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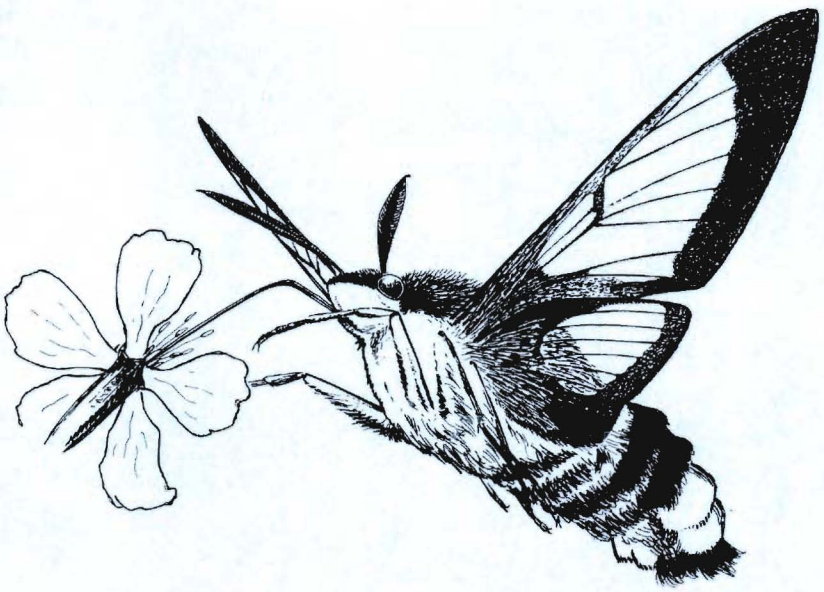

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Spiders (Araneae) from the Kvitbergvatnet area in Saltdal, northern Norway

Erling Hauge & Per Gustav Thingstad

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The spider fauna was collected in 1975 from five pitfall plots near Lake Kvitbergvatnet (454 m a.s.l.), in the northernmost part of the Saltfjell mountains in Nordland county, Norway. The sample localities were two subalpine birch forests, two low-alpine *Dryas* heaths and a lake-shore habitat; the latter representing a transect from poor pioneer vegetation to rich continuous vegetation cover, including some small specimens of *Betula* and *Salix*. During a total of 10741 trap-days 3207 spiders, representing 63 species and 8 families, were caught. The occurrence of some of the species within Linyphiidae and Lycosidae, the most abundant families in the area, are discussed. Some additional short notes are given on the records of *Satilatlas britteni, Mecynargus paetulus* and *M. sphagnicola.*

Key words: Araneae, Linyphiidae, Lycosidae, northern Norway.

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INTRODUCTION

Pitfall trapping for Carabidae was done in the Saltfjellet area during the summers of 1975 and 1976 (Thingstad 1987). The material from 1975 also included a number of spiders that represents a contribution to the knowledge of the spider fauna in the region. Previous records of spiders from relatively high elevations in Nordland county are rather few (Cooke 1967, Hauge 1976, Ashmole & Planterose 1979).

SAMPLING AREA AND METHOD

The spiders were collected from the vicinity of lake Kvitbergvatnet (454 m a.s.l.), in the northernmost part of the Saltfjellet mountain area in the Saltdal municipality, at 66°56' N and 15°05' E, a few km beyond the Arctic Circle (Figure 1). The bedrock in this area is dominated by calcite marble/ dolmite marble and mica schist/ mica gneiss (Sigmond et al. 1984), and the timber line is approximately 600 m a.s.l. For a more detailed description, see Thingstad (1987).

The spiders were collected using pitfall traps (Barber 1931). Small plastic cups, having an inner diameter of 62 mm and 4 % formaldehyde as preservation fluid, were placed in rows spaced two meters apart. The traps were emptied at least four times each mouth. The Araneae material is stored at the Zoological Museum in Bergen.

Description of the sampling plots

The five sampling plots were located in sub-alpine and low-alpine habitats:

A 1. A low alpine highly exposed heath situated

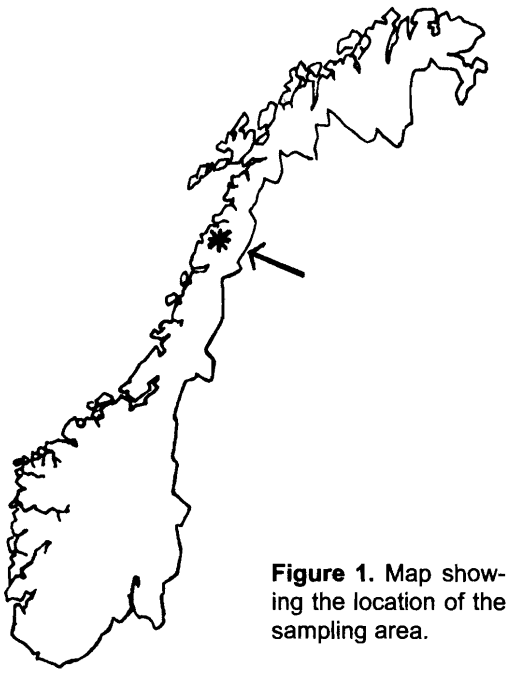

Figure 1. Map showing the location of the sampling area.

close to the top of the Kvitberget mountain (836 m a.s.l.), with a scarcely developed vegetation dominated by *Kobresia myosuroides. Dryas octopetala* was also abundant. The area was water soaked (more or less) during most parts of the summer season, due to overflow from melting snow. Sampling period: 16 June - 30 August, altogether 1500 trap-days (20 traps).

A 2. A low alpine *Dryas* heath (660 m a.s.l.), rich in herbs, particularly *Saxifraga aizoides, S. oppositifolia, Pingnicula alpina* and *Thalictrum alpinum.* The sampling site was in a south-faced slope on the Kvitberget mountain, 200 m from the birch forest and just below a dense growth of *Betula nana* and *Salix* spp. It became relatively dry, especially in late summer. Sampling period: 16 June - 3 September, altogether 1515 trap-days (20 traps).

B 1. A relatively humid birch forest situated in a south-facing, gently sloping terrain on the eastern side of the lake, 475 m a.s.l. Some scattered junipers (*Juniperus communis*) were present, and the ground cover was dominated by *Vaccinium myrtillus. Rubus chamaemorus* was also common. Sampling period: 14 June - 4 September, altogether 3300 trap-days (40 traps).

B 2. A birch forest situated in a north-west-facing terrain north-east of the lake (500 m a.s.l.), botanically more variable and richer than B 1. The ground cover was dominated by *V. myrtillus*, but also rich in *Empetrum nigrum* spp. *hermaphroditum* and herbs, the latter mostly *Geranium heterophyllum* and *Cirsium heterophyllum*. Sampling period: 17 June - 3 September, altogether 1484 trap-days (20 traps).

S. The vegetation closest to the lake-edge in this plot was in a pioneer stage (due to previous inundation), with scattered vegetation cover on the sparse humus. The beach was sandy and rich in lime. The most common plant was *Saxifraga aizoides*, but *Equisetum* sp., *Festuca rubra, Juncus arcticus, Agrostris stolonifera* and *Poa alpina* were also abundant. The plot continued towards the birch forest, with thicker humus (mean: 5.5 cm) and covered with a more continuous vegetation dominated by *Pedicularis sceptrum-carolinum.* Small specimens of *Betula pubescens* and *Salix* spp. had invaded from the neighbouring birch forest.

Unfortunately, the location labels of the material collected from this beach plot had deteriorated so that we were forced to combine two series; the one set relatively close to the lake, the other one in the more luxurious vegetation some distance from it. The length of the sampling period as in B 2; the number of trap-days 2942 (40/(20) traps).

RESULTS AND DISCUSSION

A total of 3207 spiders were caught, representing 63 species and 8 families (Table 1). Eleven species only were found in the water soaked, scarce and monotonous vegetation at A 1. In the more structural and species diverse ground flora in B 1, B 2 and A 2 the spider faunas were richer, and

within these the numbers of species were fairly equal (range 27-31). The high numbers of species (38) in S may partly be explained by the relatively variable vegetation here, mainly due to the combining of two different beach plots, as described above.

The scarcity of species in A 1 may also be a response to the harsh climate at this locality, thereby excluding many thermophilous and nocturnal species. As B 2 is a north-facing plot, and partly the same negative influence from a harch local climate could be expected here. However, the rich and variable vegetation at B 2 seems to compensate for this climatic disadvantage, as this plot has a rather long species list including many net-building species, particularly *Lepthyphantes* spp. and *Leptorhoptrum robustum*, a locally abundant species in the Fennoscandian mountains.

Lycosids

The typical high mountain species *Erigone psychrophila* (see below) and the hygrophilous *Tricca alpigena* dominated in A 1 (Table 1). Similarly this species reached its highest densities in cold, humid sites in low alpine areas at Finse, southern Norway (Hauge & Ottesen in prep.).

In the Kvitbergvatnet area (Table 1) *Pardosa palustris* clearly shows a wider ecological tolerance than *Erigone psychrophila* and *Tricca alpigena*, the former having its highest dominance value in the somewhat drier A 2, along with *Alopecosa aculeata* (see below), but it also occurred quite often together with *T. alpigena* in A 1. Except for in the variable plot S, there was little spatial overlap between *P. palustris* and the other species of this genus. Based on catches from 43 different sites in the Finse area Hauge & Ottesen (in prep.) denote the common, open living species *Pardosa palustris* as «mesic-hygric». Also on the Hardangervidda mountain plateau it obviously shuns the wettest localities (Hauge et al. 1998).

In the lowland areas *Pardosa amentata* seems to be rather stenotopic, but often abundant when present. In the Kvitbergvatnet area it seems to be restricted to habitats with some shelter, and perhaps almost outnumbered by another (even more typical) lowland forest species, *P. lugubris* in B 1, but not in B 2 and S (Table 1). The latter is perhaps the most common and widespread species of the genus in the lowland areas of Norway, and has (to our knowledge) never been reported above the timber line. *P. amentata* was totally absent from the Hardangervidda material (Hauge et al. 1998), and had its highest densities in the more humid areas, especially in the presence of some shelter (*Salix* sp.) at Finse, e.g. in a few relatively warm south-faced slopes more or less in the absence of *P. palustris* Hauge & Ottesen (in prep.) denoted it as a «hygric» species. In contrast to *E. psychrophila* and *T. alpigena*, *P. amentata* and *P. palustris* are well known also below the timber line in southern Norway; the former even in the outermost coastal areas where it is more local in occurrence, perhaps due to the presence and abundance of the more strictly coastal species *P. pullata* and *P. nigriceps* (Hauge et al. 1991, Hauge et al. in prep.). The smaller *P. hyperborea*, perhaps to be regarded as characteristic for sub-alpine forests on high ground, is usually found (but sparsely) in the lower alpine heaths in northern Fennoscandia (Holm 1950).

In the wet heaths of Finse (Hauge & Ottesen in prep.) and Hardangervidda (Hauge et al. 1998) most large, active hunting species were scarce or completely absent. We found the same situation for the moist, low alpine A 1, and partly also in the north-west faced forest B 2, but they became more numerous in the drier heath A 2 (Table 1). This trend is particularly obvious for the species within the more thermophilous families, the Gnaphosidae and Thomisidae. Therefore, the most likely explanation is that the unfavourable combination of high humidity and low temperature in the higher mountain areas (represented by A 1) leaves only those species that are well adapted to this condition as dominant species, e.g. only two Lycosidae (*Pardosa palustris* and *Tricca alpigena*). Hauge et al. (1998) found that *Alopecosa aculeata* on Hardangervidda was very abundant but restricted to the driest (warmest) of the three low alpine heaths, here almost as common as *Pardosa palustris*, while the latter was dominating alone in the dry meadow, with neither of the two

Table 1. The relative occurrence (given in % of the total number, + is less than 1 %.) of adult spiders from the five localities in the Kvitbergvatnet area, Northern Norway, in 1975. B 1 = humid heath birch forest, B 2 = meadow/heath birch forest, S = sandy lake-shore, A 1 = moist, exposed low alpine heath, A 2 = rich low alpine heath. See text for further explanation.

Name	B 1	B 2	S	A 1	A 2
Linyphiidae					
Agyneta cauta (O.P.-Cbr.,1902)		2.1	+		
A. nigripes (Simon,1884)				3.7	
A. olivacea (Emerton,1882)	1.8		+		
A. similis (Kulczynski,1926)			+		+
A. subtilis (O.P.-Cbr.,1863)		1.5			
Centromerus sylvaticus (Blackwall,1941)		+			
Ceratinella brevipes (Westring,1841)		+	+		+
Cnephalocotes obscurus (Blackwall,1834)	+		+		+
Diplocentria bidentata (Emerton,1882)	+				1.3
Erigone atra (Blackwall,1841)			9.1	1.2	
E. longipalpis (Sundevall,1830)			+		+
E. psychrophila Thorell,1871		+	+	40.1	
E. tirolensis L.Koch,1872				7.4	
Gonatium rubellum (Blackwall,1841)		+			
G. rubens (Blackwall,1833)	+		+	+	
Hilaira frigida (Thorell,1872)				+	
H. herniosa (Thorell,1875)		2.3			
H. pervicax Hull,1908			2.5		
Bolyphantes luteolus (Blackwall,1833)		+			+
Lepthyphantes angulatus (O.P.-Cbr.,1881)		5.5	+		1.0
L. mengei Kulczynski, 1887	1.6	2.5			
L. nigriventris (L.Koch,1879)		+			
L. tenebricola (Wider,1834)		9.0			
Leptorhoptrum robustum (Westring,1851)		16.7	1.0		
Mecynargus morulus (O.P.-Cbr.,1873)	+	5.3			+
M. paetulus (O.P.-Cbr.,1875)		+	4.5	+	
M. sphagnicola (Holm,1939)			3.9		
Oedothorax retusus (Westring,1851)			4.7		1.0
Oreonetides vaginatus (Thorell,1872)	+	+			
Pelecopsis mengei (Simon,1884)		4.6	+		1.3
Porrhomma pallidum Jackson,1913		+			
Satilatlas britteni (Jackson,1912)					+
Semljicola faustus (O.P.-C.,1900)		8.6	+		+
S. latus (Holm,1939)	+	4.2	+		
Tapinocyba pallens (O.P.-Cbr.,1872)	1.6	6.8			+
Tiso aestivus (L.Koch,1872)			+		+
Thyreosthenius parasiticus (Westr.,1851)	+	+	+		
Walckenaeria cuspidata (Blackwall,1833)		+	+		+
W. karpinskii (O.P.-Cbr.,1873)	+	1.1	+	+	+
W. nudipalpis (Westring,1851)			+		
Zornella cultrigera (L.Koch,1879)	+	+			
Theridiidae					
Robertus scoticus Jackson,1914	+				
Araneidae					
Hypsosinga albovittata (Westring,1851)			+		

Table 1. Cont.

