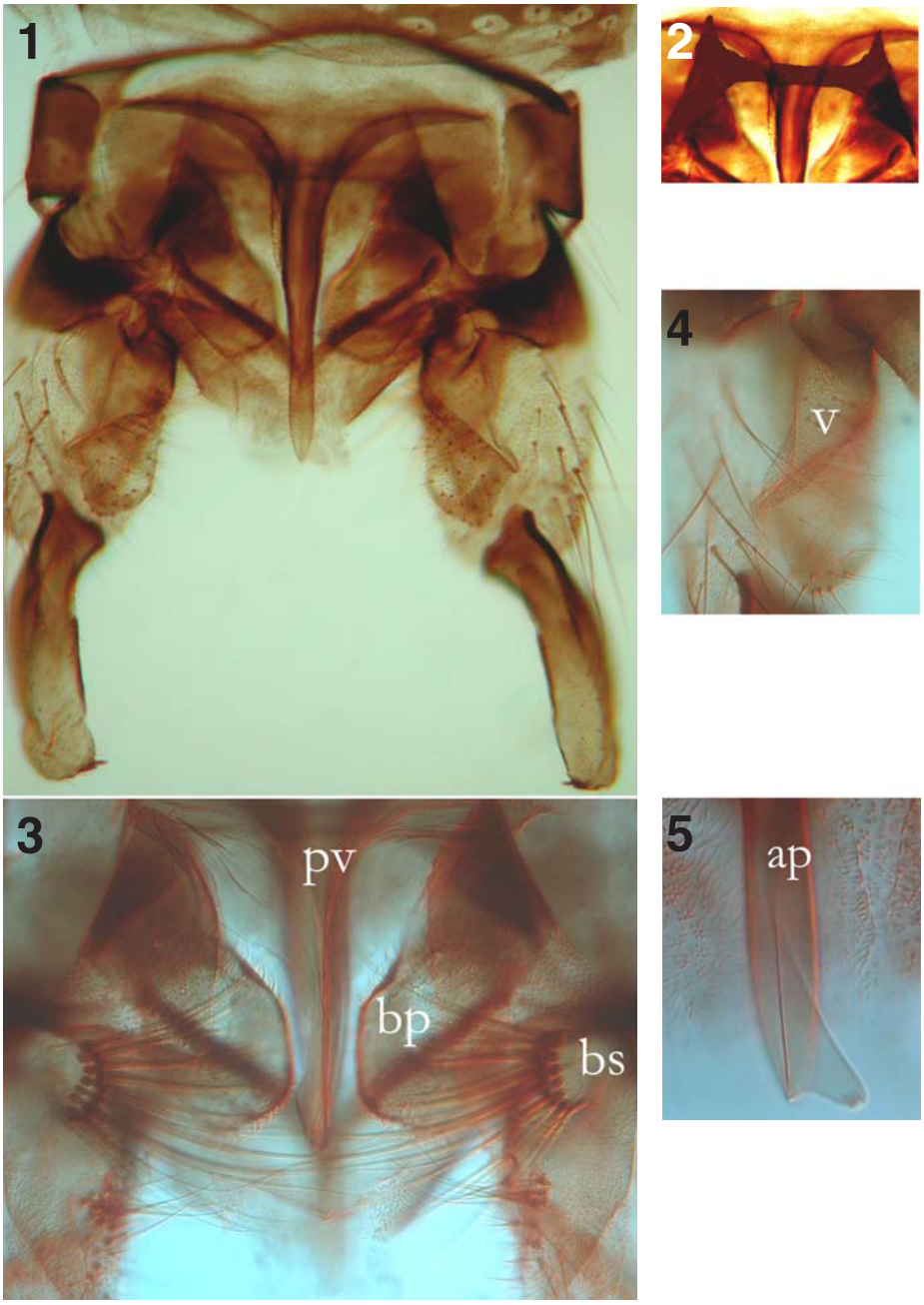
INTRODUCTION

Diamesa is known as a genus with species that are unusually tolerant to cool conditions. Larvae are predominantly found in the upper reaches of running waters with temperatures below 10ºC (Lods-Crozet et al 2001). Adults are frequently observed under winter conditions and are also known for their presence at high altitudes (Sæther & Willassen 1987, Willassen 1988, Willassen & Cranston 1986). Knowledge about the taxonomy and distribution of *Diamesa* species in Europe has accumulated with contributions from several authors (Aagaard et al 1987, Aagaard et al. 2004, Hrafnsdottir 2005, Kownacka & Kownacki 1975, Kownacki 1987, Rossaro 1988, Rossaro 1995, Serra-Tosio 1973, Willassen 1986) and the distribution of about 30 species is currently listed by Fauna Europaea (Sæther & Spies 2004). An annotation of chironomid species in Norway by Schnell & Aagaard (1996) includes 16 species of *Diamesa*. However, the occurrence of *Diamesa wuelkeri* in Norway has yet to be confirmed. *Diamesa valkanovi* Sæther (1968) must be regarded as a *nomen dubium,* and *Diamesa davisi* should be conceived a Nearctic species according to the taxonomic revision of *D. davisi* and related species (Willassen 1986). Here we report an addition to the list of European species: *Diamesa parancysta* Serra-Tosio, 1983. When accounting for a new synonymy with *Diamesa corrupta* Makarchenko, 1988, the species has previously been recorded with three individuals only from an equal amount of sites in the East Palaearctic.

MATERIAL AND METHODS

The specimens were obtained with Surber sampler in the River Alta in May 1993. River Alta is situated in northern Norway (70°N, 23°E). The catchment area is 7400 km2. Mean annual water discharge at the outlet is 75 m^3 s^{-1}. The water temperature reaches a maximum of 14-16°C in August. The material was collected in the lower part of the river, from a substrate dominated by gravel and small stones, up to 15 cm in diameter. Pine forest surrounds the river in this part.



Figures 1. 1-5 *Diamesa parancysta* Serra-Tosio. Males from River Alta, Northern Norway. 1: hypopygium overview; 2: detail of sternapodeme (outline enhanced manually with colouration); 3: pars ventralis (pv), basal plate (bp) and basimedial setal cluster (bs); 4: detail of left volsella (v) and medial field; 5: apex of anal point (ap).

The collection includes mature pupae of three males and one female. The specimens were mounted on slides in Euparal®. The specimens are kept in the Museum of Natural History and Archaeology in Trondheim, under object number 74301-4 and are labelled Alta: Altaelva st.4, surber nr.3, 05.05 1993, J.I. Koksvik. Pictures were taken with a Nikon Coolpix 990 mounted on a Leica DMLB compound microscope. The pictures (Figure 1) were edited with the software Photoshop®. Morphological terminology follows Hansen & Cook (1976) and Sæther (1980). The map (Figure 2) was made with the Generic Point Mapper at the Canadian Biodiversity Information Facility (http://www.cbif.gc.ca/mc/index_e.php).

RESULTS AND DISCUSSION

Characteristics of male *Diamesa parancysta* Serra-Tosio, 1983

We identified *D. parancysta* from the comprehensive description of adult males given by Serra-Tosio (1983). The species may be recognised by the following combination of morphological features: The antennae are plumed. The eyes are hairy. The wings are «typical» *Diamesa* with MCu crossvein connecting RM and FCu. The male genitalia have a sternapodeme (Figures 1.1-2) with strongly projecting anterolateral corners, and a long pars ventralis (Figure 1.3). The gonocoxites have broad and prominent basal plates (Figures 1.1, 1.3), a well developed basimedial setal cluster (Figure 1.3), and a volsella with obtuse mesal margin (Figure 1.4) overlying the well developed medial field. The gonostyli are gently curved and relatively broad. Tergite IX has distinct tergal bands (Figure 1.1) and the anal point is broad with a terminal dorsal keel and apical setiform sensilla (Figure 1.5).

Synonymy with *Diamesa corrupta* Markarchenko, 1988

Diamesa corrupta was described from a male collected by Chekanovskiy in 1930 near the Padun rapids of Verkhnyaya Angara (Makarchenko 1988). The type locality of *D. corrupta* in the upper Yenisey drainage basin is not very distant from the Mongolian sites where the two *D. parancysta* were collected nearly forty years later. Mararchenko (personal communication with EW) examined digital pictures of our Norwegian specimens and agrees that they are very similar to *D. corrupta*. We therefore think it justified to synonymize *D. corrupta* with *D. parancysta*.

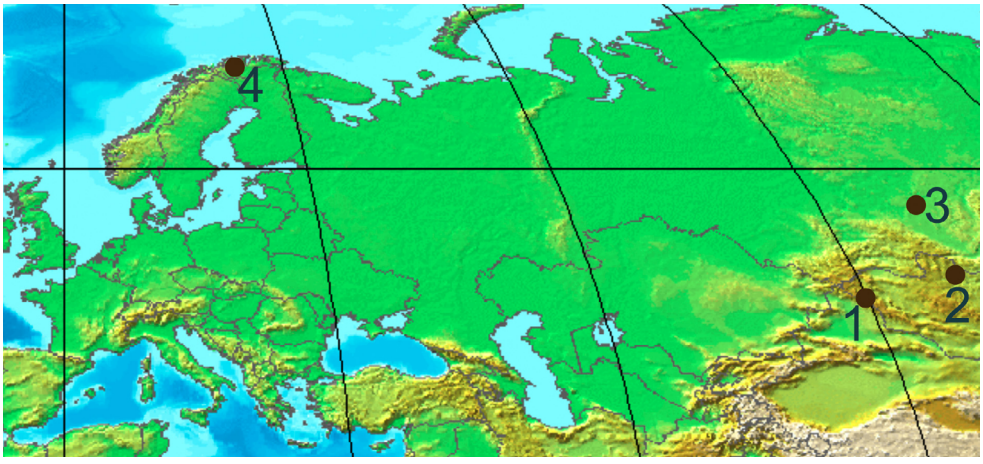


Figure 2. Map of all records of *Diamesa parancysta* Serra-Tosio (with collection year in parenthesis). 1 Mongolia: Bayan Ölgiy province (1968); 2 Mongolia: Bulgan province (1968); 3 Russia: Irkutskaya (1930) (as *Diamesa corrupta* Makarchenko); 4 Norway: Alta (1993).

A case for the «Red List»?

With the record from River Alta, *D. parancysta* is known from only four sites World wide. It is worth noting that the Siberian collection was made 75 years ago, before the construction of a gigantic power plant near the city of Bratsk, and we do not know whether this has affected the population of *D. parancysta* in that area. Although cold-stenothermic and rheophilic species are potentially threatened by climate change and river regulation, it is fair to suggest that the rarity of *D. parancysta* in the records so far is partially due to sampling bias. Much of the northern areas of the Palearctic are still poorly examined for this group of insects and with few exceptions (Tuiskunen & Lindeberg 1986) this is also the case for the western European north. Relatively denser sampling efforts have been made in the southern Norwegian and Central European mountains and negative evidence may suggest that *D. parancysta* is confined to the northern borders of Scandinavia. There are strong indications to believe that the species is very rare in River Alta, as it has been found only in one out of 134 investigated Surber samples from a 40 km river stretch, collected in different seasons through three years. The samples include more than 47 000 larvae and pupae of chironomids.

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Diurnal flight activity of codling moth, *Cydia pomonella,* (Lepidoptera: Tortricidae) males in relation to temperature and twilight

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Timed catches of *Cydia pomonella* (L.) males in sex pheromone traps were used to investigate the influence of twilight and climatic parameters on the flight activity of the moths at different latitudes. Traps were operated from 15 May until 31 July at several locations between 59°N and 60°N in south-eastern Norway, and at Sogndal (61°N) in western Norway, during 1997-2000. Time and duration of twilights were calculated from May-August for each trap-location, and compared with the activity of *C. pomonella*. Flight response appeared to be determined by the daily photoperiod, corresponding to time of sunset at the different latitudes involved in the study. This response began about two hours before sunset, and declined around 23:00 and 24:00 hours in the evening, in western and eastern Norway, respectively.
Main flight activity in both eastern and western Norway was recorded when temperatures were in the range 10-20 °C, the relative humidity was above 50 %, and at wind speeds below three m/s at the time of capture. In Norway, light conditions are suitable for *C. pomonella* flight activity all night long during the entire lifetime of the adult moths. It is concluded that temperature is the limiting factor for flight at high latitudes.

Key words: *Cydia pomonella,* diurnal flight activity, twilight, sunset, temperature, 59°-61°N, sex pheromone traps.

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INTRODUCTION

The codling moth, *Cydia pomonella* (L.) is the most serious pest of apples worldwide (Barnes 1991), and it also attacks other fruits such as pears, quince, apricots, plums as well as walnuts. Potential damage to the apple crop by the codling moth may be generalized according to the number of generations of the species in a given area. Infestation ranges from less than 15 % from a univoltine population to less than 35 % with one and a small second generation. In an area with a predominantly bivoltine population more than 75 % of the apples may be infested (Barnes 1991). In Norway only one generation has been reported (Sæthre & Edland 2001), and the damage in commercial apple orchards during the last ten years has been reported to vary from less than 1 % in some years to about 7 % in 1992. In some organically grown orchards and private gardens with no use of insecticides, however, the damage can be much higher, and in 1992 it ranged between 40-80 % of the apple crop (Edland 1993).

Monitoring of flight periods by the aid of sex pheromone traps for prognoses and forecasting of codling moth attack has been under systematic surveillance in selected apple orchards since 1994 in Norway (Sæthre & Edland 2001). The most essential parameter for assessing the risk of attack by *C. pomonella* is the temperatures at sunset, when the moths have their flight (Falcon et al. 1983). However, the time of sunset during the year varies with the latitude, both in the northern and the southern hemispheres (Ahrens 1991). The distribution of *C. pomonella* in Norway has been recorded up to 61°05'N in the eastern part of the country, while in western Norway the species is only present at a single location (Sogndal), at 61°14'N (Sæthre & Edland 2001). In Sweden, the species is distributed up to about 62°N (Svensson et al. 1987). In Finland *C. pomonella* is found almost up to 66°N in western Finland, while it is present north of the Arctic Circle (to about 67.5°N) in eastern Finland (Kerppola et al. 1995).

The onset and the duration of twilight depend on the latitude, as the altitude of the sun during the year varies with latitude (Ahrens 1991). This has a major impact on light conditions in Norway during the summer, even after sunset, and it is quite different from countries further south. Collins & Machado (1935) have shown that the flight activity of *C. pomonella* is regulated by the position of the iris pigment in the compound eye, and the moth is only active when the iris pigment migration is between its two extremes (light and dark adaptations). As a result, the moth is active in twilight but inactive in the light as well as in the dark. The state of dark-adaptation, however, is a state of extreme susceptibility to photic excitation, or a state of receptivity to the stimulus of light should that stimulus occur, since the iris-pigment is then in the optimum position to permit the penetration of the greatest amount of light. The original range of the codling moth does not include Norway, Sweden and Finland (Pashley & Bush 1979), and we found it therefore important to investigate if, and how, the light conditions at high latitudes influence the activity of the moths during their evening flight.

The surveillance program of *C. pomonella* in Norway has since 1994 used 15.6 °C as a threshold temperature for oviposition, provided that moths have been caught in the pheromone traps. More recent laboratory experiments, however, have shown that 14-15 °C is a more appropriate threshold temperature for this species in Norway (Sæthre & Hofsvang 2002). What has not been investigated is at which temperatures the evening flight actually occurs in Norway. Knowledge on flight temperatures and possible discrepancies between flight temperatures and temperatures for oviposition would be information of major importance to the surveillance program. To investigate and clarify the questions identified above, field trials were conducted during four years (1997-2000) at different locations in southern Norway with a timing sex pheromone trap. The design of the trap allowed the comparison of individual codling moth male catches to twilight and weather at the time of catch, within the accuracy of one hour.

In a report on integrated pest management of the codling moth, Rein (1994) proposed that the orchard topography produces evening temperatures that could influence the activity of the moths. He suggested that codling moth populations in orchards where the surrounding topography (e.g. mountains, hills, big trees or buildings) creates natural shadow in certain areas and hillsides previous to the astronomical time of sunset, might have their onset of flight earlier in the evenings than populations in orchards exposed to the sunlight until sunset. This may have caused the higher infestation rates observed in these orchards compared to the evening sun-exposed orchards located in the same area. One possible explanation for this phenomenon was suitable light conditions for the onset of flight because of the shadow, but without suffering from the drop in temperature that is known to take place just after sunset, and which might prevent the moths from flight and oviposition. Rein (1994), however, gave little evidence for this assumption. Therefore, a second objective of the present study was to investigate the hypothesis above.

Table 1. Locations in southern Norway where timing sex pheromone traps used to investigate *Cydia pomonella* male flight activity. Traps were operated from 15 May until 31 July. Column eight shows the agrometeorological stations providing data for the respective trap-locations. The last column shows the number of males caught at each location.

Municipality	Location	Latitude N	Longitude E	Altitude m a. s. l.	Year of trapping	Agro-meteorological station	No. of males caught
Ås	Åsbakken	59°41'	10°46'	110	2000	Åsbakken, Ås	27
Svelvik	Knem	59°36'	10°24'	10	1997	Knem, Svelvik	21
Lier	Foss Gård	59°47'	10°15'	60	1998-2000	Foss Gård, Lier	27
Lier	Egge	59°49'	10°13'	100	1998	Foss Gård, Lier	15
Ringerike	Norderhov	60°08'	10°16'	110	1997-2000	Hønefoss	46
Ringerike	Norderhov	60°08'	10°16'	120	1999-2000	Hønefoss	13
Sauherad	Holtskog	59°21'	9°13'	100	1998-2000	MTF, Gvarv	9
Sauherad	Holte	59°21'	9°13'	80	1998-2000	MTF, Gvarv	26
Sauherad	Midt-Telemark forsøksring (MTF)	59°22'	9°12'	46	1997-2000	MTF, Gvarv	16
Sauherad	Flåtin	59°23'	9°14'	40	1997	MTF, Gvarv	5
Sauherad	Jønsi	59°30'	9°20'	80	2000	Jønsi, Hjuksebø	13
Sogndal	Sogndalsfjøra	61°14'	7°14'	5	1998-2000	Njøs, Balestrand	115

MATERIALS AND METHODS

Insects

The populations of *C. pomonella* in eleven of the orchards selected for this study were those naturally occurring at the different locations. The moths trapped were thereby expected to represent the population adapted to the respective areas. However, in the experimental orchard of the Agricultural University of Norway (Åsbakken, Table 1), no catches of adult codling moths in sex pheromone baited delta traps (three-dimensional white cardboard traps) occurred in 1998 and 1999. It was therefore decided to release a few moths in the orchard in the year 2000. Larvae were collected from some orchards and gardens in Sauherad and Lier municipalities in eastern Norway in late July 1999. The larvae hibernated in paperboard in an outdoor insectary at Ås, and were transferred to emergence cages in the orchard in April 2000. The two cages were placed next to a trunk in a row of apple trees, one cage on the southern side of the trunk and one cage on the northern side. Emerging moths were trapped in a PVC container connected to the cages, and daily recordings of the sex and number of the emerging moths were conducted. The moths were thereafter released close to the cages.

Some of the released male moths in Åsbakken were later assumed to be caught in the sex pheromone baited trap located about 40 m north of the release point. The release and trapping of the moths had several purposes. One was to find out how efficient the traps were, i.e. how many male moths of those released were caught in the trap and how many disappeared and/or avoided the trap. Another reason was to compare the emergence dates of the moths with trapping dates, to get an idea of the connection between emergence dates and flight periods, however,

this is not to be reported here. It was also an opportunity to run a trap close to our laboratory.

Experimental orchards

The experimental orchards/gardens were chosen within the main fruit growing areas in Norway, which are Buskerud and Telemark counties in eastern Norway and Sogn og Fjordane county in western Norway. *C. pomonella* is not present in other parts of western Norway than Sogndal (Sæthre & Edland 2001), and thus other areas in western Norway were not included in this study.

Some locations were chosen because they were already included in the ongoing program of prognoses and forecasting of codling moth attack, and cooperation with the growers or the extension service was already established. During the period of investigations the new timing traps replaced the previously used delta traps and became a part of the surveillance program. Some of the orchards included in the surveillance program had an agrometeorological station situated in the orchard (see Table 1 and below), and it was of special interest to locate the new traps close to one of the stations. The climatic parameters measured would then be very accurate for the climate surrounding the trap. The orchards were also chosen from the idea that orchard topography could influence on population densities and possibly also the activity-pattern of the moths. This assumption was based on local knowledge and previous experience in assessing the risk of heavy attack, less heavy or hardly any attack of codling moth in different orchards located in the same area (Rein 1994). Further location of the traps inside the orchards was done according to local experience of where high abundance of moths could be expected. In addition, in cases where one person was responsible for operating more than one trap, the distance between the traps had to be limited.

Some locations were made use of only one season, while others for four years (Table 1). This was due to several reasons: the location was found unsuitable because of very low catches, new locations were considered more interesting than continuing with the old one, or the personnel operating the trap were no longer available.

Agrometeorological stations

The Norwegian Crop Research Institute runs a network of 52 automatic agrometeorological stations placed in rural districts all over the country (between 58°N and 69°N and between 8°E and 30°E) (Sivertsen 2000). The stations are placed near or within orchards and fields, and all stations are equipped with Campbell loggers. Most of the figures recorded are hourly mean values of the parameters in Central European Time (CET)), and the data are collected and stored in a database on a daily basis (Sivertsen 2000).

The stations made use of in this study all measured air temperatures in two m height (hourly mean, minimum and maximum values) and air humidity in two m height (60 min mean). All stations, except Gvarv, Svelvik and Hjuksebø, also recorded global radiation (60 min mean) and horizontal wind velocity in two m height (60 min mean). Measured global radiation represents the input of energy into the sun-earth system. It is defined as the sum of direct solar radiation and diffuse radiation (radiation of short wavelengths, below 3μm), and is expressed in Wm-2 (Utaaker 1991). The four climatic parameters, temperature, humidity, wind and radiation, together with calculated time and duration of twilights (see below) were compared with the activity of *C. pomonella* males recorded in the pheromone traps, to investigate their possible influence on male moth's activity.

Calculations of twilight

Time and duration of twilights were calculated from May to August for the location of each trap (Table 1) and for the agrometeorological stations. The different kind of twilights are defined by the sun height referred to the astronomic horizon, i.e the altitude of the sun. Civil twilight occurs when the sun is 0-6°below the horizon, nautical twilight is when the sun is 6-12°below the horizon, while astronomical twilight is when the

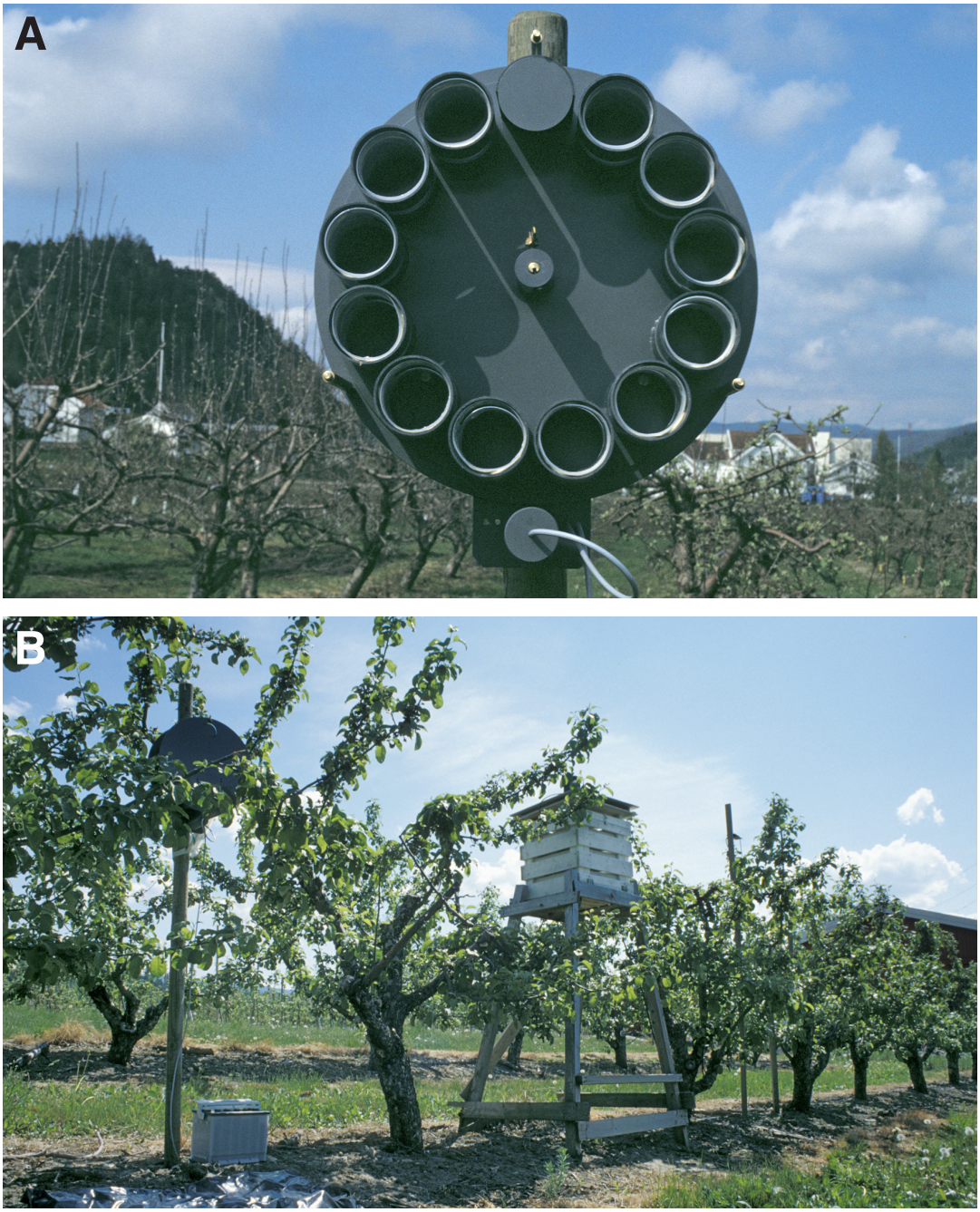

Figure 1. Timing sex pheromone trap used to investigate *Cydia pomonella* male activity at different locations in southern Norway during 1997-2000. Timed catches to an accuracy of one hour (± ten seconds) over periods of 12 hours each day. A) Trap. Front cover is removed and chambers where moths were caught are exposed. The small engine can be seen at the bottom of the trap. B) Trap placed on a stick (left in the picture) operating in the orchard. Agrometeorological station can be seen further to the right.

sun is 12-18°below the horizon, and darkness occurs when the sun is more than 18°below the horizon (Beck 1968).

For all the locations in Table 1 the astronomic horizon is more or less obscured by the local topography (hills and/or mountains) named as the local horizon, but the influence of this on the different degrees of twilight was assumed to be significant only for a couple of the stations. In addition, the angle of the sun in relation to the earth depends on the time of the year, which is another important factor, and should also be taken into consideration especially at high latitudes. However, in this study we were only interested in the altitude of the sun during the period of May to August. On June 22, the declination of the sun is at its maximum, and at noon this day the solar rays beat down upon the Northern Hemisphere more directly than during any other time of year (Ahrens 1991). In addition, each latitude in the Northern hemisphere will have more than 12 hours of daylight, and the daylength is increasing with latitude. The period (daylength) from sunrise to sunset for various latitudes on June 22 increases, however, more rapidly at higher latitudes (in the northern hemisphere), than it does on lower latitudes. E.g. the difference in day length between 30°N and 40°N is one hour, the difference between 40°N and 50°N is 1.4 hours, the difference between 50°N and 60°N is 2.1 hours, while the difference between 60°N and 70°N is as much as 5.6 hours (Ahrens 1991).

Traps

A timing sex pheromone trap, suitable to catch *C. pomonella* males at certain intervals, was designed and produced in ten identical copies (Figure 1). The traps were basically made of pieces of PVC plastic (poly-vinyl-chloride), put together with glue, while other parts were made of aluminium or brass. The trap was circular with a diameter of 38 cm (Figure 1), consisting of a posterior disc functioning as the back, a second disc, slightly smaller, and next to the posterior, and a third disc in front (diameter 38 cm) functioning as a cover. Attached to the second disc (between the second and third), were thirteen pipes (diameter six cm) placed in a circle, which was the moving part of the trap (Figure 1). The pipes were about 10,5 cm long, and the lag between the back and the cover was about 11 cm. Twelve of these pipes constituted the chambers where the pheromone was exposed to and the moths were caught. The thirteenth pipe made the position where the trap was closed. The third disc (the cover) had a contraption where the pheromone dispenser was attached.

All traps were baited with codling moth sex pheromone, codlemone. The pheromone dispensers were red rubber lures, which contained a loading of about 3 mg of active ingredients (F.C. Griepink, PHERO BANK, pers. com.). Each trap contained one pheromone dispenser. Dispensers were replaced once, in the middle of the trapping period. The twelve chambers where the moths were caught, were covered with sticky glue to ensure the insects were very well attached to the chamber when first visiting it.

A micro-engine (RH 158, 12 volts direct current), located below the circles forming the trap itself, was responsible for movement of the trap. The energy source were 12 volts batteries, constructed to give a small amount of energy for short periods, and last for a longer period of time (hobby-batteries). When the batteries were full-charged they would last for the whole season (about three months) without being recharged.

The traps were set to change position at every one hour, the accuracy of the movement of the traps was about ± ten seconds per hour, which was found accurate enough for the experiments. Traps were started manually at a specific time every day, and would then move between the twelve chambers (twelve hours) before closing.

Experiment design

Traps were installed at selected locations during the first week of May (Table 1). The trap itself was attached to a stick placed inside a row of apple trees, as close to a tree as possible. The centre of the trap was 150 cm above the ground, while the chamber where the pheromone was

exposed, was about 165 cm above ground level. Trees were of uniform height and size within each location, and the trap was installed inside the tree crowns.

The first year the experiments were conducted, the traps were started every day from May 15 until July 31, regardless of the weather conditions. There were, however no catches of codling moths if temperatures were below approximately 5°C and especially not when combined with heavy rain for one or several days. The following years the experimental design was therefore modified, and the traps were not run under such weather conditions as described above.

Occasionally, traps were started already from May 1, if temperatures were found favourable (e. g. in Gvarv in year 2000). All traps, except the one located in Sogndal, were started at 16:00 hour (CET). The trap in Sogndal was started at 14:00 hour (CET), due to practicalities. The traps in eastern Norway closed at 04:00 hour the next morning, while the trap in Sogndal closed at 02:00 hour. Catches were recorded the following day, in most cases at the same time as they were started to run for another twelve hours.

Data Analysis

The number of moths caught at most locations (and years) in eastern Norway was low (Table 1), and we decided to combine the recordings from all traps and locations in eastern Norway, except the two traps located at Norderhov, to ensure enough data to analyse the results statistically. Instead of analysing the twelve single locations listed in Table 1 separately and comparing them with each other, three groups were made. The first group consisted of nine locations (Åsbakken, Knem, Foss Gård, Egge, Holtskog, Holte, Midt-Telemark forsøksring, Flåtin and Jønsi). The second group consisted of the two traps at Norderhov, and the third group consisted of one single location, Sogndalsfjøra (western Norway). In the first group all traps were located between 59°21' N and 59°49' N (Table 1), and will from now on be referred to as 59°N. The second and the third group will be referred to as 60°N and 61°N, respectively. Since some of the locations at 59°N were rather close to the locations at 60°N (see Table 1), we also created a fourth group, with all the locations from eastern Norway merged. This group will be referred to as 59-60°N.

Binary logistic regression was used to predict the effect of time (hours), temperature (60 min mean, maximum and minimum), air humidity, global radiation, horizontal wind velocity and twilight on the male moth activity (trap catches) (MINITAB Release 13.1). The binary response variable measured were moths caught in one of the twelve chambers of the trap, compared to no moths caught in one of the twelve chambers. It was very rare that more than one moth was caught in the same chamber at the same day. In the very few cases when this happened it was not taken into account, and binary logistic regression could therefore be used.

The analysis was conducted for two different periods of time. The first period analysed included only those days when activity had been recorded in at least one of the twelve chambers of a trap a particular day, i.e. at least one male caught that day. The second period included the days from the first moth was caught in the trap until the day the last moth was caught in the same trap (= total flight period). For the second period, this implied that also days when no moths were caught in the trap was included in the analysis. The analysis was conducted for the four groups of locations separately, but also with all the data from the four groups merged.