Name	B 1	B 2	S	A 1	A 2
Hahniidae					
Hahnia ononidum Simon,1875	1.1				+
Lycosidae					
Alopecosa aculeata (Clerck,1757)	26.1	+	19.0	+	17.0
A. pinetorum (Thorell,1856)	3.9		+		
Pardosa amentata (Clerck,1757)	+	20.5	26.4		
P. hyperborea (Thorell,1872)	10.7	1.7	10.7		+
P. lugubris (Walckenaer,1802)	41.4	1.9	1.4		
P. palustris (L.,1758)		+	2.7	17.9	61.8
P. sphagnicola (Dahl,1908)			+		
Pirata piraticus (Clerck,1757)			+		
Tricca alpigena (Doleschal,1852)			7.8	26.5	+
Gnaphosidae					
Gnaphosa leporina (L.Koch,1866)	4.1	+	+		6.9
G. lapponum (L.Koch,1866)	+				
Haplodrassus signifer (C.L.Koch,1938)	+		+		+
Micaria alpina L.Koch,1972			+		+
Thomisidae					
Ozyptila atomaria (Panzer,1810)	2.0				
O. rauda Simon,1875					3.5
Xysticus cristatus (Clerck,1757)	+		+		+
X. obscurus (Clerck,1757)	+				+
Salticidae					
Evarcha falcata (Clerck,1757)	+				
Sitticus floricola (C.L.Koch,1837)			+		
Total number of specimens	**569**	**483**	**1155**	**162**	**830**
Number of species	**26**	**31**	**38**	**11**	**27**

species being found in the wet meadow. *A. aculeata* is a lowland species preferring relatively open, dry conditions (Kronestedt 1990). This is perhaps confirmed when comparing its abundance in the wet A 1 and the drier A 2 (Table 1).

Similar relations between the species groups may be observed when comparing the two woodland plots; the relatively humid, but south-faced B 1, and the drier, north-west-faced B 2 (Table 1). The density differences between these two plots may be explained by the exposure of the plots, and consequently the different temperature regimes. As concluded by Hauge et al. (1998), *Alopecosa aculeata* is probably reaching its altitudinal limit in this type of habitats, and even small humidity differences must be compensated for by higher insulation due to the varying exposure of the terrain. For the net-building species (see below) similar conclusions may be drawn, especially for A 1, in which the species are few and dominated by two species (*Erigone psychrophila* and *E. tirolensis*, together constituting 47.5 % of all adult spiders here).

Some net-building species

Erigone spp.

The high density of *E. atra* in S (close to the lake) may at least partly be related to its reputation as a pioneer species (Schaefer 1976, Meijer 1977) and

its aeronautic habits (Kronestedt 1983, Thaler 1985, Flatz 1988, Zeltner 1989). In the lowland it is commonly known as a hygrophilous open land species. At Hardangervidda it shunned the driest habitat, but was obviously less bound to the wettest places, in contrast to the humidity dependant (psychrophilous) *E. psychrophila*, which was dominating on wet meadows (Hauge et al. 1998). In A 1 it occurred together with *E. tirolensis*. The latter is perhaps, among the *Erigone* spp., the one that is reaching the highest altitudes and it is in northern Fennoscandia restricted to the alpine areas (Holm 1950). And here it has also frequently been found under stones (Holm 1950, Palmgren 1965, 1976), like some other species on our list, *Mecynargus paetulus, Oedothorax retusus* and *Agyneta nigripes*, all four species denoted by Holm (1950) as thermophilous. *E. longipalpis* has in Fennoscandia been associated with beaches, coasts and maritime conditions as well as high altitudes, northernmost to Sør-Varanger in Finnmark (Palmgren 1976).

Agyneta spp.

A. cauta and *A. subtilis* should primarily be considered as lowland species, sometimes found together in open as well as woodland areas (Hauge et al. 1991, Hauge et al. in prep.), here occurring together in the driest forest (B 2, cf Table 1). *A. olivacea*, distinguished from *A. cauta* (Hippa & Oksala 1985), has previously been reported only once from northern Norway (Hauge 1998). Here these last two species seem to be spatially well separated from each other in B 2 and B 1, but were found together (but perhaps less abundant) in the variable plot S, along with *A. similis* (Table 1). *A. similis* is restricted to the northern areas in Fennoscandia (Palmgren 1975, Jonsson pers. comm.). *A. nigripes* was very local and abundant (in A 1). In southern Norway it is known from the high mountains only (Hauge 1989).

Hilaira spp.

The three species here seem to be well separated spatially (Table 1). Like *Erigone tirolensis* (see above) *H. frigida* seems to reach the highest altitudes (Holm 1950), whereas the other two probably belong more to the forested areas, in which at least *H. herniosa* is common and euryoecious (Holm 1950; Palmgren 1965; Hauge 1977, 1998), while *H. pervicax* is more hygrophilous (Holm 1950).

Satilatlas britteni (Jackson, 1913).

This record of a single male (trapped during the period 6-17 July 1975) from a alpine *Dryas* heath approximately on the Polar Circle is quite extraordinary. Although being reported relatively far east in Europe, from Estonia to the Russian plain (Mikhailov 1997), its northernmost limit in Fennoscandia up to now has been in its eastern areas, the southern coast of Finland (Palmgren 1976) and in Sweden only from the island of Öland (Holm 1968, Jonsson pers. comm.). In the far east (southern Siberia) *S. marxi* Keyserling,1886 is obviously taking over (Eskov 1994, Mikhailov 1997). The British records of *S. britteni* are scattered north to Scotland (absent from the northernmost parts), and are locally abundant in marshy areas (Locket & Millidge 1953, Locket et al. 1974). It is a rare species elsewhere in middle Europe (Heimer & Nentwig 1991), in central (continental) Europe obviously not recorded from beyond 800 m a.s.l. (Maurer & Hänggi 1990). Dondale & Redner (1972) reckoned it as conspecific with *S. arenarius* (Emerton, 1911). In Platnick (1993) the two species are still held apart. Moist habitats seem to be preferred by both (Dondale & Redner 1972; for *S. britteni*, see also Maurer & Hänggi 1990 and Heimer & Nentwig1991).

Mecynargus paetulus (O. P. - Cambridge, 1875).

From 17 June to 10 August 1975 a total of 42 males and 13 females were trapped, the majority (41 males and 12 females) in S (Table 1). This is a holarctic (Esyunin & Efemik 1996) arcto-alpine (Thaler 1976) species, in eastern Europe distributed as far south as Latvia (Mikhailov 1997). In Central Europe (the Swiss Alps) it is probably not recorded below the sub-alpine zone (Maurer &

Hänggi 1990), in Britain it is restricted to relatively high altitudes in Scotland (Locket et al. 1974); and in northern Fennoscandia (Finnish Lapland) up to the nivale zone (Palmgren 1976). The Swedish records seem to be in some inland areas from Torne Lappmark to Jämtland (Jonsson pers. comm.). In northern Norway it is known also on the coast, e.g. Reinøy island (Holm 1973). Elsewhere in Norway it is not known south of Nordland county (Hauge 1989).

M. sphagnicola (Holm, 1939).

Twenty-three males (17 June to 10 August 1975, max. early July) and 12 females (20 June to 25 July 1975) were all trapped in S (Table 1), here together with most specimens of *M. paetulus* (see above). In Norway this hygrophilous species (cf. Holm 1950, Hauge et al. 1998) is previously known only from the southern central high mountains (Hauge 1989). In Sweden it has a similar distribution to *M. paetulus*, and occurs southwards to Härjedalen (Jonsson pers. comm.). In Finland *M. sphagnicola* is distributed in fairly humid habitats all over the country (Palmgren 1976), and in the former USSR it is reported from the «Far east» westwards to northern Europe, as well as being known from Greenland (Esyunin & Efemik 1996, Mikhailov 1997). In contrast to *M. paetulus* there are no records from «middle» Europe (Heimer & Nentwig 1991). Neither of the two species were listed from Iceland (Agnarsson 1996) or from the other North Atlantic islands (Ashmole 1979).

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The genus *Nothochrysa* (Planipennia, Chrysopidae) in Norway

Lars Ove Hansen & Kai Berggren

Hansen, L.O. & Berggren, K. 1999. The genus *Nothochrysa* (Planipennia, Chrysopidae) in Norway. Norw. J. Entomol. 46, 57–60.

The genus *Nothochrysa* is reported for the first time from Norway. The two species *N. fulviceps* (Stephens, 1836) and *N. capitata* (Fabricius, 1793) were captured in light-traps in Kristiansand (VAY) in 1999. The biology and distribution are briefly discussed, and a key to identify the two species is supplied. Both species should be included in the national red-list with the category «declining, care demanding» (DC) or «declining, monitor species» (DM).

Key words: Planipennia, Chrysopidae, *Nothochrysa*, red list.

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INTRODUCTION

Only two species of the genus *Nothochrysa* are known from Northern Europe (Aspöck et al. 1980), and surprisingly both of these were recorded for the first time in Norway in 1999. These findings increase the number of Norwegian Chrysopidae to sixteen, two more than predicted by Ottesen (1993). All the specimens of *Nothochrysa* are deposited in the collections at the Zoological Museum of Oslo.

IDENTIFICATION

The fourteen species of Chrysopidae known from Norway (i.e. *Nineta, Chrysotropia, Chrysoperla, Chrysopa, Anisochrysa, Cunctochrysa)* can be identified using the key given by Greve (1987). The genus *Nothochrysa* may be separated from these by their brownish colour of the body and wings. However, this character may be somewhat misleading, as specimens of *Chrysoperla carnea* Stephens, 1836 turn ochreous or greyish during hibernation, and the green colour in all the species easily fade in contact with certain chemicals (e.g. ethylacetate). The following key will serve to separate *Nothochrysa* from the other Norwegian Chrysopidae and to identify the two species:

1. Green or yellow coloured insects; wing venation green, sometimes with black areas. Discoidal (median) cell (Mc) triangular (Fig. 1 a). Females have so far not been observed with a white, swampy mass attached to the dorsal side of the abdomen ..... Norwegian Chrysopidae excl. *Nothochrysa*; for determination see Greve (1987).

– Reddish-brown insects; wing venation black, brown, reddish-brown or ochreous. Discoidal (median) cell (Mc) forming an elongate quadrangle (see Fig. 1 b). In fertile females a white, swampy mass is sometimes attached to the dorsal side of the abdomen (Fig. 3 a, b).. ..... *Nothochrysa* (2).

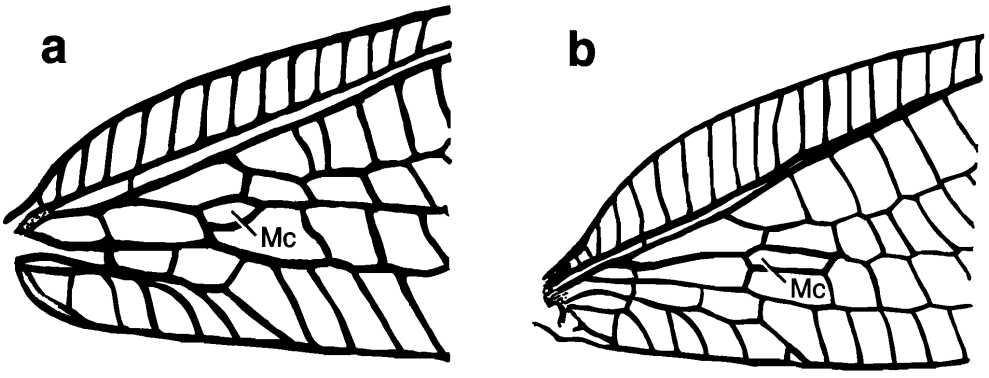

Figure 1. Wing venation: **a.** *Chrysopa septempunctata* (Wesmael, 1841) ♀; **b.** *Nothochrysa capitata* ♀.

2. Larger species, total wingspan 40–48 mm. Wings narrower and longer than in *N. capitata*. A basal expansion almost forming a teeth at the base of the tarsal claws (Fig. 2 a) .... *N. fulviceps.*

– Smaller species, total wingspan 30–36 mm. Wings broader and shorther than in *N. fulviceps*. No basal teethlike expansion at the tarsal claws (Fig. 2 b) ..... *N. capitata.*

Anomalies in wing venation can occur among the green Chrysopidae, and species like *Chrysopa abbreviata* Curtis, 1834 and *Cunctochrysa albolineata* (Killington,1935) have quite often been observed with a quadrangular discoidal cell in one or both of the forewings (Ohm 1961, Greve 1967). For this reason it is important to check both wings. However, specimens of these genera differ strikingly in colour and bodyform from the species of *Notochrysa.*

THE SPECIES

Nothochrysa fulviceps (Stephens, 1836)

A single female was captured in a light trap at **VAY** Kristiansand: Bråvann (EIS 2), 17 August 1999 (leg. KB) (Fig. 3 a). Total wingspan 41 mm. The specimen had a white, swampy mass attached to the dorsal side of the abdomen. The locality is a warm, sunexposed housing estate with scattered oak *(Quercus)* and other deciduous trees, as well as some Scotch pine *(Pinus sylvestris)*. The light trap was located close to some oak trees. *N. fulviceps* is recorded from Sweden, Denmark and Britain (Esben-Petersen 1929, Tjeder 1940, Steel 1964), but not from Finland. In Sweden it is recorded from Skåne, Östergötland, Södermanland and Uppland (Tjeder 1940, Hedström 1985). In Denmark it is found scattered all over the country, but seems to be more abundant on the islands than on the mainland (Jutland) (Esben-Petersen 1929). According to Steel (1954), *N. fulviceps* appears to be confined to oak, keeping to the upper branches and is for this reason rarely seen. Mass emergences sometimes occur, and large numbers of specimens may be found under oak trees clinging to grass stems.

Nothochrysa capitata (Fabricius, 1793)

A female was captured in a light-trap at **VAY** Kristiansand: Flekkerøy, Belteviga (EIS 2), 13 July

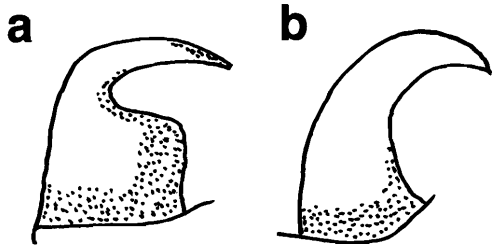

Figure 2. Tarsal claws: **a.** *N. fulviceps;* **b.** *N. capitata.*

1999 (leg. KB) (Fig. 3 b). Later, on 3 August 1999 a male was captured at the same locality (leg. KB). The total wingspan of the female was 31 mm; for the male 33 mm. As for the previous species, the female had a white, swampy mass attached to the dorsal side of the abdomen. The trap was situated at a locality with both heath, mire, forest and a large pond. The area has scattered deciduous trees such as oak *(Quercus)*, aspen *(Populus tremulae)* and different *Salix*-spp. Most dominant is, however, a dry pine forest *(Pinus sylvestris)*, and the light trap was located close to this. *N. capitata* is recorded from Sweden, Denmark and Britain (Esben-Petersen 1929, Tjeder 1940, Steel 1964), but not from Finland. It is only recorded from Skåne in Sweden (Tjeder 1940), but in Denmark it seems «not so rare» on the mainland (Jutland) (Esben-Petersen 1929). *N. capitata* is according to Esben-Petersen (1929) assosiated with conifers, and Steel (1954) mentions in particular Scotch pine *(Pinus sylvestris)* from Britain. Mass emergences take sometimes place under conifers in the same way as for *N. fulviceps*.

RED-LIST CATEGORY

Both species are assosiated with warm coastal forests, a most threatened type of nature in Southern Norway, due to logging and housing estates. For this reason both species should be included in the national red list with the category «declining, care demanding» (DC) or «declining, monitor species» (DM), which are categories in accordance with the revised red list (Direktoratet for Naturforvaltning 1999).

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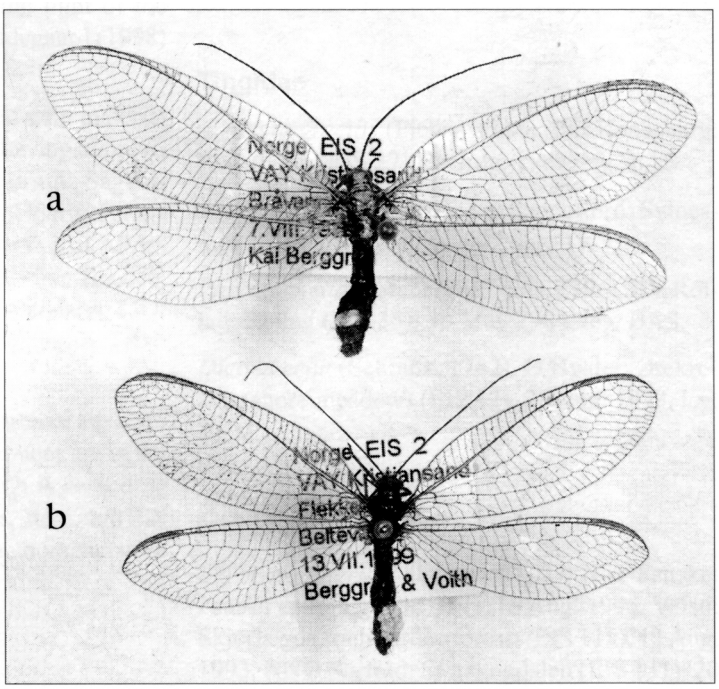

Figure 3. Imago: **a.** *Nothochrysa fulviceps* ♀; **b.** *Nothochrysa capitata* ♀. Photo: Lars Ove Hansen.

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New data on the distribution of Norwegian Hemiptera Heteroptera

Sigmund Hågvar

Hågvar, S. 1999. New data on the distribution of Norwegian Hemiptera Heteroptera. Norw. J. Entomol. 46, 61-65.

Three species of Miridae are reported new to Norway: *Phytocoris reuteri* Saunders, 1875, *Globiceps juniperi* Reuter, 1902, and *Phoenicocoris dissimilis* Reuter, 1878. New data on the distribution in Norway are given for additional 83 species.

Key words: Hemiptera Heteroptera, *Phytocoris reuteri, Globiceps juniperi, Phoenicocoris dissimilis.*

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INTRODUCTION

The first annotated catalogue of the Hemiptera-Heteroptera of Norway (Coulianos 1998) made it possible to add new information in a systematic way. This paper is presented in the light of the additional information given by Ødegaard (1998) and Hansen & Coulianos (1998).

Several collectors have contributed with material to this paper, according to the following abbreviations: ABA: Alf Bakke, BAS: Bjørn A. Sagvolden, FMI: Fred Midtgaard, HPE: Henrik Pettersen, JOD: John O. Dammen, KMY: Kai Myhr, LAB: Liv Anette Bøhle, LOH: Lars Ove Hansen, SEL: Stig E. Lanto, SSV: Svein Svendsen, TJO: Thor Jan Olsen, TKV: Torstein Kvamme, TRN: Tore R. Nielsen.

If no collector name is given, the material has been collected by the author. Most specimens are in the author's collection. The distribution is according to Økland's (1981) revised Strand system, and EIS numbers have also been given. The nomenclature follows Coulianos (1998).

SYSTEMATIC LIST

Saldidae

Saldula opacula (Zetterstedt, 1838). **HEN** Trysil: Stortjern (EIS 64), 20 May 1969.

Tingidae

Acalypta gracilis (Fieber, 1844). **BØ** Kongsberg: Rudsmoen (EIS 27), 20 Aug. 1987, leg. BAS.

A. nigrina (Fallén 1807). **VE** Sandefjord: Svinesmyra (EIS 19), 23 July 1977, leg. TKV.

Physatocheila costata (Fabricius, 1794). **BV** Rollag: Rollag (EIS 35), 30 May 1984, leg. BAS.

Dictyla echii (Schrank, 1782). **Ø** Hvaler: Ørekroken (shore meadow) (EIS 12), 28 Aug. 1979, leg. TKV.

Miridae

Bryocoris pteridis (Fallén, 1807). **NSI** Fauske: Fauske camping (EIS 131), 16 Aug. 1995. Vefsn: Skjørlægda (rich spruce forest) (EIS 115), 12 Aug. 1993. **NNØ** Sørfold: Storskogdalen (EIS 131), 20

Aug. 1991. **TRY** Lyngen: Lyngseidet camping (EIS 163), 11 August 1990.

Monalocoris filicis (Linnaeus, 1758). **NNØ** Sørfold: Storskogdalen (EIS 131), 20 Aug. 1991.

Dicyphus constrictus (Boheman, 1852). **OS** Sør-Fron: Hundorp (Augla canyon) (EIS 62), 17 Aug. 1994. **NSY** Meløy: Glomfjord (EIS 126), 21 Aug. 1991. **NSI** Hattfjelldal: Hattfjelldal, (EIS 116), 15 Aug. 1993.

D. errans (Wolff, 1804). **AK** Oslo: Nordstrand (EIS 28), 1 Nov. 1975. **BØ** Drammen: Underlia (malaise trap) (EIS 28), 1-31 Oct. 1992, leg. LOH.

D. globulifer (Fallén, 1829). **VE** Tjøme: Sandøy (on *Ononis* sp.) (EIS 19), 18 June 1996. **HOY** Lindås: Vollum (*Fagus silvatica* forest) (EIS 39), 16 Aug. 1997. Bømlo: Kalavåg (rich *Corylus avellana* forest) (EIS 22), 13 Aug. 1997.

D. stachydis J. Sahlberg, 1878. **SFI** Sogndal: Barsnes (EIS 51), 23 July 1977.

Deraeocoris scutellaris (Fabricius, 1794). **Ø** Fredrikstad: Gansrød, Øra (EIS 20), 26 June 1995, leg. TJO.

Adelphocoris lineolatus (Goeze, 1778). **VAY** Kristiansand: Torsøya (EIS 2), 19 Aug. 1972.

A. seticornis (Fabricius, 1775). **Ø** Fredrikstad: Øra (EIS 20), 24 July 1993 and 25 July 1995, leg. TJO. Sarpsborg: Grimsøy (EIS 20), July 1994, leg. TJO. Halden: Enningdalen, Kirkebøen (EIS 20), 10 Aug. 1997, leg. TJO.

Calocoris fulvomaculatus (DeGeer, 1773). **MRI** Sunndal: Nerdal (EIS 85), 20 Aug. 1994.

C. sexguttatus (Fabricius, 1777). **NSI** Vefsn: Skjørlægda (rich spruce forest) (EIS 115), 12 Aug. 1993.

Charagochilus gyllenhalii (Fallén, 1807). **OS** Østre Toten: Starum (meadow) (EIS 45), 19 Aug. 1976.

Dichrooscytus intermedius Reuter, 1885. **BØ** Ringerike: Storflåtan (EIS 36), 22 July 1974.

D. rufipennis (Fallén 1807): **BV** Rollag: Gvammen (EIS 35), 10 July 1983, leg. JOD.

Lygocoris lucorum (Meyer-Dür, 1843). **OS** Østre Toten: Bilitt (EIS 45), 16 Aug. 1976.

L. pabulinus (Linnaeus, 1761). **FV** Alta: Alta strand camping (EIS 173), 21 Aug. 1996.

Lygus pratensis (Linnaeus, 1758). **BV** Rollag: Rollag (EIS 35), 4 Sep. 1984, leg. BAS.

L. rugulipennis Poppius, 1911. **FV** Alta: Alta (EIS 173), 18 Aug. 1990.

L. wagneri Remane, 1955. **VAY** Kristiansand: Randesund (EIS 2), 16-18 Aug. 1972 and 9 Aug. 1986.

Orthops campestris (Linnaeus, 1758). **AAI** Bygland: Bygland (EIS 9), 14 July 1976, leg. TRN. **MRY** Molde: Kviltorp camping (EIS 84), 18 Aug. 1994. **NSY** Vega: (vegetation near beach) (EIS 113), 19 Aug. 1993.

Phytocoris dimidiatus Kirschbaum, 1856. **OS** Østre Toten: Starum (on *Sorbus aucuparia*) (EIS 45), 19 Aug. 1976. **BV** Rollag: Rollag (EIS 35), 12 July 1984, leg. BAS.

P. pini Kirschbaum, 1856. **Ø** Fredrikstad: Borge, Borge Varde (EIS 20), 1 Aug. 1991, leg. TJO. Sarpsborg: Råkil, Tune (EIS 20), 15 June 1992, leg. TJO.

P. populi (Linnaeus, 1758). **BV** Rollag: Laugi (EIS 35), 5 July 1992, leg. BAS.

P. reuteri Saunders, 1875. New to Norway. **AK** Oslo: Oslo (EIS 28), 9 Sep. 1974.

P. varipes Boheman, 1852. **Ø** Fredrikstad: Onsøy, Rauøy (EIS 19), 29 Aug. 1978. Sarpsborg: Råkil, Tune (EIS 20), 14 Aug. 1988 and 8 Aug. 1995, leg. TJO. Sarpsborg: Kjerringåsen (EIS 20), 15 Sep. 1996, leg. TJO. Sarpsborg: Sandbakken (EIS 20), 1 Aug. 1997, leg. TJO. Fredrikstad: Borge, Persnes (EIS 20), 10 Aug. 1994, leg. TJO.

Pinalitus cervinus (Herrich-Schaeffer, 1841). **Ø** Sarpsborg: Sandbakken (EIS 20), 20 Oct. 1997, leg. TJO. **SFI** Sogndal: Barsnes (EIS 51), 12 July 1967.

P. rubricatus (Fallén, 1807). **SFI** Sogndal: Barsnes (EIS 51), hatched on *Picea abies* 24 July 1967.

Polymerus unifasciatus (Fabricius, 1794). **NSI**

Beiarn: Arstad (rich *Pinus silvestris* forest on limerich rock) (EIS 126), 13 Aug. 1995.

Stenodema holsata (Fabricius, 1787). **FN** Porsanger: Lakselv (EIS 174), 9 July 1977, leg. TRN. Porsanger: Silfarfossen (EIS 182), 17 Aug. 1996. Porsanger: Stabbursneset (EIS 174), 18 Aug. 1996. Porsanger: Skoganvarre camping (EIS 174), 18 Aug. 1996. Tana: Tana agricultural school (EIS 183), 17 Aug. 1996.

S. trispinosa Reuter, 1904. **TEY** Skien: Børsesjø (EIS 18), 5 June 1973.

Trigonotylus ruficornis (Geoffroy, 1785). **ON** Lesja: Stuguflåten (EIS 78), 18 Aug. 1994. **NSI** Beiarn: Delta of Beiar river, shore meadow (EIS 126), 13 Aug. 1995.

Halticus apterus (Linnaeus, 1761). **Ø** Våler: Våler N (EIS 20), 6 Sep. 1992, leg. TJO.

Strongylocoris leucocephalus (Linnaeus, 1758). **ON** Nord-Fron: Vinstra (malaise trap) (EIS 62), 30 June-6 Aug. 1992, leg. KMY & LOH.

Globiceps juniperi Reuter, 1902. New to Norway. **ON** Nord-Fron: Orvellingen (EIS 62), 15 July 1973.

Mecomma ambulans (Fallén, 1807). **MRI** Sunndal: Nerdal (EIS 85), 20 Aug. 1994.

Chlamydatus pulicarius (Fallén, 1807). **NSY** Vega (vegetation near beach) (EIS 113), 19 Aug. 1993. **FØ** Sør-Varanger: Gjøkåsen (EIS 160), 12 Aug. 1996.

C. saltitans (Fallén, 1807). **AK** Nesodden: Langøyene (EIS 28), 11 Aug. 1984.

Harpocera thoracica (Fallén, 1807). **TEY** Kragerø: Jomfruland (EIS 11), 5 June 1973.

Macrotylus paykullii (Fallén, 1807). **Ø** Fredrikstad: Gansrød, Øra (EIS 20), 21 July 1995, leg. TJO.

Oncotylus punctipes Reuter, 1875. **BV** Rollag: Veggli (EIS 35), 9 July 1992, leg. BAS.

Phoenicocoris obscurellus (Fallén, 1829). **Ø** Skjeberg: Grimsøy, Dusa (EIS 20), 25 June 1993, leg. TJO.

P. dissimilis Reuter, 1878. New to Norway. **BØ** Hole: Retthellseter (EIS 36), 19 July 1974.

Plagiognathus arbustorum (Fabricius, 1794). **MRY** Molde: Kviltorp Camping (EIS 84), 18 Aug. 1994. **MRI** Sunndal: Nerdal (EIS 85), 20 Aug. 1994. **NSY** Vega (EIS 113), 19 Aug. 1993.

Plesiodema pinetella (Zetterstedt, 1828). **AK** Oslo: Nordstrand (EIS 28), 15 June 1974 and 25 June 1977. **ON** Nord-Fron: Furusjøen (EIS 62), 13 July 1973.

Psallus haematodes (Gmelin, 1790). **OS** Østre Toten: Starum (on *Salix*) (EIS 45), 19 Aug. 1976.

P. lepidus Fieber, 1858. **Ø** Sarpsborg: Borgarsyssel (EIS 20), 13 July 1995, leg. TJO.

Nabidae

Nabis flavomarginatus Scholtz, 1847. **NSY** Vega (vegetation near beach) (EIS 113), 19 Aug. 1993.