RESULTS

Twilight

Time and duration of twilights from May to August for the agrometeorological stations Gvarv, Hønefoss and Njøs are shown in Figure 2. Time and duration of twilights differ between all three locations on any given day, but the biggest difference is between Gvarv and Njøs. At Njøs the sun is never more than 6°below the horizon between 10 June (day-no. 161) and 4 July (day-

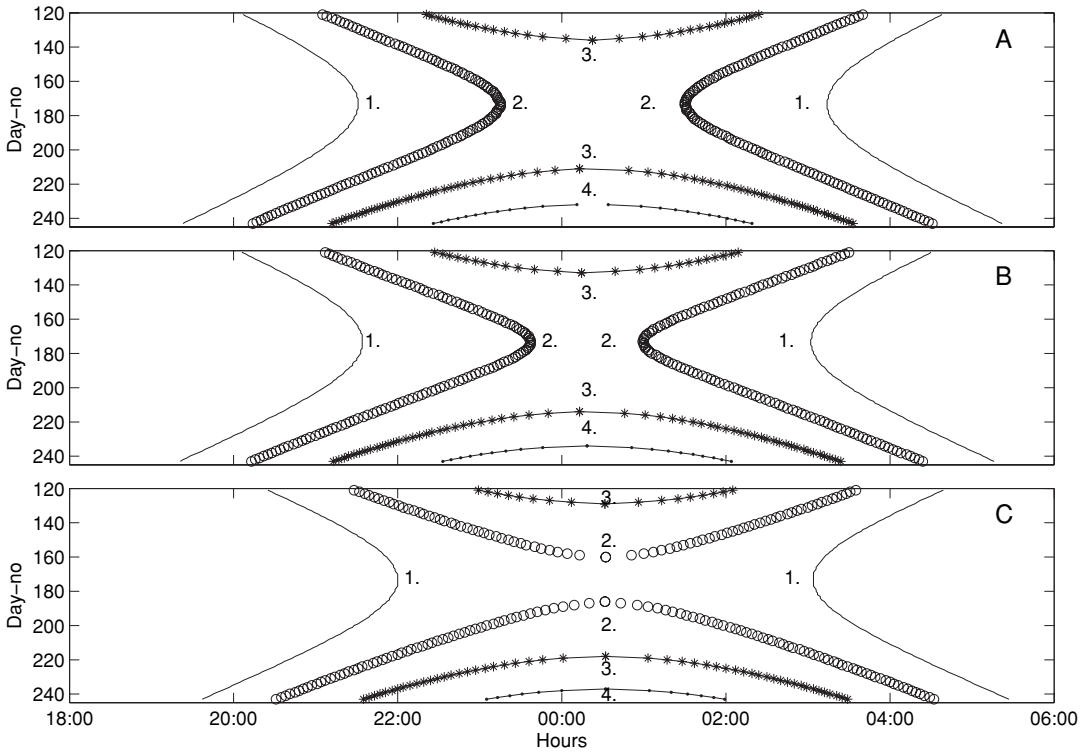

Figure 2. Times of different length of twilights calculated from May-August (Julian time) at three locations in southern Norway. 1. Civil twilight (Sun 0-6° below horizon). 2. Nautical twilight (Sun 6-12° below horizon). 3. Astronomical twilight (Sun 12-18° below horizon). 4. Darkness (Sun more than 18° below horizon). A) Gvarv (59° 22‘ 56.34 N, 9° 12‘ 42.24 E), B) Hønefoss (60° 08‘ 24.93 N, 10° 15‘ 58.01 E) and C) Njøs (61° 10‘ 44.78 N, 6° 51‘ 39.29 E).

no. 185) (Figure 2), and civil twilight (sun 0-6°below the horizon) is prevailing the entire night in the same period. One latitude further south, at Hønefoss, the sun is always more than 6°below the horizon during some parts of the night, and nautical twilight (sun 6-12°below the horizon) therefore occurs during the entire summer here (Figure 2). Even further south, at Gvarv, the situation is similar as at Hønefoss, but as can be seen from Figure 2, the period of civil twilight is shorter at Gvarv than at Hønefoss, because nautical twilights starts earlier and lasts longer at Gvarv. The duration of the night, from sunset to sunrise, is however, a little bit longer at Gvarv than at Hønefoss (Figure 2), since Gvarv is located further south. Astronomical twilight (sun 12-18°below the horizon) occurs earlier and later in the summer at all study sites (Figure 2). Darkness (sun more than 18°below the horizon) does not occur until late summer at any of the locations, and starts from 20, 22 and 25 August at Gvarv, Hønefoss and Njøs, respectively (Figure 2).

The time of sunrise and sunset is equivalent to the ending of civil twilight in the morning and the beginning of civil twilight in the evening (Figure 2). On 22 June (day-no. 173) time of sunrise at Gvarv is at 03:14 am, at Hønefoss at 03:02 am and at Njøs at 03:04 am, while time of sunset at the three locations occurs at 21:31 pm, 21:34 pm

Table 2. Flight period (Julian time) for *Cydia pomonella* males recorded in timing sex pheromone traps in southern Norway during 1997-2000. Several locations between 59° 21'-59° 49' N (= 59° N) and Norderhov 60° 08' N in eastern Norway. Sogndal 61° 14' N in western Norway.

Location	First moth caught	Main flight period	Last moth caught
59°N	152	158 - 187	208
60°N	151	155 - 180	203
61°N	161	172 - 199	212

and 22:00 pm, respectively (Figure 2). Difference in longitude between Hønefoss and Sogndal correspond to a difference in time of about 15 minutes. In summer time daylength increase with latitude and the difference in latitude between these two stations gives at midsummer a 'delay' of sunrise of about 13 minutes.

Male moth activity

The predictors, time (hours), temperature, air humidity, global radiation, horizontal wind velocity and twilight were tested separately (and together), using binary logistic regression, to identify main effects on male moth activity recorded as hourly catches in the pheromone traps. According to the goodness of fit tests conducted, the binary logistic models used fitted the data well, but the analysis was, however, not successful because most of the main effects discovered did not make sense when looking at the sign of the coefficients of the respective predictors. This was probably an effect of the low number of moths caught during the sampling years, and it continued to be a problem also when merging catches from several locations (see materials and methods). There were still too few moths caught to conduct a reliable analysis. It is assumed that the difficulties of analysing the data statistically were because there were so many hours without catches, also when the climatic conditions should be suitable for flight. A second problem disturbing the analysis was that the difference between hourly measurements of climatic parameters during one day is very small from one hour to the next. This problem was intensified by the low catches, and made the analysis unreliable. It was therefore considered more appropriate to present the results without statistical support.

The main period of flight for the three groups, as recorded in the pheromone traps during the study years, is shown in Table 2. The onset of flight in western Norway was about ten days later than in eastern Norway (Table 2), and the main flight period occurred approximately fourteen days later in the west than in the east. The duration of the main flight period was similar between all three groups (Table 2). There were small differences within the three groups between study years in the onset of flight period (first moth caught), but no main differences in the onset or duration of main flight periods between study years. By comparing the flight periods (day-no.) (Table 2) with twilights (Figure 2), it can be seen that the period of codling moth flight coincides with the brightest time of the summer in both eastern and western Norway. It should also be mentioned that during the flight period in western Norway only civil twilight occurs between day-no. 161 and day-no. 185 (Figure 2).

Daily flight pattern, based on hourly catches in timing pheromone traps at 59°N, 60°N and 61°N, is shown in Figure 3. The flight pattern at 59°N and 60°N in eastern Norway (Figure 3A and B) both had their peak between 21:00 and 22:00 hours in the evening. Both of them

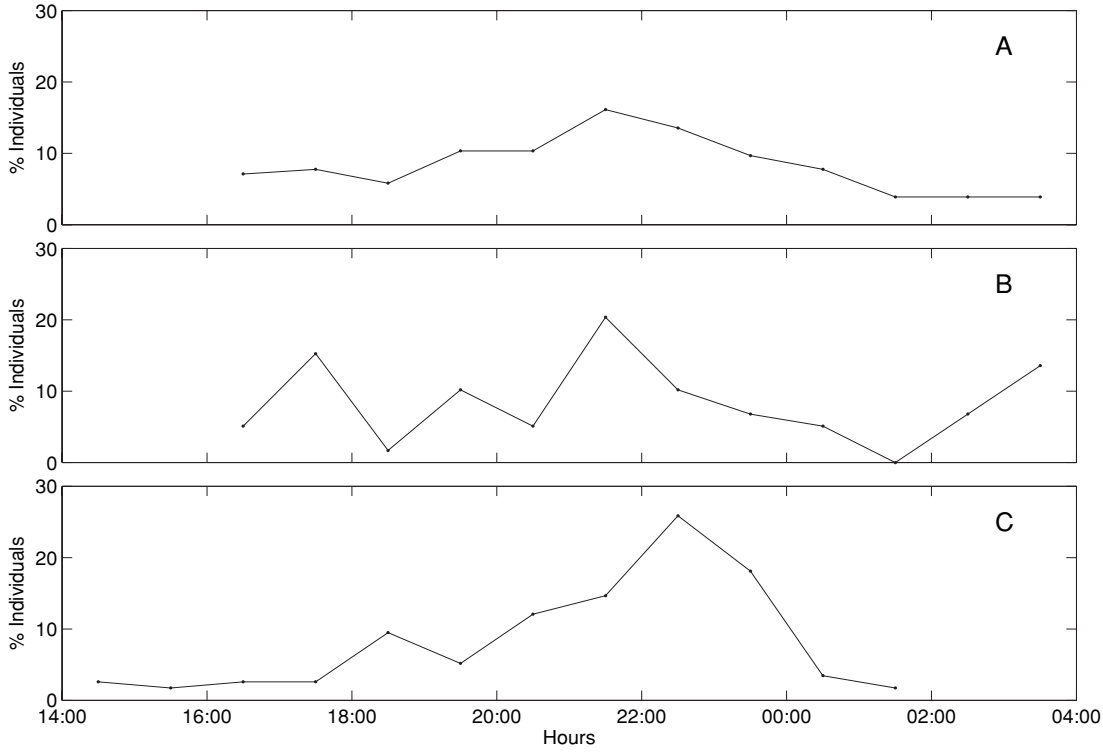

Figure 3. Percent *Cydia pomonella* males caught in timing sex pheromone traps during 1997-2000 in relation to time (Hours) in southern Norway. A) Several locations between 59°21' - 59°49' N, B) Norderhov 60°08' N and C) Sogndal 61°14' N.

have the main activity recorded between 19:00 to 24:00 hours (Figure 3A and B), and 60 % of the males were caught during these hours at 59°N (Figure 3A), while about 53 % were caught during the same hours at 60°N (Figure 3B). Before 19:00 hours and after 24:00 hours about 21 % and 19 %, respectively, of the males were caught at 59°N, while about 22 % and 25 % respectively, were caught in the same period at 60°N (Figure 3A and B). The peak flight at 61°N in western Norway occurred between 22:00 and 23:00 hours in the evening (Figure 3C), and the peak was more prominent than in eastern Norway. The main activity at 61°N was recorded between 20:00 and 24:00 hours, and about 71 % of the males were caught in this period (Figure 3C). About 24 % of the males were caught before 20:00 hours at 61°N, and about 5 % were caught after 24:00 hours (Figure 3C).

In western Norway, 61°N, all males were caught when the hourly mean temperatures recorded at the time of catch, were in the range 10-20 °C (Figure 4C). In eastern Norway, 59°N and 60°N, males were caught in the temperature range 5-28 °C, however, most males were caught in the range 10-20 °C (Figure 4A & B). On days when males were active in western Norway, the temperature rarely went below 10 °C, and if it did, it never occurred until 23:00 hours in the evening or later. Also, temperatures were not above 23 °C during any time of the day when activity of males was registered. The temperature situation in eastern Norway was similar to western Norway on days when males were active. The differences were, however, that if temperatures went below 10 °C this may occur already from around 21:00-22:00 hours in the evening, and temperatures up to

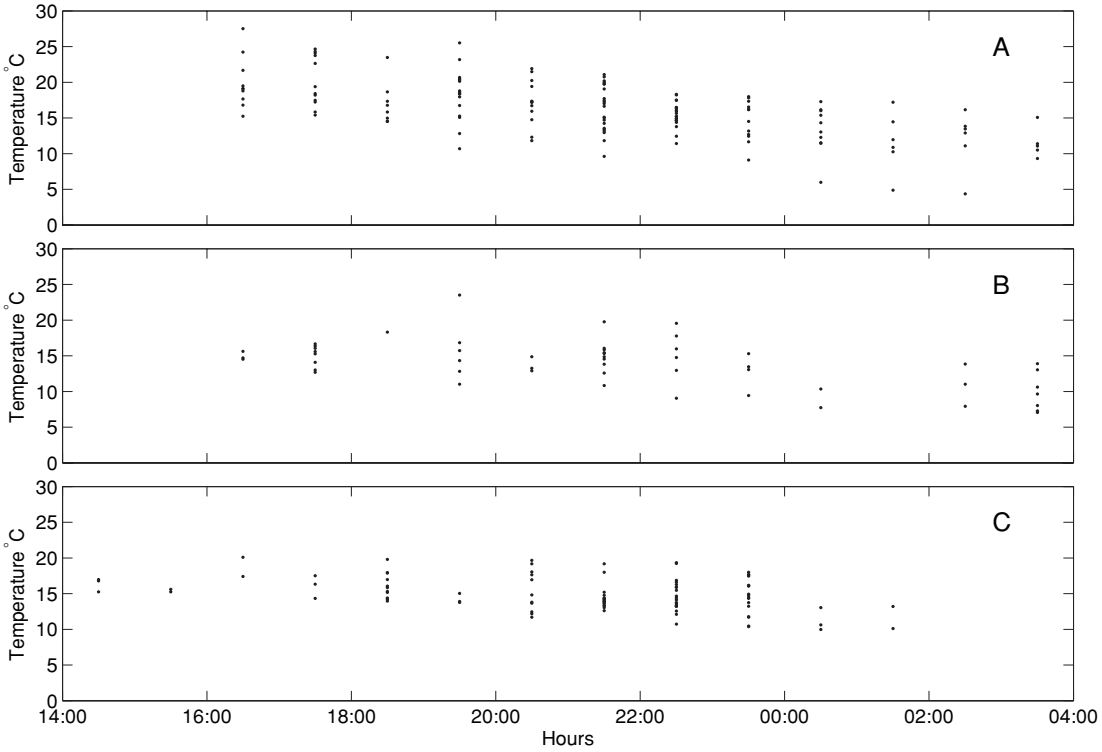

Figure 4. Individual *Cydia pomonella* males caught in timing sex pheromone traps (Hours) in relation to temperature. A) Several locations between 59°21' - 59°49' N, B) Norderhov 60°08' N and C) Sogndal 61°14' N.

30 °C were occasionally recorded on days when males were active in eastern Norway.

The hourly mean humidity (RH) and wind speed are plotted against the temperature measured at the time of individual male catches in Figure 5, for 59°N, 60°N and 61°N. The majority of males were caught when RH was above 50 % at all locations in the study (approximately 70 %, 90 % and 90 % at 59°N, 60°N and 61°N, respectively). Hourly mean wind speeds below 3 m/s were predominant for male moth activity to occur at all trap locations (Figure 5).

The number of adult codling moths emerging from the cages and released in Åsbakken in year 2000 were 149, and 65 (43,6 %) of these were males. Assumed recapture of male codling moths in the timing trap located about 40 m north of the release point were 42 %, i.e. 27 male moths were recaptured (Table 1).

DISCUSSION

Light conditions

The present study has shown that flight of *C. pomonella* males in both eastern and western Norway occurs during the brightest time of the summer, when only civil (61°N) or nautical twilight is present (Figure 2). In June-July in Central Europe (50°N, e.g in Prague and Bonn) nautical twilight begins one hour after sunset and astronomical twilight about two hours after sunset (Heikinheimo 1971). According to Beck (1968) astronomical twilight is of little or no pertinence to photoperiodism, because the light intensities are extremely low, and well below any

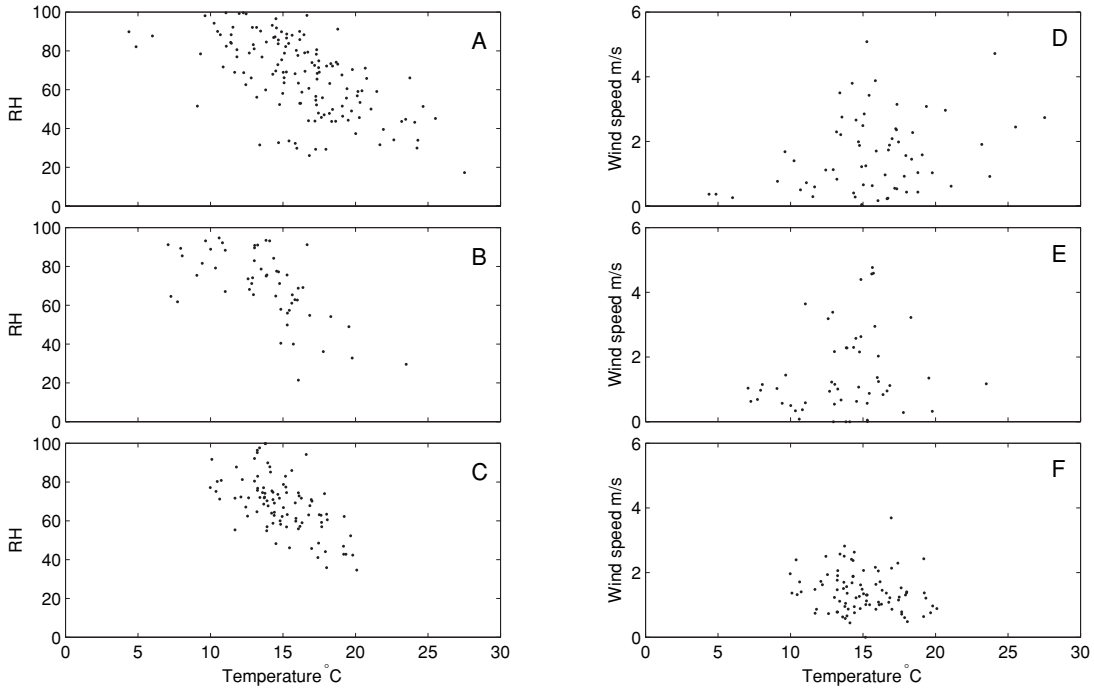

Figure 5. Parameters measured during which individual *Cydia pomonella* males were caught in timing sex pheromone traps in southern Norway are plotted against each other. Parameters measured were air temperature °C, air humidity (RH), and horizontal wind velocity (Wind speed). Hourly mean values recorded in 2 m height for all parameters. A) and D) Several locations between 59°21' - 59°49' N, B) and E) Norderhov 60°08' N, and C) and F) Sogndal 61°14' N.

known response level. In June-July civil twilight in southern Norway is about twice as long as in Central Europe, and at 61°N civil twilight constitutes the entire night of approximately 5 hours duration around midsummer (Figure 2). Further south, at 60°N and 59°N, the duration of the night around midsummer is between 5.5 to almost 6 hours, respectively (Figure 2), while during the same period the sun stays below the horizon for more than 7.5 hours in Central Europe (Heikinheimo 1971). Complete darkness at midnight occurs from 12 July in Central Europe (Heikinheimo 1971), while in southern Norway such darkness only starts between August 20 to 25 (Figure 2). Collins & Machado (1935) reported that *C. pomonella* is active in twilight and remains more or less completely passive in the light as well as in the dark (see introduction). In Norway, light conditions are therefore suitable for *C. pomonella* flight activity the entire night and during the entire lifetime of adult moths (Figure 2).

Daily flight and oviposition activities of *C. pomonella* start under Central European conditions about two hours before sunset (Heikinheimo 1971). Oviposition is discontinued approximately one hour after sunset and flight somewhat one to two hours later (Heikinheimo 1971). Around Helsinki, Finland (60.08°N, 25.00°E), *C. pomonella* flight usually began about two hours prior to sunset (about 19:40), became considerably more active at sunset (about 21:40), and continued until at least 23:00

hours, provided that temperatures was above 13.0 °C (Heikinheimo 1971). Batiste et al. (1973) reported that in Placerville, California (38.4°N, 120.5°W), the mating flight activity appeared to be circadian and entrained to the daily photoperiod (sunset time). They reported further that flight of male moths extended from about three hours before to about two hours after sunset, if temperatures were not limiting. The results reported above and results reported by Mani et al. (1974) (Switzerland), coincide quite well with the onset of main flight period found for the three groups (59°N, 60°N and 61°N) in the present study. The peak of activity for all curves in Figure 3 coincides with the time of sunset for the respective locations (Figure 2, and results), and confirms that time of sunset at different latitudes is of major importance when dealing with flight activity of *C. pomonella*. Laboratory experiments conducted by Song & Riedl (1985) reported two peaks of activity to occur during an approximately 24 hours cycle, the first at lights-off and the second at lights-on signal. Witzgall et al. (1999), conducted their observations in Sweden at about 56°N, and suggested that it is apparently the decrease in light rather than its intensity that triggers the onset of male flight activity. The present study only recorded activity of the male moths during 12 of a 24 hours (daily) cycle, and evidence for a circadian rhythm in Norway could therefore not be given. However, according to the daily flight pattern (Figure 3), it seems likely that a circadian rhythm entrained to sunset time also is present in Norwegian populations of *C. pomonella*.

Temperature

Heikinheimo (1971) reported that temperatures had to be above 13 °C for male moth activity to occur in Finland. The lower and the upper temperature thresholds reported by Batiste et al. (1973) from California were about 13 °C and 27 °C, respectively. Batiste et al. (1973) reported further that low temperatures were a limiting factor for the daily flight during the early season, while high temperatures often delayed initiation of daily flight during the latter half of the season. Song & Riedl (1985) reported 11.3 °C to be the lower threshold temperature for male moth activity, and that the second peak of activity disappeared at temperatures below 20 °C. Witzgall et al. (1999) reported that male moth activity was greatly diminished below 14 °C, and that 20 °C was the upper temperature threshold found in the Swedish study. In the present study the main activity in both eastern and western Norway occurred in the range 10-20 °C. Temperatures above 27 °C rarely occur in Norway in June, at least not in the evenings. The decline in male moth activity after 22:00 and 23:00 hours in the evening in eastern and western Norway, respectively (Figure 3), suggests that temperature, and not light conditions, is the main factor limiting flight and oviposition activity to continue throughout the night, since the light conditions are favourable for moth activity the entire night at high latitudes (Figure 2).

Relative humidity and wind speed

Relative humidity (RH) above 50 % during male moth flight found in this study (Figure 5) corresponds well with the findings of Witzgall et al. (1999). RH is directly connected to temperature, and an increase in RH in the evening is an effect of the temperature decreasing during the evenings. The influence of wind on the flight activity of the moths is not very easy to measure, because wind speed is rarely constant over time, but often changes from one second to another. The hourly mean values on wind speed obtained in this study do not give accurate information about the wind conditions at the exact time of catch, because a few strong wind gusts during one hour can give the same mean value as steady light winds. The observations (Figure 5) reported here should therefore be used as an indication of how wind speed affects the activity of the moths. Batiste et al. (1973) reported that wind did not appear to be a major factor limiting flight in their studies, but they were not able to measure the wind conditions at the actual time of catch.

Trap efficiency and population densities

According to Blomefield & Knight (2000) the number of male moths caught in a pheromone trap can be influenced by an array of factors,

such as moth density, immigration, temperature, moonlight, wind speed, trap and lure placement and maintenance, and competition between traps and calling females. Taylor et al. (1991) showed that efficiency of pheromone traps for the gypsy moth, *Lymantria dispar,* depends on male density, and as density increased pheromone traps caught a smaller proportion of the population than at low density. Thwaite & Madsen (1983) reported that traps in the upper third of apple trees caught more codling moths than traps at head height when the two traps were in direct competition. However, when the high traps were removed, the low traps caught nearly as many moths as both high and low traps combined. Howell et al. (1990) concluded that there is no important differences in either codling moth male responses or moth captures in traps placed within a person's reach and those placed near the top of the tree. The implications of the cited literature for the present study is that trap height was not influencing on or causing the low number of moths caught during the study years, and we conclude that low populations of *C. pomonella* was the major cause. The very low damage caused by codling moth larvae reported from apple growers during the study years is an additional strong indication for anticipating very low population densities.

Trap efficiency was not fully satisfactory tested at Ås in year 2000, since released moths were not marked, and it was therefore uncertain if moths caught in the trap were the ones actually released. However, there had been no sign of codling moth damage in the orchard previously, and pheromone baited traps the two previous years did not catch any codling moths. Immigration of male moths should not be completely ruled out, but this seems unlikely to have happened only in year 2000, and not in the previous years. Also, possible orchards from where immigration may have occurred were at significant distance from the experimental orchard, and since the codling moth are known to be a rather sedentary species (Mani & Wildbolz 1977) immigration seemed unlikely. The theory of no immigration of male moths is also supported by the fact that catches were recorded mainly the first or to a lesser extent the second, evening after release of individual males had taken place in the orchard. On this background we conclude that trap efficiency was satisfactory, because the purpose of the study was to monitor behaviour and not actual population densities. We therefore also assume that the lack of males in the traps during those days when the climatic conditions should be very suitable for flight of the species, was due to very low population densities in the orchards, and not caused by some other unidentified factor inhibiting flight.

Catches of *C. pomonella* males during the study years (1997-2000) were surprisingly low, based on previous years experience at the same or nearby locations. E.g. in Svelvik, the mean number of males caught (two or three traps) during 1990-1996 was between 79 and 246 males, except in 1994 when mean catches were 14 male moths (T. Edland, unpublished), while in 1997 the average catch was 9 males. The situation before 1997 was similar at Ringvold, Foss Gård and Gvarv, although the decline in number of males caught was not as big as in Svelvik. In Sogndal 150 males were caught in 1995. There is no reason to believe that the low number of moths caught during the study years has influenced the results obtained, in the sense that the major trends presented here would have been different.

Topography

The low number of males caught at each location did, however, prevent possible variations in the onset of flight in the evening between trap locations to be discovered. The present study was therefore not able to verify or reject the hypothesis that orchard topography influences the time of onset of codling moth flight (Rein 1994). Still, some support for this theory can be found in Mani & Wildbolz (1978). They reported that on clear days the sun disappeared locally behind an adjacent building one hour before the astronomical sunset in their experimental orchard, and on such days oviposition started with the disappearance of the sun and remained for some hours. Parker (1959) reported that orchard topography might produce

night temperature differences, which may contribute to false conclusions to be drawn when the orchard temperature is within a degree or two of the critical low temperature for oviposition of the codling moth. Topography affects the local climate both actively and passively (Utaaker 1991), however, in this study we were not able to combine any such effects with the flight activity of *C. pomonella*. This theory can only be tested when codling moth populations are higher than they were during the study years.

Conclusions

Timed catches of *Cydia pomonella* (L.) males (by the aid of sex pheromone traps especially designed for this study) were successfully used to provide new knowledge on the influence of twilight and climatic parameters on the flight activity of the species at northern latitudes. Mating-flight response was determined by the daily photoperiod, clearly corresponding to time of sunset at the different latitudes involved in the study. This response began about two hours before sunset, and declined around 23:00 and 24:00 hours in the evening, in western and eastern Norway, respectively. Main flight activity in both eastern and western Norway were recorded when temperatures were in the range 10-20 °C, the relative humidity was above 50 %, and at wind speeds below three m/s at the time of catches. The study provides new knowledge in basic as well as in applied science. It is concluded that temperature, and not light conditions, is the limiting factor for flight at high latitudes. This conclusion gives a better understanding for the management of this species, i.e. monitoring, surveillance and forecasting of codling moth attack, under Norwegian conditions, and that time of sunset at different latitudes is of major importance when dealing with flight activity of *C. pomonella*.

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Aquatic Coleoptera from Vest-Agder and Aust-Agder, Norway

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Seventy-eight species of water beetles were recorded from 37 sites in Outer Vest-Agder (**VAY**) and 48 species from 32 sites in Inner Aust-Agder (**AAI**). *Cyphon hilaris* Nyholm (Scirtidae), collected near Lonestranda and Spangereid (municipality of Lindesnes), and Hoven and Farestad (municipality of Mandal) in Vest-Agder, is new to the fauna of Norway. Nineteen species appeared to be new for **VAY** and 39 for **AAI.** Some aspects of the fauna are discussed.

Key words: Aquatic Coleoptera, new records, Agder, Norway

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INTRODUCTION

The aquatic Coleoptera fauna of the Vest-Agder and Aust-Agder fylkes (counties) of southern Norway is poorly known. Information on the distribution of the aquatic beetles, considered here in a rather wide sense to include Scirtidae and part of the Chrysomelidae, is retrieved from the checklist of Ødegaard, Hanssen & Dolmen (1996), which largely draws on Holmen (1987) (Gyrinidae, Haliplidae, Noteridae), Hansen (1987) (Hydraenidae, Helophoridae, Hydrochidae, Hydrophilidae), Nilsson & Holmen (1995) (Dytiscidae), Nyholm (1972) (Scirtidae), and Silfverberg (1992) (the genera *Donacia* and *Plateumaris* within the Chrysomelidae). Silfverberg (1992) was also checked for additional records in earlier publications. Nilsson (1996) recently listed the distribution of Dryopidae and Elmidae. Nomenclature here follows recent Palaearctic catalogues of Löbl & Smetana (2003, 2004) for Hydradephaga, Hydrophiloidea and Hydraenidae, other names following Nilsson (1996).

THE SURVEY

Thirty-seven wetland sites in Outer Vest-Agder (**VAY**) and 32 sites in Inner Aust-Agder (**AAI**) were surveyed for aquatic Coleoptera in July 1998. The sites in Vest-Agder were in the municipalities of Flekkefjord, Lindesnes, Mandal, Marnaland and Kristiansand, while all sites in Aust-Agder were in the municipality of Bykle.

The survey was covered all types of stagnant waters from sea level to high altitude (1180 m), from fresh to brackish, from acid to base-rich. Most sites were mossy, acid to slightly acid, oligo- to mesotrophic pools in bogs or lake margins with a well developed emergent vegetation. Streams were very poor in species with one exception, a small stream in Vest-Agder near Vigeland (Fardal) a few hundred metres before its mouth in Turvatnet (LK 979406). The main difference between the two (parts of the) fylkes is the altitude: sites in Vest-Agder were situated below 300 m, while all sites in Aust-

Agder were above 525 m above sea level and most of them above the treeline (approximately 1000 m). A further but smaller difference was the more mesotrophic condition of a number of Vest-Agder sites.

In total, 102 species were found, 78 in Outer Vest-Agder and 48 in Inner Aust-Agder (Table 1). The average number of species per site for Outer Vest-Agder was 10.3 with a mode of 10; for Inner Aust-Agder the average was 8.5 with a mode of 8. Seven sites were species-rich with 18 or more species: six sites in Vest-Agder and one in Aust-Agder. These sites are briefly described below.

1. Lindesnes, Lonestranda, small mesotrophic lake, altitude 30 m, 12 July 1998 (**VAY** LK961352). This clear water lake with a peaty soil and a depth of >1.0 m was, at its western margin, surrounded by a dense *Sphagnum*-carpet with bushes of *Myrica gale*. Other sides of the lake had a dense *Phragmites australis* vegetation. At the water's edge there was a sparse vegetation mainly of *Carex, Potentilla palustris* and *Menyanthes trifoliata*. On the lake there were some floating leaves of *Nymphaea alba* and *Nuphar luteum*.

2. Mandal, Hoven, large mesotrophic fen, altitude 3 m, 13 July 1998 (VAY MK034333). Collections were mainly in a wide zone between a forest dominated by *Alnus glutinosa* and deeper fen dominated by *Phragmites*. The vegetation in this 0.3 m depth zone was dominated by *Carex, Potentilla palustris* and *Myrica gale;* the soil consisted of coarse organic litter and peat.

3. Lindesnes, Spangereid, abandoned fish ponds, altitude 5 m, 15 July 1998 (**VAY** LK904351). A number of small ponds with very low dykes, mostly interconnected, formed more or less one waterbody surrounded by *Vaccinium*-heathland. The slightly humic water had a depth of 0.25 m and a peaty soil. The vegetation was dominated by *Eleocharis palustris* and *Potentilla palustris* with an abundant cover of the moss *Calliergon*.

4. Lindesnes, Ramsland, Hægeland, flooded mire with deep ditch, altitude 95 m, 15 July 1998 (**VAY** LK868341). The ditch with a depth of 0.9 m had slightly humic water and a soil consisting of muddy peat. The sparse vegetation in the ditch comprised grasses such as *Holcus lanatus, Glyceria fluitans* and *Agrostis*. At the southeastern bank the ditch passed into a mire dominated by *Salix cinerea* and *Betula* with an undergrowth of *Molinia caerulea;* the grassy northwestern bank abutted an unmetalled road.

5. Lindesnes, Vigeland, Tredal, Fasselandsvatnet, altitude 17 m, 16 July 1998 (**VAY** MK024379). Collections were made in the deeply flooded western edge of the lake with clear water and a depth of >1.0 m. The vegetation on the edge was dominated by *Phragmites australis, Carex, Potentilla palustris, Myrica gale* and *Sphagnum*.

6. Mandal, Hoggandvik, «Hoggandviktjønna», altitude 10 m, 16 July 1998 (**VAY** MK036341). This large meso-eutrophic lake with a depth of >1.0 m had clear water and steep margins at the sampling site. A small but dense fringe of *Iris pseudacorus* and *Phalaris arundinacea* bordered the southern margin, where the root systems of the *Iris*-plants formed the soil.

7. Bykle, Hovden, Nordli, lake, altitude 760 m, 21 July 1998 (**AAI** ML101970). This clear water lake with a depth of >1.0 m and a peaty soil was partly surrounded by a fringe of *Carex rostrata* in the open water. Dense *Sphagnum*-carpets bordered the lake, situated in an open *Betula*-forest with some *Picea abies*.

NOTES ON INDIVIDUAL SPECIES

In the following notes, grid references (for UTM Zone 32V) are given for most sites except for the seven speciose ones already described above. Most species (for authorities see Table 2) collected at more than five sites in one or both areas are not treated below as they are considered to be common. Absence of these species from

Table 1. Number of species of aquatic beetles per family recorded in Outer Vest-Agder (**VAY**) and Inner Aust-Agder (**AAI**). Abbreviations used: A: number of species known from the literature; B: number of species collected in July 1998; C: number of newly recorded species.

	Outer Vest-Agder			Inner Aust-Agder		
	A	B	C	A	B	C
Gyrinidae	6	3	0	0	2	2
Haliplidae	6	1	0	0	1	1
Noteridae	0	1	1	0	0	0
Dytiscidae	40	40	9	10	33	25
Hydraenidae	4	3	1	0	1	1
Hydrochidae	1	1	0	0	0	0
Helophoridae	2	4	3	0	2	2
Hydrophilidae	28	11	1	4	4	3
Dryopidae	2	1	0	0	0	0
Elmidae	2	3	1	1	0	0
Scirtidae	9	7	2	0	2	2
Chrysomelidae Donaciinae	8	3	1	0	3	3
Totals	108	78	19	15	48	39

previous checklists is most probably the result of under-recording and not from extension of distribution areas or climatological changes.

Gyrinidae

Gyrinus minutus

In Vest-Agder only recorded from the lake near Lonestranda. Common (and most often in company with *G. opacus*) in Aust-Agder on bog-pools and small, rocky lakes above the treeline with a sparse emergent vegetation of *Carex* and *Eriophorum*. Both species were encountered readily only between denser stands of these macrophytes and rarely on open water.

Gyrinus aeratus

One male on the lake near Lonestranda and two specimens on the Farestadtjønna (**VAY** MK1229), a *Lobelia*-lake with partly rocky margins and partly *Sphagnum*-bordered, on the island of Skjernøya (municipality of Mandal).

Haliplidae

Haliplus ruficollis

The only record for this species was based on males found in a rich fen by a lake at Frivoll (municipality of Mandal; **VAY** MK1230).

Haliplus fulvus

Only one male from a small lake with rocky margins and scattered *Carex rostrata* at an altitude of 1,140 m at Stølskardet (**AAI** MM048064) above Hovden (municipality of Bykle).

Noteridae

Noterus crassicornis

Common in the meso-eutrophic «Hoggandvik-tjønna».

Dytiscidae

Agabus affinis

The frequent presence in Vest-Agder sites is striking in comparison with its virtual absence

Table 2. Water beetles recorded in Outer Vest-Agder (**VAY**) and Inner Aust-Ag¬der (**AAI**). Abbreviations used: -: previously known, not recorded in July 1998; *: previously known, also recorded in July 1998: **: new record.