N. limbatus Dahlbom, 1851. **MRY** Molde: Kviltorp Camping (EIS 84), 18 Aug. 1994.

Anthocoridae

Elatophilus stigmatellus (Zetterstedt, 1838). **FØ** Sør-Varanger: Ellenkoia, Øvre Pasvik National Park (EIS 160), 13 Aug. 1996.

Anthocoris nemoralis (Fabricius, 1794). **MRY** Molde: Kviltorp Camping (EIS 84), 18 Aug. 1994.

Scoloposcelis pulchella (Zetterstedt, 1838). **HES** Sør-Odal: Mårud (EIS 37), 27 June and 24 July 1972, leg. HPE.

Reduviidae

Rhynocoris annulatus (Linnaeus, 1758). **Ø** Aremark: Bøensætra (EIS 21), 20 June 1998, leg. LAB.

Reduvius personatus (Linnaeus, 1758). **Ø** Sarpsborg: Grimsøy (EIS 20), 22 June 1986, leg. TJO. Sarpsborg: Råkil, Tune (EIS 20), 1988, leg. TJO.

Aradidae

Aradus betulae (Linnaeus, 1758). **TEI** Notodden: Lisleherad (burned coniferous forest) (EIS 27), 27 May 1993, leg. ABA.

A. betulinus Fallén, 1829. **HES** Eidskog: Slettemoen (EIS 38), 10 June 1976, leg. TKV.

A. depressus (Fabricius, 1794). **TEI** Notodden: Gransherad (EIS 27), 28 June 1991, leg. SEL.

A. obtectus Vasarhelyi, 1988 [= *pictus* auctt. nec Bärensprung, 1859]. **TEI** Notodden: Gransherad (EIS 27), 28 June 1991, leg. SEL. Notodden: Lisleherad (burned coniferous forest) (EIS 27), 27 May 1993, leg. ABA.

Berytidae

Neides tipularius (Linnaeus, 1758). **Ø** Fredrikstad: Borge,Torsnes (EIS 20), 17 June 1991, leg. TJO.

Lygaeidae

Nysius groenlandicus (Zetterstedt, 1838). **NSI** Hattfjelldal: Hattfjelldal (EIS 116), 15 Aug. 1993. **FV** Alta: Alta (EIS 173), 18 Aug. 1990.

N. thymi (Wolff, 1804). **NSY** Vega (vegetatian near beach) (EIS 113), 19 Aug. 1993.

Kleidocerys resedae (Panzer, 1797). **TEI** Tinn: Håkanes (EIS 26), 4 April 1985, leg. BAS.

Gastrodes abietum Bergroth, 1914. **TEY** Skien (EIS 18), hatched 1 February 1973, leg. HPE.

G. grossipes (DeGeer, 1773). **SFI** Sogndal: Barsnes (EIS 51), 1 July 1980.

Scolopostethus affinis (Schilling, 1829). **BØ** Kongsberg: Hvittingfoss (EIS 19), 30 Jan. 1992, leg. BAS. Kongsberg: Kongsberg city (EIS 27), 7 Feb. 1992, leg. BAS.

S. pictus (Schilling, 1829). **Ø** Sarpsborg: Kvastebyen (EIS 20), 6 June 1993, leg. TJO. Fredrikstad: Gansrød, Øra (EIS 20), 2 May 1995, leg. TJO. **SFI** Sogndal: Barsnes (on shore), (EIS 51), 11 May 1967.

Acompus rufipes (Wolff, 1804). **Ø** Fredrikstad: Gansrød, Øra (EIS 20), 15 June 1995, leg. TJO. **OS** Ringebu: Elstad camping (EIS 63), 16 Aug. 1994.

Peritrechus convivus (Stål, 1858) [= *distinguendus* (Flor, 1860)]. **Ø** Rygge: Sildebauen (under stone, edge of field) (EIS 19), 1 May 1977, leg. TKV.

P. geniculatus (Hahn, 1832). **Ø** Rygge: Sildebauen (under stone on meadow at shore) (EIS 19), 1 May 1977, leg. TKV. Sarpsborg: Tune, Jelsnes (EIS 20), Aug. 1992, leg. TJO. Sarpsborg: Tune, Holleby (EIS 20), 16 June 1993, leg. TJO. Sarpsborg: Blåkollen, Skjeberg (EIS 20), 20 Sep. 1994, leg. TJO. Fredrikstad: Gansrød, Øra (EIS 20), 12 June 1995, leg. TJO. Aremark: Bøensætra (EIS 21), 20 June 1998, leg. TJO.

Trapezonotus arenarius (Linnaeus, 1758). **TEI** Tinn: Håkanes (EIS 26), 4 April 1985, leg. BAS.

T. desertus Seidenstücker, 1951. **TEI** Tinn: Håkanes (EIS 26), 4 April 1985, leg. BAS.

Rhopalidae

Rhopalus maculatus (Fieber, 1837). **BV** Rollag: Rollag (EIS 35), 11 Sep. 1984, leg. BAS.

R. subrufus (Gmelin, 1790). **OS** Nordre Land: Dokka (EIS 45), 7 June 1984, leg. FMI. **SFI** Sogndal: Barsnes (EIS 51), July 1973.

Stictopleurus abutilon (Rossi, 1790). **BV** Rollag: Rollag (EIS 35), 4 Sept. 1984, leg. BAS. **VE** Våle: Langøya (EIS 19), 16 May 1990, leg. LOH.

Scutelleridae

Eurygaster testudinaria (Geoffroy, 1785). **Ø** Hvaler: Bølingshamn (swamp near shore) (EIS 12), 30 July 1980, leg. TKV. Sarpsborg: Tune (EIS 20), 7 Sep. 1996, leg. TJO.

Pentatomidae

Neottiglossa pusilla (Gmelin, 1789). **TEI** Tinn: Håkanes (EIS 26), 4 April 1985. leg. BAS.

Stagonomus pusillus (Herrich-Schaeffer, 1830).

VE Larvik: Roppestad (EIS 19), 9 June 1984, leg. BAS.

Holcostethus vernalis (Wolff, 1804). **BV** Rollag: Rollag (EIS 35), 12 July 1984, leg. BAS.

Troilus luridus (Fabricius, 1775). **BØ** Drammen: Underlia (EIS 28), 6 Nov. 1991, leg. LOH.

Zicrona caerulea (Linnaeus, 1758). **AAI** Evje og Hornnes: Evje (EIS 5), 30 May 1977, leg. SSV.

Acanthosomatidae

Elasmostethus interstinctus (Linnaeus, 1758). **ON** Nord-Fron: Vinstra (EIS 62), 1-25 May and 25 May-30 June 1992 (malaise trap), leg. KMY & LOH.

Elasmucha fieberi Jakovlev, 1864. **Ø** Fredrikstad: Nes i Torsnes (EIS 20), 5 April 1992, leg. TJO. **ON** Nord-Fron: Vinstra (EIS 62), 1-25 May (malaise trap), leg. KMY & LOH.

REMARKS TO SPECIES NEW TO NORWAY

Phytocoris reuteri. The species is known from both Denmark and Sweden, on deciduous trees (Gaun 1974).

Globiceps juniperi. One typical female together with three males were found on *Betula nana*, 900 m above sea level. Heiss (1988) showed that *G. woodroffei* Wagner, 1960 should be regarded as a synonym of *G. juniperi,* and that *G. juniperi* can be separated from *G. salicicola* Reuter, 1883 only by the females. The head of the present female suites the description of *G. juniperi* in Heiss (1988), and the simultaneously collected males probably belong to the same species. Gaun (1974) mentions records of the synonymous *woodroffei* from different plants, including *Betula*, in England and Scotland. As far as these records are based on females, they belong to *G. juniperi*. A doubtful female is mentioned from Denmark . The original descriprion of *G. juniperi* was from Austria (Heiss 1988). The species may thus turn out to be widespread in Europe.

Phoenicocoris dissimilis. From the nordic countries, the species has been recorded on coniferous trees in Denmark (Gaun 1974).

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Moth flies (Diptera, Psychodidae) from the Faroes

Trond Andersen

Andersen, T. 1999. Moth flies (Diptera, Psychodidae) from the Faroes. Norw. J. Entomol. 46, 66.

Two species of Psychodidae, *Pericoma pseudoexquisita* Tonnoir, 1940 and *Psychoda grisescens* Tonnoir, 1922, were taken in light traps and Malaise tents on Streymoy, the Faroes, in 1990.

Key words: *Pericoma pseudoexquisita, Psychoda grisescens,* Psychodidae, the Faroes.

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In 1990 insects were trapped with light traps and Malaise tents at four localities on Streymoy, the largest of the Faroe Islands (Andersen et al. 1992). In the catches a few specimens of two Psychodidae species were present. One male of *Pericoma pseudoexquisita* Tonnoir, 1940 was taken in a light trap at Stidin, 24-31 July 1990. Three males and one female of *Psychoda grisescens* Tonnoir, 1922 were taken in the same ligt trap at Stidin 15-24 July 1990, while three males were taken in a Malaise tent at Kaldbak, 17-22 July 1990.

Moth flies are apparently not previously recorded from the Faroes. The Danish species are treated by Nielsen (1961, 1964). *Pericoma pseudoexquisita* is not recorded from Denmark. According to Wagner (1990) the species is distributed in southern and central parts of Europe north to Germany, Belgium and the British Isles. *Psychoda grisescens* is distributed in most parts of Europe and in North Africa (Wagner 1990).

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Invasive beetle species (Coleoptera) associated with compost heaps in the Nordic countries

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Extensive changes in the species composition of beetles in compost heaps have taken place in the Nordic countries during the 20th century. In this period, a total of 34 alien beetle species have established populations in at least two of the countries (Norway, Sweden, Denmark, and Finland). A short review of each species' immigration history is given. The possible methods for dispersal of the species, the reasons for their successful establishment in the Nordic countries and possible effects of native species are discussed. The following seven rove beetle species (Coleoptera, Staphylinidae) are reported for the first time in Norway; *Coproporus colchicus* Kraatz, 1858, *Acrotona parens* (Mulsant & Rey, 1852), *Acrotona pseudotenera* (Cameron, 1933), *Falagrioma concinna* (Erichson, 1839), *Bohemiellina flavipennis* (Cameron, 1920), *Trichiusa immigrata* Lohse, 1984, *Heterothops stiglundbergi* Israelson, 1979.

Key words: alien species, Coleoptera, compost heaps, invasive species, Staphylinidae.

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INTRODUCTION

Compost heaps are accumulations of dead organic material most commonly of plant origin. There are huge variations in material composition, size and distribution of compost heaps that offer varied habitats suitable for insects. Thus, more than 250 species of beetles can be found in one single compost heap (Lundberg & Persson 1973, Baranowski 1978, Palm 1979).

During the 20th century, compost heaps in Northern Europe have been successively invaded by new beetle species originating away from the region (e.g. Horion 1949, Hansen 1952, Strand 1955b, Lundberg & Persson 1973, Hammond 1974, Ødegaard & Tømmerås in press). The information on the occurrence of these beetle species in the Nordic countries is mostly fragmentary, and many new species have established populations in the region the last two decades. Therefore, the aim of this paper is to review and summarise the information on the immigration history and the present state of these beetle species. The data also serves as basic information that can stimulate to further work on the many unsolved ecological questions that arise with this topic.

MATERIAL AND METHODS

Due to the increase in published records during the 20th century and the greater number of entomological collections, the changes in the status of Nordic beetle species in recent times are rather well documented. The species considered in this survey are selected on the basis of information in entomological journals, catalogues, and collections established during the 20th century. Often the immigrant status of a species is supported by literature from other European countries as well. At present, the listed species in this survey have compost heaps as their primary habitat. They are successful invaders, which have established populations in at least two of the four Nordic countries: Norway, Sweden, Denmark, or Finland. Generally, there are no records of the species prior to 1900.

However, some extremely successful colonists of the last part of the 19th century are included in the survey.

Localities and collection reports are given for species being new to Norway and species where new northern limits in Norway are found. Specifications and abbreviations of Norwegian localities follow Økland (1981). Other abbreviations: FØD=Frode Ødegaard, POT=Preben Ottesen, SLI=Sindre Ligaard. The nomenclature follows Lundberg (1995), and the family and subfamily rankings are presented according to Lawrence and Newton (1995).

THE SPECIES

Carabidae

Porotachys bisulcatus (Nicolai, 1822)

A species originally associated with coniferous forest. Today, however, it is only found at sawmills in heaps of damp, fermenting spruce bark, where development is undertaken (Palm 1938, Lindroth 1985). The species has expanded from east to west in the Nordic countries and at present the species is known from most provinces in Denmark and Sweden (Lundberg 1995, M. Hansen 1996). In Norway, most records come from SE parts of the country (Lindroth 1986) and northernmost from **NTI** Lierne, Eidesvika (Nikolaysen & Nordtug 1980, Hanssen 1985). It is not known if the species has been present, although rarely, in natural habitats in this region before the expansion.

Perigona nigriceps (Dejean, 1831).

A species, probably originating from southern Asia, already known in western Europe by the 19th century (Lindroth 1986). In the period from 1948 to 1961, *P. nigriceps* established populations in all the Nordic countries (V. Hansen 1952, Strand 1965, Lindroth 1986). Today, the species is widespread in warm compost in Sweden and Denmark (Lundberg 1995, M. Hansen 1996). From Norway there are new provincial records from the following localities: **VAY** Kristiansand: Hamresanden (EIS 2), 19 June 1989 (leg. & coll. FØD). One individual sifted from grass compost; **OS** Ringebu: Ringebu (EIS 63), 2 June 1998 (leg. & coll. FØD). Three individuals sifted from bark compost; **STI** Trondheim: Ringve Botanical Garden (EIS 92), 25 Aug. 1997 and 27 Sept. 1997 (leg. & coll. FØD). Several individuals sifted from warm grass compost. The records from Trondheim represent the northern limit of this species in Norway.

Hydrophilidae

Cercyon laminatus Sharp, 1873

This is a recent immigrant that originates from Japan. It has spread rapidly towards the west during the 1950s, and the first European report on this species is from Germany 1956. Thereafter, the species was found consecutively in Italy 1958, Finland 1959, Sweden 1959, and Denmark 1960 (Gønget 1961). The species has not been reported from Norway. Due to few records in recent years, it is somewhat unclear if the species still disperses (M. Hansen 1987). In Sweden, *C. laminatus* is only known in Skåne, Gotland, and Norrbotten (Lundberg 1995). The species is a very active flyer, frequently caught on black light (Gønget 1961). The natural habitat of the species is plant debris (M. Hansen 1987). In Sweden, it is found in cow dung and manure heaps (Lundberg & Persson 1973).

Cryptopleurum subtile Sharp, 1884

Discovered in Germany in 1959 as new to the European fauna (Strand 1964). Further checking of material showed that the species appeared in Norway and Sweden by 1953 and in Denmark in 1962. *C. subtile* spread rapidly throughout Europe. In the early 1960s it already was distributed widely, and today it is common in composts throughout the Nordic countries (Strand 1964, Lundberg 1969). A new northern limit of the species in Norway is reported; **STI** Trondheim: Ringve Botanical Garden (EIS 92), 27 Sept. 1997 (leg. & coll. FØD). Several individuals sifted from a warm grass-compost. The species originates from Japan (M. Hansen 1987).

Histeridae

Carcinops pumilo (Erichson, 1834)

This cosmopolitan species is known in Denmark since the 19th century (Grill 1895), but only from indoor habitats. The species was found in a compost heap nearby Oslo, Norway in 1932 (Münster 1933). Contemporary records are reported from the other Nordic countries (Hellén 1939). The species is now established in all 4 countries and common especially in warm types of compost. A new northern limit of the species in Norway is reported; **STI** Trondheim: Ringve Botanical Garden (EIS 92), 27 Sept. 1997 (leg. & coll. FØD). Several individuals sifted from a warm grass-compost.

Ptiliidae

Baeocrara japonica (Matthews, 1884)

First recorded as new to the European fauna in Finland 1974 (Rutanen & Mouna 1977). During a period of 18 years the species spread to all the Nordic countries (Lundberg 1978, Palm 1979, Ødegaard 1992, M. Hansen et al. 1993). Prior to 1974, this species was only known in Japan and the Philippines (Rutanen & Muona 1977), indicating that the species has undergone a rapid dispersal from east to west. A new northern limit of the species in Norway is reported; **STI** Trondheim: Ringve Botanical Garden (EIS 92), 14 Sept. 1998 (leg. & coll. FØD). One female sifted from a warm grass-compost.

Acrotrichis insularis Mäklin, 1852

First reported in Europe from Norway in 1965 (Sundt 1968), and from England in 1966 (Johnson 1966). Later, the species was found in Sweden and Finland (Gillerfors 1973, Rutanen 1982). The species is probably parthenogenetic, and it is very general in its habitat use. *A. insularis* has undergone an extreme expansion in Europe, and together with *A. intermedia,* it is now the most common and widespread Ptiliidae-species in the Nordic countries (Pritzel & Mahler 1980). The species is native to North-America.

Staphylinidae

Hapalaraea puberula (Bernhauer, 1903)

Reported for the first time in the Nordic countries from Gotland (Sweden) in 1929 (Palm 1940), and some years later found both in Denmark and Norway (Strand 1937). The first individuals were found close to seaport towns (Palm 1940), indicating that the species was introduced by man. *H. puberula* is native to southern Europe, and at present it is well established and common in all the Nordic countries.

Omalium rugatum Mulsant & Rey, 1880

The expansion of this species is somewhat difficult to follow historically, due to taxonomic confusion with *O. caesum* (Strand 1960). However, since before the species was considered as valid (Lohse 1960), it seems like this species has spread significantly from southern Europe to the Nordic countries (Strand 1960, 1965). This is a typical invasive species, like *Acrotrichis insularis*, which is very common and widespread in many types of natural habitats throughout the Nordic countries.

Coproporus colchicus Kraatz, 1858

The first European record is from Norway; **AK** Bærum: Fossum Bruk (EIS 28), 28 July 1992 (leg. & coll. FØD & SLI). Several individuals were sifted from a warm bark compost heap together with other species typical to bark-compost (e.g. *Perigona nigriceps, Carpophilus hemipterus, Falagrioma concinna, Silvanus bidentatus, Cartodere constricta, Acrotona parens*). Recently, *C. colchicus* is also recorded in Sweden (Lundberg & Petterson 1997). The species has probably invaded the region very recently, and probably the species will spread further to similar habitats elsewhere throughout Europe.

Acrotona parens (Mulsant & Rey, 1852)

This species was first identified in the Nordic countries from Gotska Sandön, Sweden, in 1967 (Lundberg 1972). The first Danish records were from 1978 and 1979 (Bangsholdt 1981), while the first

Finnish specimens were found in 1983 (Rutanen 1985). In Norway, there are new records from **AK** Oslo: Sørkedalen (EIS 28), 11 May 1994 and 29 May 1998 (leg. & coll. FØD). Several individuals caught in by car netting; **AK** Bærum: Fossum Bruk (EIS 28), 13 May 1994 and 29 May 1998 (leg. & coll. FØD). Several individuals sifted from warm bark-compost. This thermophilic species is still in expansion. By 1995, it was recorded as far northwards as Värmland in Sweden (Lundberg 1995). The species is not restricted to compost heaps, but seems to be rather eurytopic in warm habitats like rodent nests (Koch 1989).

Acrotona pseudotenera (Cameron, 1933)

A very recent invader from the Far East. The species is described from Japan, and the first European records were from Finland in 1988 (Muona 1993). Subsequently, the species was reported from several localities in Denmark and Sweden (M. Hansen et al. 1994, Gillerfors 1995). The species is now also recorded from Norway; **TEI** Seljord: Vefall (EIS 17), 6 Sept. 1998 (leg. & coll. FØD). Four specimens sifted from decaying hay. It is most commonly found in grass and hay composts.

Atheta coriaria (Kraatz, 1856)

This is one of the most common *Atheta* species in the Mediterranean area (Palm 1970). The species probably started its expansion northwards in the beginning of the 20th century. The first Norwegian record dates from 1919 (Münster 1921), while the first Danish specimens probably were collected somewhat later (V. Hansen 1952). The species was found in Sweden around 1940 (Palm 1970), and in Finland the species was established in 1960 (Lindroth 1960). Today, the species is rather common in different kinds of compost heaps in all the Nordic countries. A new northern limit of the species in Norway is reported; **STI** Trondheim: Ringve Botanical Garden (EIS 92), 25 Aug. 1997 (leg. & coll. FØD). Several individuals sifted from a warm grass-compost.

Atheta triangulus (Kraatz, 1856)

This was originally a seashore species distributed in southern Europe, but today it is found under very different conditions (V. Hansen 1952) also in compost heaps (Palm 1970).

The first Nordic specimen was recorded in 1921 in Åbenrå in Denmark (V. Hansen 1952). Later, in 1930, the species was found in three different localities in Skåne, Sweden (Palm 1970), and now it is distributed north to Västerbotn (Lundberg 1995). The species still has not been recorded in Norway. The northward expansion of this species is probably due to the shift in habitat exploitation.

Falagrioma concinna (Erichson, 1839)

A cosmopolitan species, typical to warm compost heaps. The species dispersed in Germany during the 1970s (Bangsholdt 1981) and the first record from the Nordic countries was from Norrbotten in Sweden in 1970 (Lundberg 1972). Later, in 1979, *F. concinna* was recorded from Denmark (Bangsholdt 1981). The first Norwegian record dates from 1986 at **AK** Oslo: Fossum Bruk (EIS 28) (leg. & coll. POT). The species was abundant at the same locality on 28 July 1992 (leg. & coll. FØD) where it was sifted from warm bark compost. Today, the species seems to be scattered distributed throughout the Nordic countries where it is confined to warm bark-composts.

Thecturota marchii (Dodero, 1922)

This species was described in 1922 from specimens collected in Genova in 1920. Later on, it was recorded in many European countries. The first Nordic specimens were recorded from Norway in 1945 (Strand 1945), and it is now found in all the Nordic countries (Lundberg 1995). The species has not been collected in Norway since 1950 and the distribution in Sweden and Denmark seems to be very scattered (Lundberg 1995, M. Hansen 1996).

Bohemiellina flavipennis (Cameron, 1920)

This is one of the species of exotic origin, which was described subsequent of its arrival to Europe.

Therefore, its origin is hard to prove. The species was recorded in Denmark, Sweden and Finland during the 1940s (V. Hansen 1952, Jansson 1952). However, the first Norwegian record was done recently at **STI** Trondheim: Ringve Botanical Garden (EIS 92), 25 Aug. 1997 and 14 Sept. 1998 (leg. & coll. FØD). The species was sifted in large numbers from a warm grass-compost. In general, the species seems to be rare everywhere (Palm 1968), although several new records during the last decades indicate that the species is still well established in the Nordic countries (Lundberg 1972, M. Hansen 1996).

Trichiusa immigrata Lohse, 1984

This is one of the most recent colonists to Europe, probably originating from North America. The first European specimens were introduced to Berlin in 1975 (Lohse & Lucht 1989). The species dispersed rapidly to almost the whole of central and northern Europe. The first Nordic specimens were reported from Rosenfelt (Denmark) 8-10 June 1992 (M. Hansen et al. 1993) and from Öland (Sweden) 8 Sept.1992 (Andersson 1993). The first Norwegian specimens appeared at **STI** Trondheim: Ringve Botanical Garden (EIS 92), 25 Aug. 1997, 27 Sept. 1997 and 14 Sept. 1998 (leg. & coll. FØD). Several individuals were sifted from a warm grass-compost. Also found under fox faeces in a fox farm at **STI** Trondheim: Jakobsli (EIS 92), 5 July 1999 (1 individual) and 21 Sept. 1999 (2 individuals) (leg. & coll. FØD). As far as I know, the species has still not been recorded in Finland. The species prefers warm types of compost.

Oligota parva Kraatz, 1862

A species probably introduced with goods from South America in late 19th century. In the Nordic countries, the first records were from 1907 in Denmark (Odense), 1932 in Norway (Oslo), 1945 in Finland (Joutseno), and 1950 in Sweden (Alnarp) (Palm 1968). The species is typically found in warm grass-compost heaps, and seems to be well established in the region. The species has dispersed to most parts of Denmark (M. Hansen 1996), and up to Lycksele Lappmark in Sweden (Lundberg 1995). In Norway, the species is fairly common in the SE and a new Norwegian northern limit of the species is reported from **STI** Trondheim: Ringve Botanical Garden (EIS 92), 25 Aug. 1997 (leg. & coll. FØD). Several individuals sifted from a warm grass-compost.

Oxytelus migrator Fauvel, 1904

A recent invader from the eastern and southern Asia, which appeared in Finland in 1975 (Dahlgren 1980) as new to the European fauna. Subsequently, the species was reported from Germany in 1977 (Lohse 1978), and from Sweden and Denmark in 1978 (Dahlgren 1980, Mahler & Pritzel 1980). The species has not been found yet in Norway, which probably relates to the fact that the species only has reached the SE parts of Sweden where only few records exist during the last decade (S. Lundberg pers. comm.). The species is most frequently found in compost heaps containing kitchen garbage e.g. rotten fruit and vegetables, but also in compost mixed with dung (Palm & Lundberg 1993).

Gabronthus thermarum (Aubé, 1850)

Grill (1895) mentions this species as introduced to Denmark from the south. It was established in all the Nordic countries during the 1930s (Münster 1932, Palm 1941). *G. thermarum* is known as a cosmopolitan species with uncertain origin. The first European records are from Paris in 1850 and from Berlin in 1851 (Horion 1949). It seems like the expansion of this species has ceased, and today it is not common in the Nordic part of the distribution area, although there are some new records.

Philonthus rectangulus Sharp, 1874

A species native to China and Japan and first found in Europe in Italy in 1927 (Horion 1949). The species expanded rapidly to all the Nordic countries (V. Hansen 1952, Strand 1955b, Palm 1963), and it is now widely distributed in all types of compost heaps throughout the region. This is a very successful invader that is distributed throughout

the Palaearctic region and in North-America (Palm 1963). There is a possibility that this species has been introduced with prisoners of war returning to Europe after world war one (Palm 1949a).

Philonthus parcus Sharp, 1874

In the beginning of the 1960s the first European specimens were found in Sweden, Norway and England (Lundberg 1966, Strand 1967). Later, it was also recorded in Denmark and Finland (V. Hansen 1972a, Ranta 1980). The species is described from Japan. Today, the species is fairly common in all four countries. A new northern limit of the species in Norway is reported; **STI** Røros: Småsætran (EIS 81), 17 July. 1987 (leg. & coll. FØD). One female caught in flight. Generally, *Ph. parcus* prefers compost mixed with manure.

Heterothops stiglundbergi Israelson, 1979

Described after one specimen collected in Sweden 1976. More specimens were reported in Germany and Sweden at the same time (Israelson 1979). However, the first Nordic record was probably from Denmark in 1963 (M. Hansen et al. 1994). The species is also recorded in Finland (Rutanen 1984), and one specimen was found in Norway recently; **AK** Oslo: Sørkedalen (EIS 28), 11 May 1994 leg. & coll. FØD. One individual caught by car netting. The origin of *H. stiglundbergi* is unknown. According to Mahler (1987), the habitat is straw and horse dung. The species is not very common, and the northern limit has not expanded beyond Akershus county in Norway.

Lithocharis nigriceps Kraatz, 1859

A species native to Asia, which has shown an extreme dispersal in Europe since the first record from Finland 1938 (Kangas 1953). It reached Germany and Austria in 1943 (Scheerpelz 1944, Horion 1949), Denmark in 1947 (V. Hansen 1952), Sweden in 1949 (Palm 1949b), and Norway in 1950 (Strand 1955b). Today, the species is very common in warm compost heaps throughout Europe. This species seems to substitute the congeneric species *L. ochracea* (Kangas 1953). A new northern limit of the species in Norway is reported; **STI** Trondheim: Ringve Botanical Garden (EIS 92), 14 Sept. 1998 (leg. & coll. FØD). Several individuals sifted from a warm grass-compost.

Scarabaeidae

Oryctes nasicornis (Linnaeus, 1758)

This peculiar species is native to the Mediterranean area, where it develops in decaying wood. The species has gone through an ecological change, which seems to be concurrent with its spread to the north. The first Nordic record of this species probably comes from Norway; **STI** Trondheim: Kalvskinnet, one specimen found in a garden around 1870 (leg. V. Storm) (Lysholm 1924). This material, however, does not exist and the species has never since been reported from Trondheim. Storm's specimen, thus, probably represents an accidentally introduced individual. *O. nasicornis* has been present in Sweden since 1888 (Grill 1889), and in Denmark since the same time period (Horion 1949). In Norway, the species was noted nearby Oslo in 1905, and the species first occurred nearby Helsinki, Finland in 1919 (Horion 1949). In the Nordic countries the species is rather common especially in sawdust, but also in different kinds of compost, in the lowlands of the southern parts of the region. The species is known northwards to Norrbotten in Sweden (Lundberg 1995), whereas in Norway it is only found in SE parts of the country today.