Species	Outer Vest-Agder	Inner Aust-Agder
Gyrinidae		
Gyrinus aeratus Stephens, 1835	*	
G. minutus Fabricius, 1798	*	**
G. opacus Sahlberg, 1819		**
G. substriatus Stephens, 1828	*	
Haliplidae		
Haliplus fulvus (Fabricius, 1801)	-	**
H. ruficollis (DeGeer, 1774)	*	
Noteridae		
Noterus crassicornis (Müller, 1776)	**	
Dytiscidae		
Agabus affinis (Paykull, 1798)	*	
A. arcticus (Paykull, 1798)	*	*
A. bipustulatus (Linnaeus, 1767)	*	*
A. congener (Thunberg, 1794)	**	**
A. guttatus (Paykull, 1798)	*	**
A. lapponicus (Thomson, 1867)		**
A. sturmii (Gyllenhal, 1808)	*	**
Ilybius aenescens Thomson, 1879	*	**
I. angustior (Gyllenhal, 1808)	-	**
I. ater (DeGeer, 1774)	**	
I. crassus Thomson, 1856	**	*
I. erichsoni Gemminger & Von Harold, 1868		**
I. fuliginosus (Fabricius, 1792)	*	**
I. picipes (Kirby, 1837)		**
Platambus maculatus (Linnaeus, 1758)	**	*
Colymbetes dolabratus (Paykull, 1798)		**
C. paykulli Erichson, 1837		**
Rhantus exsoletus (Forster, 1771)		*
R. suturellus (Harris, 1828)	*	**
Acilius canaliculatus (Nicolai, 1822)	**	
A. sulcatus (Linnaeus, 1758)	*	**
Dytiscus lapponicus Gyllenhal, 1808		**
D. marginalis Linnaeus, 1758	-	**
D. semisulcatus Müller, 1776	*	
Deronectes latus (Stephens, 1829)		*
Graptodytes pictus (Fabricius, 1787)		*

Table 2. Continued

Species	Outer Vest-Agder	Inner Aust-Agder
Hydroporus angustatus Sturm, 1835		*
H. erythrocephalus (Linnaeus, 1758)	*	**
H. geniculatus Thomson, 1856		**
H. gyllenhalii Schiødte, 1841	*	
H. incognitus Sharp, 1869	*	**
H. longicornis Sharp, 1871		**
H. melanarius Sturm, 1835	*	*
H. memnonius Nicolai, 1822	*	**
H. morio Aubé, 1838	-	**
H. nigrita (Fabricius, 1792)	*	
H. notabilis LeConte, 1850		**
H. obscurus Sturm, 1835	*	**
H. obsoletus Aubé, 1838	**	
H. palustris (Linnaeus, 1761)	*	*
H. planus (Fabricius, 1781)		*
H. pubescens (Gyllenhal, 1808)	*	
H. rufifrons (Müller, 1776)		**
H. scalesianus Stephens, 1828	**	
H. striola (Gyllenhal, 1826)		**
H. tristis (Paykull, 1798)	*	*
H. umbrosus (Gyllenhal, 1808)		*
Nebrioporus depressus (Fabricius, 1775)	*	
Oreodytes alpinus (Paykull, 1798)		*
Stictotarsus duodecimpustulatus (Fabricius, 1792)	*	
S. multilineatus (Falkenström, 1922)		**
Hygrotus inaequalis (Fabricius, 1777)	*	
H. novemlineatus (Stephens, 1829)		*
Hyphydrus ovatus (Linnaeus, 1761)		*
Laccophilus minutus (Linnaeus, 1758)	**	
Helophoridae		
Helophorus aequalis Thomson, 1868	**	
H. brevipalpis Bedel, 1881	**	
H. flavipes Fabricius, 1792	*	**
H. glacialis Villa & Villa, 1833		**
H. granularis (Linnaeus, 1760)		**
Hydrochidae		
Hydrochus ignicollis Motschulsky, 1860	*	
Hydrophilidae		
Anacaena globulus (Paykull, 1798)	*	**
A. lutescens (Stephens, 1829)	*	

Table 2. Continued

Species	Outer Vest-Agder	Inner Aust-Agder
Enochrus affinis (Thunberg, 1794)	*	**
E. coarctatus (Gredler, 1863)	**	
E. ochropterus (Marsham, 1802)		*
Helochares obscurus (Müller, 1844)	*	
Hydrobius fuscipes (Linnaeus, 1758)	*	
Laccobius minutus (Linnaeus, 1758)		*
Coelostoma orbiculare (Fabricius, 1775)	*	
Cercyon impressus (Sturm, 1807)	-	**
C. lateralis (Marsham, 1802)	-	*
C. littoralis (Gyllenhal, 1808)	*	
Megasternum concinnum (Marsham, 1802)	*	
Hydraenidae		
Hydraena britteni Joy, 1907	*	
H. gracilis Germar, 1824		**
Limnebius truncatellus (Thunberg, 1794)	*	**
Dryopidae		
Dryops luridus (Erichson, 1847)	*	
Elmidae		
Elmis aenea (Müller, 1806)		*
Oulimnius tuberculatus (Müller, 1806)	**	
Limnius volckmari (Panzer, 1793)	*	
Scirtidae		
Microcara testacea (Linnaeus, 1767)	**	
Cyphon hilaris Nyholm, 1944	**	
C. kongsbergensis Munster, 1924	*	**
C. ochraceus Stephens, 1830	*	
C. padi (Linnaeus, 1758)	*	
C. pubescens (Fabricius, 1792)	*	
C. variabilis (Thunberg, 1787)		**
Scirtes hemisphaericus (Linnaeus, 1758)	*	
Chrysomelidae Donaciinae		
Plateumaris discolor (Panzer, 1795)	-	**
Donacia aquatica (Linnaeus, 1758)	-	**
D. clavipes (Fabricius, 1793)	*	
D. crassipes Fabricius, 1775	*	
D. obscura Gyllenhal, 1813		**
D. thalassina Germar, 1811	**	

from Aust-Agder sites, where *Sphagnum* was just as frequent.

Ilybius erichsoni

This species was common in the lake at Nordli, an exception to its normal occurrence in small temporary water-bodies (Nilsson & Holmen 1995).

Ilybius picipes

Females of this species are easily confused with females of *I. angustior,* which was very common in Aust-Agder. Therefore, our records concern only males. One male was taken respectively in the mossy pool near Breitvatn at Bjåen, a peaty pool with a fringe of *Carex rostrata* and mossy borders in the Nipadalen at Bjåi (**AAI** MM104136), and in a peat-mire near the Raudtjønn at Hovden (**AAI** MM034029).

Colymbetes dolabratus

At the edge of its southern distribution area in Norway (Nilsson & Holmen 1995), this species was frequently encountered in low abundance in shallow, most often, rocky lakes above the treeline at Galteflotti, Storenos and Tveite-Djupetjønn in Aust-Agder. Most specimens were collected in denser stands of *Carex rostrata* with accumulations of its leaf-litter.

C. paykulli

One specimen was found in a small, hard-bottomed lake with a fringe of *Carex rostrata* in Lislevatn Nature Reserve (**AAI** MM091984), and another nearby in a similar pool below Lislefjøddstøylen (**AAI** VM114088), outside the nature reserve.

Rhantus exsoletus

This species was common in sedge-beds of the Søylevatnet near Røksland.

Acilius canaliculatus

One female with four third instar larvae were taken in the *Glyceria*-ditch near Hægeland.

Dytiscus lapponicus

Adults and third instar larvae were abundant in traps with cat food in the lake at Nordli. Both the sulcate and the non-sulcate female forms were present. One male and a third instar larva were collected with the hand net in a small lake in the Lislevatn Nature Reserve (**AAI** MM091085) at Hovden.

Dytiscus marginalis

Using bottle traps baited with cat food, one male was taken in a rocky pool besides the river Otra near Ørnefjell (**AAI** ML0996) in the municipality of Bykle.

Dytiscus semisulcatus

Two specimens of the conspicuous larva of *D. semisulcatus* were sampled in the *Glyceria*-ditch near Hægeland.

Deronectes latus

Two adults and a larva were found in the stream near Farland.

Graptodytes pictus

This species was very common between *Phragmites australis* in the mesotrophic Frøtjønn (**VAY** MK488528) in the municipality of Kristiansand, in a rich fen by Frivoll (**VAY** MK1230) in the municipality of Mandal, the Fasselandsvatnet and "Hoggandviktjønna", all waters with a supposed high productivity.

Hydroporus angustatus

One male was taken from a *Lobelia*-lake near Gåsestein (**VAY** LK943377). It was common in the mesotrophic fen near Hoven and the "Hoggandviktjønna".

Hydroporus geniculatus

The identity of this species, resembling *H. nigellus* Mannerheim, was confirmed by Dr A. N. Nilsson. The species was common, but usually in low numbers, in exposed, shallow peaty pools and lake margins in Aust-Agder just below and above the treeline.

Hydroporus longicornis

Four males and three females were taken in a sandy, mossy ditch with *Molinia caerulea-*

tussocks on the Studeheia (**VAY** MK512515) in the municipality of Kristiansand. The ditch in a dense, mixed stand of *Betula* and *Picea abies* received seepage water. This habitat closely resembles the one described in Nilsson & Holmen (1995).

Hydroporus nigrita
Two specimens were found in pools with *Juncus effusus* near Homsvika (**VAY** MK121315) in the municipality of Mandal and again two specimens in a grassy salt-marsh with fresh seeping water near Åvik (**VAY** LK950344) in the municipality of Lindesnes.

Hydroporus notabilis
Common in Aust-Agder in peaty *Sphagnum*-pools and *Sphagnum*-rich borders of small lakes, most often above the treeline.

Hydroporus obsoletus
A small grassy pool, fed by a very small trickling stream, at sea level on the island Skjernøya (**VAY** MK1228) produced two specimens. This species is only known from a few scattered records in Norway north to Sogn og Fjordane (Nilsson & Holmen 1995).

Hydroporus rufifrons
This species was only found in the lake near Nordli.

Hydroporus scalesianus
This species is only known from scattered records from four fylkes in southeastern Norway (Nilsson & Holmen, 1995). The species was quite common in the meso-eutrophic «Hoggandviktjønna».

Hydroporus striola
Numerous remarkably brightly marked specimens were taken in mossy pool near Breidvatn at Bjåen (**AAI** MM126125) in the municipality of Bykle.

Nebrioporus depressus
The stony foam zone at the northeastern edge of Turvatnet near Vigeland (**VAY** LK987404) in the municipality of Lindesnes produced one female of this species.

Oreodytes alpinus
This species occurred in high numbers in the Breidvatn (**AAI** MM127124) and the Hartevatn (**AAI** MM039035) in the municipality of Bykle, both large lakes with bare, rocky margins below the treeline. The observed protandrism for this species in Hordaland by Foster (1992) could not be confirmed as the sex-ratio in our samples was not obviously deviant from 1 : 1 (31 ♂♂ : 22 ♀♀).

Stictotarsus duodecimpustulatus
Adults and larvae were taken in the Farestadtjønna (for a further description see *Gyrinus aeratus*).

Stictotarsus multilineatus
This species was common in small, rocky lakes with a sparse emergent vegetation above the treeline in Aust-Agder. Presumed protandrism was found for this species: our material contained sixty males and only four females.

Hygrotus novemlineatus
Common in the Vasslandsvatnet (**VAY** MK059528) in the municipality of Lindesnes. In this lake, seashells had been dumped as part of a liming programme to improve water quality for trout (fishing).

Hyphydrus ovatus
This species was common in Carex-beds in the Søylevatnet near Røksland (**VAY** MK075466) and a *Lobelia*-lake near Vågestad (**VAY** MK084478), both in the municipality of Lindesnes.

Laccophilus minutus
This was taken at the same sites as *Hyphydrus ovatus*.

Hydrochidae
Hydrochus ignicollis
Altogether four specimens from the Fasselandsvatnet and the «Hoggandviktjønna».

Helophoridae
Helophorus granularis
A single male was taken in a grassy salt-marsh near Åvik.

Hydrophilidae

Anacaena globulus

This species was common in Vest-Agder, but in Aust-Agder only one specimen was collected in a ditch near the Storetjønn at Bykle (**AAI** ML0479).

Helochares obscurus

In agreement with the distribution in Hansen (1982) *H. obscurus* was only found in the extreme eastern part of Vest-Agder in bog pools (**VAY** MK491525; MK496523) and a more mesotrophic lake margin dominated by *Phragmites australis* (**VAY** MK488528). In these types of habitat in western Europe *H. obscurus* is replaced by the Atlantic *H. punctatus* Sharp (Cuppen, 1986).

Cercyon spp.

The three recorded species were terrestrial. *Cercyon littoralis* was found three times in large numbers under seaweed on Vest-Agders sandy beaches near Tjøm and Spangereid, *C. lateralis* in elk dung at Nordli, and *C. impressus* in cow dung in a forest at Bjåen.

Megasternum concinnum

A single specimen was found on the edges of the stream at Fardal.

Hydraenidae

Hydraena britteni

This species was abundant in the «Hoggandvik-tjønna» and common in some small pools with *Juncus effusus* near Homsvika (MK121315).

Hydraena gracilis

A single teneral male from the stream near Farland.

Limnebius truncatellus

One female from a *Lobelia*-lake near Gåsestein (**VAY** LK943377) in the municipality of Lindesnes and one male from the stream near Fardal, both Vest-Agder. In Aust-Agder one male and two females from a small, peaty stream near Nordli (**AAI** ML099699) and one specimen from a ditch above the Storetjønn (**AAI** ML0479).

Dryopidae

Dryops luridus

Only one male from the flooded margins of lake Kallevatnet (**VAY** MK075550) near Kalland in the municipality of Marnadal.

Elmidae

All three elmid species were only collected in the stream near Farland between coarse gravel and among aquatic mosses on larger stones. *Elmis aenea* was the commonest species and *Oulimnius tuberculatus* the rarest. These three species are the most widely distributed species of the family and the characteristic combination in running waters is sometimes known in Great Britain as «the Three Musketeers».

Scirtidae

Microcara testacea

This species was abundant in the fen at Hoven.

Cyphon hilaris

New to Norway. One female was collected on 12 July 1998 in a small, *Sphagnum*-surrounded, mesotrophic lake near Lonestranda in the municipality of Lindesnes. One male and one female were found on 13 July 1998 in a fen-carr, dominated by *Carex, Myrica gale, Potentilla palustris* and *Phragmites australis,* at Hoven in the municipality of Mandal. On 14 July 1998 one male and three females were found in an over-grown boggy pool dominated by *P. palustris, Nymphaea alba* and *Sphagnum* on the island Skjernøya. Finally, one male and one female were taken on 15 July in boggy, old, fishponds with *Eleocharis palustris, P. palustris* and *Calliergon*-moss near Spangereid (municipality of Lindesnes). Identification of this species, which morphologically resembles e.g. *Cyphon ochraceus* Stephens, is easy after dissection and comparison of the male or female genitalia with figures in e.g. Nyholm (1972). The distribution of *C. hilaris* is typically Atlantic with many records from England, Ireland, The Netherlands, northern Germany, Denmark and southern Sweden, and isolated records from Finland, northwest France and northwest Spain (Kevan 1962, Wiebes & Wiebes-Rijks 1964,

Klausnitzer 1968, Nyholm 1972,). The main habitats of *C. hilaris* are *Sphagnum*-dominated peatbog complexes and small Sphagnetea (Nyholm 1972) but it is occasionally found under more eutrophic conditions, e.g. reedbeds. The main activity period of *C. hilaris* is July (Wiebes & Wiebes-Rijks 1964, Nyholm 1972, Cuppen 1993).

Cyphon kongsbergensis

Two males from the fen at Hoven. The species was also collected in large numbers from the lake at Nordli by sweeping *Molinia caerulea* and *Eriophorum angustifolium,* but only in a small area in the southwestern corner where a small trickle left the lake. The five females, as opposed to 19 males, contained no eggs.

Cyphon padi

Two males were found respectively in the fen at Hoven and the Fasselandsvatnet.

Cyphon variabilis

One male was found by sweeping near the lake at Nordli.

Cyphon pubescens

The fen at Hoven produced one female without eggs.

Cyphon ochraceus

Two males were found respectively in the fen at Hoven and the abandoned fishponds at Spangereid.

Scirtes hemisphaericus

This species was common in several mesotrophic lakes in Vest-Agder: Tvitjønn (**VAY** MK496523) in the municipality of Kristiansand, the lake at Lonestranda and the «Hoggandviktjønna», most females carrying ripe eggs.

DISCUSSION

The survey detected 102 species of water beetle, 78 from Outer Vest-Agder and 48 from Inner Aust-Agder (Tables 1 and 2), of which 19 appeared to be new for Outer Vest-Agder and 39 for Inner Aust-Agder. In comparison with the known numbers of species in the literature it is clear that both fylkes were under-recorded, Inner Aust-Agder especially so. Most additions in Outer Vest-Agder concern widely distributed aquatic beetles from meso-eutrophic systems which are more common in Central Europe (e.g. *Noterus crassicornis, Laccophilus minutus*) and some rare species (e.g. H*ydroporus obsoletus, H. scalesianus, H. longicornis*). Additions to the Inner Aust-Agder fauna comprise very common species with very wide distribution areas (e.g. *Hydroporus obscurus, H. erythrocephalus, A. sturmii*) and boreal faunal elements (e.g. *Hydroporus notabilis, Stictotarsus multilineatus, and Colymbetes dolabratus*).

Though the number of sites in both fylkes is nearly equal, and also the mean and mode of number of species per site, it is clear that the (bio)diversity and species composition differ. About 75% of the species collected occurred in only one fylke (Table 2). This large difference is certainly caused in part by the relatively low number of sampling sites, but great differences in species composition are realistic as most Vest-Agder sites were taken at very low altitude (<100 m) while most Aust-Agder sites were from high altitude (>750 m). The decline in number of species is often observed when lowland sites are compared with highland sites.

The discovery of *Cyphon hilaris* at four sites in Vest-Agder does indicate that the species will be more common along the Norwegian south coast. A contagious distribution area with the known southwestern populations in Sweden (Nyholm 1972) seems likely. Nyholm (1972) gives many records of other *Cyphon* species from southern Norway so this find might indicate a recent extension of the distribution area of *C. hilaris*. On the other hand the family Scirtidae is not very popular among coleopterists as they are difficult to identify on external characters (but easy on the basis of the genitalia), and are also difficult to set. Also the Scirtidae are under-represented

in coleopterological surveys in Vest-Agder as all species were new to the fylke. Besides that it could also be an isolated, extreme southern outpost of the species in Norway: all records originate from a small, coastal area at very low altitude.

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Mesostigmatid mites (Acari, Mesostigmata) new to the fauna of Norway

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This work presents 25 mite species from the order Mesostigmata that are new to Norway's fauna. These species belong to 3 suborders, 14 families and 18 genera. Most of them were found in Sogn og Fjordane. Localities and ecological preferences are given.

Key words: Mites, Acari, Mesostigmata, Southern Norway, species new for Norway.

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INTRODUCTION

Little work has been done on Norway's Mesostigmata (Acari). In a checklist of Norwegian mites, Mehl (1979) listed only 96 species belonging to the Mesostigmata. Since this paper was published, phytoseiid mites have been intensively studied by Edland (1987, 1994), Karg & Edland (1987), Edland & Evans (1998), Evans & Edland (1998) and Denmark & Edland (2002). In addition, Lundqvist et al. (2000) examined Mesostigmata from Norwegian caves, and Mehl (1998) found some species in agricultural habitats. Slomian et al. (2005) investigated Gamasina and Microgyniina from two traditional farms in Sogn og Fjordane, and listed 36 new species for Norway. However, the Norwegian mesostigmatids fauna is little known. This paper is the result of a primary study of Maria E. Gulvik's collection, belonging to Sogn og Fjordane University College, Department of Natural Science, Norway, and deposited in the museum De Heibergske Samlinger (The Heiberg Collections, Vestreim, Kaupanger) in Norway. Microslides of the species new to Norway's fauna have been deposited in the Museum of the University of Bergen (The Natural History Collections), in The Heiberg Collections, (Vestreim, Kaupanger) in Norway, and in The Bavarian State Collection of Zoology (Zoologische Staatssammlung München) in Germany.

METHODS AND MATERIAL

Material was collected from differs vegetation types and microhabitats in South Norway, mainly in Sogn og Fjordane region. The soil mesofauna was extracted from the samples with a modified Tullgren funnel for six days, at a temperature of up to 40-45 °C (measured above the samples) and 10-15 °C lower in the rooms with the collecting vessels. The specimens were collected in beakers of 75 % ethanol, and then fixed on permanent slides in Hoyer's medium. Select adult Gamasida were identified to the species level according to Ghilarov & Bregetova (1977), Hirschmann, Wisniewski & Kaczmarek (1991), Karg (1993), Mašan (2003, 2004).

The list of species is presented in systematic order by suborder and family, includes information about species' microhabitat preferences (based on the literature), and gives details of the finds in Norway (date of collection, locality, microhabitats and vegetation type). The sex and/or developmental stage of the specimens in the samples are given: ♀ - female, ♂ - male, D – deutonymph, P – protonymph, L - larvae. Information on localities is given according to the Strand system for use in biogeographic work in Norway (Økland 1981). This consists of a symbol for a region followed by the name of the municipality. Additional information on each sample is provided.

Symbols for regions: **AAI:** Aust Agder interior part, **BV:** Buskerud western part, **BØ:** Buskerud eastern part, **HOI:** Hordaland interior part, **HOY:** Hordaland coastal part, **ON:** Oppland northern part, **SFI:** Sogn og Fjordane interior part, **SFY:** Sogn og Fjordane coastal part.

Classification of vegetation types is given according to Fremstad (1997).

A: Lichen/bryophyte and dwarf-shrub woodland, A3: Heather – bog bilberry – Scots pine woodland, A3b: Mountain st., A3c: Coastal st., A3e: Damp st., A4: Bilberry woodland, A4a: *Vaccinium myrtillus* st. A5: Small-fern woodland, A6: Rock ledge woodland.

B1: Low-herb woodland, B1b: Oceanic lowland st.

C: Tall-fern and tall-herb woodland, C1: Tall-fern woodland, C1e: Fern – *Equisetum* – *Picea abies* st. C2: Tall-herb, downy birch and Norway spruce forest, C2c: Low-herb st. with scattered tall herbs, C3: *Alnus incana* – *Prunus padus* woodland, C3a: Tall-herb – *Matteuccia struthiopteris* st.

D: Thermophilous deciduous woodland, D2: Low-herb deciduous woodland, D4: *Ulmus glabra* – *Tilia cordata* woodland, D5: *Alnus incana* - *Ulmus glabra* woodland, D6a: *Alnus incana* – *Fraxinus excelsior* st.

G: Anthropogenous grassland, G3: *Deschampsia cespitosa* grassland, G5c: *Festuca ovina* st. G14: Intermediate, nutrient-rich "old" (cultivated) meadow.

I7: Forestry plantation.

K: Poor fen, K1: Wooded poor fen, K1a: Wooded st., K1d: *Salix* st.

L1: Intermediate wooded and scrub-covered fen.

S: Early snow patch vegetation, S6: Poor tall-herb meadow and scrub, S7: Rich tall-herb meadow and scrub.

T: Late snow patch vegetation, T4a: *Salix herbacea* st.

U6: Gravelly shore.

LIST OF SPECIES

SEJINA

Sejidae

Sejus togatus C.L. Koch, 1836.

SFI Sogndal: Near museum De Heibergske Samlinger (61°12` N,07°11` E), 15 August 2000, 1 ♂ in rotten wood in trunk in K1a vegetation type, 1♀, 2♂♂, 2D, 1P in moss and rotten cortex of dead trunk in K1a, 3♀♀, 10♂♂, 2D in rotten cortex and wood, trunk in C1e, 6♀♀, 11D, 6P in rotten cortex and wood of trunk in B1 vegetation.

Microhabitat preferences: Mainly in rotten wood, also under bark and sometimes in forest litter (Hirschmann et al. 1991).

GAMASINA

Epicriidae

Epicrius canestrinii Haller, 1881.

HOY Lindås: Near Seim (60°37` N, 05°16` E); 6 April 1999, 2♀♀ in organic strata in I7 vegetation with *Picea abies,* 2♂♂ in organic

strata and soil in D vegetation, **SFY** Flora: Near Knappstad and road No. 5 (61°35` N, 05°30` E), 13 August 2000, 1♀ in moss and organic strata in A3c vegetation, Flora: Svanøy island, near Hovedgård (61°29` N, 05°08` E), 6. November 2000, 2♀♀, 1♂ in humus from hollow stump of Quercus sp. on wooded pasture G5c vegetation type, Jølster: Near Kjøsnesfjord and road No. 5 (61°33` N, 06°34` E), 10 November 2000, 1♂ in rotten wood from hollow *Ulmus glabra* (old pollard) in overgrown wooded meadow in D5 vegetation type.
Microhabitat preferences: In litter, moss and humus (Ghilarov & Bregetova 1977, Karg 1993).

Epicrius mollis (Kramer, 1876).
SFI Sogndal: Near museum De Heibergske Samlinger (61°12` N, 07°11` E), 15 August 2000, 1♀ in moss and rotting bark on stump in K1a vegetation, Luster: Near Hafslo and road No. 55 (61°17` N, 07°11` E), 14 October 2000, 1♀, 1♂ in moss and humus on rotten stump of *Pinus silvestris* in A4a vegetation, **SFY** Jølster: Near Kjøsnesfjord and road No. 5 (61°33` N, 06°34` E), 10 November 2000, 5♀♀, 3♂♂ in organic strata close to *Ulmus glabra* (old pollard) in overgrown wooded meadow in D5 vegetation type.
Microhabitat preferences: In litter, humus and moss (Ghilarov & Bregetova 1977, Karg 1993).

Epicrius resinae Karg, 1971.
BØ Krødsherad: Near Noresund and road No. 7 (60°12` N, 09°37` E), 26 August 2000, 1♀ in rotten wood in stump in C3 vegetation, **BV** Hemsedal: Near Hjelmen and road No. 52 (60°49` N, 08°41` E), 26 August 2000, 4♀♀, 3♂♂ in organic strata in A3e vegetation, **SFI** Luster: At Skjolden near road No. 331 (61°11` N, 07°12`E), 20 May 2201, 1♀ in tussocks of grass on stony fjord shore in U6 vegetation.
Microhabitat preferences: In soil and forest litter (Karg 1993).

Zerconidae

Zercon zelawaiensis (Sellnick, 1944.)
SFY Flora: Svanøy island (61°30` N, 05°08` E) and (61°28` N, 5°05` E), 13 August 2000, 1♀ in organic strata under moss in A4a vegetation, 1♀ in organic strata under *Corylus avellana* in grazed B1b vegetation, Flora: Near Knappstad and road No. 5 (61°35` N, 05°30` E), 13.August 2000, 1♀ in moss and organic strata in A3c vegetation, **HOI** Odda: Near crossroads between E134 and 520 (59°49` N, 06°46` E), 8 August 2000, 1♀ in moss and organic strata in A3b vegetation type,
Microhabitat preferences: In litter, especially in coniferous forest (Blaszak 1974, Mašan 2004).

Macrochelidae

Macrocheles montanus (Willmann, 1951.)
SFI Luster: Near Skjolden and near road No. 55 (61°28` N, 07°32` E), 18. April 1998, 3♀♀ in moss, organic strata and soil in D5 vegetation, Luster: Near Nigardsbreen Nature Reserve (61°39` N, 07°16` E), 20 September 2000, 3♀♀ in rotting wood in trunk of *Betula* sp., organic strata and soil in C2c vegetation, 4♀♀ in rotting wood in trunk of *Betula* sp. in A4a vegetation, 15♀♀ in organic strata and soil in A6 vegetation, Luster: Jostedalen near road No. 604 (61°40` N, 07°12` E), 20 September 2000, 1♀ in organic strata in A4a vegetation, Luster: Opptun beside road No. 55 (61°29` N, 07°44` E), 20 September 2000, 3♀♀ in wet litter on border of C3a vegetation.
Microhabitat preferences: In litter, under bark, in nest of Rodentia (Ghilarov & Bregetova 1977, Mašan 2003).

Eviphididae

Iphidosoma physogastris Karg, 1971.
SFY Flora: Svanøy island (61°28` N, 5°05` E), 13 August 2000, 1D in organic strata under *Corylus avellana* in grazed B1b vegetation, **SFI** Luster: Jostedalen near road No. 604 (61°40` N, 07°12` E), 1D in organic strata in A4a vegetation.
Microhabitat preferences: In litter, moss and humus (Ghilarov & Bregetova 1977, Karg 1993).

Ascidae

A*rctoseius minutus* (Halbert, 1915).
SFY Førde: Near Førde at Kusslid farm (61°27` N, 05°58` E), 18 October 2001, 1♀ in organic strata and soil in wooded pasture (with pollarded

Ulmus glabra and *Fraxinus excelsior*) in G3 vegetation.
Microhabitat preferences: Occurs in many habitats, but prefers litter, humus and moss (Ghilarov & Bregetova 1977, Karg 1993).

Cheiroseius laelaptoides (Berlese, 1887).
SFI Luster: Near Skjolden beside road No. 55 (61°27` N, 07°31` E), 23 May 2005, 3♀♀ in wet moss on stones at edge of stream on border of C3a vegetation.
Microhabitat preferences: In litter, on bog, in nest of Rodentia (Evans & Hyatt 1960, Ghilarov & Bregetova 1977, Karg 1993).

Cheiroseius necorniger (Oudemans, 1903).
ON Lom: Near Bøvertunet beside road No. 55 (61°37` N, 08° 03` E), 30 May 2004, 1♀ in wet moss from mountain stream in S7 vegetation, Lom: Sognefjellet near dam and road No. 55 (61°33` N, 08°02` E), 30 May 2004, 4♀♀ in wet moss from rill in T4a vegetation, **SFI** Luster: Sognefjellet near Oscarshaug, (61°30` N, 07°48` E), 30 May 2004, 1♀ in dry *Sphagnum* sp. from bog K1d vegetation, Luster: Near Skjolden beside road No. 55 (61°27` N, 07°31` E), 23 May 2005, 2♀♀ in wet moss on stones at edge of stream, on border of C3a vegetation.
Microhabitat preferences: In soil and humus on wet meadow (Evans & Hyatt 1960, Ghilarov & Bregetova 1977, Karg 1993).

Iphidozercon gibbus Berlese, 1903.
SFI Sogndal: Near museum De Heibergske Samlinger (61°12` N, 07°11` E), 15.08.2000, 3♀♀, 1♂ in rotten cortex and wood of trunk in C1e vegetation.
Microhabitat preferences: In soil, litter, humus and nest of Rodentia (Evans 1958, Ghilarov & Bregetova 1977, Karg 1993).

Leioseius magnanalis (Evans, 1958).
SFI Luster: Opptun beside road No. 55 (61°29` N, 07°44` E), 30 May 2004, 1♀ in wet litter in border of C3a vegetation.
Microhabitat preferences: In soil, litter, moss and nest of Rodentia (Evans 1958, Ghilarov & Bregetova 1977, Karg 1993).

Platysejus major (Halbert, 1923).
SFI Luster: Opptun beside road No. 55 (61°29` N, 07°44` E), 26 April 2004 and 30 May 2004, 28♀♀, 3♂♂, 34DD, 5P, 10LL in wet moss from rill on border of C3a vegetation.
Microhabitat preferences: In wetlands and marshes, in moss on rocks in mountain rivers (Evans & Hyatt 1960, Ghilarov & Bregetova 1977, Karg 1993).

Laelapidae
Hypoaspis (Cosmolaelaps) vacua (Michael, 1891).
HOI Odda: Near crossroads between E134 and 520 (59°49` N, 06°46` E), 8 August 2000, 3♀♀, 1♂, 2D in moss and organic strata in A3b vegetation.
Microhabitat preferences: In soil, litter, moss, rotting wood, anthills of Formicidae and nest of Rodentia (Ghilarov & Bregetova 1977, Karg 1993).

Veigaiaidae
Veigaia transisalae (Oudemans, 1902).
SFI Sogndal: Near museum De Heibergske Samlinger (61°12` N, 07°11` E), 15 August 2000, 4♀♀ in moss and rotten cortex of dead trunk in K1a vegetation, 2♀♀ in rotten cortex and wood of trunk in C1e vegetation, 2♀♀, 1D in rotten cortex and wood of trunk in B1, Luster: Near Nigardsbreen Nature Reserve (61°39` N, 07°16` E), 20 September 2000, 1♀ in organic strata in C2c vegetation.
Microhabitat preferences: In soil, litter, moss, under bark and in nest of Rodentia (Ghilarov & Bregetova 1977).

Halolaelapidae
Saprosecans baloghi Karg, 1969.
SFI Leikanger: Grinde farm (61°12´ N; 06°45´ E), 19 October 2001, 1♀ in organic strata and soil in semi-natural traditional wooded (with pollarded *Ulmus glabra* and *Fraxinus excelsior*) meadow G14 vegetation type.
Microhabitat preferences: Very rare species, was

found in organic strata and soil (Karg 1993).

Ameroseiidae

Epicriopsis horridus (Kramer, 1876).
SFI Luster: Near Ornes beside road No. 331 (61°18` N, 07°19` E), 26 May 2004, 1♀ in wet moss on rock in seasonal rill on border of C3 vegetation, Luster: Opptun beside road No. 55 (61°29` N, 07°44` E), 30 May 2004, 3♀♀ in wet moss on bank of rill on border of C3a vegetation.
Microhabitat preferences: In humus and moss (Ghilarov & Bregetova 1977, Karg 1993).

UROPODINA

Trachytidae

Trachytes aegrota (C.L. Koch, 1841).
AAI Valle: Setesdal near Valle (59°11` N, 07°33` E), 8 August 2000, 2♀♀ in organic strata in A4 vegetation, **SFY** Flora: Svanøy island (61°28` N, 5°05` E), 13 August 2000, 2♀♀ in organic strata under *Corylus avellana* in grazed B1b vegetation, **SFI** Luster: Mørkridsdalen (61°31` N, 07°36` E), 20 April 2003, 5♀♀ in rotten bark from rotten trunk of *Ulmus glabra* (overgrown wooded meadow) in D6a vegetation, Luster: Near Feigum and road No. 331 (61°24` N, 07°28` E), 20 July 2004, 10♀♀ in organic strata under moss (especially *Rhytidiadelphus triquetrus*) in D4 vegetation, Luster: Sognefjellet beside road No. 55 (61°31` N, 07°49` E), 8 May 2005, 1D in moss on rock in S6 vegetation, Luster: Opptun beside road No. 55 (61°29` N, 07°44` E), 8 May 2005, 1♀, 4D in wet moss on bank of rill on border of C3a vegetation.
Microhabitat preferences: In soil, litter, moss, anthills of Formicidae and nests of Talpidae (Wisniewski & Hirschmann 1993).