Nitidulidae

Carpophilus marginellus Motschulsky, 1858

This species, native to SE Asia, has dispersed to Europe and America during this century. In Europe this species was first only known as an indoor species, but it has probably undergone an extension of habitat range (Hammond 1974). In the Nordic countries *C. marginellus* first appeared in Oslo in 1960 (Strand 1961). The species seems to be established outdoors in Denmark and most southern districts of Norway, and Finland (Manerkoski & Ferrer 1992, M. Hansen 1996). In Sweden, the species is known virtually from the whole

country at present (S. Lundberg pers. comm.).

Silvanidae

Ahasverus advena (Waltl, 1834)

Originally a typical cosmopolitan indoor species associated with e.g. stored grain products. During the 1970s there were several reports that the species was established in compost heaps in Sweden and Denmark (Lundberg & Persson 1973, Bangsholdt 1975, Palm 1979). The species has also been naturalised in Finland (Silfverberg 1992). In Norway, there are still only indoor records of the species.

Silvanus bidentatus (Fabricius, 1792)

A species native to the region that is originally found under bark of coniferous tree species and *Quercus* (Palm 1959), but also under bark of *Betula* and *Populus* (Lundberg 1969). Today, the species also is common in bark compost. It seems like this species still is found in its natural habitats in spite of its expansion due to habitat change. In Denmark, the species originally was found purely synanthropic (V. Hansen 1964), but it is now also found under bark (V. Hansen 1972b). In Norway, the speçies is recorded northwards to **NTI** Lierne: Eidesvika og Storbekken (Zachariassen 1990).

Cryptophagidae

Atomaria lewisi Reitter, 1877

This species, originating from several areas in eastern Asia, has shown an extreme dispersal subsequent to its arrival in Europe (London) in 1937. The species established populations in the Nordic countries during the 1950s (Strand 1955a), and eventually, it has become one of the most common beetle species in different kinds of compost heaps in the Nordic countries.

Corticariidae

Cartodere nodifer (Westwood, 1839)

Although this species almost reached the height of its expansion during the 19th century, I want to include it in this survey, because of the importance of the species as an extremely successful invader. The species originates from Australia and New Zealand, and it was described after the first European specimens were recorded in England in 1839 (Horion 1949). The species spread rapidly throughout the world, and today, it is distributed practically everywhere in compost and other decaying material. In Sweden and Denmark the species was established during the last part of the 19th century (Grill 1895), while the first Norwegian record was in 1905 followed by a rapid establishment of the species along the Norwegian coastal districts (Helliesen 1910, Münster 1927).

Cartodere constricta (Gyllenhal, 1827)

This species is originally native to the region and an inhabitant of coniferous forests where it used to be associated with fungi under bark and in sprigs of spruce (V. Hansen 1951). This description resembles Gyllenhal's original interpretation of the ecology of the species (Jansson 1952). However, Reitter (1911) mentions this species existing in decaying hay and grass, indicating that a switch in preferences had taken place in Germany at that time. Jansson (1952) reports the first mass occurrences in synanthropic habitats from Sweden in 1951. Today, the species is commonly distributed in all Nordic countries in different kinds of mould-fungi in compost heaps and indoor. S. Lundberg (pers. comm.) confirms that the species also is rather common in its original habitats in Sweden.

Tenebrionidae

Alphitophagus bifasciatus (Say, 1823)

A species, originating from America, having for a long time been known as a cosmopolitan indoor species, found mostly in grain stores (Hammond 1974). Lindroth (1933) reports the species as being introduced to Stockholm. In recent years in England, this species has become more frequent in outdoor situations such as in compost, but also under fungus infected bark (Hammond 1974). The species probably acclimatized in Sweden around

1950 (Palm 1953). In Denmark and Finland, the species was established in 1960 (Lindroth 1960), whereas the first Norwegian specimens were found as late as in 1984 (L.O. Hansen et al. 1998).

Cynaeus opacus Champion, 1886

Under natural conditions, *Cynaeus* species live under decaying desert plants in Mexico. *C. opacus* is often confused with the closely related *C. angustus*, which has spread rapidly throughout USA and southern Canada after 1924 (Mannerkoski & Ferrer 1992). The range expansion of these species is probably a result of a habitat switch to stored products. The first European records of *C. opacus* were from Finland in the period from 1989 to 1991. Here, the species was found at three separate localities; in seed compost, in old hay, and in a dumping area of plastic sacks containing dried waste sludge, respectively (Mannerkoski & Ferrer 1992). In 1993, the species was recorded in seed compost in Sweden (Lundberg 1996).

DISCUSSION

The beetle fauna of the Nordic countries is far from completely investigated (Ottesen 1993, Lundberg 1995, M. Hansen 1996). However, there is no reason to believe that the species listed in this survey have been overlooked by former collectors. Contemporary records from several different countries, and the large abundance of many of the species today, serves as strong evidence for a hypothesis proposing that the species have invaded the areas in recent times (V. Hansen 1952). In addition, compost species are easy to detect and the collecting activity in the Nordic countries has been fairly high in the actual period.

The origin of some species is often hard to tell because many species are described after their arrival in Europe. However, for those invaders where the area of origin is documented, many species originate from the SE Asia. Species from distant continents undoubtedly rely on human assisted transport (Hammond 1974). Many of the species also have good abilities to disperse naturally, either by actively directed flight or as passive wind drift material (Strand 1955b). Thus, natural dispersal is probably important too, at least at the local scale, for instance within a country.

The increase in distribution and diversity of man-made habitats in agriculture practise and land-use (Lodge 1993) is perhaps also an important factor that affects the probability for invasions of alien species in these habitat types. The distribution of compost heaps is patchy throughout the landscape, and the distribution patterns of the specific beetle populations, therefore, are expected to occur in metapopulation structures according to Gilpin & Hanski (1991). Thus, species richness should be higher in large heaps with a high degree of continuity, and species richness should be affected by the average distance between heaps. Areas where heaps are densely distributed are expected to have more species than areas with a scattered distribution of heaps. Accordingly, the success of the beetles in compost heaps could be a result of the combination between increased human transport rates and a wider extent of suitable habitats. These hypotheses, however, remain to be tested. Other prerequisites of many invading species, such as small body-size, high reproduction potential and large size of original distribution area could also be important for a successful establishment in new areas (Strand 1955b, Lawton & Brown 1986, Crawley 1987, Pimm 1991).

Another untested, but interesting, hypothesis is that compost heaps are predisposed habitats for accumulating species due to the thermal stability of the habitats. As a result of fermentation processes, large compost heaps may stay warm throughout the cold season. Beetle species preferring warm compost, therefore, probably do not suffer from chilling injuries during the Nordic winter despite that the temperature tolerances of most of the species are adapted to a warmer climate.

Despite that as many as 34 alien species has invaded compost heaps in the Nordic countries during the 20th century, very few native species seem to have declined or disappeared. The only example that is often cited in the literature is the decline of *Lithocharis ochracea,* explained as a result of the success of the closely related *L. nigriceps* (e.g. Kangas 1953). Introductions of species

into man-made habitats are often successful, probably due to a high degree of disturbance and young age of the habitat (Connell 1978, Huston 1979), which is different from introductions into undisturbed, old habitats that often fail (Simberloff 1981, Herbold & Moyle 1986, Huston 1994). Some of the listed species have naturalised in habitats others than compost heaps (Ødegaard & Tømmerås in press). Mould feeding species such as *Atomaria lewisi* and *Cartodere nodifer* have become extremely successful in natural conditions. In the same way, *Acrotrichis insularis* and *Omalium rugatum* have become very common throughout the region during the last two decades, and they are found in a variety of natural habitats. *Philonthus rectangulus* is occasionally found in natural habitats, for example in rein deer droppings, and once under bark of Norway spruce *(Picea abies)* (Horion 1949, Strand 1955b). Ødegaard and Tømmerås (in press) has shown that the species associated with bark compost and generalist compost species establish away from compost heaps more successfully than other groups of compost beetles. It is not known to what extent these invasive species have exerted any effect of native beetle communities.

The accumulation of species in compost-heaps in the Nordic countries probably has been a continuing process, since the time of the first agriculture-based settlements after the end of the last glaciation until today (Hammond 1974). Some 80 species of beetles have entered the British Isles as a result of human accumulation of plant material before the 18th century (Hammond 1974). Accordingly, many of those species, which we interpret as native compost inhabitants, probably are invaders of the last 500 years. As human transport and trade between continents continues at high rates and as long as compost habitats remain common and frequently distributed in the region, there is no reason to expect that the immigration of new beetle species associated with compost material will stop. Rather, the compost fauna is expected to possess considerable changes in species composition also in the future.

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Tanytarsus mancospinosus sp. n. (Diptera: Chironomidae) from eutrophic lakes in Europe

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Ekrem, T., Reiss, F. & Langton, P.H. 1999. *Tanytarsus mancospinosus* sp. n. (Diptera: Chironomidae) from eutrophic lakes in Europe. Norw. J. Entomol. 46, 79-87.

Tanytarsus mancospinosus sp. n. is described as male, pupa and larva. It is placed in the *T. mendax*-species group based on the morphology of the pupal exuviae and the male hypopygium. The length of the styli of Lauterborn organs is suggested as a possible diagnostic character for larvae in the *T. mendax* group. The species is found in eutrophic ponds and lakes at two localities in Europe (Denmark and Germany) where it coexists with several other *Tanytarsus* species. It occurs in quite high numbers during its main emergence period, and could be an important food source for fish in productive lakes and ponds.

Key words: Chironomidae, *Tanytarsus*, taxonomy, new species

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INTRODUCTION

Tanytarsus v. d. Wulp, 1874 is one of the most species-rich genera of the family Chironomidae, with at least 85 species described from the Holarctic region (Cranston et al. 1989). Reiss & Fittkau (1971) placed the European *Tanytarsus* species into species-groups based solely on adult male characters. Their suggestions were adopted by Cranston et al. (1989) in the key to the adult males of Holarctic Chironominae, but the *holochlorus*-group was renamed the *mendax*-group as *Tanytarsus holochlorus* sensu Reiss & Fittkau proved to be a synonym of *T. mendax* Kieffer. Other authors have later suggested different, similar, regional species groups for Australia and Japan (Glover 1973; Sasa & Kikuchi 1995) without adopting the ideas of Reiss & Fittkau (1971). Their groups do therefore not correspond to the established Holarctic species groups. The new species described here possesses the diagnostic characters of the *T. mendax*-species group both in the male adult and pupal stage. It is found mainly in eutrophic lakes (Lindegaard & Brodersen 1999), but is also recorded from a more mesotrophic part of Chiemsee, Bavaria (Reiff 1994). Where records have been made, the species shows high abundance at emergence maxima (Reiff 1994; Lindegaard and Brodersen 1999), and it is quite probable that the immatures are a valuable food source for fish and invertebrates in eutrophic lakes in Europe.

During the work of describing this new species, the second author sadly passed away. Friedrich Reiss was not only a highly respected scientist, but also a good friend. The first author had many helpful, interesting and amusing conversations

with him in ZSM over the last two years. These highly appreciated talks and discussions will as well as his high knowledge in the field of chironomid research, be greatly missed!

MATERIAL, METHODS AND MORPHOLOGY

The terminology follows Sæther (1980) with the additions and corrections given by Sæther (1990) and Langton (1991), «PCu» is used as an abbreviation for postcubitus. The term «taeniae» (Langton 1994) is used for the lamelliform setae (LS) of the pupal abdomen. Measurements are taken according to Schlee (1966) with the additions given by Ekrem (1999). All specimens are mounted in Euparal.

Tanytarsus mancospinosus Ekrem & Reiss sp. n.

Tanytarsus Pe 21 Langton, 1991
Tanytarsus Pe 21 Reiff, 1994
Tanytarsus sp. A. Lindegaard and Brodersen, 1999

Etymology. «*mancospinosus*» from Latin meaning «missing spines», referring to the missing spine patches of pupal tergite VI.

Type material: Holotype 1 single reared ♂ Germany, Bavaria, Munich, Nymphenburger Park, Kleiner See, 24.-30.VII.1999, leg. T. Ekrem, ZMBN No. 351; paratypes: 2 single reared ♀♀ as holotype but collected 13.-14.VII.1999 and 24.VII.-6.VIII.1999; 4 ♂♂ as holotype but collected 3.VI.1998, leg. W. Schacht; 1 pharate ♂ adult, 26 pupal exuviae as holotype but collected 7.VIII.1998, leg W. Schacht; 2 ♂♂ Denmark, Jutland, Stigsholm Sø, 7.VI.1994, leg. C. Lindegaard; 4 ♂♂ as previous but collected 21.-27.VI.1993; 7 pupal exuviae as previous but collected 15.VI. 1995.

Holotype and 12 paratypes in Museum of Zoology, Bergen, Norway. 31 paratypes and additional alcohol material in Zoologische Staatssammlung München, Munich, Germany. Three paratypes and additional alcohol material also deposited Museum of Zoology, Copenhagen, Denmark.

Diagnostic characters. The following combination of characters separates *T. mancospinosus* from other *Tanytarsus* species. Male adult: Bare Cu on wing, An with at least 3 times more setae than PCu; hypopygium without median setae; anal point relatively broad, parallel sided with blunt apex, crests well-developed with strong spines in between, about same thickness apically as medially; anal tergite bands curved towards but usually not reaching anal point crests; setiger of superior volsella with inner median seta weaker than the outer two and with well developed posteroventral lip. Pupa: Long, thick, thoracic horns long and broad, covered with small knoblike chaetae and one row of long chaetae, longer than width of horn; precorneals arranged in a row, the two anterior most setae set closer together than to the third; well developed cephalic tubercles; pedicel sheath tubercles obvious; posterior thoracic mound absent or very small; spine patches of tergite III moderately large with relatively short anally directed spines; spine patches of tergites IV and V small; tergite VI without spine patches; segments I-VI without taeniae (LS), segment VII with 1 and VIII with 4-5; fringe of anal lobe with about 32-59 taeniae in one row. Larva: AR about 2.1; Lauterborn organs with stylus about the length of the last 4 antennal segments; mandible with three spines on mola, two large dorsal teeth; premandible with dark sclerotized second half and 5 teeth.

Male imago (n = 5-6 if otherwise not stated). Total length 3.0-4.6, 4.0 (9) mm. Wing length 1.36-2.51, 2.10 (9) mm. Total length/ wing length 1.7-2.2, 1.9 (9).

Colouration. Head light yellowish with dark brown eyes, dark brownish pedicel, light brown flagellum; thorax variable, often with dark patches on scutum, vittae, postnotum, pre episternum and median anepisternum II, legs and abdomen light brownish; wings without pigmented cells.