Trachytes montana Willmann, 1953.
SFI Luster: Sognefjellet beside road No. 55 (61°31` N, 07°49` E), 8 May 2005 7♀♀ in moss on rock in S6 vegetation.
Microhabitat preferences: In soil and litter (Wisniewski & Hirschmann 1993).

Trachytes pauperior (Berlese, 1914).
SFI Leikanger: Grinde farm (61°12` N, 06°45` E), 2 October 1998, 3♀♀ in organic strata and soil in semi-natural traditional wooded (with pollarded *Ulmus glabra* and *Fraxinus excelsior*) meadow G14 vegetation type, Luster: Opptun beside road No. 55 (61°29` N, 07°44` E), 30 May 2004, 1♀ in wet litter on bank of rill on border of C3a vegetation, Luster: Near Sørheim and road No. 331 (61°24` N, 7°29` E), 20 July 2004, 1♀ in rotting wood and organic strata under moss (especially *Rhytidiadelphus loreus*) in C3 vegetation, Luster: Near Feigum and road No. 331 (61°24` N, 07°28` E), 20 July 2004, 2♀♀ in organic strata under moss (especially *Rhytidiadelphus triquetrus*) in D4 vegetation, Luster: Sognefjellet beside road No. 55 (61°31` N, 07°49` E), 8 May 2005, 10♀♀ in moss on rock in S6 vegetation, Luster: Opptun, beside road No. 55 (61°29` N, 07°44` E), 20 July 2004, 1♀ in wet moss on bank of rill on border of C3a vegetation, **HOY** Lindås: Near Seim (60°37` N, 05°16` E), 6 April 1999, 1♀ in organic strata and soil in D vegetation.
Microhabitat preferences: In soil, litter, rotting wood (Wisniewski & Hirschmann 1993).

Polyaspidae

Polyaspinus cylindricus Berlese, 1916.
SFY Flora: Svanøy island (61°28` N, 5°05` E), 13 August 2000, 1♀ in rotting wood from roots and stump of *Betula* sp. in grazed B1b vegetation.
Microhabitat preferences: In moss, litter, detritus (Wisniewski & Hirschmann 1993).

Urodinychidae

Dinychus arcuatus (Trägårdh, 1922).
SFI Luster: Near Sørheim and road No. 331 (61°24` N, 7°29`21` E), 20 July 2004, 3♀♀, 6♂♂, in rotting wood and organic strata under moss (especially *Rhytidiadelphus loreus*) in C3 vegetation, Luster: Near Feigum and road No. 331 (61°24` N, 07°28` E), 20 July 2004, 1♀in rotting wood from rotting branch of *Ulmus glabra* in D4 vegetation, 1♂ in humus under moss (especially *Rhytidiadelphus triquetrus*) in D4 vegetation.

Microhabitat preferences: In humus, litter, rotting wood (Wisniewski & Hirschmann 1993).

Dinychus perforatus Kramer, 1882.
SFI Leikanger: Grinde farm (61°12´, 06°45´), 2 October 1998, 4♀♀, 6♂♂ in organic strata and soil in semi-natural traditional wooded (with pollarded *Ulmus glabra* and *Fraxinus excelsior*) meadow G14 vegetation type, Luster: Mørkridsdalen (61°31` N, 07°36` E), 20 April 2003, 4♀♀, 3♂♂ in rotten bark from rotten trunk of *Ulmus glabra* in overgrown wooded meadow in D6a vegetation, Luster: Near Feigum, near road No. 331 (61°24`3`` N, 07°28`11`` E), 20 July 2004, 4♂♂ in organic strata under moss (especially *Rhytidiadelphus triquetrus*) in D4 vegetation, Luster: Opptun beside road No. 55 (61°29` N, 07°44` E), 30 May 2004, 1♀, 1♂ in wet litter on bank of rill on border of C3a vegetation.
Microhabitat preferences: In soil, litter, rotting wood, nest of Talpidae (Wisniewski & Hirschmann 1993).

Uropodidae

Uropoda minima (Kramer, 1882).
SFI Luster: Opptun beside road No. 55 (61°29` N, 07°44` E), 8 May 2005, 2♀ in wet moss on bank of rill on border of C3a vegetation.
Microhabitat preferences: In humus, litter, rotting wood, moss, anthills of Apidae and Formicidae (Wisniewski & Hirschmann 1993).

Uropoda misella (Berlese, 1916).
SFI Leikanger: Grinde farm (61°12´, 06°45´), 2 October 1998, 5♀♀ in organic strata and soil in semi-natural traditional wooded (with pollarded *Ulmus glabra* and *Fraxinus excelsior*) meadow G14 vegetation type, Luster: Near Feigum and road No. 331 (61°24` N, 07°28` E), 20 July 2004, 1♂ in rotting wood from roots and trunk of *Ulmus glabra* in D4 vegetation.
Microhabitat preferences: In moss, litter and nest of Talpidae (Wisniewski & Hirschmann 1993).

DISCUSSION

This paper presents 25 mite species of the order Mesostigmata that are new to Norway's fauna. These species belong to 3 suborders, 14 families and 18 genera. Mehl (1979) listed *Zercon zelawaiensis* in his checklist, but as *Zercon* cf. *zelawaiensis*. We can confirm that this species occurs in Norway. In a relatively small number of samples taken for the present study, we found 25 species that were new for Norway, including one very rare species (*Saprosecans baloghi*) in an old hay meadow. The fact that relatively common species such as *Trachytes aegrota, T. pauperior, Uropoda misella, U. minima, Dinychus perforatus, Macrocheles montanus, Epicrius mollis, Sejus togatus* and *Platysejus major* have not previously been registered in Norway, illustrates how little is known about the Norwegian Mesostigmata (except the Phytoseiidae), both in soil and in some other microhabitats like rotten wood and wet moss. Gamasina may be used as bioindicators of changes in soil properties and of the impact of human activities on the environment (Ruf 1998, Ruf et al. 2003). More studies of different habitats at various temporal and spatial scales are needed to establish a database that can be used in developing a system for use in a monitoring network.

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Folsomia bisetosella n. sp. A new species of Collembola (Isotomidae) from Greenland and Northern Europe

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Fjellberg, A. 2005. *Folsomia bisetosella* n. sp. A new species of Collembola (Isotomidae) from Greenland and Northern Europe. Norw. J. Entomol. 52, 111-113.

Folsomia bisetosella occurs in dry coastal habitats in Greenland, Iceland, Faroe Islands, Norway, Sweden and Denmark. It differs from the related *F. bisetosa* by smaller size, absence of anterolateral microsensillum on the first abdominal segment, reduced number (3) of prelabral setae, presence of seta ml_1 on dorsal side of manubrium and more elongate maxillary lamellae.

Key words: Collembola, new species, *Folsomia bisetosella,* Europe.

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INTRODUCTION

The northern species *Folsomia bisetosa,* originally described from the arctic island of Jan Mayen by Gisin (1953), has an almost circumpolar distribution. The status of the more southern populations has been questioned (Potapov 2001). A detailed study of specimens from Nordic countries including Svalbard, Iceland and Greenland, proved that a distinct new species of more southern distribution is commonly present.

DESCRIPTION

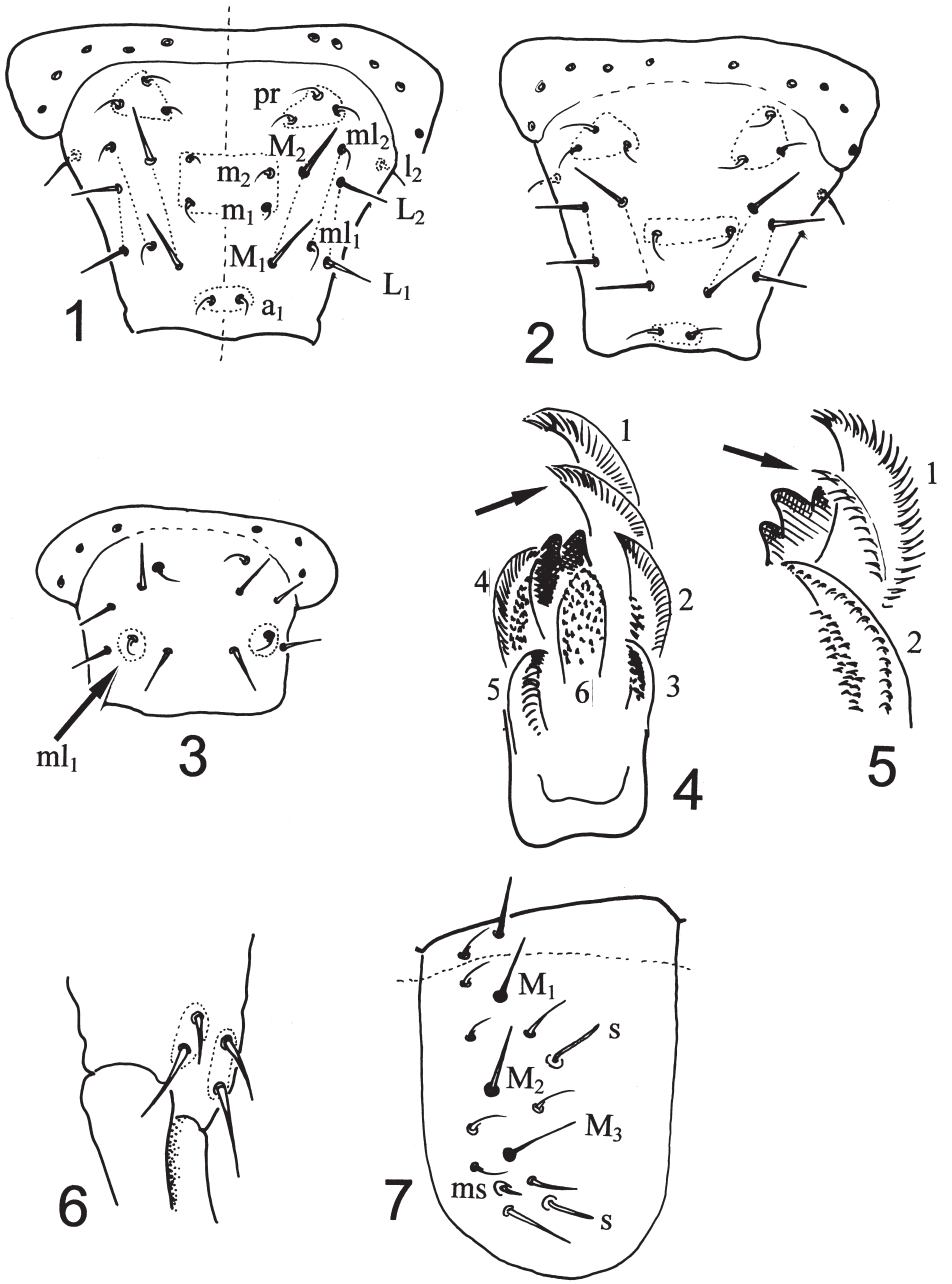
Folsomia bisetosella n. sp.
Figures 1, 3, 4, 6.

Type material, deposited at Zoological Museum (Dept. of Entomology), Copenhagen: Holotypus (female in slide) and 3 paratypes (slide) from ”Greenland, SW. Tasiussaq, Evighedsfjord. 65°51’N, 52°47’W, 19 July 2003. Dry heath, sand. Empetrum, lichens. A. Fjellberg 03.080”

White species without ocelli, size up to 0.6 mm. Body shape slender, cylindrical. PAO narrow elongate. Ant.1 with 2 ventral sensilla. Lateroapical sensillum present on Ant.2. Lateroapical spine-like sensillum present on Ant.3. Labrum with 5-5-4 setae. Prelabral setae 3. Frontoclypeal field with 4-6 setae. Labium complete, with all papillae and guards present. Maxilla as Figure 4. Lam.1 strong, subapical frige of cilia reaches well beyond tip of capitulum. Maxillary palp bifurcate, with 4 sublobals. Head with 4+4 postlabial setae. Sensilla of body thin, hair-like. Upper sensillum of abd. 1-3 set within the p-row. Abd.1 without anterolateral microsensillum. Macrochaetae short, smooth. On Abd.4-6 chaeta M_1 about twice as long as inner edge of claw. Thorax without ventral setae. Ventral tube with 4-5 distal and 4-6 caudal setae. Retinaculum with 4+4 teeth and one seta. Manubrium with 2+2 ventroapical setae (Figure 6), dorsal chaetotaxy as Figure 1. Seta ml_1 present. Dens about as long as manubrium, dorsal side with 3 setae near base and 2 in the middle.Ventral side with about 15 setae. Tib.1-2 with 3 complete whorls of setae (A-C), Tib.3 with a few additional D-setae at base. Claws without teeth. Males present, not epitokous.

Figures 1-7. Morphology of *Folsomia*. 1-3. Dorsal chaetotaxy of manubrium in adult *bisetosella* n. sp. (1), adult *bisetosa* (2) and first instar juvenile *bisetosella* n. sp. (3); 4-5. maxillary head with arrows pointing to subapical fringe of *bisetosella* n.sp. (4) and *bisetosa* (5); 6. ventroapical setae of manubrium in *bisetosella* n. sp.; 7. chaetotaxy on left side of abd.1 in a first instar juvenile *bisetosa.*

Abbreviations: a – apical, l – lateral, L – lateral macrochaeta, m – median, M – median macrochaeta, ml – mediolateral, ms – microsensillum, pr – proximal, s – sensillum.



DISCUSSION

The new species is very similar to *F. bisetosa,* but smaller (*bisetosa* reaches 0.8 mm). The only sharp differences are number of prelabral setae which is 3 in *bisetosella* and 4 in *bisetosa,* and the absence of anterolateral microsensillum on abd.1 (microsensillary formula 10/000, in *bisetosa* 10/100). On the posterior side of manubrium the median field usually has 4 m-setae (2 in *bisetosa*) and the seta ml_1 are present in *bisetosella* and absent in *bisetosa* (Figures 1, 2). The maxilla is slightly longer and more narrow, in particular the capitular teeth are finer, Lam.1 is longer and Lam.6 is more elongated (Figure 4). In *bisetosa* the subapical fringe of Lam.1 does not rech beyond tip of capitulum (Figure 5). The 1.instar juveniles of the two species also show consistent differences: In *bisetosella* ml_1 (Figure 3) is present on manubrium (absent in *bisetosa*) and the microsensillum is absent on abd.1 (present in *bisetosa,* Figure 7).

In Greenland the distribution of *F. bisetosella* covers both coast from southern districts north to about 75°. Other records are from Iceland (Reykjavik, Snefellsnes, Hafnarskogur), Faroe Islands (Vágar, Kunoy), Norway (along the coast N to Tromsø), Sweden (Ystad, Skillinge), Denmark (Thy). Most records are from dry, coastal sandy habitats (meadows, sand dunes), with some observations from dry inland sites. *F. bisetosa* has a more northern and almost circumpolar distribution with records from the arctic islands (Svalbard, Jan Mayen, Bjørnøya), N. Norway (Troms, Finnmark), N.Sweden (Abisko), Greenland and Iceland. The two species overlap in Greenland and Iceland and may be found together in the same sample without showing intermediary characters. Published records of *F. bisetosa* from N. America and the Russian arctic need verification (definite *bisetosa* are seen from Taimyr and Chaun Bay). Males are observed in *bisetosella* while *bisetosa* appears to be parthenogenetic.

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Anapausis helvetica Haenni, 1984 (Diptera; Scatopsidae), a species new to Fennoscandia and Denmark

Jean-Paul Haenni & Lita Greve

Haenni, J.-P. & Greve, L. 2005. *Anapausis helvetica* Haenni, 1984 (Diptera; Scatopsidae) a species new to Fennoscandia and Denmark. Norw. J. Entomol. 52, 115-116.

One male *Anapausis helvetica* Haenni, 1984 (Diptera, Scatopsidae) was collected in a Malaise-trap in Ringerike municipality, Buskerud (BØ) between 30 May and 3 July 2004. The locality is situated at the farm Hovland close to Sokna centre. This is the first record of this species from Norway and Northern Europe as a whole.

Key words: *Anapausis helvetica,* Scatopsidae, Diptera, Norway.

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Only one species of the genus *Anapausis viz. A. rectinervis* Duda, 1928, has hitherto been recorded from Norway (Haenni & Greve 1995, 2000). A second species of the genus, *Anapausis helvetica* Haenni, 1984, is presently recorded as new to Fennoscandia and Denmark. One male was collected in a Malaise trap at BØ Hovland, Sokna in Ringerike (EIS 36) between 30 May and 3 July 2004, leg. L. Greve, ZMB. The locality is a small open, sparsely wooded area with pines *(Pinus silvestris),* willows (*Salix* sp.), rowan *(Sorbus aucuparia)* and various herbaceous plants close to farmland. The trap was not closed until October, but no more specimens were collected.

A. helvetica has been recorded from the Alps and mountainous areas of Switzerland, Italy, France, Germany, Czech Republik and Slovakia, and also from the Pyrenees in Andorra (Haenni 2005). It has been caught once at low elevation in Central Germany (Buck 1996). The present record from South Norway extends strongly its distribution northwards.

Presently more than twenty species of genus *Anapausis* are known from Europe (Haenni 2004), but several others are awaiting description. The external morphology is very uniform within this genus. In both sexes separation of most species may be based on examination of the terminalia which display good identification characters. A. helvetica belongs to a group of closely related species including *A. dudai* Haenni, *A. dufourella* Haenni, *A. nigripes* (Zetterstedt), *A. pseudohelvetica* Haenni, and other till now undescribed species. *A. helvetica* may be recognized from related species by the rounded median posterior emargination of sternite 6, the shape of sternite 10 and penis valves in the male, by the shape of tergite 8 and sternite 8 in the female. For a thorough description and figures of the genital figures of *A. helvetica* see Haenni (1984).

With the present record, thirtytwo species of Scatopsidae have so far been recorded from Norway. Since five species of *Anapausis* have been recorded from Sweden (Andersson 1982) more species of this genus can be expected to occur in Norway.

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Checklist of Norwegian mesostigmatid mites (Acari, Mesostigmata).

Dariusz J. Gwiazdowicz & Maria E. Gulvik

Gwiazdowicz, D.J. & Gulvik, M.E. 2005. Checklist of Norwegian mesostigmatid mites (Acari, Mesostigmata). Norw. J. Entomol. 52, 117-125.

This checklist includes 220 species of the order Mesostigmata, assigned to 4 suborders, 26 families and 74 genera. The list is based on data from the literature and our own studies.

Key words: Acari, Mesostigmata, mites, fauna of Norway, checklist.

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INTRODUCTION

In his checklist, Mehl (1979) listed 96 mite species of the order Mesostigmata as occurring in Norway. Since then, the names of many of the species he listed have been changed. Moreover, recent acarological work has resulted in records of approximately 100 new species in Norway (Karg & Edland 1987, Wisniewski 1993, Edland & Evans 1998; Evans & Edland 1998; Denmark & Edland 2002; Slomian et al., 2005; Gwiazdowicz & Gulvik, 2005). These developments made it important to update the checklist of mites in Norway.

The list is presented in systematic order according to the current names of species based on Ghilarov & Bregetova (1977), Karg (1993), Hyatt (1980) or other listed literature. The checklist does not include questionable species from older studies, such as *Ornithonyssus pipstrelli* (Oudemans), *Uropoda formicarum* Thor and *Phaulocylliba ventricosa* Berlese (listed by Mehl 1979), because they are not included in world-wide revisions of Mesostigmata taxonomy (Wisniewski 1993 and other).

For each species in the list, reference to the literature is included.

MICROGYNIINA

Microgyniidae

Microgynium rectangulatum Trägårdh 1942 - (Slomian et al. 2005)
Microsejus truncicola Trägårdh, 1942 - (Slomian et al. 2005)

SEJINA

Sejidae

Sejus togatus C.L. Koch, 1836 - (Gwiazdowicz & Gulvik 2005)

GAMASINA

Epicriidae

Epicrius canestrinii Haller, 1881 - (Gwiazdowicz & Gulvik 2005)
Epicrius mollis (Kramer, 1876) - (Gwiazdowicz & Gulvik 2005)
Epicrius resinae Karg, 1971 - (Gwiazdowicz & Gulvik 2005)

Zerconidae

Parazercon radiatus (Berlese, 1914) - (Hågvar 1978, 1984, Hågvar & Abrahamsen 1980, 1990, Hågvar & Amundsen 1981, Hågvar & Kjøndal 1981a,b).
Prozercon kochi Sellnick, 1943 - (Hågvar 1978,

Hågvar & Abrahamsen 1980, Hågvar & Kjøndal 1981a,b, Slomian et al. 2005)
Prozercon traegardhi (Halbert, 1923) - (Slomian et al. 2005)
Zercon baloghi Sellnick, 1958 - (Slomian et al. 2005)
Zercon curiosus Trägårdh, 1910 - (Slomian et al. 2005)
Zercon triangularis C.L. Koch, 1836 - (Slomian et al. 2005)
Zercon zelawaiensis Sellnick, 1944 - (Gwiazdowicz & Gulvik 2005)

Parasitidae

Parasitinae

Parasitus coleoptratorum (Linne, 1758) - (Berlese 1906)
Parasitus consanguineus Oudemans et Voigts, 1904 - (Mehl 1979)
Parasitus beta Oudemans et Voigts, 1904 - (Berlese 1906)
Parasitus furcatus (G. et R. Canestrini, 1882) - (Berlese 1906)
Parasitellus fucorum (De Geer, 1778) - (Mehl 1979)
Poecilochirus carabi G. et R. Canestrini, 1882 - (Edler & Mehl 1972)
Vulgarogamasus immanis (Berlese, 1903) - (Berlese 1904, 1906)
Vulgarogamasus kraepelini (Berlese, 1905) - (Edler & Mehl 1972, Hågvar 1978, Slomian et al. 2005)
Vulgarogamasu oudemansi (Berlese, 1904) - (Slomian et al. 2005)
Vulgarogamasus remberti (Oudemans, 1912) - (Edler & Mehl 1972)
Vulgarogamasus trouessarti (Berlese, 1892) - (Berlese 1904, 1906)

Pergamasinae

Amblygamasus dentipes (C.L. Koch, 1835) - (Slomian et al. 2005)
Amblygamasus hamatus (C.L. Koch, 1839) - (Slomian et al. 2005)
Holoparasitus calcaratus (C.L. Koch, 1839) - (Slomian et al. 2005)
Leptogamasus suecicus Trägårdh, 1936 - (Slomian et al. 2005)
Paragamasus (Paragamasus) robustus (Oudemans, 1902) - (Berlese 1906, Hågvar 1978, Hågvar & Abrahamsen 1980, Hågvar & Kjøndal 1981a, Lundqvist et al. 1999)
Paragamasus (Aclerogamasus) alpestris (Berlese, 1904) - (Slomian et al. 2005)
Paragamasus (Aclerogamasus) insertus (Micherdzinski, 1969) - (Slomian et al. 2005)
Paragamasus (Anidogamasus) cambriensis Bhattacharyya, 1963 - (Slomian et al. 2005)
Paragamasus (Anidogamasus) celticus Bhattacharyya, 1963 - (Slomian et al. 2005)
Paragamasus (Anidogamasus) lapponicus (Trägårdh, 1910) - (Hågvar 1978, Slomian et al. 2005)
Paragamasus (Anidogamasus) parrunciger Bhattacharyya, 1963 - (Hågvar & Kjøndal 1981b)
Paragamasus (Anidogamasus) runcatellus (Berlese, 1903) - (Slomian et al. 2005)
Paragamasus (Anidogamasus) runciger (Berlese, 1903) - (Berlese 1904, 1906)
Paragamasus (Anidogamasus) schweizeri Bhattacharyya, 1963 - (Hågvar 1978)
Paragamasus (Anidogamasus) vagabundus (Karg, 1968) - (Slomian et al. 2005)
Pergamasus (Pergam*asus) brevicornis* Berlese, 1903 - (Berlese 1906)
Pergamasus (Pergamasus) crassipes (Linne, 1758) - (Berlese 1904, 1906, Slomian et al. 2005)
Pergamasus (Thenargamasus) norvegicus (Berlese, 1905) - (Berlese 1906)
Pergamasus (Thenargamasus) septentrionalis (Oudemans, 1902) - (Slomian et al. 2005)

Macrochelidae

Geholaspis (Geholaspis) longispinosus (Kramer, 1876) - (Slomian et al. 2005)
Geholaspis (Longicheles) mandibularis (Berlese, 1904) - (Slomian et al. 2005)
Macrocheles (Macrocheles) decoloratus (C.L. Koch, 1839) - (Mehl 1979)
Macrocheles (Macrocheles) matrius (Hull, 1925) - (Mehl 1979)
Macrocheles (Macrocheles) montanus Willmann, 1951 - (Gwiazdowicz & Gulvik 2005)
Macrocheles (Macrocheles) muscaedomesticae (Scopoli, 1772) - (Mehl 1979)

Eviphididae

Crassicheles concentricus (Oudemans, 1904) – (Lundqvist et al. 1999)

Eviphis ostrinus (C.L. Koch, 1836) - (Edler & Mehl 1972, Hågvar 1978, Hågvar & Abrahamsen 1980, Hågvar & Kjøndal 1981a, b, Slomian et al. 2005)

Iphidosoma physogastris Karg, 1971 - (Gwiazdowicz & Gulvik 2005)

Ascidae

Ascinae

Gamasellodes bicolor (Berlese, 1918) - (Hågvar 1978, Hågvar & Abrahamsen 1980, Hågvar & Kjøndal 1981a, Slomian et al. 2005)

Lasioseius muricatus (C.L.Koch, 1839) - (Slomian et al. 2005)

Lasioseius ometes (Oudemans, 1903) - (Slomian et al. 2005)

Leioseius magnanalis (Evans, 1958) - (Gwiazdowicz & Gulvik 2005)

Proctolaelaps pygmaeus (Müller, 1860) - (Edler & Mehl 1972, Slomian et al. 2005)

Arctoseiinae

Arctoseius minutus (Halbert, 1915) - (Gwiazdowicz & Gulvik 2005)

Arctoseius semiscissus (Berlese, 1892) - (Slomian et al. 2005)

Iphidozercon gibbus Berlese, 1903 - (Gwiazdowicz & Gulvik 2005)

Platyseiinae

Cheiroseius borealis (Berlese, 1904) - (Berlese 1904, Slomian et al. 2005)

Cheiroseius laelaptoides (Berlese, 1887) - (Gwiazdowicz & Gulvik 2005)

Cheiroseius necorniger (Oudemans, 1903) - (Gwiazdowicz & Gulvik 2005)

Platyseius major (Halbert, 1923) - (Gwiazdowicz & Gulvik 2005)

Platyseius subglaber (Qudemans, 1902) - (Oudemans 1927)

Laelapidae

Haemogamasinae

Eulaelaps novus Vitzthum, 1925 - (Mehl 1979)

Eulaelaps stabularis (C.L. Koch, 1840) - (Berlese 1904, Edler & Mehl 1972, Mehl 1972)

Haemogamasus ambulans (Thorell, 1872) - (Edler & Mehl 1972)

Haemogamasus hirsutus Berlese, 1889 - (Edler & Mehl 1972)

Haemogamasus horridus Michael,1892 - (Edler & Mehl 1972)

Haemogamasus liponyssoides Ewing, 1925 - (Mehl 1979)

Haemogamasus nidi Michael,1892 - (Edler & Mehl 1972)

Haemogamasus nidiformes Bregetova, 1955 - (Edler & Mehl 1972)

Haemogamasus pontiger (Berlese, 1904) - (Mehl 1977, 1998)

Hirstionyssinae

Hirstionyssys isabellinus (Oudemans, 1913) - (Edler & Mehl 1972)

Hirstionyssys latiscutatus (de Meillon et Lavoipierre, 1944) - (Edler & Mehl 1972)

Hirstionyssys sciurinus (Hirst, 1921) - (Mehl 1971)

Hirstionyssus soricis (Turk, 1945) - (Edler & Meh 1972; Slomian et al. 2005)

Hirstionyssys tatricus Mrciak, 1958 - (Edler & Mehl 1972)

Laelapinae

Androlaelaps casalis (Berlese, 1887) - (Edler & Mehl 1972, Mehl 1998, Slomian et al. 2005)

Androlaelaps fahrenholzi (Berlese, 1911) - (Edler & Mehl 1972)

Hyperlaelaps microti (Ewing, 1933) - (Edler & Mehl 1972)

Hyperlaelaps amphibius Zachvatkin, 1948 - (Mehl 1970)

Hypoaspis (Hypoaspis) krameri (G. et R. Canestrini, 1881) - (Mehl 1979)

Hypoaspis (Alloparasitus) oblonga (Halbert, 1915) - (Slomian et al. 2005)

Hypoaspis (Alloparasitus) sardoa (Berlese, 1911) - (Edler & Mehl 1972, Slomian et al. 2005)

Hypoaspis (Geolaelaps) aculeifer (Canestrini, 1883) - (Hågvar 1978, Slomian et al. 2005)

Hypoaspis (Geolaelaps) brevipilis Hirschmann, 1969 - (Slomian et al. 2005)

Hypoaspis (Geolaelaps) forcipata Willmann, 1955 - (Hågvar & Kjøndal 1981b)
Hypoaspis (Geolaelaps) helianthi Samšinak, 1958 - (Slomian et al. 2005)
Hypoaspis (Cosmolaelaps) vacua (Michael, 1891) - (Gwiazdowicz & Gulvik 2005)
Hypoaspis (Pneumolaelaps) lubrica Voigts et Oudemans, 1904 - (Mehl 1979)
Hypoaspis (Pneumolaelaps) marginepilosa (Sellnick, 1939) - (Mehl 1979)
Laelaps agilis C.L. Koch, 1836 - (Edler & Mehl 1972)
Laelaps clethrionomydis Lange, 1955 - (Edler & Mehl 1972)
Laelaps hilaris C.L. Koch, 1836 - (Edler & Mehl 1972)
Laelaps lemmi Grube, 1851 - (Edler & Mehl 1972)
Laelaps muris (Ljungh, 1799) - (Mehl 1970)
Ololaelaps placentula (Berlese, 1887) - (Berlese 1904)
Ollaelaps veneta (Berlese, 1903) - (Hågvar 1978)

Myonyssinae

Myonyssus ingricus Bregetova, 1956 - (Edler & Mehl 1972)

Macronyssidae

Macronyssinae

Macronyssus kolenati (Oudemans, 1902) - (Mehl 1979)

Ornithonyssinae

Ophionyssus natricis (Gervais, 1844) - (Mehl 1979)
Ophionyssus saurarum (Oudemans, 1901) - (Mehl 1979)
Ornithonyssus bacoti (Hirst, 1913) - (Mehl 1978)
Ornithonyssus sylviarum (Canestrini et Franzango, 1877) - (Mehl 1979)
Steatonyssus periblepharus Kolenati, 1858 - (Mehl 1979)

Dermanyssidae

Dermanyssus (Dermanyssus) americanus Ewing, *1923 - (Mehl 1979)*
Dermanyssus (Dermanyssus) chelidonis Oudemans, 1939 - (Mehl 1979)
Dermanyssus (Dermanyssus) gallinae (De Geer, 1778) - (Mehl 1978, 1998)
Dermanyssus (Dermanyssus) hirundinis (Hermann, 1804) - (Mehl 1978)
Dermanyssus (Dermanyssus) quintus Vitzthum, 1921 - (Mehl 1979)
Dermanyssus (Microdermanyssus) alaudae (Schrank, 1781) - (Mehl 1979)

Halarachnidae

Pneumonyssoides caninum (Chandler et Ruhe, 1940) - (Tharaldsen & Grondalen 1978)

Spinturnicidae

Spinturnix acuminatus (C.L. Koch, 1836) - (Mehl 1979)
Spinturnix kolenati Oudemans, 1910 - (Mehl 1979)
Spinturnix myoti (Kolenati, 1856) - (Mehl 1979)
Spinturnix mystacinus (Kolenati, 1857) - (Mehl 1979)
Spinturnix plecotinus (C.L. Koch, 1839) - (Mehl 1979)

Veigaiaiidae

Veigaia cervus (Kramer, 1876) - (Hågvar 1978, Hågvar & Kjøndal 1981a, Slomian et al. 2005)
Veigaia decurtata Athias-Henriot,1961 - (Slomian et al. 2005)
Veigai exigua (Berlese, 1916) - (Hågvar 1978, Slomian et al. 2005)
Veigaia kochi (Trägårdh, 1901) - (Slomian et al. 2005)
Veigaia nemorensis (C.L. Koch, 1839) - (Hågvar 1978, Hågvar & Kjøndal 1981a, b, Hågvar & Abrahamsen 1980, Slomian et al. 2005)
Veigaia transisalae (Oudemans, 1902) - (Gwiazdowicz & Gulvik 2005)

Rhodacaridae

Cyrtolaelaps minor Willmann, 1952 - (Edler & Mehl 1972)
Cyrtolaelaps mucronatus G. et R. Canestrini, 1881 - (Edler & Mehl 1972, Lundqvist et al. 1999)

Gamasellus montanus (Wilmann, 1936) - (Hågvar 1978, Hågvar & Kjøndal 1981b, Slomian et al. 2005)
Rhodacarellus epigynalis Sheals, 1956 - (Slomian et al. 2005)
Rhodacarellus kreuzi Karg, 1965 - (Slomian et al. 2005)

Halolaelapidae

Halolaelaps marinus (Brady, 1875) - (Oudemans 1927)
Saprosecans baloghi Karg, 1964 - (Gwiazdowicz & Gulvik 2005.)

Pachylaelapidae

Pachylaelaps (Pachylaelaps) furcifer Oudemans, 1903 - (Slomian et al. 2005)
Pachylaelaps (Pachylaelaps) karawaiewi Berlese, 1920 - (Slomian et al. 2005)
Pachylaelaps (Pachylaelaps) laeuchlii Schweizer, 1922 - (Slomian et al. 2005)
Pachylaelaps (Pachylaelaps) sculptus Berlese, 1920 - (Berlese 1920)
Pachylaelaps (Pachyseius) humeralis Berlese, 1910 - (Slomian et al. 2005)

Digamasellidae

Dendrolaelaps (Cornodendrolaelaps) cornutulus Hirschmann, 1960 - (Slomian et al. 2005)
Dendrolaelaps (Dendrolaelaps) nostricornutus Hirschmann et Wisniewski, 1982 - (Slomian et al. 2005)
Dendrolaelaps (Punctodendrolaelaps) punctatus Hirschmann, 1960 - (Slomian et al. 2005)

Ameroseiidae

Ameroseius furcatus Karg, 1971 - (Slomian et al. 2005)
Epicriopsis horridus (Kramer, 1876) - (Gwiazdowicz & Gulvik 2005)

Phytoseiidae

Amblyseius hederae Denmark et Muma, 1989 - (Denmark & Edland 2002)
Amblyseius januaricus Wainstein et Vartapetov, 1973 - (Denmark & Edland 2002)
Amblyseius latoventris Karg et Edland, 1987 - (Karg & Edland 1987, Denmark & Edland 2002)
Amblyseius masseei (Nesbit, 1951) – (Edland 1994)
Amblyseius obtusus (Koch, 1839) - (Hågvar 1978, Edland 1987, Karg & Edland 1987, Denmark & Edland 2002)
Amblyseius parakaguya Denmark et Edland, 2002 - (Denmark & Edland 2002)
Amblyseius silvaticus (Chant, 1959) - (Denmark & Edland 2002)
Amblyseius tubae Karg, 1970 - (Denmark & Edland 2002)
Anthoseius algonquinensis (Chant, Hansell et Yoshida, 1974) - (Evans & Edland 1998)
Anthoseius bakeri (Garman, 1948) - (Edland 1987, Karg & Edland 1987, Evans & Edland 1998)
Anthoseius caucasicus (Abbasova, 1970) - (Edland 1994, Evans & Edland 1998)
Anthoseius caudiglans (Schuster, 1959) - (Evans & Edland 1998)
Anthoseius foenilis (Oudemans, 1930) - (Evans & Edland 1998)
Anthoseius halinae Wainstein et Kolodochka, 1974 - (Evans & Edland 1998)
Anthoseius inopinatus Wainstein, 1975 - (Evans & Edland 1998)
Anthoseius parinopinatus Evans et Edland, 1998 - (Evans & Edland 1998)
Anthoseius picea Karg et Edland, 1987 - (Karg & Edland 1987)
Anthoseius rhenanus (Oudemans, 1915) - (Edland 1987, Karg & Edland 1987, Evans & Edland 1998)
Anthoseius richteri (Krag, 1970) - (Edland 1987, Karg & Edland 1987, Evans & Edland 1998)
Anthoseius suecicus (Sellnick, 1958) - (Evans & Edland 1998)
Anthoseius toruli Karg et Edland, 1987 - (Karg & Edland 1987)
Euseius finlandicus (Oudemans, 1915) - (Edland 1987, 1994, Karg & Edland 1987, Denmark & Edland 2002)
Kampimodromus aberrans (Oudemans, 1930) - (Edland 1987, Karg & Edland 1987, Denmark & Edland 2002)
Kampimodromus langei Wainstein et Aruntunjan, 1973 - (Denmark & Edland 2002)

Neoseiulus umbraticus (Chant, 1956) - (Denmark & Edland 2002)
Neoseiulus astutus (Beglyarov, 1960) - (Denmark & Edland 2002)
Neoseiulus arenarius Denmark et Edland, 2002 - (Denmark & Edland 2002)
Neoseiulus alpinus (Schweizer, 1922) - (Denmark & Edland 2002)
Neoseiulus barkeri Hughens, 1948 - (Denmark & Edland 2002)
Neoseiulus scoticus (Collyer, 1957) - (Denmark & Edland 2002)
Neoseiulus bicaudus (Wainstein, 1962) - (Denmark & Edland 2002)
Neoseiulus cucumeris (Oudemans, 1930) - (Denmark & Edland 2002)
Neoseiulus communis Denmark et Edland, 2002 - (Denmark & Edland 2002)
Neoseiulus zwoelferi (Dosse, 1957) - (Denmark & Edland 2002)
Neoseiulus septentrionalis (Karg, 1977) - (Denmark & Edland 2002)
Neoseiulus ribes Denmark et Edland, 2002 - (Denmark & Edland 2002)
Neoseiulus graminis (Chant, 1956) - (Denmark & Edland 2 002)
Neoseiulus haimatus (Ehara, 1967) - (Denmark & Edland 2002)
Neoseiulus latoventris (Karg et Edland, 1987) - (Denmark & Edland 2002)
Paraseiulus soleiger (Ribaga, 1902) - (Edland 1987, 1994, Karg & Edland 1987)
Paraseiulus triporus (Chant et Shaul, 1982) - (Edland 1987, 1994)
Paraseiulus talbii (Athias-Henriot, 1960) - (Edland 1987)
Phytoseius macropilis (Banks, 1909) - (Edland 1987, 1994, Karg & Edland 1987)
Phytoseius ribagai Athias-Henriot, 1960 - (Edland 1987, Karg & Edland 1987)
Phytoseiulus persimilis Athias-Henriot, 1957 - (Stenseth 1968)
Proprioseiopsis okanagensis (Chant, 1957) - (Edland 1987, Karg & Edland 1987, Denmark & Edland 2002)
Proprioseiopsis jugortus (Athias-Henriot 1966) - (Hågvar1978, Denmark & Edland 2002)
Proprioseiopsis sharovi (Wainstein, 1975) - (Denmark & Edland 2002)
Seiulus aceri (Collyer, 1957) - (Edland 1987, Karg & Edland 1987)
Seiulus sexapori Karg et Edland, 1987 - (Krag & Edland 1987)
Seiulus tiliarum (Oudemans, 1930) - (Edland 1987, Karg & Edland 1987)
Typhlodromips masseei Nesbitt, 1951 - (Karg & Edland 1987, Denmark & Edland 2002)
Typhlodromus baccettii Lombardini, 1960 - (Edland & Evans 1998)
Typhlodromus bichaetae Karg, 1989 - (Edland & Evans 1998)
Typhlodromus corticis Herbert, 1958 - (Krag & Edland 1987)
Typhlodromus ernesti Ragusa et Swirski, 1978 - (Edland & Evans 1998)
Typhlodromus eucervix Karg et Edland, 1987 - (Krag & Edland 1987, Edland & Evans 1998)
Typhlodromus laurae Arutunjan, 1974 - (Edland & Evans 1998)
Typhlodromus norvegicus Edland et Evans, 1998 - (Edland & Evans 1998)
Typhlodromus phialatus Athias-Henriot, 1960 - (Edland & Evans 1998)
Typhlodromus pyri Scheuten, 1857 - (Edland 1987, 1994, Krag & Edland 1987, Edland & Evans 1998)
Typhlodromus tubifer Wainstein, 1961 - (Krag & Edland 1987)

UROPODINA

Trachytidae

Trachytes aegrota (C.L. Koch, 1841) - (Gwiazdowicz & Gulvik 2005)
Trachytes montana Willmann, 1953 - (Gwiazdowicz & Gulvik 2005)
Trachytes pauperior (Berlese, 1914) - (Gwiazdowicz & Gulvik 2005)

Polyaspidae

Polyaspinus cylindricus Berlese, 1916 - (Gwiazdowicz & Gulvik 2005)
Uroseius (Uroseius) acuminatus (C.L. Koch, 1847) - (Wisniewski 1993)

Trematuridae

Trichouropoda ovalis (C.L. Koch, 1839) - (Berlese 1904, Wisniewski 1993)

Trichouropoda punctata Hirschmann et Zirngiebl-Nicol, 1961 - (Wisniewski 1993)

Urodinychidae

Dinychus arcuatus (Trägårdh, 1922) - (Gwiazdowicz & Gulvik 2005, Trägårdh 1943)

Dinychus perforatus Kramer, 1886 - (Gwiazdowicz & Gulvik 2005)

Uroobovella marginata (C.L. Koch, 1839) - (Schøyen 1919-1930)

Uroobovella notabilis Berlese, 1903 - (Wisniewski 1993)

Trachyuropodidae

Trachyuropoda coccinea (Michael, 1891) - (Wisniewski 1993)

Uropodidae

Uropoda (Uropoda) minima (Kramer, 1882) - (Gwiazdowicz & Gulvik 2005)

Uropoda (Uropoda) misella (Berlese, 1916) - (Gwiazdowicz & Gulvik 2005)

Uropoda (Phaulodinychus) replectus Berlese, 1904 - (Berlese 1904)

Uropoda (Phaulodinychus) simplex Berlese, 1903 - (Berlese 1904)

Table 1. Number of recorded species, genera and families of mesostigmatid mites in Norway.

Suborder	Family	Genus	Species
Microgyniina	1	2	2
Sejina	1	1	1
Gamasina	18	63	201
Uropodina	6	8	16
Total	**26**	**74**	**220**

DISCUSSION

So far, 220 mesostigmatid mite species have definitely been recorded in Norway, assigned to 4 suborders, 26 families and 74 genera (Table 1). It should be noted that mites of the family Phytoseiidae have been very well described, and that this is the best-known mesostigmatid mite family in Norway. The reason for this is that several species can be used in biological control (Edland 1994, De Boer & Dicke 2005). Parasitic mites living on animals are also fairly well studied in Norway. However, there is a notable lack of information about mites living in specific microhabitats such as soil, litter, rotten wood, animal droppings, anthills and bird's nests. Moreover, there have been no studies of the phoretic mitefauna on insects in Norway.The Norwegian mitefauna is not expected to be as rich as the fauna at central and southern Europe. This is partly because Norway's northern latitude and harsh climate with a short growing season, and partly because Norwegian ecosystems have developed after deglaciation about 8000 yr BP and thus are relatively young. Furthermore, Norway is mostly a mountainous country, and for this reason there are fewer species than in central and southern Europe. However, this does not alter the fact that we still have insufficient knowledge of the Norwegian fauna of Acari. The

research efforts in this field should therefore be maintained to obtain better information on the zoogeography, biology and ecology of particular species. Norway's climate, vegetation and soils are very varied, and detailed studies of mite communities in different habitats are therefore needed. Mesostigmata might be used as bioindicators, for example in environmental monitoring (Ruf & Beck 2005).

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Faunistics of Norwegian Phasiinae (Diptera, Tachinidae)

Knut Rognes

Rognes, K. 2006. Faunistics of Norwegian Phasiinae (Diptera, Tachinidae). Norw. J. Entomol. 52, 127-136.

Records of 14 species of Phasiinae (Diptera, Tachinidae) from Norway are given and their distribution mapped in terms of European Invertebrate Survey (EIS) 50 km squares. *Phasia aurulans* Meigen, 1824 is reported from Norway for the first time.

Key words: Diptera, Tachinidae, Phasiinae, faunistics, Norway, Heteroptera

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INTRODUCTION

This paper is the first in a planned series updating the knowledge of Norwegian parasite flies, (Diptera, Tachinidae). I have dealt with the Tachinidae in earlier papers (Rognes 1981, 1982, 1983a, 1983b, 1986, 1995; Rognes & Hansen 1996) but those were mainly fragmentary faunistic notes. My check-list from 1986, although based on material in all Norwegian entomological museums at the time, does not give any distributional data. The purpose of the planned series is to give complete faunistic data for all Norwegian tachinid flies, including distributional maps.

The present paper deals with the subfamily Phasiinae, which are parasitoids of Heteroptera. It is based on material in Zoological Museum, University of Bergen (ZMB), Zoological Museum, University of Oslo (ZMO), Tromsø University Museum (TM), on material in my own collection accumulated through gifts and my own collecting efforts over the last twenty years (KR), and the small collection of Thor Jan Olsen (Sarpsborg) (TJO).

The classification and nomenclature follows Herting & Dely-Draskovits (1993) and Tschorsnig & Herting (1994). No breeding data are available from Norway. The brief notes on biology are taken from Belshaw (1993) and Tschorsnig & Herting (1994). 14 phasiine species are now known from Norway, whereas 20 additional species are known from Sweden. Undoubtedly further species will turn up in Norway (Tschosnig 2005). Taxa new to this country are marked with an asterisk (*).

TACHINIDAE

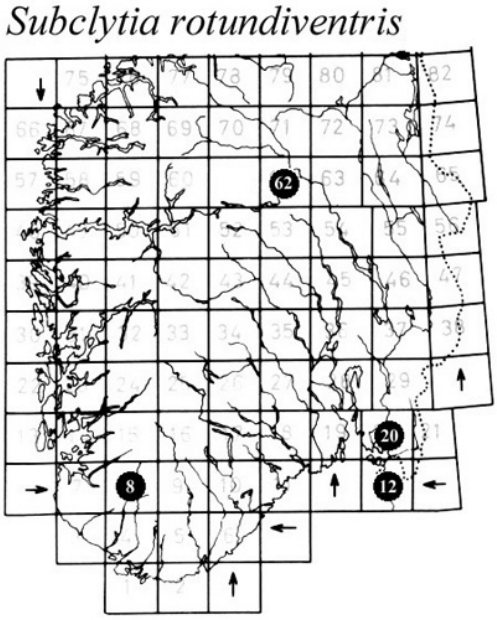
Subfamily Phasiinae

Tribe Phasiini

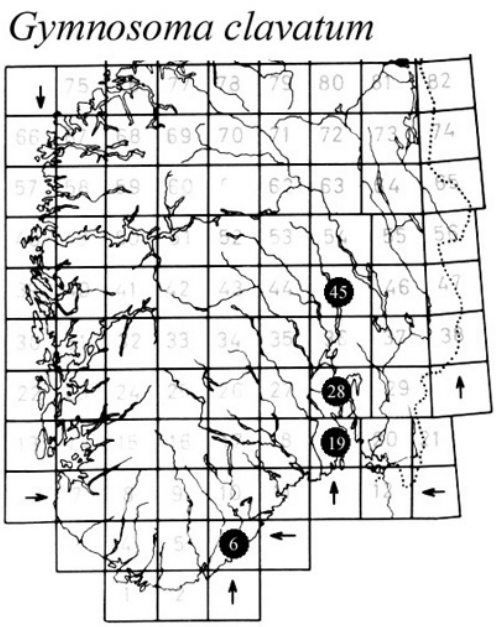
Subclytia rotundiventris (Fallén, 1820) (Map 1)

Ø Halden: Berby (EIS 12) 1♂ 30 July 1984 (K. Rognes) (KR); Brekke sluser (EIS 20) 1♂ 2 August 1984 (K. & Ø. Rognes) (KR); Sarpsborg: Råkil i Tune (EIS 20) 1♂22 July 1994 (T. J. Olsen) (ZMO); **OS** Sør-Fron: Breivegen bru (EIS 62) 1♀4-18 August 1979 (S. Andersen) (KR); **RI** Forsand: Daladalen (EIS 8) 1♀ 7 August 1983 (T. Jonassen) (KR).

Bred from various Acanthosomatidae and Pentatomidae (Heteroptera).



Map 1. Distribution of records of *Subclytia rotundiventris* (Fallén, 1820) in Norway.



Map 2. Distribution of records of *Gymnosoma clavatum* (Rohdendorf, 1947) in Norway.

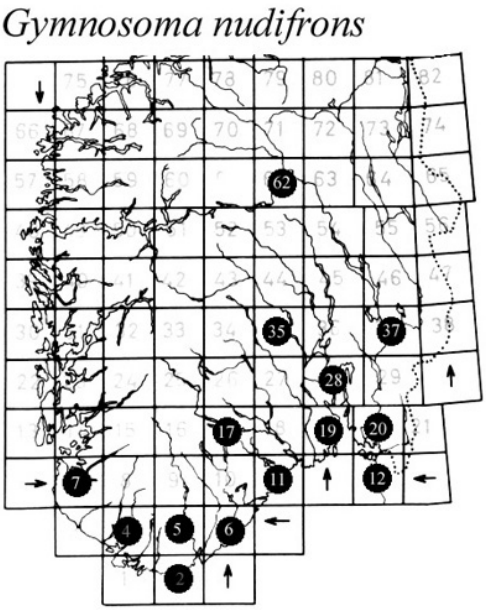
Gymnosoma clavatum (Rohdendorf, 1947) (Map 2)

AK Oslo: Oslo (EIS 28) 1♂ ?date (Siebke) (ZMO) [B. Herting det.]; **OS** Søndre Land: Land (EIS 45?) 1♂ ?date (Siebke) (ZMO) [B. Herting det.]; **VE** ?loc (EIS 19) 1♂ 2♀♀ ? date (O. Bidenkap) (ZMB); Horten: Borre (EIS 19) 1♂ 13 August ?year (O. Bidenkap) (ZMB); Sem: Slagen (EIS 19) 1♀ 6 August ?year (O. Bidenkap) (ZMB); **AAY** Hisøy: Ramsø (EIS 6) 3♂♂19 July 1935 (T. Soot-Ryen) (TM).

Bred from various Pentatomidae (Heteroptera).

Gymnosoma nudifrons Herting, 1966 (Map 3)

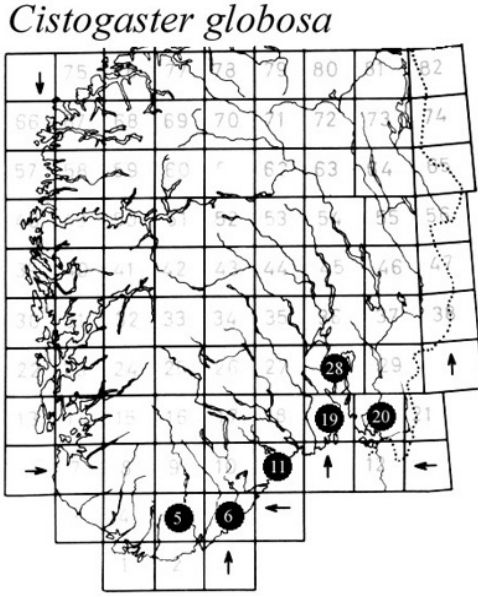
Ø Sarpsborg: Skjebergdalen (EIS 20) 1♂ 1 June 1997 (T. J. Olsen) (TJO); Fredrikstad: Gansrød / Øra (EIS 20) 1♀ 11 August 1995 (T. J. Olsen) (TJO); Hvaler: Kirkøy, Ørekroken (EIS 12) 1♀ 12 July 1992 (T. J. Olsen) (TJO); Vesterøy (Vauer) (EIS 20) 1♀ 29 July 1984 (K. Rognes) (KR); Vesterøy (Vauer-Guttormsvauen) (EIS 20) 2♂♂ 1♀ 29 July 1984, 1♀ 3 August 1984 (K. Rognes) (KR); Vesterøy (Vauer-Kuvauen) (EIS 20) 1♂ 3 August 1984 (K. Rognes) (KR); Onsøy:



Map 3. Distribution of records of G*ymnosoma nudifrons* Herting, 1966 in Norway.

Mærrapanna (EIS 20) 1♀ 9 June 1996 (T. J. Olsen) (TJO); **AK** Oslo: Oslo (EIS 28) 1♀ ?date (L. M. Esmark) (ZMO); Oslo, Sognsvatn (EIS 28) 1♀ 31 July 1935 (T. Soot-Ryen) (TM); Frogn: Sønderstøa-Degerud (EIS 28) 4♂♂ 2♀♀ 10 June 1935, 1♂ 8 August 1935, 1♂ 9 August 1935 (T. Soot-Ryen) (TM); Bærum: Ostøya (EIS 28) 1♀ 2 June 1984 (L. Greve, "på strandvortemelk") (ZMB); 1♀ 2 June 1984, 2♂♂ 1♀ 10 June 1984 (F. Midtgaard) (KR); 1♂ 30 May 1984, 1♂ 2♀♀ 31 May 1984, 1♂ 2 June 1984, 1♀ 16 June 1984 (T. R. Nielsen) (KR); Ullensaker: Sessvoll (EIS 37) 1♀ 10 July 1996, 1♂ 19 July 1996, 1♀ 21 August 1996 (K.Sand, sweep net, sand) (KR); **ON** Nord-Fron: Kvam (EIS 62) 3♂♂ 4♀♀ 2 August 1850 (Siebke) (ZMO); **OS** Sør-Fron: Fron [ved Moen] (EIS 62) 1♂ ?date (Siebke) (ZMO); **BØ** Modum: ?loc (EIS 28) 2♂♂ ?date (W. M. Schøyen) (ZMO) 1♂ ?date (W. M. Schøyen) (TM); Hurum: Østnestangen (EIS 19) 1♂ 1♀ 6 July-20 August 1995 (L. O. Hansen, M-trap) (KR/ZMO); **BV** Rollag: Bråtåsen (EIS 35) 1♂ 1♀ July 1994, 1♀ August 1994 (L. O. Hansen & B. Sagvolden, M-trap) (KR/ZMO); **VE** Horten: Veggefjellet (EIS 19) 1♂ July 1997 (L. O. Hansen, M-trap) (ZMB); Adalstjern (EIS 19) 1♀ July 1997 (L. O. Hansen, M-trap) (ZMB); Larvik: Larvik (EIS 19) 1♂ ?date (Siebke) (ZMO); Tjøme: Kjære (EIS 19) 1♀ 29 June 1977 (A. Fjellberg) (ZMB); Brunlanes: Pauler (EIS 19) 1♀ 22 July 1985 (B. Borgersen) (KR/ZMO); **TEI** Seljord: Seljord (EIS 17) 1♂ 2♀♀ 26 July 1976 (T. R. Nielsen) (KR); **AAY** Risør: Risør (EIS 11) 1♀ 27 June 1975 (T. R. Nielsen) (KR); Tromøy: Tromøya (EIS 6) 1♂15 July 1960 (A. Bakke) (KR); **AAI** Evje og Hornnes: Bjorå (EIS 5) 3♂♂ 19 June 1977 (S. Svendsen) (KR); **VAY** Kristiansand: Stangenes (EIS 2) 1♀ 13 June 1976, 1♂ 27 May 1984 (S. Svendsen) (KR); Mandal: Skogsfjord (EIS 2) 1♀ 6 August 1976 (T. R. Nielsen) (KR); Mandal (EIS 2) 1♀ 14 July 1935 (T. Soot-Ryen) (TM); Flekkefjord: Hidra, Dragøy (EIS 4) 1♂ 6 May-20 June 1982 (T. R. Nielsen, M-trap) (KR); **VAI** Kvinesdal: Gjemlestad (EIS 4) 1♂ ?date (J. Knaben) (ZMO); **RI** Forsand: Songesand (EIS 7) 1♂ 27 May 1984 (T. Jonassen) (KR).
Bred from various Pentatomidae (Heteroptera).

Cistogaster globosa (Fabricius, 1775) (Map 4)
Ø Hvaler: Vesterøy (Vauer-Guttormsvauen) (EIS 20) 1♀ 31 July 1984 (K. Rognes) (KR); **AK** Oslo: Hovedøya (EIS 28) 1♂ 12 July 1985 (A. Fjeldså) (ZMB); Bærum: Ostøya (EIS 28) 1♀ 31 May 1984, 1♀ 2 June 1984 (F. Midtgaard) (KR); **BØ** Drammen: Drammen (EIS 28) 1♂ 1♀ 16 July 1996 (B. Sagvolden) (KR/ZMO); Underlia 1♀ July 1994 (L. O. Hansen, M-trap) (KR/ZMO); **VE** Horten: Adalstjern (EIS 19) 1♂ 1♀ July 1997 (L. O. Hansen, M-trap) (ZMB); Løvøya (EIS 19) 1♂August 1997 (L. O. Hansen) (ZMB); Tjøme: Kjære (EIS 19) 1♂ 26 June 1977 (A. Fjellberg) (ZMB); **TEY** Porsgrunn: Helleåsen (EIS 11) 3♀♀13 July-27 August 1995 (L. O. Hansen & O. Hanssen, M-trap) (KR/ZMO); Bamble: Langesundtangen (EIS 11) 1♂ 2♀♀ 13 July-27 August 1995 (L. O. Hansen & O. Hanssen, M-trap) (KR/ZMO); Langøya (EIS 11) 1♀ 6-31 July 1995 (L. O. Hansen & R. Mehl, M-trap) (KR/ZMO); Kragerø: Portør (EIS 11) 1♂ 2 August 1996 (L. Greve) (ZMB); **AAY** Tromøy: Løvstad (EIS 6) 1♂ 31 July 1974 (T. R. Nielsen) (KR); **VAY** Kristiansand: Hamresanden (EIS 5) 1♂ 15 July 2003 (K. Berggren) (KR).
Bred from various Pentatomidae (Heteroptera).



Map 4. Distribution of records of *Cistogaster globosa* (Fabricius, 1775) in Norway.

** Phasia aurulans* Meigen, 1824 (Map 5)
RI Suldal: Sand, Eide (EIS 14) 3♂♂ 26 September 2004 (R.Voith / K.Berggren) (KR); **SFI** Sogndal: Kaupanger, Rudsviki (EIS 51) 8♂♂ 1♀ 19 July-1 August 2003, 13♂♂ 9♀♀ 8 July-6 August 2004 (S. J. Hegland) (KR).

The material from Kaupanger was collected on various flowers during a pollination study which will be reported upon later by Stein Joar Hegland in his PhD thesis.

The male has a large pentagonal mark of golden pollinosity at the hind half of the dorsum of the thorax (Figure 1). In the female the mark is smaller and partly subdivided by a narrow longitudinal black stripe entering the spot from behind. Both sexes have the hind femora all black, whereas in the similar *Phasia hemiptera* (Fabricius) they are reddish yellow in about the basal half. The ovipositor (sternite 7) is shining black and curved strongly downwards. In *Phasia hemiptera* it is straight or bent slightly upwards.
Hosts unknown.

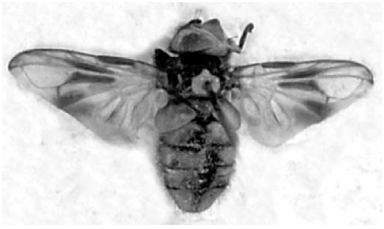
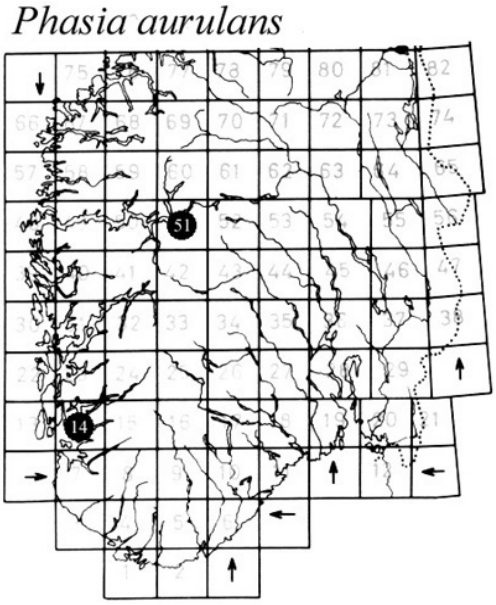
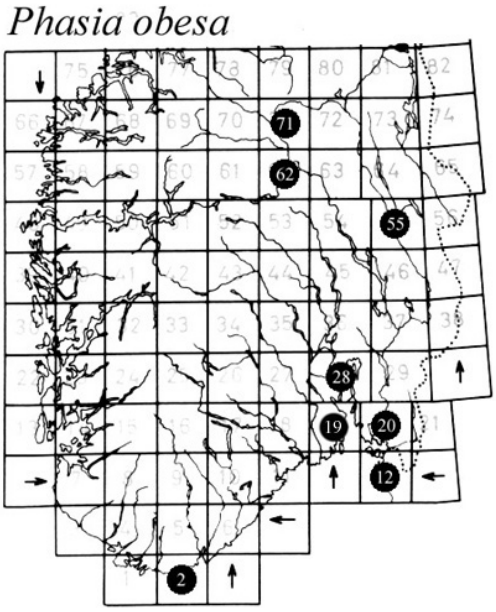


Figure 1. *Phasia aurulans* Meigen, ♂. Specimen from **RI** Suldal (R. Voith leg.). Note the wing pattern and the conspicuous golden spot on the dorsum of the thorax (around base of pin). (Photograph by K. Berggren).



Map 5. Distribution of records of *Phasia aurulans* Meigen, 1824 in Norway.



Map 6. Distribution of records of *Phasia obesa* (Fabricius, 1798) in Norway.

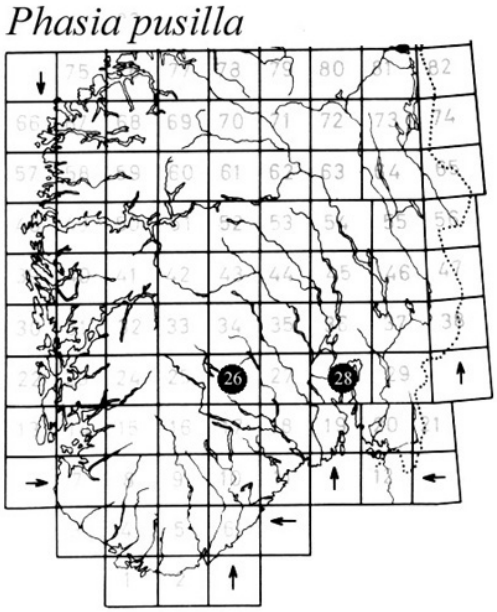
Phasia obesa (Fabricus, 1798) (Map 6)
Ø Halden: Berby (EIS 12) 1♀ 30 July 1984 (K. Rognes) (KR); Fredrikstad: Gansrød-Øra (EIS 20) 1♀ 19 September 1996 (T. J. Olsen) (TJO); Moss: Kambo, Moss sentralsykehus (EIS 19) 1♂ 15 September 2001 (O. Sørlibråten) (ZMO); Rakkestad: ?loc (EIS 20) 1♂ 27 October 1990 (T. J. Olsen) (KR/TJO); **AK** Oslo: Tveita (EIS 28) 1♂ 20 July 1846 (Siebke) (ZMO); Tøyen (EIS 28) 1♂ ?date (Siebke) (ZMO); Bærum: Østerås (EIS 28) 1♂ 1♀ 15 July 1981 (K. Rognes) (KR); **HES** Elverum: Elverum (EIS 55) 1♀ July 1870 (Siebke) (ZMO); Grundset (EIS 55) 1♀ ?date (Siebke) (ZMO) 1♀ ?date (Siebke) (TM); **ON** Dovre: Toftemo (EIS 71) 1♂ 5 August 1873 (Siebke, dissected by KR) (ZMO); **OS** Sør-Fron: Fron [ved Moen] (EIS 62) 1♀ ?date (Siebke) (ZMO); **VAY** Mandal: Mandal (EIS 2) 1♀ 14 July 1935 (T. Soot-Ryen) (TM).

Bred from various Pentatomidae, Cydnidae, Coreidae, Lygaeidae and Miridae (Heteroptera).
The specimen from Rakkestad has yellow legs, and Hans-Peter Tschorsnig, who has examined the specimen, considers this as an aberration not affecting its identity.

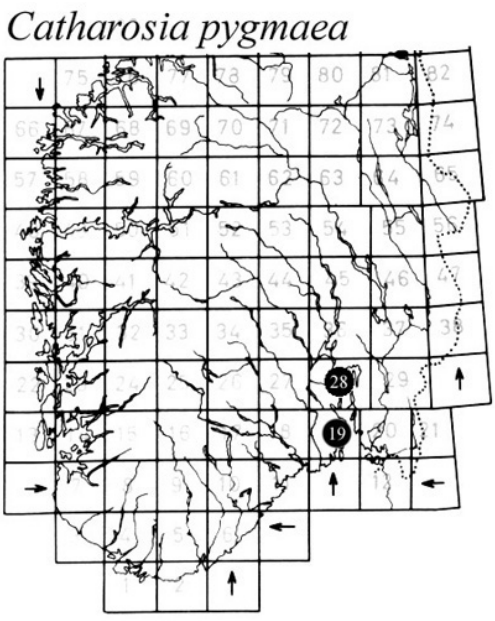
Phasia pusilla (Meigen, 1824) (Map 7)
AK Oslo: Bygdøy, Hengsengen (EIS 28) 1♀ 1 June 1984 (L. Greve) (ZMB); Tøyen (EIS 28) 1♀ 19 August 1851 (Siebke) (ZMO); 1♂?date (Siebke) (TM); **BØ** Hurum: Filtvet (EIS 28) 1♂ 1 June 1983 (F. Midtgaard) (KR); **TEI** Hjartdal: Gvammen (EIS 26) 1♂ 12 July 1976 (T. R. Nielsen) (KR).

Bred from various Lygaeidae, Cydnidae and Anthocoridae (Heteroptera).

Tribe Catharosiini
Catharosia pygmaea (Fallén, 1815) (Map 8)
?loc., 1♀ ?date (Siebke) (ZMO); **BØ** Drammen: Underlia (EIS 28) 1♀ August 1992, 1♂ 1♀ August 1994, 1♀ July 1995 (L.O.Hansen, M-trap) (KR/ZMO); **VE** Tjøme: Gon (EIS 19) 1♀ 11 July 1993 (A. Fjellberg) (ZMB).
Bred from *Beosus maritimus* (Scop.) (Lygaeidae, Heteroptera.).



Map 7. Distribution of records of *Phasia pusilla* (Meigen, 1824) in Norway.



Map 8. Distribution of records of *Catharosia pygmaea* (Fallén, 1815) in Norway.

Tribe Leucostomatini

Cinochira atra (Zetterstedt, 1845) (Map 9)

RI Forsand: Songesand skole (EIS 7) 1♂ 5 August 1982, 1♂ 28 June 1984 (T. Jonassen) (KR).
Bred from various Lygaeidae (Heteroptera).