Head. (Figure 1B). AR 1.25-1.49, 1.39 (9). Thirteen flagellomeres with last flagellomere 533-756, 684 µm long. Longest antennal seta about 450-650 µm long. Eyes with dorsomedian elongation. Distance between eyes about 250 µm. Cephalic tubercles cylindrical, 22-32, 26 µm long. Temporal bristles 11-13; 4 inner verticals, 3-5 outer verticals, 3-4 post orbitals. Clypeus about 60 µm long

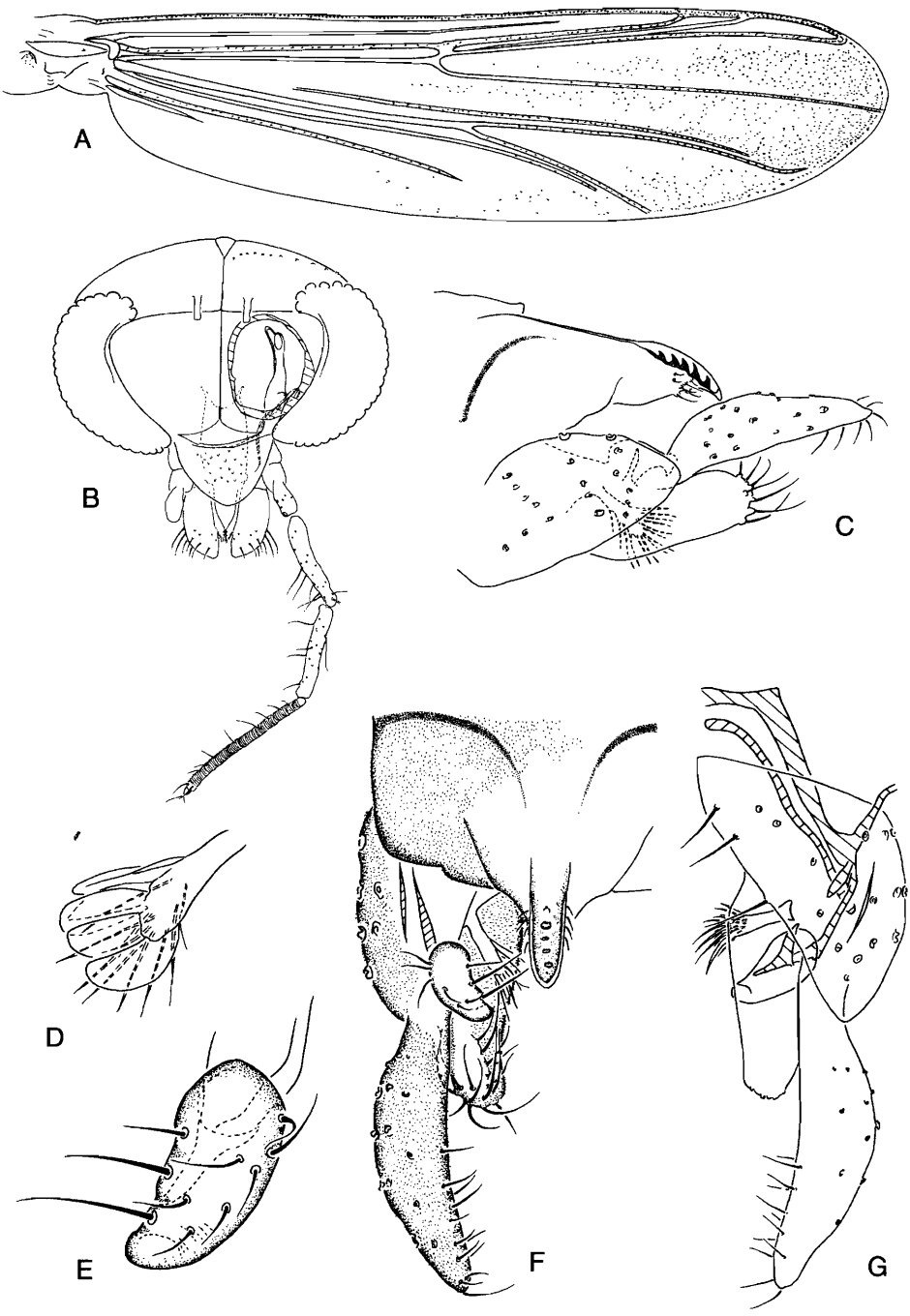

Figure 1. *Tanytarsus mancospinosus* sp. n., male. A, wing. B, head. C, hypopygium lateral view. D, median volsella. E, superior volsella. F, hypopygium dorsal view. G, hypopygium ventral view.

with 15-20 setae. Tentorium 162-180, 170 (4) µm long, 36-40 (4) µm wide at sieve plate. Stipes 126-140, 134 (4) µm long. Width of cibarial pump 54-61 (4) µm. Lengths of palp segments (in µm): 29-43, 39; 25-54, 45; 101-151, 137; 115-151, 139; 194-245, 224.

Thorax. Dorsocentrals 9-16, 14; acrosticals 12-21, 16; prealars 1. Scutellum with 6-10, 9 setae. Halteres with 6-7 small setae.

Wing.(Figure 1A). VR 1.11-1.14, 1.12 (7). Brachiolum with 1 seta, Sc bare, R with 24-34, 28 setae; R_1 with 24-30, 27; R_{4+5} with 26-50, 42 setae on apical 1/2, M bare, M_{1+2} with 60-75, 67; M_{3+4} with 36-42, 40; Cu bare, Cu_1 with 18-28, 23; PCu with 7-13, 9 and An with 35-46, 41 setae. Cells: m with about 10 setae, r_{4+5} with about 150-200, m_{1+2} with about 200 including false vein, m_{3+4} with about 60-90, cu with about 30 and an with about 10 setae.

Legs. Spur of fore tibia 29-43 µm long. Spurs of middle tibia 25-43 µm long including 14-22 µm long comb and 22-32 µm long including 14-18 µm long comb; of hind tibia 40-47 µm long including 18-22 µm long comb and 36-47 µm long including 18-22 µm long comb. 6-7 sensilla chaeticae on ta_2, pulvilli well developed. Lengths (in µm) and proportions of legs are given in Table 1 and 2.

Hypopygium (Figure 1C-G). Tergite IX 93-124, 109 µm long with no median and 14-16, 14 apical setae. Anal point 45-66, 58 µm long, 16-23, 20 µm wide at base and about 14-20, 17 µm wide at apex. Anal point with 4-11, 6 (9) spines between well-developed anal crests. Anal tergite bands curved towards but not reaching crests of anal point. Transverse sternapodeme 66-98, 73 µm long, phallapodeme 111-143, 134 µm long. Gonocoxite 134-182, 165 µm long. Gonostylus 125-188, 162 mm long. Superior volsella (Figure 1E) somewhat bean- shaped with 5-7 small setae on dorsal side, 3 ventromedian setae where the anterior most seta is much weaker than the other two; well developed posteroventral lip. Digitus short, not extending beyond median margin of setiger. Median volsella (Figure 1D) 61-73, 67 µm long including 23-34, 28 µm long lamellae, at least five being spatulate. Inferior volsella 101-138, 127 µm long, medially curved, with about 15 strong apical setae.

Remarks. The smallest values in the above description are measured on the specimen that was reared alone. This specimen is significantly smaller than the other measured specimens, perhaps because of food shortage during the rearing period.

Pupa (n = 7-10). Total length 3.3-5.5, 4.6 mm, abdomen length 2.4-4.4, 3.7 mm. Colour of pupal

Table 1. Lengths (in µm) of legs for males of *Tanytarsus mancospinosus* sp. n.

	fe	ti	ta1	ta2	ta3	ta4	ta5
p1	598-965, 810	360-608, 510	828-1220, 1091	410-616, 543	334-514, 451	248-378, 337	112-151, 136
p2	565-950, 838	565-907, 785	313-522, 436	184-310, 264	130-230, 195	83-144, 125	61-94, 83
p3	648-1116, 945	738-1321, 1087	468-799, 688	295-504, 437	245-425, 363	230-270, 242	86-126, 112

Table 2. Proportions of legs for males of *Tanytarsus mancospinosus* sp. n.

	LR	BV	SV	BR
p1	2.01-2.30, 2.15 (8)	1.59-1.68, 1.64	1.16-1.29, 1.21	3.3-4.3, 3.9
p2	0.50-0.61, 0.55 (8)	2.91-3.17, 3.07	3.55-3.87, 3.68	5.7-7.1, 6.5
p3	0.60-0.66, 0.64 (8)	2.16-2.44, 2.34	2.86-3.05, 2.95	5.5-9.0, 6.8

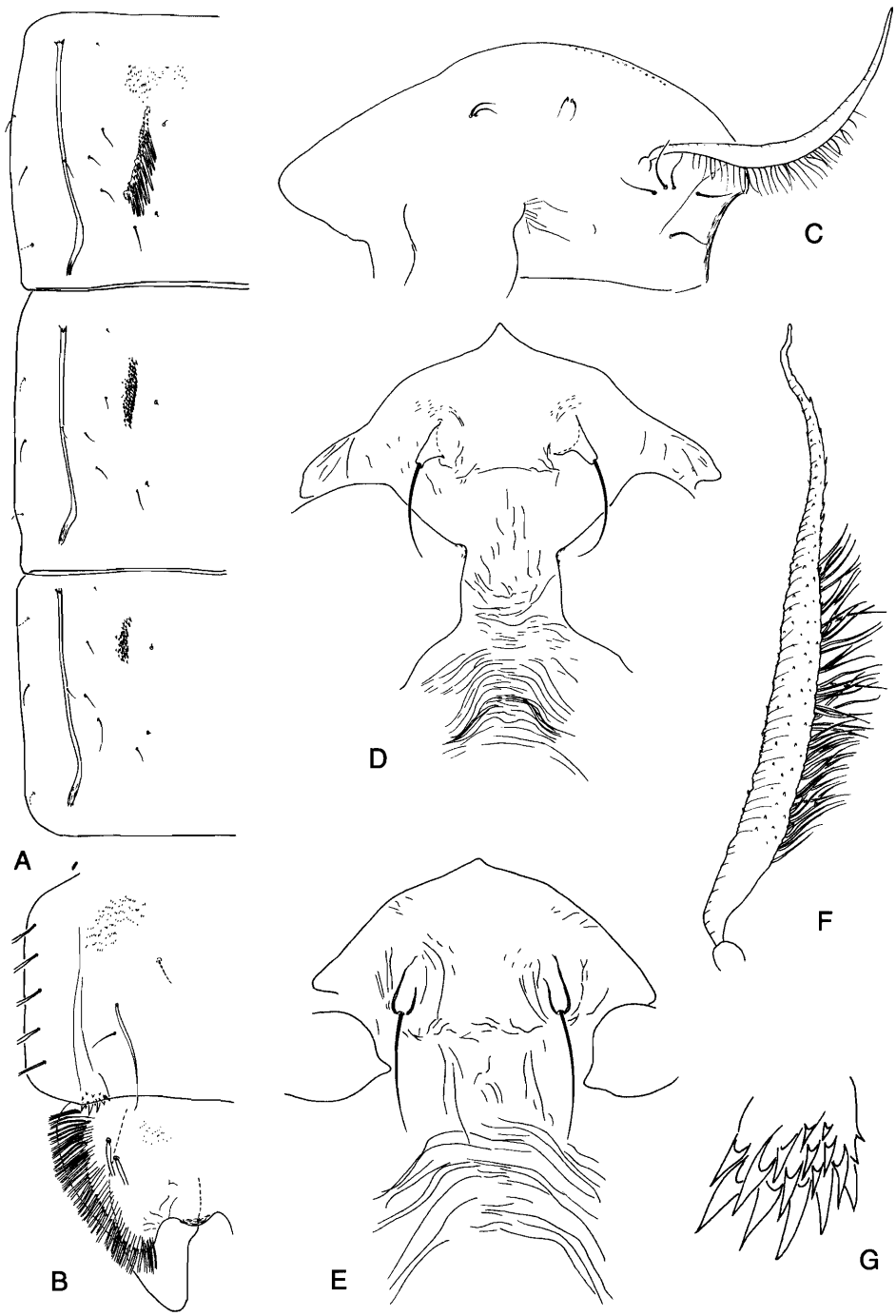

Figure 2. *Tanytarsus mancospinosus*sp. n., pupa. A, tergites III-V. B, tergite VIII and anal lobe. C, thorax lateral view. D, male frontal apotome. E, female frontal apotome. F, thoracic horn. G, posterior lateral comb.

exuviae pale brown with anterior part of cephalothorax somewhat darker, obvious dark stripes over base of wing sheath and on posterior thoracic mound.

Cephalothorax (Figure 2C). Length of frontal setae 65-108, 92 µm, cephalic tubercles well-developed (Figure 2D-E) 22-47, 40 µm long. Pedicel sheath tubercle distinct about 18 µm long. Thoracic horn broad, 576-1120, 807 µm long, 50-83, 62 µm wide, bare. Three precorneals in a row (Figure 2C), anterior two precorneals set closer to each other 76-154, 104 µm and 97-187, 119 µm long, posterior precorneal 79-148, 107 µm long; median antepronotal 76-120, 89 µm long; lateral antepronotal, 47-76, 57 µm long; 2 pairs of dorsocentrals, anterior pair 43-83, 60 µm and 54-86, 72 µm long, equally thick; posterior pair 50-137, 85 µm and 43-94, 68 µm long. Fine narrow row of granulation dorsal to anterior dorsocentrals. Nose of wing sheath well-developed, posterior thoracic mound absent or very small.

Abdomen (Figure 2A-B). Shagreen on tergite (T) II in a B- pattern, on T III as two triangles anterior to the spine patches; pedes spurii B on TII obvious; hook row 137-252, 198 µm long, about 1/3 width of TII; length of longest spines of TIII-TV (in µm): 58-90, 73; 12-58, 33; 7-22, 16; spines of TIII in medium sized, 151-238, 204 µm long, straight patches in middle to posterior half of tergite; spines of TIV in fairly small, 104-158, 132 µm long, straight patches in anterior half of tergite; spines of TV in small 65-119, 87 µm long patches in anterior half of tergite; no spines on T VI. Segment II with 3 D, 2 V and 3, 32-36 µm long L setae; segment III with 5 D, 4 V and 3, 28-50 µm long L setae; segment IV with 5 D, 4 V and 3, 34-50 µm long L setae; segment V with 5 D, 4 V and 3, 36-45 µm long L setae; segment VI with 5 D, 4 V and 3, 36-45 µm long L setae; segment VII with 5 D, 4 V, 3, 36-47 µm long L setae and 1, 101-216 µm long LS seta; segment VIII with 2 D setae, anterior most usually taeniate 72-173, 130 µm long, 1 V seta and 5, about 125-250 µm long LS setae of which the second and third seta sometimes are placed more medially than the other three. Two pairs of small sensorial setae on TII-V, one on TVI and TVII; one pair of o-setae present on tergites and sternites II-VII. Anal lobe with 2 dorsal taeniae, 162-225, 191 µm long, anal fringe with 32-59, 45, about 360-550 µm long taeniae. Posterior lateral comb of segment VIII (Figure 2G) 32-94, 57 µm wide with 6-11, 8 apical teeth. The Danish specimens have in general combs twice as broad as the central European specimens. Lengths of genital sacs: 263-331, 288 µm (♂, n=3) and 72-144, 117 µm (♀, n=7).