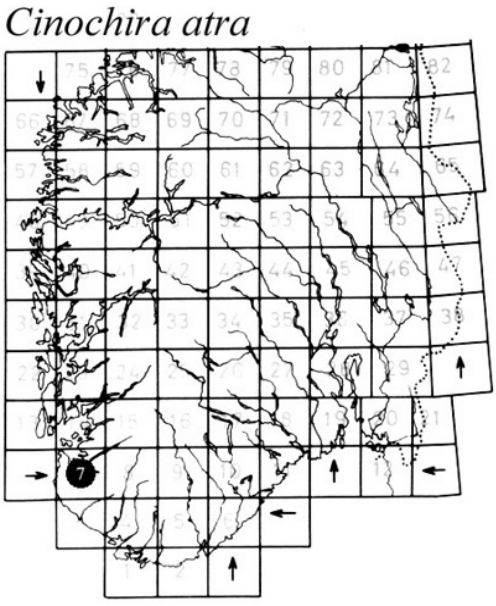
Tribe Cylindromyiini

Lophosia fasciata Meigen, 1824 (Map 10)

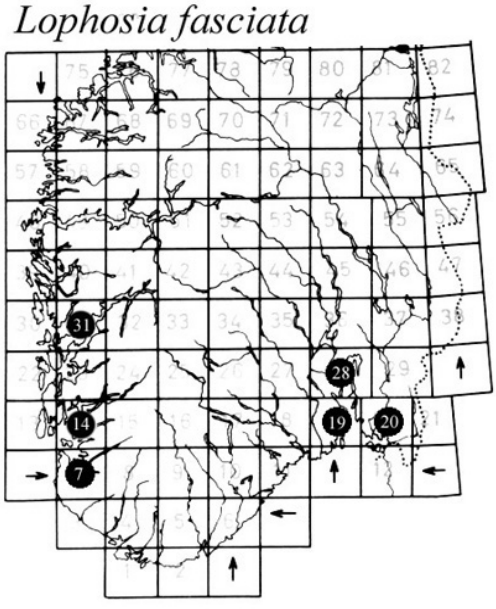
Ø Halden: Enningdalen-Kirkebøen (EIS 20) 1♂ 5 August 1997 (T. J. Olsen) (TJO); Sarpsborg: Skjeberg kirke (EIS 20) 1♂ 20 July 2003 (T. J. Olsen) (TJO); Råkil i Tune (EIS 20) 1♂ 24 July 1996 (T. J. Olsen, completely eaten away) (TJO); Rygge: Sildebauen (EIS 19) 1♂ 23 June 1984 (L. Aarvik) (ZMB); **AK** Bærum: Ostøya (EIS 28) 1♂ 24 July 1984 (F. Midtgaard) (ZMB); **BØ** Drammen: Underlia (EIS 28) 1♂ 1-30 June 1992 (L. O. Hansen, M-trap) (ZMB); Røyken: Kinnartangen (EIS 28) 1♂ 28 July 1986 (L. O. Hansen) (KR/ZMO); 1♂ 3 June 1993 (L. O. Hansen, M-trap) (ZMB); **VE** Horten: Adalstjern (EIS 19) 2♂♂ July 1997 (L. O. Hansen, M-trap) (ZMB); **RY** Finnøy: Kvitevik (EIS 14) 1♀ 9-27 July 1993 (J. Skartveit, M-trap) (ZMB); **RI** Forsand: Songesand skole (EIS 7) 1♂ 25 June 1984 (T. Jonassen) (KR); **HOY** Kvam: Gravdal, Svevatn (EIS 31) 1 ♂ 29 July-11 September 1997 (J. Skartveit, M-trap) (ZMB).
Bred from various Pentatomidae (Heteroptera).

Cylindromyia brassicaria (Fabricus, 1775) (Map 11)

Ø Halden: Endetjern (EIS 12) 1♀ 12 August 1996 (M. Pettersen) (TJO); Sarpsborg: Råkil i Tune (EIS 20) 1♀ 28 August 1991 (T. J. Olsen) (TJO); Rygge: Sildebauen (EIS 19) 1♂ 23 July 1995 (L. Aarvik) (KR); **AK** Oslo: Oslo (EIS 28) 1♀ ?date (Siebke) 1♂ 1♀ ?date (L. M. Esmark) (ZMO); 1♂ ?date (L. M. Esmark) (TM); Bekkelaget (EIS 28) 1♂ 30 June 1847, 2♂♂ 1♀ 17 July 1851 (Siebke) (ZMO); Frogn: Håøya (EIS 28) 1♀ 18 August 1984 (F. Midtgaard) (KR); Sønderstøa-Degerud (EIS 28) 1♂ 8 August 1935 (T. Soot-Ryen) (TM); Bærum: ?loc. (EIS 28) 1♂ ?date (W. M. Schøyen) (ZMO); Nordli 1,5 km NØ Østerås (EIS 28) 1♀ 30 July 1982 (K. Rognes) (KR); Steinshøgda (EIS 28) 1♂ 29 July 1977 (K. Rognes) (KR); Enebakk: Ekeberg (EIS 29) 1♀



Map 9. Distribution of records of *Cinochira atra* (Zetterstedt, 1845) in Norway.



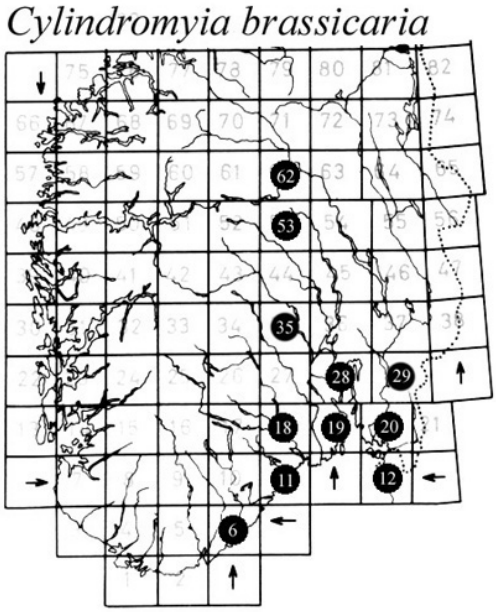
Map 10. Distribution of records of *Lophosia fasciata* Meigen, 1824 in Norway.

25 June-30 July 1991 (B. Økland, Collision-trap) (ZMB); Lørenskog: Losby (EIS 29) 1♀ 27 June-1 August 1991 (B. Økland, Collision-trap) (ZMB); **OS** Nord-Aurdal: Aurdal (EIS 53) 1♂ ?date (Siebke) (ZMO); **ON** Nord-Fron: Vinstra (EIS 62) 1♂ 10 June 1981 (S. Svendsen) (KR); **BØ** Drammen: Underlia (EIS 28) 1♀ June 1992 (L. O. Hansen) (ZMB); 1♂ 1♀ July 1995 (L. O. Hansen, M-trap) (KR/ZMO); Kongsberg: Hvittingfoss (EIS 19) 1♂ 6 August 1979 (K. Rognes) (KR); Komnes (EIS 19) 1♂ 6 August 1979 (K. Rognes) (KR); **BV** Rollag: Rollag (EIS 35) 1♂ 9 August 1994 (B. Sagvolden) (ZMB); **VE** ?loc (EIS 19) 2♂♂ 1♀ ?date (O. Bidenkap) (ZMB); Horten: ?loc (EIS 19) 1♀ 30 July 1890 (O. Bidenkap) (ZMB); Tjøme: Moutmarka (EIS 19) 1♀ 4 July 1977 (A. Fjellberg) (ZMB); Kjære (EIS 19) 1♂ 15 July 1978 (A. Fjellberg) (ZMB); Hedrum: Vestmarka (EIS 19) 1♂ 21 July 1985, 1♂ 8 August 1985 (B. Borgersen) (KR/ZMO); **TEY** Porsgrunn: Helleåsen (EIS 11) 3♂♂ 2♀♀ 13 July-27 August 1995 (L. O. Hansen & O. Hanssen, M-trap) (KR/ZMO); **TEI** Sauherad: Nordagutu (EIS 18) 1♀ 26 July 1979 (K. Rognes) (KR); **AAY** Tvedestrand: Dypvåg (EIS 6) 1♀ 24 July 1960 (A. Løken) (KR); Hisøy: Ramsø (EIS 6) 1♂ 19 July 1935 (T. Soot-Ryen) (TM).

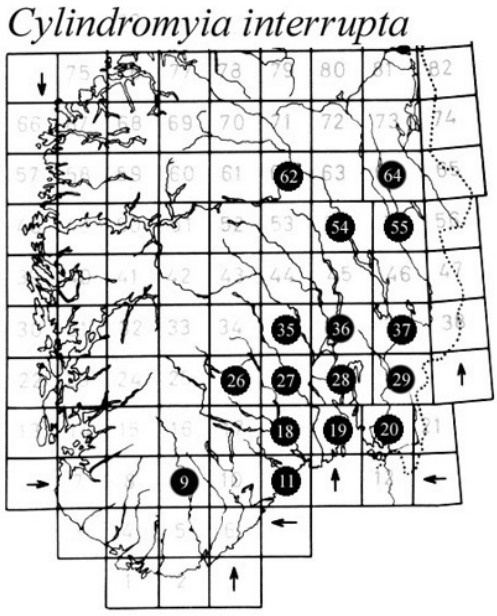
Bred from *Dolycoris* spp. (Pentatomidae, Heteroptera).

Cylindromyia interrupta (Meigen, 1824) (Map 12)

Ø Rakkestad: ?loc (EIS 20) 1♂ 21 July 1991 (T. J. Olsen) (TJO); **AK** Oslo: Bygdøy Hengsengen (EIS 28) 1♂ 1 June 1984 (L. Greve) (TJO); Vestby: Hølen (EIS 28) 1♂ 29 June 2002 (T. J. Olsen) (TJO); Frogn: Sønderstøa (EIS 28) 1♀ 8 August 1935 (T. Soot-Ryen) (TM); Bærum: Ostøya (EIS 28) 1♀ 31 May 1984 (F. Midtgaard) (KR), 1♀ 16 June 1985 (T. R. Nielsen) (KR); Øverland (EIS 28) 1♀ 23 June 1979 (K. Rognes) (KR); Sørum: Sørumsand (EIS 37) 1♂ 4 June 1984 (F. Midtgaard) (KR); Enebakk: Ekeberg (EIS 29) 1♂ 25 June-30 July 1991 (B. Økland, Collision-trap) (ZMB); Ullensaker: Rambydalen (EIS 37) 1♂ 11 August 1994) (K. Sand, meadow), 2♂♂ 8 July 1995 (K. Sand, sweep net, meadow) (KR); Rambybråten



Map 11. Distribution of records of *Cylindromyia brassicaria* (Fabricius, 1775) in Norway.



Map 12. Distribution of records of *Cylindromyia interrupta* (Meigen, 1824) in Norway.

(EIS 37) 1♂ 11 August 1996 (K. Sand, sweep net, forest) (KR); Sesvoll (EIS 37) 1♂ 26 June 1995, 1♂ 9 July 1995, 1♀ 26 June 1995, 3♀♀ 9 July (K.

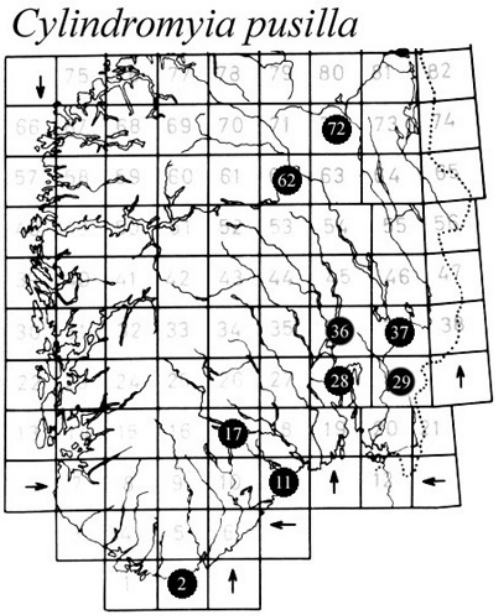
Sand, sweep net, sand) (KR); **HES** Elverum: Vestad (EIS 55?) 1♀ 12 August 1979 (L. Aarvik) (KR/ZMO); **HEN** Åmot: 2-3 km N Deset (EIS 64) 1♀ 25 June 2003 (L. Greve) (ZMB); Åsta bru (EIS 55) 3 ♂♂ 29 June 1998 (L. Greve) (ZMB); **OS** Lillehammer: Gausa elv v/Flåkåli bru 5km V Fåberg (EIS 54) 1♂ 14 July 1982 (K. Rognes) (KR); Sør-Fron: Harpefoss (EIS 62) 1♂ 14 July 1981 (T. R. Nielsen) (KR); **ON** Nord-Fron: Kvam (EIS 62) 1♂ 10 June 1981 (S. Svendsen) (KR); Vinstra (EIS 62) 1♂ 10 June 1979 (S. Svendsen), 1♂ 6 July 1982 (F. Midtgaard), 1♂ 16 June 1984 (S. Svendsen) (KR); 1♀ 25 May-30 June 1992 (K. Myhr & L. O. Hansen) (ZMB); 3 km Ø Vinstra (EIS 62) 1♂ 17 July 1982 (K. Rognes, dissected) (KR); **BØ** Drammen: Underlia (EIS 28) 1♂ June 1992 (L. O. Hansen); 1♀ June 1994 (L. O. Hansen, M-trap) (ZMB); 1♂ 1♀ July 1995 (L. O. Hansen, M-trap) (KR/ZMO); Ringerike: Sokna sentrum v/ jernbanen (EIS 36) 1♂ 1♀ 30 July 2005 (L. Greve) (ZMB); Hurum: Verket (EIS 28) 1♀ 6 June-8 July 1995 (L. O. Hansen & O. Hanssen, M-trap sandy slope) (KR/ZMO); Flesberg: Lampeland (EIS 27) 1♂ 13 June 1984 (F. Midtgaard) (KR); **BV** Rollag: ?loc. (EIS 35) 1♂ 1 August 1984 (”NIR”) (KR/ ZMO); **VE** ?loc (EIS 19) 1♂ 1♀ ?date (O. Bidenkap) (ZMB); Tjølling: Løveskogen (EIS 19) 1♀ 15 August 1984 (B. Borgersen) (KR/ZMO); Brunlanes: Mørje, Tvedalen (EIS 11) 1♀ 20 June 1985 (B. Borgersen) (KR/ZMO); Hedrum: Lauvås (EIS 19) 1♂ 1♀ 6 July 1984 (B. Borgersen ?) (KR/ ZMO); Roppestad (EIS 19) 1♀ 10 June 1984 (B. Borgersen) (KR/ZMO); **TEY** Porsgrunn: Helleåsen (EIS 11) 3♂♂ 1♀ 13 July-27 August 1995 (L. O. Hansen & O. Hanssen, M-trap) (KR/ZMO); **TEI** Sauherad: Nordagutu (EIS 18) 1♀ 19 June 1985 (T. R. Nielsen) (KR); Tinn: Håkånes (EIS 26) 1♂ 4 July 1983 (B. Sagvolden) (KR/ZMO); Hjartdal: Gvammen (EIS 26, 1♂ 12 July 1976 (T. R. Nielsen) (KR); **AAI** Bygland: Heddevika (EIS 9) 3♂♂ 11 June-4 July 1997 (K. Berggren, M-trap); 1♀ 11 June-1 July 1998 (K. Berggren) (ZMB).
Hosts unknown.

Cylindromyia pusilla (Meigen, 1824) (Map 13)

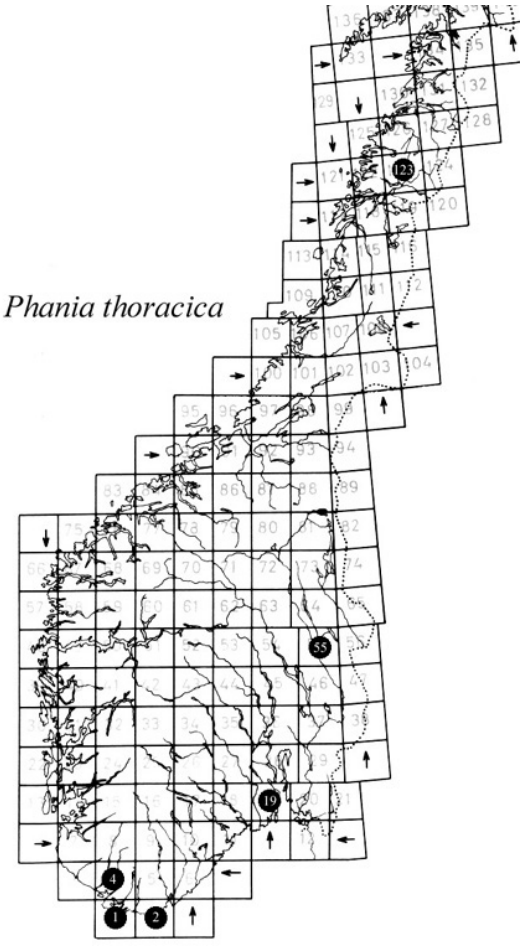
AK Bærum: Ostøya (EIS 28) 12♂♂ 12 August-1 September 1984 (F. Midtgaard, M-trap) (ZMB); Østerås (EIS 28) 1♂ 15 July 1981 (K. Rognes) (KR); Enebakk: Ekeberg (EIS 29) 3♀♀ 25 June-30 July 1991 (B. Økland, Collision-trap) (ZMB); Vangen (EIS 29) 5♂♂ 1♀ 24 June-29 July 1991; 1♂ 25 June-29 July 1991 (B. Økland, Collision-trap) (ZMB); Lørenskog: Losby (EIS 29) 1♂ 26 June-31 July 1991; 6♂♂ 9♀♀ 27 June-1 August 1991 (B. Økland, Collision-trap) (ZMB); Ullensaker: Sesvoll (EIS 37) 1♂ 9 July 1995 (K. Sand, sweep net sand) (KR); **HEN** Tynset: Tylldalen (EIS 72) 1♂ ?date (Siebke) (ZMO); **ON** Nord-Fron: 3 km Ø Vinstra (EIS 62) 3♂♂ 3♀♀ 17 July 1982 (K. Rognes) (KR); **BØ** Drammen: Underlia (EIS 28) 2♂♂ June 1992 (L. O. Hansen); 6♂♂ June 1994 (L. O. Hansen, M-trap) (ZMB); 1♂July 1994, 2♂♂ July 1995 (L. O. Hansen, M-trap) (KR/ZMO); Ringerike: Sokna sentrum v/ jernbanen (EIS 36) 2♂♂ 30 July 2005 (L. Greve) (ZMB); **TEY** Porsgrunn: Helleåsen (EIS 11) 6♂♂ 1♀ 13 July-27 August 1995 (L. O. Hansen & O. Hanssen, M-trap) (KR/ZMO); Bamble: Langøya (EIS 11) 1♂ 6-31 July 1995 (L. O. Hansen & R. Mehl, M-trap pine forest) (KR/ZMO); **TEI** Kviteseid: Kviteseid gamle kirke (EIS 17) 1♀ 25 June 1980 (K. Rognes) (KR); Skredtveit (EIS 17) 1♂ 5 July 1980 (K. Rognes) (KR); Vrådal v/ Nordbø (EIS 17) 1♂ 6 July 1980 (K. Rognes) (KR); **VAY** Kristiansand: Marvika (EIS 2) 1♀ 16 June 2003 (K. Berggren) (KR/ZMO); Mandal: Mandal (EIS 2) 1?sex 14 July 1935 (T. Soot-Ryen) (TM).
Bred from *Sciocoris cursitans* F. (Pentatomidae, Heteroptera).

Phania thoracica Meigen, 1824 (Map 14)

HEN Åmot: Åset (EIS 55) 1♂ 7 July 1848, 1♀ ?date (Siebke) (ZMO); **BØ** Hurum: Tofteholmen (EIS 19) 1♀ 7-31 July 1991 (L. O. Hansen, M-trap) (KR/ZMO); **VAY** Kristiansand: Hamresanden (EIS 2) 1♂ 25 July 1977 (T. R. Nielsen) (KR); Farsund: Våge (EIS 1) 1♀ 12 July 1998 (K. Rognes) (KR); Lindesnes: Jørgenstad (EIS 1) 1♂ 26 June 1995 (T. R. Nielsen) (KR); **RY** Lund: Moi (EIS 4) 1♂ 25 June 1982 (T. R. Nielsen) (KR); **NSI** Rana: Mo i Rana (EIS 123) 1♂ 2 July 1983 (T. R. Nielsen) (KR).
Hosts unknown.



Map 13. Distribution of records of *Cylindromyia pusilla* (Meigen, 1824) in Norway.



Map 14. Distribution of records of *Phania thoracica* Meigen, 1824 in Norway.

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New records of *Mochlonyx* spp. (Diptera, Chaoboridae) in Norway

Øyvind Håland

Håland, Ø. 2005. New records of *Mochlonyx* spp. (Diptera, Chaoboridae) in Norway. Norw. J. Entomol. 52, 137-138.

New records of distribution of the two Norwegian species of Mochlonyx spp. are given. Both *M. velutinus* (Ruthe, 1831) and *M. fuliginosus* (Felt, 1905) are distributed over most of the country. They have previously only been positively identified from northern Norway.

Key words: Chaoboridae, *Mochlonyx velutinus, Mochlonyx fuliginosus*.

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INTRODUCTION

The distribution of the two species treated here is very incompletely known in Norway. Although they are only recorded from the northernmost parts (Sæther 1996), they probably occur in most of the country. Only four species of Mochlonyx are known in the world (Borkent 1993), and two of them are from Norway. Both have a Holarctic distribution (Borkent 1981) and can be determined in all stages with the help of Klink (1972), who also described a third European species, which, however, is not present in my material.

I have used the opportunities to collect these species when I have been travelling throughout Norway, but since I have seldom been to the western parts, so far no records are available from that region. The samples were stored in 70% alcohol and are all identified by me. They are kept in the author's collection.

RECORDS

Mochlonyx fuliginosus (Felt, 1905) (syn. *M. martini* Edwards, 1930).
TRI Karlstad (EIS 154) 24 July1987, 1 juv.; 20 km N Bardufoss (EIS 154) 29 June1987, 3 juv. **NNØ** 5 km E Hamarøy (EIS 138) 30 June1987, 4 juv. **NSY** Lurøy, Tonnes (EIS 122), 5 Oct.1985, 1 juv. **NTI** 5 km S Grong (EIS 107) 3 July1987, 1 juv. **AK** Oslo, Lutvann (EIS 28) 11 Sept.1983, 5 juv. **AAI** Bykle, Bjørneråa (EIS 16) 5 Aug. 2001, 2 juv. **HES** Ringsaker, Mesnali, (EIS 54) 25 Aug. 2002, 1 M. **ON** Lesja, Bjorli (EIS 70) 5 July 1987, 1 M, 1 juv. **BV** Hol, Viken by Pålsbufjorden (EIS 43) 2 Aug.1988, 2 juv., 11 Sept.1994 4 MM, 4 FF, ex juv., 25 July 1998, 1 juv.; Nore og Uvdal, Jønndalen, Rustbøle (EIS 43), 15 July 2000, 1 juv.

Mochlonyx velutinus (Ruthe, 1831) (syn. *M. culiciformis* (De Geer, 1776)).
TRI Øvre Dividal, near Frihetsli (EIS 147) 24 July 1987, 1 juv. **NSI** Grane, 2 km N Majavatn (EIS 115) 27 July 1985, 1 juv.; Grane, 4 km E Trofors (EIS 115) 8 June1987, 1 juv. **BV** Hol, the same dam as *M.fuliginosus* at Viken (EIS 43) 8 July 1986, 3 MM, 6 FF, 10 July 1987, 3 juv., 29 July 1990, 1 M, 21 July 1996, 7 MM, 15 FF, 29 July 1997, 1 M, 6 FF, 14 Aug. 1999, 1 juv., 18 July 2002, 3 MM, 3 FF, 9 Aug. 2003, 4 juv, 1 pupa. **ON** Dovre, Fokstua (EIS 71) 15 July 1987, 1 juv.; Ringebu (EIS 63) 11 May 1996, 1 juv., 7 June 2001, 2 MM; Nord-Fron, Skåbu (EIS 62) 18 June

2001, 1 M, 9 July 2001, 7 MM, 9 FF; Nord-Fron, Fefor (EIS 62), 17 July 1997, 2 juv, 4 pupae. **HEN** 10 km S Folldal (EIS 72) 25 June 1997, 2 juv. **HES** Ringsaker, 10 km N Brumunddal (EIS 54) 31 May 2003, 1 juv. , 20 June 2003, 2 juv.

DISCUSSION

Both species, which are Holarctic in their general distribution, are according to Sæther (1996) and Borkent (1981) previously only recorded from northern Norway. Adults of *M. fuliginosus* were found from 5 July until 5 October, while the adults of *M. velutinus* were found between 5 June and 14 August in my collections. Although the material is scanty, it may indicate a difference in flying season of the two species, or the possibility of two generations per year since larvae were found as late as 5 October (Tonnes, *M. fuliginosus*) and 14 August (Viken, *M. velutinus*) or delayed hatching of some eggs. Studies in North America indicate a one-year life cycle for *M. velutinus* (James 1957) and a multivoltine life cycle for *M. fuliginosus* (Lake 1969). Both species are found in both permanent dams and in semi permanent ones that dries out in late summer. *Mochlonyx cinctipes,* an American species, spends the winter in the egg stage (O'Connor 1959). The eggs are deposited on the ground after the dam dries out and hatches the following spring when the dam fills with water. This is probably also the case with the two species in Norway.

It is interesting that both species were found in the same dam (at Viken), but never together in the same year. One possibility is that they had different flying time, so that by collecting only once a year, only one of the species will be found. Another explanation may be that they replace each other, possibly as a consequence of the dam drying out some years.

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Additions and corrections to the Norwegian list of hoverflies (Diptera, Syrphidae)

Tore R. Nielsen

Nielsen, T.R. 2005. Additions and corrections to the Norwegian list of hoverflies (Diptera, Syrphidae). Norw. J. Entomol. 52, 139-144.

The paper reports on new records of some hoverfly species in Norway. *Pipiza accola* Violovitsh, 1985 and *Temnostoma sericomyiaeforme* (Portschinsky, 1887) are new to the fauna. Our record of *Psilota anthracina* Meigen, 1822 has been revised to *P. atra* (Fallén, 1817) and the only record of *Temnostoma bombylans* (Fabricius, 1805) is revised to *T. angustistriatum* Krivosheina, 2002.

Key words: Syrphidae, new records, new species in Norway.

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INTRODUCTION

The Norwegian hoverfly fauna was recently revised and summarized in a check list by the present author (Nielsen 1999), followed by a supplementary list (Nielsen 2002). The present paper includes further records and two species new to the Norwegian fauna.

Records of each species include the EIS-grid number, based on 50 x 50 km squares. Regional abbreviations are identical to those given by Økland (1981).

Most of the material is kept in the following collections: INA = Department of Ecology and Natural Resource Management, Norwegian University of Life Sciences, Ås; TRM = Tromsø Museum; TRN = the author's collection; ZMB = Zoological Museum, Bergen; ZMO = Zoological Museum, Oslo; ZMTH = Zoological Museum, Trondheim.

THE RECORDS

Anasimyia contracta Claussen & Torp Pedersen, 1980
VAY Kristiansand: Hamresanden (EIS 5), 3 July 2004, 1♂, leg. K. Berggren, coll. TRN. Previously known from the Oslo Fjord area (EIS 19 and 28).

Anasimyia lunulata (Meigen, 1822)
AK Oslo: Snarøya (EIS 28), 26 May 2002, 1♀, leg. and coll. TRN. **VAY** Lindesnes: Spangereid, Njervetjørna (EIS 1), 13 May 2000, 4♂♂ on *Potentilla palustre,* leg. and coll. TRN.

Brachyopa bicolor (Fallén, 1817)
HOI Ullensvang: Tveisme (EIS 32), 4 June 1982 1♀, leg. K. Hesjedal, coll. ZMB. The first record of this species from western Norway. Hatched from bark of a pear (*Pyrus* sp.) tree.

Brachyopa obscura Thompson & Torp, 1982
HOI Ullensvang: Tveisme (EIS 32), 14 June 1982 1♂, hatched from bark of a pear (*Pyrus* sp.) tree, in coll. ZMB. **SFY** Luster: Fortundalen, Yttri, Djupedalen (EIS 60), 4♂♂, 5♀♀ in window trap near large *Populus* in old *Pinus* forest, 600 m a.s.l., 8-21 June 2003, leg. J. Anonby, coll. ZMB.

Brachypalpus laphriformis (Fallén, 1816)
AAI Birkenes: Birkeland (EIS 6), 27 June 2002, 1♂, leg. S. Svendsen, coll. TRN. **VAY** Farsund: Straumen (EIS 1), 15 May-13 June and 13 June-

8 July 1999, 2♀♀ in light trap, leg. K. Berggren, coll. TRN. **HOY** Bergen (Åsane), at the outlet of Haukåsvassdraget (EIS 39), 24 April-5 June 2003, 1♀ in Malaise trap, leg. L. Greve & G. Bakkerud, in coll. ZMB.

Brachypalpoides lentus (Meigen, 1822)
MRI Neset: Øvre Vike (EIS 78), 12 June 1999 1♂, leg. and coll. F. Ødegaard.

Chalcosyrphus valgus (Gmelin, 1790)
MRI Sunndal: Graven (EIS 78), 30 June 1999 1♂, leg. and coll. F. Ødegaard.

Cheilosia uviformis Becker, 1894
HOY Bergen: Paradis (EIS 39), 20 and 22 June 1968, 4♂♂, leg. TRN, in coll. ZMB.

Chrysosyrphus niger (Zetterstedt, 1843)
FN Nesseby: Rei'kejåkguolba (EIS 176), 7 July 1998 1♂, 1♀ leg. and coll. F. Ødegaard.

Chrysotoxum cautum (Harris, 1776).
AK Rælingen: Nordby (EIS 28), 5 June 2004, 1♂, leg. K. Berggren, coll. TRN.

Chrysotoxum vernale Loew, 1843
TEI Seljord: Heggeneset (EIS 17), 30 May 1998 1♀, leg. and coll. F. Ødegaard. **TEY** Porsgrunn: Hellåsen (EIS 11), 10 June 2002, 1♂, leg. L. Aarvik, in coll. ZMO.

Criorhina asilica (Fallén, 1816)
AAI Bygland: Heddevika (EIS 9), 29 July-27 Aug. 1997, 1♀ in Malaise trap, leg. K. Berggren, coll. TRN.

Epistrophe flava Doczkal & Schmid, 1994
AK Oslo: Snarøya (EIS 28), 26 May 2002, leg. and coll. TRN. **VAY** Kristiansand: Gimle Gård (EIS 2), 29 May 2004, 1♀, leg. K. Berggren, coll. TRN.

Eristalis tenax (Linnaeus, 1758)
NNV Vestvågøy: Leknes (EIS 136), 2 Oct. 2004, 1♀ in a cowshed, coll. TRM. One of our northernmost records (nearly 68°10´ N) of *E. tenax*.

Eumerus sabulonum (Fallén, 1817)
VAY Farsund: near Lista lighthouse (EIS 1), 26 June and 7 July 2005, 2♂♂ on *Galium album* flowers, leg. A.T. Andreassen, in coll. ATA and TRN. This is our second record of this species, the first one was at Kjevik near Kristiansand (Nielsen 2002).

Eupeodes abiskoensis (Dušek & Láska, 1973)
BV Hol: Kvasshøgda-omr., 1200 m (regio alpina) (EIS 42), 8 July 1966, 1♂, leg. A. Løken, in coll. ZMB. **HOI** Eidfjord: Stigstuv (EIS 33), 15 July 1972, 1♂ on *Salix,* leg. A. Fjellberg, in coll. ZMB. **FV** Alta: Stengelsen (EIS 173), 16 July 1986, 1♀, leg. H. Huru, coll. TRM. **FN** Lebesby: Ifjord (EIS 183), 15 July 1997, 1♀, leg. R. Bergersen, coll. TRM.

Eupeodes punctifer (Frey, 1934)
NNØ Hamarøy: Tømmeråsen (EIS 138), 24 July 1997, 1♀, leg. A.C. Nilssen. **TRY** Tromsø: Sjursnes (EIS 163), 14 July 1998, 1♀, leg. A. C. Nilssen. **FV** Alta: Stengelsen (EIS 173), 11 Aug. 1986, 1♀, leg. H. Huru. **FØ** Sør-Varanger: Grense Jakobselv (EIS 169), 5 July 1989, 1♂, leg. A. Fjellberg TRM.

In Finland, 25 km N Utsjoki 13 July 1985, 1♀, leg. A. Fjellberg, coll. TRM.

Helophilus groenlandicus (Fabricius, 1780)
RY Bjerkreim: Støle (EIS 8), June 1999, 2♂♂ in subalpine boggy area at about 800 m a.s.l., leg. J. I. Johnsen, coll. ZMB. A southernmost locality in Norway (58° 45'N) for this boreoalpine and arctic species.

Heringia (Neocnemodon) verrucula (Collin, 1931)
RY Klepp: near lake Øksnevadtjern, in pine and spruce plantation (EIS 7), 9-30 May 1994, 1♂ in Malaise trap, leg. A. Folvik, coll. TRN.

Lejota ruficornis (Zetterstedt, 1843)
HES Ringsaker: Bjørnåsen, 700 m a.s.l. (EIS 54), June 2003, 1♂ in Malaise trap, leg. J. Bakkerud, coll. ZMB. **VE** Brunlanes: Anvik (EIS 19), 2-

9 Aug. 1983, 2♂♂ in Malaise trap, leg. E.S. Paulsen, in coll. TRN. **HOI** Ulvik, Bruravik, Hallanger (EIS 41), 28 May – 16 June 1982, 1♂, leg. A.-J. Nilsen, in coll. TRN.

Leucozona inopinata Doczkal, 2000
AK Oslo: Skullerud (EIS 28), 14 July 2002, 1♀, leg. and coll. H. Hjelde; Maridalen, Damsjøen (EIS 36), 10 Aug. 1999, 1♀, leg. O. Lønnve, in coll. ZMO. Previously known from three EIS squares (19, 28 and 45) in eastern Norway (as *L. nigripila* Mik).

Melangyna barbifrons (Fallén, 1817)
HEN Rendalen: Ytre Rendalen, Solbakken (EIS 64), 11 June 1944, 1♀, leg. L.R. Natvig, in coll. ZMO. **RY** Klepp: near lake Øksnevadtjern, in pine and spruce plantation (EIS 7), 9-30 May 1994, 4♀♀ in Malaise trap, leg. A. Folvik, coll. TRN.

Paragus (Paragus) finitimus Goeldlin, 1971
ON Vang: Døtten, Vennis (EIS 52), 1 Aug. 2003, 1♂, leg. K. Berggren, coll. TRN. **BØ** Nedre Eiker, Mjøndalen, Hagatjern, Ryggsetra (EIS 28), June 1994, 1♀ in Malaise trap, leg. Y. Berg & L.O. Hansen, coll. TRN; Flesberg: Grønli (EIS 27), 2 July 2000, 1♂, leg. B.A. Sagvolden, coll. TRN. **VE** Brunlanes: Mølen (EIS 11), 20 June 1983, 1♂, leg. G.E. Ellefsen, coll. ZMB.

Paragus (Pandasyophthalmus) tibialis (Fallén, 1817)
VE Brunlanes: Anvik (EIS 19), May 1983, 1♂, leg. E.S. Paulsen, coll. TRN.

Parhelophilus consimilis (Malm, 1863)
AAY Vegårdshei v/Ålkarbekk (EIS 10), 29 June 2003, 1♂, 1♀ leg. L. Greve, coll. ZMB. **VAY** Kristiansand: Justnes (EIS 5), 9 July 2003, 1♂, 1♀, leg. K. Berggren, coll. TRN.

Pelecocera tricincta Meigen, 1822
VAY Kristiansand: Hamresanden (EIS 5), 11 July 1999, 1♀ and 3 July 2004, 1♂, 1♀, leg. K. Berggren, in coll. TRN.

Pipiza accola Violovitsh, 1985
Ø Våler (EIS 20), 3 May 1986, 1♀, leg. NIR (B.A. Sagvolden), det. H. Bartsch, coll. TRN. New to the Norwegian fauna.

Platycheirus holarcticus Vockeroth, 1990
TRY Tromsø: Kvaløya, Slettaelva (EIS 162), 1♂, leg. A.C. Nilssen, in coll. TRM.

Platycheirus jaerensis Nielsen, 1971
HES Kongsvinger: Abborhøgda (EIS 38), 26 May – 22 June 2003, 3♂♂, 2♀♀ in Malaise trap, leg. K. Sund. **Ø** Rygge: Sildebauen (EIS 19), 30 May 2004, 1♂, leg. L. Aarvik. All in coll. ZMO. **RY** Klepp: near lake Øksnevadtjern, in pine and spruce plantation (EIS 7), 9-30 May 1994, 3♂♂, 4♀♀ in Malaise trap, leg. A. Folvik, coll. TRN.

Platycheirus laskai Nielsen, 1999
HES Ringsaker: Furnes, hamnehagen (EIS 45), June 1997, 1♂ in Malaise trap, leg. J. Bakkerud. Same locality June-18 July 1998, 1♂ in Malaise trap, leg. G. Bakkerud, in coll. ZMB. Elverum: v/Øksetsaga 29 June 1998, 1♂, leg. L. Greve, in coll. ZMB.

Platycheirus perpallidus (Verrall, 1901)
HOY Lindås: Storavatn nature reserve (EIS 39), 24 June 2002, 2♀♀, leg. Greve & Jordan, in coll. ZMB.

Platycheirus ramsarensis Goeldlin, Maibach & Speight, 1990
TRY Tromsø: Breivikeidet (EIS 163), 15 June 1989, 1♂, leg. A. Fjellberg, in coll. TRM.

Portevinia maculata (Fallén, 1817)
SFY Hyllestad, Botnen (EIS 48), 21 June - 25 July 1999, 1♂ in Malaise trap, leg. L. Sognen & L. Greve, coll. ZMB.

Psilota atra (Fallén, 1817)
In my previous check-list (Nielsen 1999: 9 and 85)) *Psilota anthracina* Meigen, 1822 was reported with a single record from Norway (EIS 6). After a revision of the Dutch *Psilota* species (Smit & Zeggers 2005) John Smit (pers. comm.) kindly checked the specimen and found that it belonged to *P. atra*.

The species name *P. anthracina* should be deleted from the Norwegian fauna list.

Rhingia borealis Ringdahl, 1928
OS Sør-Aurdal: near Bagn (EIS 44), 11 July 1996, 1♀, leg. T. Munk, coll. TRN. **STI** Røros: Røros, Småseteran (EIS 81), 10 July 1964, 1♀, leg. and coll. F. Ødegaard.

Sericomyia nigra Portschinsky, 1873
TEI Hjartdal: Ambjørndalen (EIS 26), 25 July 1998, 1♀, leg. and coll. F. Ødegaard. **VAY** Kristiansand: Bråvann (EIS 2), 12 July 1999, 1♀, leg. K. Berggren, in coll. TRN.

Sphecomyia vespiforme (Gorski, 1852)
ON Vang: Døtte (EIS 52), 14-16 July 2004, 1♂, leg. and coll. S. Svendsen. **TEI** Fyresdal: Slystøyl, 650 m a.s.l. (EIS 16), 1♀, leg. K. Rognes, coll. TRN. **HOI** Ullensvang: Djønno (EIS 41), 5 June 1984, 1♀, leg. L. Greve, coll. ZMB.

Spilomyia diophthalma (Linnaeus, 1758)
OS V. Toten: Raufoss (EIS 45), 1984, 1♀, leg. and coll. F. Ødegaard.

Spilomyia manicata (Rondani, 1865)
SFI Sogndal: Rudsviki (EIS 51), 6 Aug. 2004, 1♀ on *Knautia* flower, leg. S.J. Hegland, in coll. INA. This is the first record of *S. manicata* from western Norway.

Syrphus sexmaculatus (Zetterstedt, 1838)
STI Røros: Sølendet (EIS 88), 24 July 1997, 1♀, leg. and coll. F. Ødegaard.

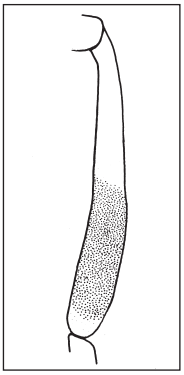

Figure 1. *Temnostoma angustistriatum* Krivosheina, hind tibia, dark brown medially.

Temnostoma angustistriatum Krivosheina, 2002
Examination of the only Norwegian record of *"T. bombylans"* shows that the specimen belongs to *T. angustistriatum*. It differs in both sexes from *T. bombylans* (Fabricius, 1805) in having the hind tibia darkened medially (Figure 1) and in other characters (Krivosheina & Ståhls, 2003: 98).
The name *T. bombylans* (Fabricius, 1805) should be deleted from the Norwegian fauna list.

T. sericomyiaeforme (Portschinsky, 1887)
VAY Kristiansand S: Vrånes (EIS 2), 1♂ in Malaise trap 22 June 1982, leg. T.R. Nielsen & E. Wrånes, in coll. TRN. The species is new to the Norwegian fauna.

The species has recently been elevated by Krivosheina (2004) from a previous synonym of *T. vespiforme* (Linnaeus, 1758) to a valid species. It is readily recognised by single (greyish) bands on tergites 2-4 (two bands on each tergite in *T. vespiforme*) (Figure 2A,B) and by the male terminalia.

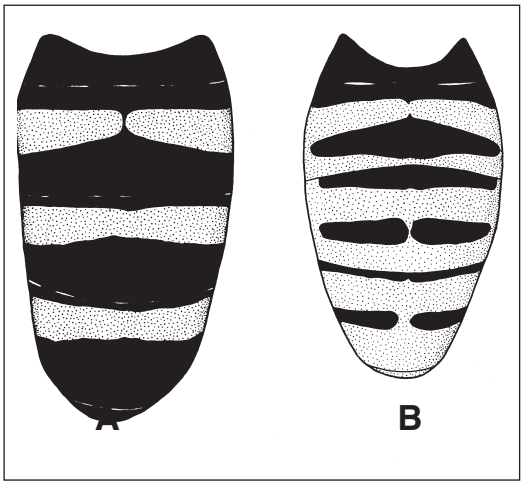

Figure 2. A: *Temnostoma sericomyiaeforme* Portsch. (from Kristiansand: Vrånes), male abdomen. **B:** *T. vespiforme* (L.), male abdomen.

Volucella inanis (Linnaeus, 1758)
SFI Sogndal: Rudsviki (EIS 51), 6 Aug. 2004 1♂ on Achillea, leg. S.J. Hegland, in coll. INA. The northernmost record of inanis in Norway. **OS** V. Toten: Raufoss, Vestrumenga (EIS 45), 2 July 1984 1♀, leg. and coll. F. Ødegaard. **AK** Fet: N. Øyeren (EIS 29), 9 Aug. 1996, 1♂, leg. and coll. F. Ødegaard. **Ø** Halden: Enningdalen (EIS 12), 27 July 1997, 1♂ and Fredrikstad: Gansrød/Øra (EIS 20), 25 July 1995, 1♂, both leg. and coll. T.J. Olsen.

Volucella pellucens (Linnaeus, 1758)
TRY Tromsø: Tromsøya (EIS 162), 10 Aug. 1992, 1♂, 1♀; same locality 1 Aug. 2003, 1♂, 2♀♀, leg. S. S.-Olsen, in coll. TRM. The first record of *pellucens* in North Norway (nearly 70° N).

Xanthandrus comtus (Harris, 1780)
VAY Kristiansand: Flekkerøy, Belteviga (EIS 2), 18 July 1999, 1♂; 17 Sept. – 28 Oct. 2000 3♂♂, 1♀; Kjevik (EIS 5), 4 June – 3 Sept. 2000 2♂♂, 1♀; Brennevann (EIS 2), 29 June 2003, 1♀; Justnes (EIS 2), 17 Aug. 2003 1♀; Farsund: Sellegrod (EIS 1), 28 July – 13 Oct. 1999, 5♂♂; all in light trap, leg. K. Berggren, coll. TRN; Farsund: Vetteland (EIS 1), 4 – 26 Sept. 2000, 1♂, 1♀, leg. R. Voith, coll. TRN. **SFI** Sogndal: Rudsviki (EIS 51), August 2003 1♂, leg. S.J. Hegland, coll. INA.

Xanthogramma pedissequum (Harris, 1776)
SFI Luster: Solvorn (EIS 51), 27 June – 30 July 1991, 1♀ in pitfall trap in hillside, SE facing termophilic vegetation, 100-200 m a.s.l., leg. J. Anonby, coll. TRN.

Xylota caeruleiventris Zetterstedt, 1838.
As stated by Bartsch & al. (2002) there is only a single specimen of this species known from Norway: **AK** Kristiania (= Oslo), no collecting date given, 1♂, leg. Siebke, in coll. ZMO.

Xylota jakutorum Bagatshanova, 1980
Frequent and widespread in Norway. It represents the major part of the previously reported material of *X. caeruleiventris* (Nielsen 1999: 97).

Xylota sylvarum (Linnaeus, 1758)
STI Midtre Gauldal: Støren (EIS 87) 22 Aug. 2005, 1♀, leg. and coll. F. Ødegaard. A northernmost record of this species in Norway, previously recorded only from the coastal areas of SE Norway. **VAY** Kristiansand: Justnes (EIS 5) 22 Sept. 2003, 1♂, leg. K. Berggren, coll. TRN.

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Tenthredo amoena Gravenhorst, 1807, *T. mandibularis* Fabricius, 1804 and *Rhogogaster californica* (Norton, 1872) (Hymenoptera, Symphyta, Tenthredinidae) in Norway

Erik Heibo & Ole J. Lönnve

Heibo, E. & Lönnve, O. J. 2005. *Tenthredo amoena* Gravenhorst, 1807, *Tenthredo mandibularis* Fabricius, 1804 and *Rhogogaster californica* (Norton, 1872) (Hymenoptera, Symphyta, Tenthredinidae) in Norway. Norw. J. Entomol. 52, 145-149.

The following two species of sawflies (Hymenoptera, Symphyta, Tenthredinidae) *Tenthredo amoena* Gravenhorst, 1807 and *T. mandibularis* Fabricius, 1793 are recorded for the first time from Norway. A rediscovery of *Rhogogaster californica* (Norton, 1872) in Norway is also presented.

Keywords: Tenthredinidae, *Tenthredo amoena, T. mandibularis, Rhogogaster californica, new records, distribution, Norway.*

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INTRODUCTION

The milestones on Symphyta research in Norway are the publications of Siebke (1880), Strand (1898) and Kiær (1998), with smaller additions by Strand (1900, 1901, 1903). Since then, few publications have emerged. Here we present some data from a large material on sawflies collected the last decade in Norway. All hitherto known records of *Tenthredo amoena* and *T. mandibularis* in Norway are presented, and both species are new to Norway. In addition we also give an interesting record of *Rhogogaster californica* from N. Norway.

MATERIAL AND METHODS

A greater part of the material was collected with sweep-nets, while some were caught in colour pan-traps and Malaise-traps. The sawflies are deposited at the Natural History Museum, University of Oslo, and in the senior author's private collection. Material from the other larger museums in Norway, have also been examined. The following abbreviations have been used: AF = Arild Fjeldså, AL = Astrid Løken, EH = Erik Heibo, HH = Harald Hjelde, JHSS = Johan Heinrich Spalchawer Siebke LA = Leif Aarvik, LOH = Lars Ove Hansen, MF = Morten Falck, NHMO = Natural History Museum, Oslo, OJL = Ole J. Lønnve, RM = Reidar Mehl, SO = Stefan Olberg, ZMUB = Zoological Museum, University of Bergen. Regional abbreviations are given in accordance to Økland (1981). Nomenclature is according to Benson (1952), Zhelochovtsev (1994) and Taeger & Blank (1998), while plant names are according to Lid (1987).

RESULTS AND DISCUSSION

Tenthredo amoena Gravenhorst, 1807

T. amoena has probably a limited distribution in

Norway. So far, no other records have appeared outside the Oslofjord-area (see Table 1). Viitasaari & Vikberg (1985) report *T. amoena* from Finland, while Nielsen & Henriksen (1915) claim it to be relatively common in Denmark. There are no records of *T. amoena* in Malaise (1931) from Sweden but the senior author took a single ♀ in S. Sweden (Blekinge, Sölvesborg 29 June 2003 leg. EH (coll. EH) and 3♂♂ and 3♀♀ 10 July 2005 leg. EH (coll. EH). *T. amoena* is also reported from Britain, where it is local in S. England (Benson 1952, Fitton et al. 1978). According to Zhelochovtsev (1994) it is distributed in most of Russia, but also W. Europe and the Balkans. The host plant is given to be *Hypericum perforatum* (Kontuiemi 1960) and *Hypericum maculatum* (Zhelochovtsev 1994). Both plants occur in Norway, and especially *H. perforatum* has a wide distribution (Lid 1987). The imagines of *T. amoena* often visit flowers, especially umbellifers. The flight period is relatively long, from June to primo August, though most of the records are from July (Table 1). Still *T. amoena* seem to be single-brooded in Norway.

Tenthredo mandibularis Fabricius, 1804

The Norwegian records of this species are given in Table 2, and may indicate a restricted distribution to the Oslofjord-area. Three ♂♂ of *T. mandibularis* were taken in vegetation on a riverbank of the small river Grobruelva. The edge of this riverbank turns yellow in spring with *Tussilago farfara,* and according to Taeger & Blank (1998) *T. farfara* and *Petasites* sp. are the host plants for the larvae. Only *T. farfara* is naturally and widely distributed in Norway. No records of *T. mandibularis* are made in Finland or Sweden (Viitasaari & Vikberg 1985, Malaise 1931), while it is reported as uncommen in Denmark (Falster, Vejle and Horsens) (Nielsen & Henriksen 1915). In Germany *T. mandibularis* is on the red list as category 3 "endangered" (Taeger & Blank 1998). The species is known from central parts of W. Europe, Britain, Latvia, C. Russia and Transcaucasia (Benson 1952, Fitton et al. 1978, Zhelochovtsev 1994). The Norwegian records seem to be the northernmost of the species. *T. mandibularis* is a relatively large insect (12-14 mm), with a long flight-period from primo June to primo August. Occasionally it can be found resting on leaves in the vegetation.

Rhogogaster californica (Norton, 1872)

[Syn.: *Rhogogaster polaris* Lindqvist, 1964 (Benson, 1965)]

A single ♀ was captured at Storsteinnes, Balsfjord municipality (TRI), (UTMWGS8434WDB 311 846; EIS 154) on 1 July 2005 (leg. EH). Lindqvist (1964) decribed *R. polaris* on the basis of two males from N. Norway (TRI, Målselv: Målselva (EIS 154) 26 June 1951, leg. E. Klefbeck (Coll.: Zoological institute, Lund, Sweden), but Benson (1965) synonymized it with *R. californica,* and stated it to be holoarctic and recorded from N. America and Norway. The species resembles the common *R. viridis* (L., 1758) in external characters but is distinguished in both sexes by differences in the genitalia (Ross 1943). This makes it quite difficult to separate the two species in the field, and, thus, *R. californica* may easily be overlooked. The species is present on the Norwegian Red List (1999), with status DM, "declining in need of monitoring".

Acknowledgments. We would like to thank Lars Ove Hansen, University of Oslo, for help with old literature and Andreas Taeger Curator at the Deutches Entomologisches Institut (DEI), Germany, for verification of the *Tenthredo* species.

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Table 1. The records of *Tenthredo amoena* in Norway. For abbreviations see introduction.

Strand-region	Municipality	Locality	EIS	n	Date	Leg.	Coll.
Ø	Moss	Jeløya	19	1♀	12 July 1994	OJL	NHMO
Ø	Rygge	Sildebauen	19	1♀	20 July 1998	LA	NHMO
Ø	Fredrikstad	Ramseklo, Onsøy	20	1♀	27 June 2004	OJL	NHMO
Ø	Fredrikstad	Slevik, Onsøy	20	1♂/1♀	28 June 2003	OJL	EH/NHMO
AK	Asker	Nesøya	28	1♂	25 July 1996	EH/OJL	NHMO
AK	Bærum	Bærumsmarka	28	1♂	3 July 1997	OJL	NHMO
AK	Bærum	Kjaglidalen	28	1♀	16 July 1996	OJL	EH
AK	Bærum	Kjaglidalen	28	1♂	4 July 1997	EH/OJL	EH
AK	Bærum	Kjaglidalen	28	2♂/3♀	12 July 1999	OJL	NHMO
AK	Bærum	Oksenøya	28	3♂/1♀	3-9 July 1997	EH	NHMO
AK	Bærum	Ostøya	28	1♂	1985	RM	NHMO
AK	Frogn	Bonn	28	13♂/2♀	14-15 July 2002	OJL	EH/NHMO
AK	Nesodden	Skoklefall	28	3♂	2-22 July 2003	OJL	EH
AK	Ski	Kontra	28	1♂	28 July 2004	HH	NHMO
AK	Oslo	Hovedøya	28	1♂	19 June 2002	EH	NHMO
AK	Oslo	Lindøya	28	2♂	14 June 2002	OJL	NHMO
AK	Oslo	Lindøya	28	1♀	4 August 2005	SO	NHMO
AK	Oslo	Manglerud, Østensjøvannet	28	1♀	July 1996	LOH/MF	NHMO
BØ	Lier	Lierskogen	28	3♂	26-28 July 1996	EH	NHMO
BØ	Lier	Lierskogen	28	1♂	7 Aug. 1996	EH	NHMO
BØ	Lier	Lierskogen	28	8♂/7♀	8-15 July 1997	EH	NHMO
BØ	Lier	Lierskogen	28	1♂	24 June 2002	EH	NHMO
BØ	Lier	Lierskogen	28	1♀	4 Aug. 2002	EH	EH
BØ	Lier	Padderudvann	28	4♂/2♀	10-27 July 1996	EH	NHMO
BØ	Lier	Tovrerud	28	2♀	20 July 1998	OJL	NHMO
BØ	Røyken	Kinnartangen	28	1♂	July 1998	LOH	NHMO
VE	Sande	Sande	19	9♂/2♀	3-9 July 1985	AF	ZMUB

Table 2. The records of *Tenthredo mandibularis* in Norway. For abbreviations see introduction.

Strand-region	Municipality	Locality	EIS	n	Date	Leg.	Coll.
Ø	Trøgstad	Rud	29	1♀	5 July 1958	AL	ZMUB
AK	Asker	Nesøya	28	1♂	25 July 1996	EH/OJL	NHMO
AK	Bærum	Kjaglidalen	28	3♂	4 July 1997	EH/OJL	EH/NHMO
AK	Bærum	Kjaglidalen	28	1♀	4-16 July 1997	OJL	NHMO
AK	Nesodden	Flaskebekk "Alpinbakken"	28	1♀	3 July 2004	OJL	NHMO
AK	Nesodden	Skoklefall	28	4♂/1♀	2-16 July 2003	OJL	NHMO/EH
AK	Nesodden	Skoklefall	28	2♀	6 June 2004	OJL	NHMO
AK	Nesodden	Skoklefall	28	1♀	9 July -2 Aug. 2005	OJL	NHMO
AK	Oslo	Ryenbjerg	28	1♂	June 1845	JHSS	NHMO
AK	Oslo	Stubberud, Sørkedalen	36	1♂	8 Aug.-9 Sept. 2002	EH/OJL	NHMO
AK	Lørenskog	Nes	29	1♀	21 June 2005	OJL	NHMO
BØ	Hurum	Verket	28	1♀	29 July 1997	LOH	NHMO
BØ	Lier	Lierskogen	28	3♂	6-16 July 1997	EH	EH
BØ	Lier	Lierskogen sentrum	28	3♂	25 June 1997	EH	NHMO

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Ichneumonidae (Hymenoptera) new for the fauna of Norway, Part 2

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This survey gives distributional records for 117 species of Ichneumonidae (Hymenoptera) which are not previously recorded from Norway. 15 of these have hitherto not been reported from Scandinavia.

Key words: Ichneumonidae, Norway.

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INTRODUCTION

The family Ichneumonidae is a very large group of parasitic Hymenoptera, and represents the most speciesrich group of insects in the Palaearctic. Due to their diversity and difficult determination, our knowledge of the taxonomy and distribution of many species remains fragmentary.

In the last years, we have reported almost 250 Ichneumonidae as new for the fauna of Norway (Riedel & Berg 1997, Riedel et al. 2000). Although more than 1250 species have been recorded from Norway so far, there is still a large portion of unrecorded species occuring in Norway. In this third paper we give distributional records for 117 species not previously recorded from Norway. Some corrections to our previous published records are given as well. 15 of the species have hitherto not been recorded in Scandinavia.

MATERIAL

The Ichneumonidae recorded in this paper were collected in all parts of the country by the use of sweep-nets, light-traps, yellow pan-traps, pitfall-traps and malaise-traps. To avoid severe misinterpretations, we excluded all species which have not been identified with certain accuracy.
The subfamilies, tribes, genera, and species are listed in alphabetic order using the recent «Interactive Catalogue of World Ichneumonidae» (Yu 1999). From this we have extracted the world distribution, and added the Nordic countries in more detail. The faunistic divisions of Norway (i.e. «the Strand-system») are defined in accordance with Økland (1981).

The reference material is kept in the personal collection of the first author (M. Riedel), in Natural History Museum of Oslo (ZMO), Zoological Museum of Bergen (ZMB), and Tromsø Museum (ZMT).

The geographical names of localities only are given in the list, but further data on each locality, including UTM-references and EIS-grid numbers, are presented in Table 1.

The following abbreviations have been used: SN = Sweepnet, MT = Malaisetrap, LT = Lighttrap, YPT = Yellow pantrap, PFT = Pitfall-trap.

LIST OF SPECIES

ADELOGNATHINAE

Adelognathus chrysopus (Gravenhorst, 1829)
[syn. *A. granulatus* Perkins, 1943]
Ø Råkil, 1 ♀ 28 August 1995.
Distribution: Palaearctic; Finland and Sweden.

Adelognathus dealbatus Kasparyan, 1990
TRI Fjellfröskv., 1 ♀ 23 July 1926 (TM).
Distribution: Russia and China; new to Scandinavia.

Adelognathus dorsalis (Gravenhorst, 1829)
OS Bagn, 2 ♀♀ 8-12 July 1996.
Distribution: Holarctic, Finland and Sweden.

Anomaloninae

Agrypon anomelas (Gravenhorst, 1829)
VE Tjøme, 1 ♀ 12 June 1964 (ZMB No. 2106).
Distribution: Oriental and Palaearctic; Sweden.

BANCHINAE

Glyptini

Apophua cicatricosa (Ratzeburg, 1848)
OS Bagn, 2 ♀♀ 8-12 July 1996.
Distribution: Palaearctic; Finland and Sweden.

Glypta (Conoblasta) areolaris Hellén, 1915
Ø Sildebauen, 1 ♀ 25 May 1995; Vister, 1 ♀ 10 July 1999.
Distribution: Palaearctic; Finland and Sweden.

Glypta (Conoblasta) elongata Holmgren, 1860
Ø Gonvad, 1 ♀ 6 July 1994.
Distribution: Palaearctic; Finland and Sweden.

Glypta nigricornis Thomson, 1889
HEN Rød, 2 ♀♀ 30 June 1998 [ZMB 2029, 2033]; VE Langøya [N], 1 ♀ 8 July - 2 August 1991 (MT).
Distribution: Palaearctic; Finland and Sweden.

Glypta nigrina Desvignes, 1856
Ø Telemarkslunden, 1 ♂ 19 May - 17 June 1992 (MT).
Distribution: Oriental and Palaearctic; Finland and Sweden.

Glypta nigroplica Thomson,1889
TEI Lisleherad, 2 ♀♀ 22 June - 6 August 1993 (MT).
Distribution: Palaearctic; Sweden.

Glypta pedata Desvignes, 1856
Ø Sandbakken, 1 ♂ 13 June 1996.
Distribution: Palaearctic; Finland and Sweden.

Glypta tenuicornis Thomson, 1889
RY Randaberg, 1 ♀ 20 July 1996, 1 ♂ 9 July 1997.
Distribution: Palaearctic; Denmark, Finland and Sweden.

Glypta vulnerator Gravenhorst, 1829
Ø Sandbakken, 1♀ 12 July 1996.
Distribution: Palaearctic; Denmark, Finland and Sweden.

Atrophini

Lissonota admontensis Strobl, 1902
STI Ramstad, 1 ♀ and 2 ♂♂ 18 April 2003, 1 ♀20 April 2003 (YPT).
Distribution: Previously only the Alps; new for Scandinavia. Apparently a boreomontane species.

Lissonota biguttata Holmgren, 1860
Ø Huser, 1 ♀ 3 August 1996.
Distribution: Palaearctic; Finland and Sweden.

Lissonota bistrigata Holmgren, 1860
Ø Råkil, 1 ♀ 1 August 1995.
Distribution: Palaearctic; Finland and Sweden.

Lissonota fletcheri Bridgman, 1882
BØ Ryghsetra, 1 ♀ May 1994 (MT).
Distribution: Palaearctic; Finland.

Lissonota fundator (Thunberg, 1822)
Ø Gunnarsbybekken, 3 ♀♀ 1 ♂ 24 August - 16 October 1992 (MT); Råkil, 1 ♀ 1 September 1993.
Distribution: Holarctic; Finland and Sweden.

Table 1. EIS- and UTM-references of Ichneumonidae-records included in this study. Collector is given for each locality. Abbreviations: LOH = Lars Ove Hansen, ØBe = Øistein Berg, TJO = Thor Jan Olsen, ZMB = Zoological museum, Bergen, TM = Tromsø Museum.

Locality	Municipality	EIS	UTM [WGS84]	Leg.:
ØSTFOLD (Ø)				
Bauserud	Rakkestad	20	32V PL 365.931	TJO
Bøensætra	Aremark	21	32V PL 549.781	TJO
Flesjøvannet	Våler	20	32V PL 107.907	TJO
Gonvad, Kråkerøy	Fredrikstad	20	32V PL 095.603	LOH
Grimsøy, Skjeberg	Sarpsborg	20	32V PL 25.57	TJO
Gunnarsbybekken, Ekeby	Rygge	19	32V NL 946.842	LOH & G.Walberg
Huser, Asmaløy	Hvaler	12	32V PL 11.48	M. Pettersen
Kjærringåsen	Sarpsborg	20	32V PL 18.85	TJO
Kvastebyen	Sarpsborg	20	32V PL 240.638	TJO
Mærrapanna	Fredrikstad	20	32V PL 023.623	TJO
Rauer, Onsøy	Fredrikstad	19	32V NL 96.66	TJO & A.L. Aase
Remmendalen [SW]	Halden	20	32V PL 34.56	O. Hanssen & G. Hardeng
Roppestad, Nes	Fredrikstad	20	32V PL 155.602	TJO
Råkil, Tune	Sarpsborg	20	32V PL 194.755	TJO
Sandbakken	Sarpsborg	20	32V PL 241.699	TJO
Sildebauen	Rygge	19	32V NL 976.777	ØBe
Skjeberg[dalen]	Sarpsborg	20	32V PL 30.73	TJO & A.L. Aase
Skjeberg kirke	Sarpsborg	20	32V PL 240.639	TJO
Skrabberud	Rakkestad	20	32V PL 430.913	TJO
Solli, Tune	Sarpsborg	20	32V PL 120.788	TJO
Telemarkslunden, Ekeby	Rygge	19	32V NL 948.844	LOH & G.Walberg
Vesttorp	Halden	20	32V PL 312.644	TJO
Vister	Sarpsborg	20	32V PL 152.741	TJO
Øra, Gansrød[bukta]	Fredrikstad	20	32V PL 135.628	TJO
AKERSHUS (AK)				
Egner, Lørenfallet	Sørum	37	32V PM 24.61	LOH & O. Sørlibråten
Eiksmarka	Bærum	28	32V NM 906.466	ØBe
Hølen	Vestby	28	32V NM 983.014	TJO
Kjaglidalen	Bærum	28	32V NM 792.470	M. Falck
Kopperud, Hemnessjøen [S]	Aurskog-Høland	29	32V NM 126.411	TJO
Sørkedalen	Oslo	36	32V NM 90.54	ØBe
Vangen	Enebakk	29	32V PM 12.32	B. Økland [ZMB]
HEDEMARK Southern (HES)				
Romåsen	Ringsaker	54		ØBe
Tangen	Stange	46	32V PN 272.382	ØBe

Table 1. (continued)

HEDEMARK Northern (HEN)				
Atnosen	Stor-Elvdal	63	32V NP 962.454	ØBe
Rød [v. bro til]	Åmot	55	32V PN 339.921	L. Greve [ZMB]
Åkrestrømmen	Rendalen	64	32V PP 16.41	ØBe
Åstabro, Rena	Åmot	55	32V PN 27.74	L. Greve [ZMB]
OPPLAND Southern (OS)				
Bagn	Sør-Aurdal	44	32V NN 297.434	T. Munk
BUSKERUD Eastern (BØ)				
Fiskum	Øvre-Eiker	28	32V NM 45.17	T.G. Münster [TM]
Kinnartangen	Røyken	28	32V NM 750.201	ØBe, LOH
Kongsberg [2 km E]	Kongsberg	27	32V NM 38.14	T. Munk
Miletjern, Mjøndalen	Nedre-Eiker	28	32V NM 582.237	Y.Berg, D.Ruud & LOH
Ryghsetra, Hagatjern	Nedre-Eiker	28	32V NM 588.221	Y. Berg, LOH
Underlia	Drammen	28	32V NM 661.247	LOH
BUSKERUD Western (BV)				
Kjomme	Rollag	27	32V NM 175.477	B.A. Sagvolden
VESTFOLD (VE)				
Kjære	Tjøme	19	32V NL 804.527	A. Fjellberg [ZMB]
Langøya [N], Våle	Re	19	32V NL 774.965	LOH
Lerungsand, Brunlanes	Larvik	11	32V NL 483.429	ØBe
Sandøy	Tjøme	19		A. Fjeldså [ZMB]
Tjøme	Tjøme	19		A. Fjellberg [ZMB]
Tvedalen, Brunlanes	Larvik	19	32V NL 50.44	G. E.Ellefsen [ZMB]
TELEMARK Coastal (TEY)				
Dammane	Porsgrunn	18	32V NL 388.466	G.E. Ellefsen [ZMB]
Skjelsvik	Porsgrunn	18	32V NL 39.51	G.E. Ellefsen [ZMB]
TELEMARK Interior (TEI)				
Hægeberget	Tinn	34	32V MM 73.61	T. Munk
Lisleherad	Notodden	27	32V NM 15.07	A. Bakke
Nåpågarden	Tinn	26	32V MM 973.430	T. Munk
Steinsbøle [2 km E]	Tinn	34	32V MM 800.603	T. Munk
AUST-AGDER Coastal (AAY)				
Skiftenes, Landvik	Grimstad	6	32V MK 702.747	E. Oug [ZMB]

Table 1. (continued)

ROGALAND Coastal (RY)				
Randaberg	Randaberg	7	32V LL 058.448	J.A. Stenløkk
HORDALAND Coastal (HOY)				
Herlandsnesjane	Osterøy	40		L. Greve [ZMB]
Vollane, [Åsane]	Bergen			L. Greve [ZMB]
HORDALAND Interior (HOI)				
Djønno, Kinsarvik	Ullensvang		32V LN 762.053	O. Lundetræ [ZMB]
Viermyr	Ulvik			L. Greve [ZMB]
SOGN OG FJORDANE Coastal (SFY)				
Brekkestad	Gulen			L. Greve [ZMB]
Jølster [7.5 km W of]	Jølster	59	32V LP 657.280	L. Greve [ZMB]
SOGN OG FJORDANE Interior (SFI)				
Upsete	Aurland	41		Anonymous [ZMB]
MØRE OG ROMSDAL Interior (MRI)				
Fjøra, Ystefurneset	Norddal	77	32V MQ 152.068	K.J. Grimstad a.o.
SØR-TRØNDELAG Interior (STI)				
Ramstad	Midtre Gauldal	87	32V NQ 68.81	ØBe
NORDLAND South outer (NSY)				
Svartisen [NSY]	Meløy/Rødøy			T. Soot-Ryen [TM]
NORDLAND South interior (NSI)				
Svartisen [NSI]	Rana	123		T. Soot-Ryen [TM]
TROMS Interior (TRI)				
Fjellfrøskv[atnet]	Balsfjord	154		T. Soot-Ryen [TM]
Kvænangsbotn	Kvænangen	164	34W EC 430 368	P. Ottesen [TM]
FINNMARK West (FV)				
Gunnarnes, Rolvsøy	Måsøy	186	35W LU 94.79	P. Tangen

Lissonota quadrinotata Gravenhorst, 1829
Ø Roppestad, 1 ♂ 27 August 1999.
Distribution: Palaearctic; Finland and Sweden.

Banchini

Exetastes nigripes (Gravenhorst, 1829)
HES Tangen, 1 ♀ 30 June 2002.
Distribution: Palaearctic; Finland and Sweden.

CAMPOPLEGINAE

Bathyplectes rostratus (Thomson, 1887)
Ø Råkil, 1 ♀ 20 July 1994.
Distribution: Palaearctic; Finland and Sweden.

Diadegma angitiaeforma Horstmann, 1969
OS Bagn, 1 ♀ 812 July 1996.
Distribution: Bulgaria, France and Russia; new to Scandinavia.

Diadegma claripenne (Thomson, 1887)
AK Kopperud, 1♀ 25 June 1995.
Distribution: Palaearctic; Sweden.

Diadegma crassicorne (Gravenhorst, 1829)
Ø Vister, 1 ♀ 25 May 1999.
Distribution: Palaearctic; Denmark, Finland and Sweden.

Diadegma crassiseta (Thomson, 1887)
Ø Råkil, 1 ♀ 20 July 1995; Skjeberg, 1 ♀ 22 July 1995.
Distribution: Palaearctic; Sweden.

Diadegma ruficeps (Holmgren, 1860)
Ø Bøensætra, 1 ♀ 6 August 1995.
Distribution: Palaearctic; Denmark, Finland and Sweden.

Dusona carinifrons (Holmgren, 1860)
Ø Råkil, 1 ♀ 18 July 1999.
Distribution: Palaearctic; Finland and Sweden.

Dusona contumax (Förster, 1868)
HOY Vollane, 1 ♀ 8 - 13 July 1978 [ZMB, No. 1948].
Distribution: Palaearctic; Finland and Sweden.

Nemeritis stenura Thomson, 1887
Ø Kvastebyen, 1 ♀ 9 September 1995.
Distribution: Palaearctic; Sweden.

Nepiesta mandibularis (Holmgren, 1860)
Ø Sildebauen, 1 ♀ and 1 ♂ 27 May 1995.
Distribution: Palaearctic; Sweden.

Olesicampe vexata (Holmgren, 1860)
SFY Brekkestad, 1 ♂ 30 June 1983 [ZMB No. 1946].
Distribution: Palaearctic; Sweden.

Rhimphoctona (Xylophylax) xoridoideus (Strobl, 1904).
Ø Råkil, 1 ♀ 28 June 1995.
Distribution: C and SE Europe; new to Scandinavia.

CRYPTINAE

Cryptini

Hoplocryptus coxator (Tschek, 1871)
HOI Viermyr, 1 ♀ 6 August 1977, [ca. 900 m ZMB No. 1925].
Distribution: Palaearctic; Finland.

Hoplocryptus femoralis (Gravenhorst, 1829)
BØ Underlia, 1 ♀ 1 ♂ May 1994 (MT).
Distribution: Palaearctic; Sweden.

Hoplocryptus odoriferator (Dufour & Perris, 1840)
[syn. H. graefei Thomson, 1896]
AK Sørkedalen, 1 ♂ 16 June 1996.
Distribution: Palaearctic; new for Scandinavia.

Trychosis mesocastana (Tschek, 1871)
AAY Skiftenes, 1 ♀ 30 June 1971 [Eikeskog, ZMB No 2150].
Distribution: Palaearctic; Finland and Sweden.

Trychosis timenda Van Rossem, 1990
HEN Atnosen, 1 ♂ 29 June 2003.
Distribution: Palaearctic; Sweden.

Xylophrurus augustus (Dalman, 1823)
Ø Råkil, 1 ♀ 1 June 1997.
Distribution: Palaearctic; Finland.

Hemigastrini

Colocnema erythrosticta (Gravenhors, 1829)
Ø Skjeberg kirke, 1 ♀ 20 July 2003.
Distribution: Only Switzerland and UK; new to Scandinavia.

Phygadeuontini

Atracodes (Hadratractodes) vicinus Förster, 1876
TEI Hægeberget, 1 ♀ 26 July 1987[9 km E Kalhovd, 800-1000m].
Distribution: Palaearctic; Finland and Sweden.

Bathythrix tenuis (Gravenhorst, 1829)
Only reported by Roman (1942) as doubtful.
VE Lerungsand, 1 ♀ 28 June 1995.
Distribution: Palaearctic; Finland and Sweden.

Gelis mangeri (Gravenhorst, 1815)
BØ Fiskum [handwritten label, no date: Ths. Münster Hemit. fulveol. Mangeri Gr.].
Distribution: Palaearctic; Finland and Sweden.

Gelis obesus (Ashmead, 1902) [M. Schwarz det.]
FV Gunnarnes, 2 ♀ Sept. 1992 (MT).
Distribution: Holarctic; Sweden, A boreoalpine species.

Glyphicnemis vagabunda (Gravenhorst, 1829)
BØ Kinnartangen, 1 ♂ 8 July 1989.
Distribution: Palaearctic; Denmark, Finland and Sweden.

Mesoleptus scrutator (Haliday, 1839)
Ø Råkil, 1 ♀ 20 July 1994; Solli, 1 ♀ 20 June 1994; **TEI** Steinsbøle, 1 ♀ 24 July 1987 [ca. 750 m].
Distribution: Palaearctic; Finland and Sweden.

Tropistes falcatus (Thomson, 1884)
Ø Råkil, 1 ♀ 5 May 2002.
Distribution: Palaearctic; Finland and Sweden.

CTENOPELMATINAE

Pionini

Rhorus exstirpatorius (Gravenhorst, 1829)
Ø Kjærringåsen, 1 ♀ 29 June 1997.
Distribution: Palaearctic; Denmark, Finland and Sweden.

Rhorus punctus (Gravenhorst, 1829)
HEN Åkrestrømmen, 1 ♀ 28 June 2003.
Distribution: Palaearctic; Finland and Sweden.

Zaplethocornia procurator (Gravenhorst, 1829)
Ø Skrabberud, 1 ♀ 3 June 2000.
Distribution: Palaearctic; Denmark, Finland and Sweden.

Perilissini

Absyrtus vernalis Bauer, 1961
BØ Miletjern, 2 ♂♂ July 1988 (LT); 4 ♂♂ June 1988 (LT).
Distribution: Known from Bulgaria, France, Germany and Russia; new to Scandinavia.

Perilissus albitarsis Thomson, 1883
Ø Råkil, 1 ♀ 6 July 1996; Vesttorp, 1 ♂ 18 August 2000; BØ Kinnartangen, 1 ♂ 8 July 1989; Miletjern, 2 ♂♂ June 1988 and 2 ♂♂ July 1988 (LT).
Distribution: Palaearctic; Finland and Sweden.

Mesoleiini

Anoncus sobrinus (Holmgren, 1876)
OS Bagn, 1 ♀ 8-12 July 1996.
Distribution: Only Finland and Sweden.

Mesoleius melanoleucus (Gravenhorst, 1829)
Ø Grimsøy, 1 ♀ 27 June 1990.
Distribution: Palaearctic; Denmark, Finland and Sweden.

Protarchus grandis (Thomson, 1888)
Ø Sandbakken, 1 ♀ 18 September 1998.
Distribution: Palaearctic; Sweden.

Saotis nigriventris (Thomson, 1895)
Ø Skrabberud, 1 ♀ 1 June 2002.
Distribution: Palaearctic; Finland and Sweden.

Euryproctini

Hadrodactylus fugax (Gravenhorst 1829)
VE Kjære, 1 ♂ 12 June 1964 [ZMB No. 2134]; Tvedalen, 1 ♂ 20 June 1983 [ZMB No. 2128].
Distribution: Palaearctic; Denmark, Finland and Sweden.

Phobetes nigriceps (Gravenhorst, 1829)
NSI Svartisen [NSI], 1 ♀ 11 July 1948.
Distribution: Palaearctic; Finland and Sweden.

DIPLAZONTINAE

Campocraspedon annulitarsis (Hedwig, 1938) (determined by E. Diller)
Ø Råkil, 1 ♀ 2 August 1999.
Distribution: Previously reported from Poland, United Kingdom, and Belgium; new for Scandinavia.

Syrphoctonus tarsatorius (Panzer,1809)
Ø Vesttorp, 1 ♀ 2 August 2001; OS Bagn, 1 ♂ 8-12 July 1996; SFI Upsete, 1 ♂ 22 July 1996 [ZMB No. 1880].
Distribution: Oriental and Holarctic; Finland and Sweden.

ICHNEUMONINAE

Oedicephalini

Notosemus bohemani (Wesmael, 1855)
AAY Skiftenes, 1 ♂ 5 July 1971 [ZMB No. 2013].
Distribution: Palaearctic; Finland and Sweden.

Platylabini

Hypomecus quadriannulatus (Gravenhorst, 1829)
Ø Vesttorp, 1 ♀ 23 September 2001.
Distribution: Oriental and Holarctic; Finland and Sweden.

Platylabus dolorosus (Gravenhorst, 1829)
Ø Sandbakken, 1 ♀ 5 October 2001; Sildebauen, 1 ♀ 26 August 1995.
Distribution: Palaearctic; Finland and Sweden.

Ichneumonini

Barichneumon chionomus (Wesmael, 1845)
Ø Rauer, 1 ♂ 13 July 1999.
Distribution: Palaearctic; Finland.

Barichneumon derogator (Wesmael, 1845)
Ø Råkil, 1 ♀ 12 May 1997.
Distribution: Palaearctic; Finland and Sweden.

Barichneumon gemellus (Gravenhorst, 1829)
Ø Mærrapanna, 1 ♀ 17 August 2001.
Distribution: Palaearctic; Finland and Sweden.

Chasmias paludator (Desvignes, 1854)
TEI Hægeberget, 1 ♀ 26 July 1987 [800-1000m].
Distribution: Palaearctic; Finland.

Diphyus quadripunctorius (Müller, 1776)
Ø Rauer, 1 ♂ 14-16 July 2000 (Specimen with completely black gaster);
Råkil, 1 ♀ 10 July 1997.
Distribution: Palaearctic; Sweden.

Ichneumon crassifemur Thomson, 1886
Ø Grimsøy, 1 ♀ 26 June 1995.
Distribution: Palaearctic; Finland and Sweden.

Ichneumon haglundi Holmgren, 1864
HES Romåsen, 1 ♂ 10 July 2003 [800 m].
Distribution: Palaearctic; Finland and Sweden.

Ichneumon spurius Wesmael, 1848
Ø Remmendalen [SW], 1 ♀ 1 June - 6 July 1995 [PFT].
Distribution: Palaearctic; Finland.

Spilichneumon ammonius (Gravenhorst, 1820)
BV Kjomme, 1 ♀ 13 June 1995.
Distribution: Palaearctic; Finland and Sweden.

Virgichneumon callicerus (Gravenhorst, 1820)
Ø Råkil, 1 ♂ July 2002 [ex pupa].

Distribution: Palaearctic; Finland and Sweden.

Virgichneumon monostagon (Gravenhorst, 1820)
MRI Fjøra [100 moh], 1 ♂ 11 June - 16 July 2000 [ZMB No 1985].
Distribution: Palaearctic; Finland and Sweden.

Heresiarchini

Aglaojoppa centummaculata (Christ, 1791)
HOI Djønno, 1 ♂ 20 April 1938 [ZMB No. 1792].
Distribution: Palaearctic; Finland.

MESOCHORINAE

Astiphromma nigrocoxatum Strobl, 1902
Ø Skjeberg kirke, 1 ♂ 1 June 2003.
Distribution: C Europe; new for Scandinavia.

Astiphromma rimosum Schwenke, 1999
Ø Bøensætra, 1 ♀ 5 June 1995; BØ Underlia, 1 ♀ May 1994 (MT).
Distribution: Known from Germany and Poland, new for Scandinavia.

Cidaphus areolatus (Boie, 1850)
Ø Sandbakken, 1 ♀ 5 October 1998.
Distribution: Palaearctic; Finland.

Mesochorus gemellus Holmgren,1860
Ø Råkil, 1 ♀ 5 September 1993.
Distribution: Palaearctic; Finland and Sweden.

Mesochorus giberius (Thunberg, 1822)
Ø Flesjøvannet, 1 ♀ 3 July 1996; Råkil, 1 ♀ 10 October 1993; BØ Miletjern, 4 ♀♀ June 1988 (LT), 2 ♀♀ and 1 ♂ July 1988.
Distribution: Palaearctic; Denmark, Finland and Sweden.

Mesochorus globulator (Thunberg, 1822)
Ø Råkil, 1 ♀ 15 June 1994.
Distribution: Holarctic; Finland and Sweden.

Mesochorus pallipes Brischke, 1880
Ø Øra, 1 ♂ 29 May 1998.
Distribution: Palaearctic; Sweden.

Mesochorus tuberculiger Thomson, 1886
Ø Råkil, 1 ♀ 29 June 1998; Sandbakken, 1 ♀ 22 September 1998.
Distribution: Palaearctic; Finland and Sweden.

Mesochorus velox Holmgren, 1860
AK Egner, 1 ♀ October 1994 (MT).
Distribution: Palaearctic; Denmark, Finland and Sweden.

METOPIINAE

Chorinaeus cristator (Gravenhorst, 1829)
Ø Vesttorp, 1 ♀ 2 August 2001; AAY Skiftenes, 3 ♂♂ 28 May 1971 [ZMB No. 2100, 2012, 2151]; TEY Skjelsvik, 1 ♂ 4 July 1982 [ZMB No. 2119].
Distribution: Palaearctic; Finland and Sweden.

Chorinaeus flavipes Bridgman, 1881
Ø Bauserud, 1 ♂ 13 May 2001. According to Aeschlimann (1975) no male of this species has been found in Europe. The present specimen differs from the description of Japanese male specimens (Kusigemati 1967) in several aspects: body length about 6.5 mm, gaster completely black, mandibles, clypeus, and face clear yellow, legs pale yellow, hind coxae black in the basal 2/3. Reddish-yellow are hind femora in the middle part (the basal and apical 0.2 pale yellow), small spot at the apex of hind tibia, the apical 0,2 of hind metatarsus, and segments 2-5 of hind tarsi.
Distribution: Palaearctic; Finland and Sweden.

Chorinaeus talpa (Haliday, 1839)
AAY Skiftenes, 1 ♂ 28 May 1971 [ZMB No. 2152].
Distribution: Palaearctic; Finland and Sweden.

Exochus erythronotus (Gravenhorst, 1820)
Ø Råkil, 1 ♀ 20 August 1998.
Distribution: Palaearctic; Finland and Sweden.

Exochus tardigradus Gravenhorst, 1829
BV Kjomme, 1 ♂ 13 June 1995.

Distribution: Palaearctic; Finland and Sweden.

Metopius anxius (Wesmael, 1849)
NSI Svartisen [NSI], 1 ♀ 11 July 1948 (TM); **NSY** Svartisen [NSY], 1 ♀ 7 July 1948 and 1 ♂ 5 July 1948 [TM].
Distribution: Palaearctic; Finland and Sweden.

Metopius dissectorius (Panzer, 1805)
TEY Dammane, 1 ♂ 15-20 July 1983 [ZMB No. 1795].
Distribution: Oriental and Palaearctic; Finland.

Triclistus pygmaeus (Cresson, 1864)
[syn. *pallipes* auct. nec Holmgren]
MRI Fjøra [100 moh], 1♀ 5 May - 11 June 2000 [ZMB No. 1994]. The specimen of *pallipes* mentioned by Strand (1906) from Norway might belong to this species.
Distribution: Oriental and Holarctic; Denmark and Sweden.

ORTHOCENTRINAE (INCL. HELICTINAE)

Eusterinx argentula Förster, 1871
TEI Steinsbøle, 1 ♂ 24 July 1987 [ca. 750 m]. The following ♀♀ probably belong to this species: **TEI** Hægeberget, 1 ♀ 26 July 1987 [800-1000m]; Steinsbøle, 1 ♀ 24 July 1987 [ca. 750 m]; Nåpågarden, 1 ♀ 23 July 1987 [ca. 700 m].
Distribution: Palaearctic; Finland and Sweden.

Eusterinx obscurella Förster, 1871
BØ Kinnartangen, 1 ♀ 6 July - 4 August 1991, (MT).
Distribution: C Europe; new to Scandinavia.

Eusterinx refractaria van Rossem, 1982
OS Bagn, 1 ♀ 8-12 July 1996.
Distribution: Holarctic; Sweden.

Neurateles falcatus (Thomson, 1897)
Ø Gunnarsbybekken, 1 ♀ 19 May - 17 June 1992 (MT).
Distribution: Palearctic, Finland and Sweden.

Neurateles papyraceus Ratzeburg, 1848
TEI Lisleherad, 1 ♂ 6 August - 19 October 1993 (MT).
Distribution: Palearctic; Finland.

Orthocentrus orbitator Aubert, 1963
A conspicious species with yellow margins on facial orbits and temples.
TEI Lisleherad, 1 ♀ 6 August - 19 October 1993, (MT).
Distribution: Only France by original description; new to Scandinavia.

Picrostigeus setiger (Brischke, 1871)
OS Bagn, 1 ♀ 8-12 July 1996; TEI Hægeberget, 1 ♀ 26 July 1987 [800-1000m].
Distribution: Palaearctic; Finland and Sweden.

P*roclitus comes* (Haliday,1839)
BØ Kongsberg, 1 ♀ 23 July 1987 [2 km E].
Distribution: Palaearctic; Finland and Sweden.

PHRUDINAE

Phrudus monilicornis Bridgman, 1886
VE Sandøy, 1 ♀ 6 June 1979 [ZMB No. 2098]; see the notes below.

PIMPLINAE

Ephialtini

Afrephialtes cicatricosus (Ratzeburg, 1848)
VE Tjøme, 1 ♀ 10 August 1969 [ZMB No. 2097].
Distribution: Palaearctic; new for Scandinavia.

Delomerista borealis Walkley, 1960
NSI Svartisen [NSI], 1 ♀ 11 July 1948 (TM).
Distribution: Holarctic; Sweden.

Dolichomitus crassiceps (Thomson, 1877)
TRI Kvænangsbotn, 1 ♀ 11 September 1988 [TM].
Distribution: Palaearctic; Sweden.

Dolichomitus dux (Tschek, 1869)
Ø Råkil, 1 ♀ 5 August 2001.
Distribution: Palaearctic; Finland and Sweden.

Dolichomitus sericeus (Hartig, 1847)
AK Vangen, 1 ♀ 24 June 29 July 1991 [ZMB No. 1996].
Distribution: Holarctic; Finland.

Endromopoda phragmitidis (Perkins, 1957)
Ø Vesttorp, 1 ♀ 2 August 2001; **AK** Kjaglidalen, 1 ♀ 11-26 July 1990, (MT).
Distribution: Palaearctic; Sweden.

Perithous albicinctus (Gravenhorst, 1829)
VE Lerungsand, 1 ♀ 10 July 1999, 2 ♀♀ 7 July 2001.
Distribution: Palaearctic; Finland and Sweden.

Scambus eucosmidarum (Perkins, 1957)
HOY Herlandsnesjane, 1 ♀ 30 September 1990 [ZMB No. 1817].
Distribution: Palaearctic; Denmark and Sweden.

Polysphinctini

Polysphincta vexator Fitton, Shaw & Gauld, 1988
AK Hølen, 1 ♀ 29 June 2002.
Distribution: Palaearctic; Finland and Sweden.

Pimplini

Itoplectis enslini (Ulbricht, 1911)
AK Eiksmarka, 1 ♂ 13 August 1995.
Distribution: Central and Eastern Europe, new for Scandinavia

TRYPHONINAE

Tryphonini

Ctenochira genalis (Thomson, 1883)
Ø Råkil, 1 ♀ 14 June 1999.
Distribution: Palaearctic; Sweden.

Ctenochira pratensis (Gravenhorst, 1829)
HEN Åstabro, 1 ♀ 29 June 1998 [ZMB No. 2010].
Distribution: Palaearctic; Finland and Sweden.
Grypocentrus cinctellus Ruthe, 1855
Ø Vister, 1 ♀ 25 May 1999.
Distribution: Palaearctic; Finland and Sweden.

Exenterini

Exenterus vellicatus Cushman, 1940
Diagnosis: Coxae III with a yellow streak, puncture on mesopleura finer above the speculum than below. Small central yellow patch at the hindcorner of tergite 1, tergites otherwise completely black.
Ø Kjærringåsen, 1 ♀ 11 June 2000.
Distribution: Holarctic; new for Scandinavia.

Smicroplectrus perkinsorum Kerrich, 1952
SFY Jølster, 1 ♀ 4 July 1983 [7.5 km W of; ZMB No. 2025].
Distribution: Palaearctic; Finland.

XORIDINAE

Odontocolon appendiculatum (Gravenhorst, 1829)
AAY Skiftenes, 1 ♂ 6 August 1971 [ZMB No. 2159].
Distribution: Palaearctic; Finland and Sweden.

Xorides depressus (Holmgren, 1860)
VE Tjøme, 1 ♂ 11 June 1964 [ZMB No. 2129].
Distribution: Palaearctic; Finland and Sweden.

CORRECTIONS OF PREVIOUS PUBLICATIONS

Agrothereutes (recte *Idiolispa*) *grossus* (Gravenhorst, 1829)
This species was reported from Norway by Riedel & Berg (1997). However, the reported male belongs to *Idiolispa subalpina* (Schmiedeknecht, 1904) which can be distinguished by sparse longs hairs beside a shorter pubescens on the surface of head and thorax (Schwarz 1988). *Idiolispa grossa* (Gravenhorst, 1829) has not been reported from Scandinavia, and should thus be deleted from the Norwegian list.

Trieces facialis (Thomson, 1887)
The species was reported from Norway by Riedel & Berg (1997). The available male belongs to *Trieces tricarinatus* (Holmgren, 1858) which has been found in Norway before (see Riedel et al. 2000). *T. facialis* has not been caught in Norway so far.

Phrudus monilicornis Bridgman, 1886
The species was reported from Norway by Riedel et al. (2000). After reexamination using the recent revision by Vikberg (2000), this female actually belongs to *Astrenis brunneofacies* Vikberg, 2000 which is a new finding for Norway. However, a specimen of Phrudus monilicornis has been found in the collection of the Zoological Museum of Bergen (see above).

Platylabus decipiens Wesmael, 1848
The species was reported from Norway by Riedel et al. (2000), but has to be deleted from the Norwegian list because the specimen is in fact a male of *Platylabus vibratorius* (Thunberg, 1822). This species has not been reported from Norway so far.

Acknowlegdements. For the collection and loan of material we would like to thank all the collectors who generously donated their material for this study, especially Thor Jan Olsen and Thorkild Munk. For the loan of material from Museum collections we are very thankful to Lita Greve (Zoological Museum in Bergen) and Arne C. Nilssen and Robert Bergersen (Tromsø museum). For help in determination we thank Mr Erich Diller (Zoologische Staatssammlung München) and Maximilian Schwarz (Biologiezentrum Linz).

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Book reviews

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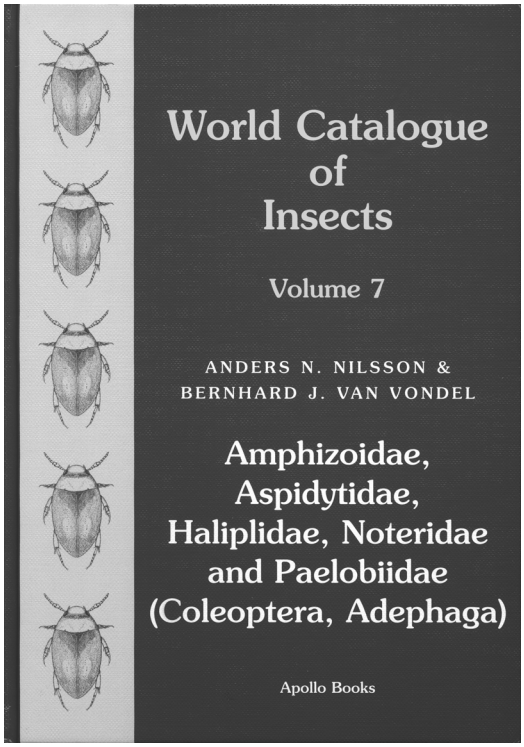


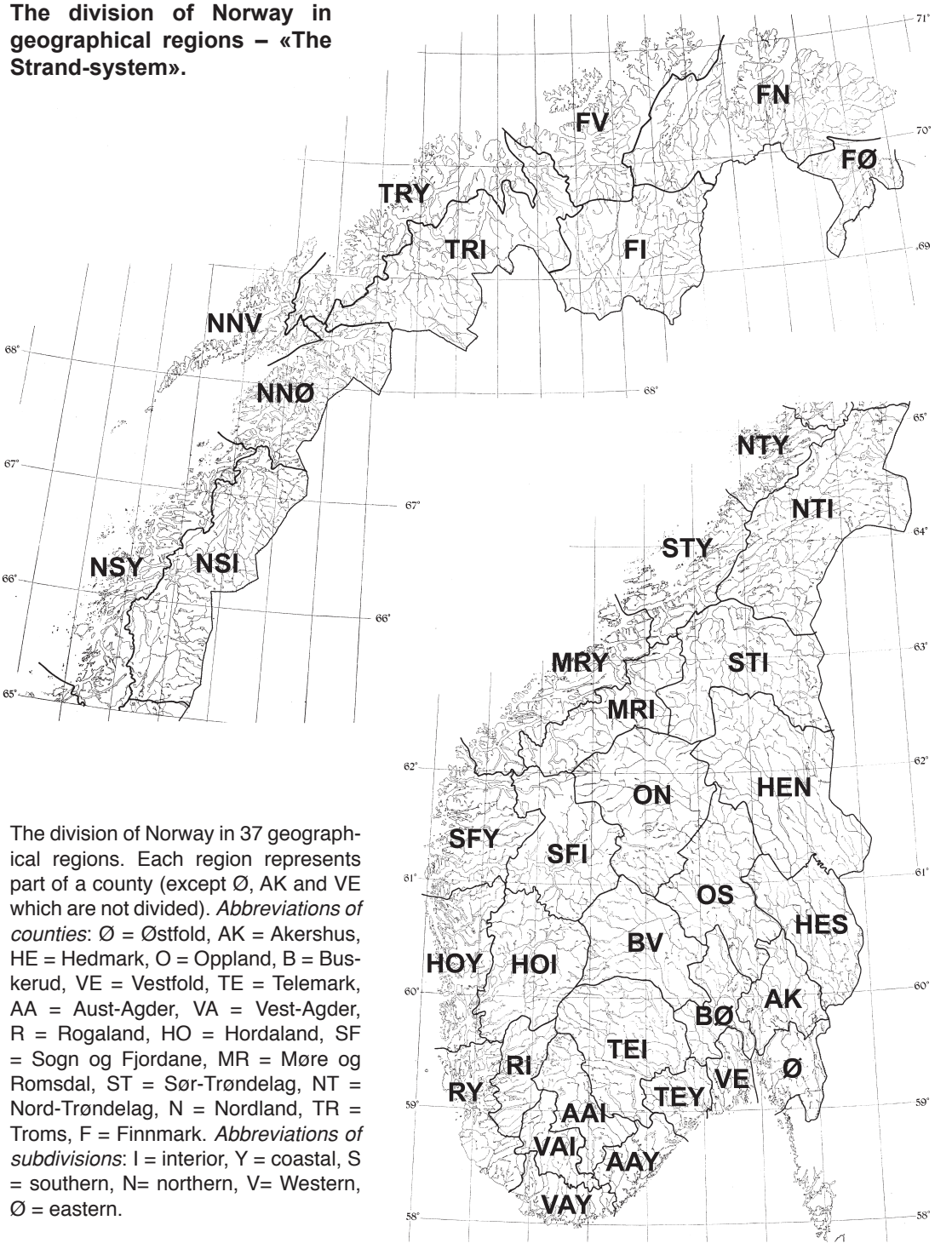
Det syvende bindet med den optimistiske tittelen "World Catalouge of Insects" har kommet. Dette er det andre bindet omhandlende de Adephage billene og dermed er denne underordnen nesten komplett med tanke på de vannlevende familiene. I likhet med vannkalv-bindet som utkom i 2001, er det den meget dyktige Anders Nilsson som står ved roret og fører denne utgivelsen vel i havn.

Katalogen følger i stor grad den samme oppbygningen som tidligere bind i serien. Etter en kort introduksjon og brukerveiledning, tar forfatterne for seg familiene. Etter gjennomgangen av artene avsluttes hver familie med en egen referanseliste, noe som letter arbeidet for dem som vil sette seg dypere inn i kun èn av familiene. Jeg føler også at det er lettere å få oversikt over både utbredelse og den taksonomiske historikken i dette bindet enn tidligere bind som jeg har sett. Grunnen til dette er blant annet at det bak hvert taxon er angitt den biogeografiske sonen og for hver art er landene, eller områder av et land artene er registrert i, tatt med. All taksonomisk informasjon ser også ut til å være med og forkortelser er det minimalt av. Dette øker brukervennligheten betraktelig, men tar selvfølgelig større plass. De fem familiene som er omhandlet i bindet har et lavt eller meget lavt artsantall på verdensbasis og kun de to største familiene (Haliplidae og Noteridae) er representert i Norden. Det er bare 15 av de 467 artene i katalogen som er norske og ingen av disse har endret taksonomisk status i forhold til Silfverbergs' billekatalog (Sahlbergia Vol 9:1, 2004).

Denne katalogen utgjør et meget viktig bidrag til kunnskapen om disse små og ofte neglisjerte familiene av vannlevende biller. Forhåpentligvis vil den kunne inspirere til økt interesse. Prisen for bøkene i denne serien er muligens noe i overkant av hva den gjengse entomolog er villig til å betale, men så er jo også serien rettet mot spesialister, museer og andre vitenskapelige institusjoner verden over. Og disse bør absolutt vite sin besøkelsestid!

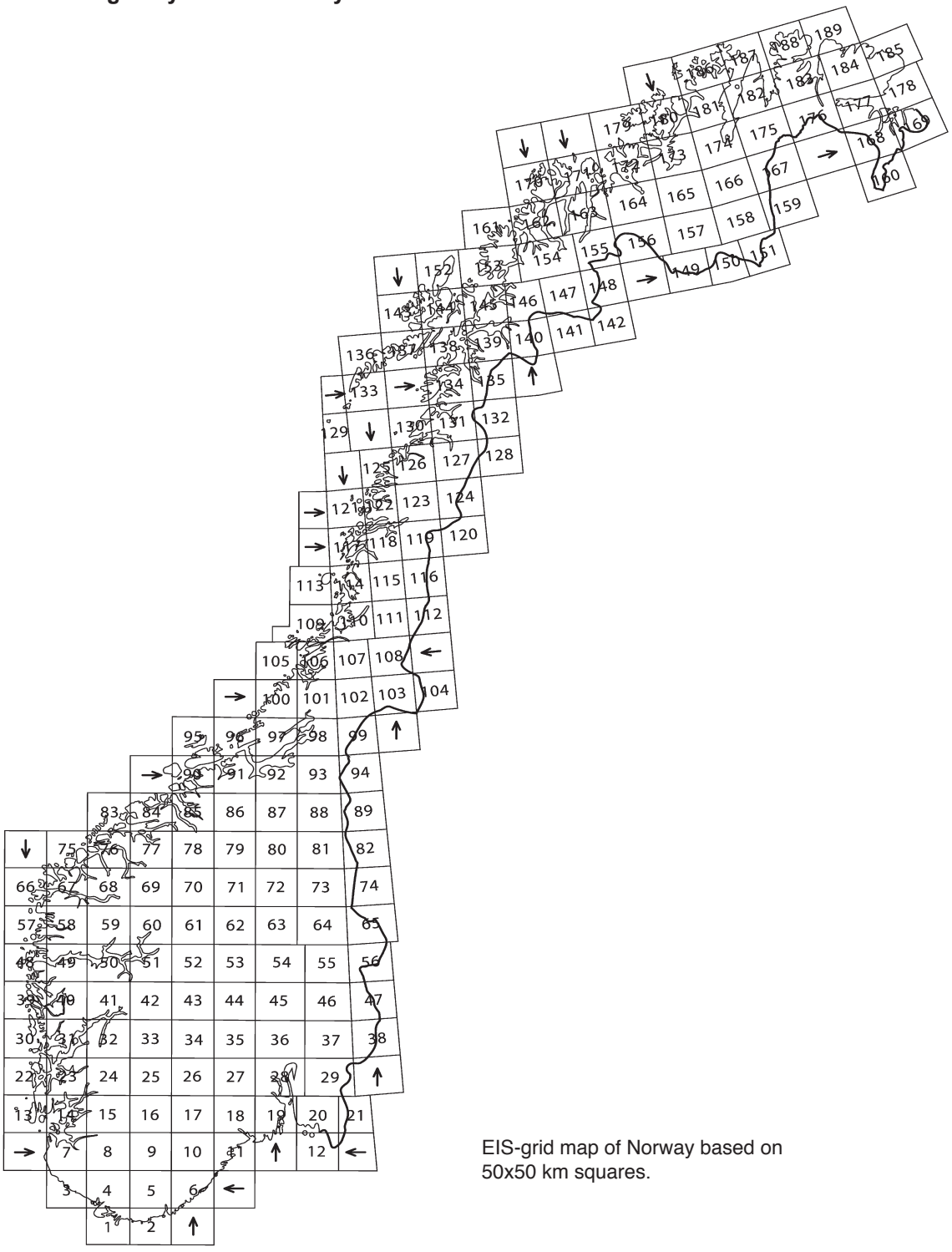
Stefan Olberg

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.

The EIS-grid system of Norway



EIS-grid map of Norway based on 50x50 km squares.

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Articles

Instructions to authors

Manuscripts should be written in English or occasionally in Norwegian with an English summary. The authors are advised to consult previous issues for lay-out and fonts. The manuscripts should be submitted in duplicate as «one and a half» spaced lines on one side of the paper. Separate sheets should be used for (1) title page with authors names, (2) abstract followed by a list of up to six Key words and 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. All manuscripts will be considered by referees before acceptance.

Abstract should not exceed 300 words and should cover the main results and conclusions of the paper 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 Tables.

Figures should (if at all possible) be submitted electronically as separate files, e.g. in JPEG, TIFF or EPS formats, with resolution not less than 600 dpi. The Figures must be numbered consecutively and all Figures must be referred to in the text. Write «Figure» in full. On paper copies the 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. *Rhyacophila 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 or UTM should be added. Dates are written e.g. as 17 May 2005, see previous issues.

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 orders (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).

Examples:

Journal paper

Chant, D.A. & McMurtry, J.A. 1994. A review of the subfamilies Phytoseiinae and Typhlodrominae (Acari: Phytoseiidae). Int. J. Acarol. 20, 223-310.

Book

Borror, D.J., Tripleton, C.A. & Johnson, N.F. 1989. An introduction to the study of insects. Sixth edition. 875 pp. Saunders College Publ., Philadelphia.

Chapter in book

Dennis, R.L.H. & Williams, W.R. 1995. Implications of biogeographical structures for the conservation of European butterflies. Pp. 213-230 in Pullin, A.S. (ed.), Ecology and conservation of butterflies. Chapman & Hall, London.

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Proofs and reprints. The author will receive one set of proofs which must be returned without delay. Extensive alterations will be charged to the authors. An order form for reprints must be returned with the proofs. The journal does not provide free reprints.

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Articles

Information

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.