Larva (n = 3). Head. Length of head capsule 360-396 µm, width 306-320 µm, length/width = 1.18-1.24. Ventral postoccopital margin (Figure 3F) brown with darker brown stripe between tentoria. Antennal pedestal 63-79 µm long, with longer median margin but without spur. Antenna (Figure 3A) 5- segmented, always shorter than head capsule; first and second antennal segment well sclerotized; lengths of segments (in µm): 111-154, 27-40, 14-22, 7, 3-4. AR 2.11-2.16. Antennal blade 36-40 µm long, antennal seta 40-43 µm long at 2/3 length of antennal segment 1. Mandible (Figure 3C-D) 130-140 µm long, 70-76 µm wide, with 1 ventral apical tooth, 3 ventral inner teeth, and 2 well-developed dorsal teeth present; two outer mandibular setae; seta subdentalis thick, about 48-50 µm long and curved, reaching apex of apical dorsal tooth; seta interna well-developed with 4 main branches. Mentum (Figure 3B) 86-91 µm wide with 11 teeth; median tooth paler than other teeth; ventromental plate 97-104 µm wide. Labrum with S I plumose, chaetae serrated; S II and chaetulae simple; labral lamella comblike; pecten epipharyngis consisting of three plumose lobes; premandible (Figure 3E) with 5 teeth, dark sclerotized apical half, premandibular brush well-developed; maxilla with two long and one short chaetae, palp normal.

Body. Anterior and posterior parapods with simple claws; procercus with two small setae in addition to anal setae. Eight anal setae: 4 short, 216-270 µm long and 4 long, 396-468 µm long.

DISCUSSION

Based on adult male characters, *Tanytarsus mancospinosus* keys out to the *mendax*- group (Cranston et al. 1989), and the species fulfils all the require-

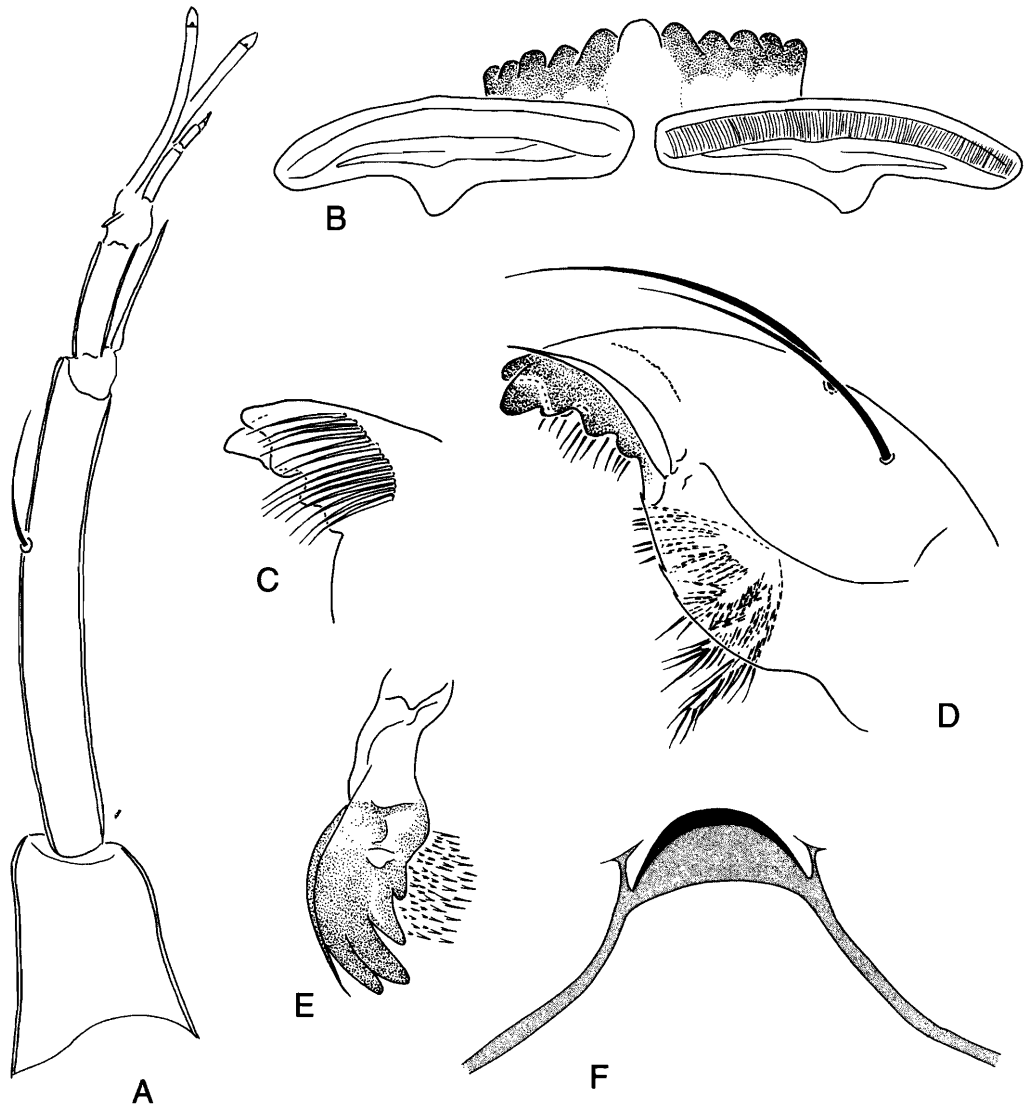

Figure 3. *Tanytarsus mancospinosus* sp. n., larva. A, antenna. B, mentum. C, mandobular teeth, dorsal view. D, mandible, ventral view. E, premandible. F, ventral postoccipital margin.

ments given by Reiss & Fittkau (1971) in the group diagnosis. Males of *T. mancospinosus* separate from the other species in the *T. mendax*- group by having a broad, apically rounded anal point and no median setae on the anal tergite. Among the European *Tanytarsus* species, the new species can be confused with *T. fimbriatus* Reiss & Fittkau, 1971 which lacks the median setae on the anal tergite as well. *T. mancospinosus*, however, has an evenly rounded anal point and smoothly edged, spatulate lamellae on the median volsella. Of the Nearctic *Tanytarsus* species, the males of *T. mancospinosus* are probably morphologically closest to *T. dendyi* Sublette, 1964. The only character that might be used to separate the species is the width of the anal point, which is broader in *T. mancospinosus*. *T. konishii* Sasa & Kawai, 1985 collected in Toyama, Japan, also lacks the median setae on the anal tergite. This species also fits in the diagnosis of the *T. mendax* group, and has several characters in common with *T. mancospinosus*. The missing digitus and long anal tergite bands, on the other hand, do separate it from the above described species. The pupae of the new species keys to the same group based on pupal morphology (Pinder & Reiss 1986). *T. mancospinosus* pupae can easily be separated from the other species in the *T. mendax*- group by the missing spine patches of tergite VI and the species specific thoracic horn. Diagnostic characters for larvae in the *T. mendax*- group have not been well established, but common for *T. mendax* Kieffer, 1925, *T. volgensis* Miseiko, 1967, *T. horni* Goetghebuer, 1934, *T. minutipalpus* Ekrem & Harrison, 1999, *T. dycei* Glover, 1973 and *T. mancospinosus*, all probable members of the *T. mendax* group, is the relatively short styli of Lauterborn organs (never longer than two times the length of antennal segment III-V combined) (Sublette 1964; Dejoux 1968; Glover 1973; Shilova 1976; Cranston 1996; Spies 1998; Ekrem and Harrison 1999). Simple chaetae and spinulae on labrum is not the case for *T. mancospinosus*, and contrary Ekrem & Harrison's suggestion (1999) this is probably not a good diagnostic character for larvae of the *T. mendax* species group. A revision of this and related species groups is necessary to find good diagnostic group characters.

All localities where the new species has been recorded are meso- to eutrophic lakes. The shallow Lake Stigsholm in Denmark and its chironomid fauna is thoroughly described by Lindegaard & Brodersen (1999). In Lake Stigsholm, they recorded 7 *Tanytarsus* species. Two of the most abundant species were *T. mancospinosus* and *T. mendax*, which both were found to have one long emergence period from June to August. The collection dates in the Bavarian populations suggest a similar univoltine pattern there. In Chiemsee, a total of 17 *Tanytarsus* species were recorded, but at the eutrophic localities, where *T. mancospinosus* had a higher emergence abundance compared with the mesotrophic localities, 6 additional species were dominating. At these localities, all 7 species had emergence maxima at within the same time period. In Kleiner See in Nymphenburger Park, Bavaria, *T. mancospinosus*, *T. mendax* and *T. occultus*, all members of the *T. mendax* species group, are at least in part emerging during the same period in the summer, and the larvae of *T. mancospinosus* were found coexisting with *T. mendax* and *T. occultus* in the mud at about 50 cm depth. It is interesting to observe that the closely related species are neither temporally nor spatially separated. A phylogenetic analysis of the *T. mendax*- and related species groups will reveal if these three species really are closest relatives. If so, the species could be a result of sympatric speciation.

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Myrmica rugulosa Nylander, 1849 (Hymenoptera, Formicidae) new to Norway

Thor Jan Olsen

Olsen, T.J. 1999. *Myrmica rugulosa* Nylander, 1849 (Hymenoptera, Formicidae) new to Norway. Norw. J. Entomol. 46, 88.

The myrmicine ant *Myrmica rugulosa* Nylander, 1849 are reported new to Norway from the Sarpsborg area, Østfold.

Key words: *Myrmica rugulosa*, Formicidae.

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The myrmicine ant *Myrmica rugulosa* Nylander, 1849 is reported new to Norway. The species is not listed by Kvamme (1982). It was collected 5 May 1995 from Ø Sarpsborg: Landebo, Råkil, SE of lake Tunevann (EIS 20). The habitat was a dry, sandy slope towards East, belonging to the big moraine «Raet» which run through the community. The area has scattered houses and patches of rather intact scrubs and patches of forest. In Sweden the species has been taken in similar open, sandy fileds (Douwes 1995).

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The distribution of bee flies (Diptera, Bombyliidae), except the genus *Villa*, in Norway

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Falck, M. & Greve, L. 1999. The distribution of bee flies (Diptera, Bombyliidae), except the genus *Villa*, in Norway. Norw. J. Entomol. 46, 89–109.

The Bombyliidae (Diptera), except for the genus *Villa* Lioy, 1864, of Norway is reviewed, based on material in the collections of the four Norwegian university museums, as well as the collections of private collectors. Ten species are listed as belonging to the Norwegian fauna, viz. *Glabellula arctica* (Zetterstedt, 1838), *Phthiria pulicaria* Mikan, 1796, *Bombylius major* Linnaeus, 1758, *B. medius* Linnaeus, 1758, *B. minor* Linnaeus, 1758, *Anthrax anthrax* (Schrank, 1781), *A. trifasciatus leucogaster* Wiedemann in Meigen, 1820, *A. varius* Fabricius, 1794, *Hemipenthes maurus* (Linnaeus, 1758) and *Thyridanthrax fenestratus* (Fallén, 1814). Two of these, *Phthiria pulicaria* and *Anthrax trifasciatus leucogaster*, are recorded as new to Norway. The distribution within Norway is given for each species. As far as known, notes are given about the host species. A key to the species is also given.

Key words: Diptera, Bombyliidae, bee flies, Norway, distribution.

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INTRODUCTION

The Bombyliidae is a numerous, well defined, and highly variable family of Diptera, comprising about 200 genera and 4500 species hitherto described on the world level (Woodley 1989, Yeates 1994). Woodley placed the family in the superfamily Asiloidea within the Brachycera. Sinclair et al. (1993), while keeping the family within the Heterodactyla group of the Muscomorpha, removed it from the Asiloidea. This view is controversial (Griffiths 1996), and not accepted by Yeates (1994), who in later years has undertaken comprehensive studies of the family on a world level. Yeates & Wiegmann (1999) review the debate and states that the relationships of the Bombyliidae within the Asiloidea is not yet resolved.

During most of this century the Bombyliidae has been more or less conveniently divided into the two divisions Homeophthalmae and Tomophthalmae, based on the indentation of the hind margin of the eye. The aim has been to group together several of the subfamilies proposed by the diverse subfamiliar classifications presented in this century. Yeates (1994) reviews the different proposed schemes of classification and makes a thorough cladistic analysis, thus laying the foundation for a more stable division into subfamilies. Here we follow the classification of Yeates (1994).

Hall (1981) describes the species as being «Small to large flies, variously hued with bright colors. Wing often patterned. Body generally covered with delicate hairs or scales, or both. Thoracic bristles rarely strongly developed. Proboscis often very long. Crossvein m-cu always present.» Norwegian species have a general «fly outlook», i.

e. rounded and «stubby», and not long and slender. Members of the genera *Glabellula* and *Phthiria* are small.

The early stages and biology of many species are unknown. As far as is known, the species are either parasitoids on the larvae and/or pupae of various species of Hymenoptera, Lepidoptera, Diptera, Coleoptera or Neuroptera, or predacious on the egg pods of grasshoppers. (Andersson 1974, Hall 1981). The evolutionary pattern of host use in the Bombyliidae was recently summarized Yeates & Greathead (1997).

The family is worldwide in distribution with the greatest number of species in the dry and warm regions of the world. Several hundred species are present in the Palaearctic area, of which only a small number reaches the Scandinavian countries. Denmark has 18 species (Lyneborg 1965 a), Sweden 22 species (Hedström 1986, 1991). Hackman (1980) lists 23 Finnish species, of which one is a synonym (Zaitzev 1989), thus bringing the number to 22. The number of species present in Great Britain was given as 10 or 11 (with some uncertainty) by Kloet & Hincks (1976), but the most recent check-list sets the number to 9 (Chandler 1998). No treatment of the Norwegian species has been published since Siebke's Enumeratio Insectorum Norvegicorum (Siebke 1877), which listed the following 12 species: «*Bombylius major* Lin., *B. medius* Lin., *B. minor* Lin., *B. pumilus* Meig., *Anthrax flava* Meig., *A. circumdata* Meig., *A. cingulata* Meig., *A. maura* L., *A. fenestrata* Fall., *A. aethiops* Fall., *A. varia* Fabr.,» and «*Sphaerogaster arcticus* Zett.,» the last one recorded by Siebke as belonging to the family «*Acrocerinae Zett.*»

The Siebke collection is still in existence, constituting the main part of the older dipterological collections in the Zoological Museum of the University of Oslo (ZMO). Some of the families have been worked through and revised by different researchers during the more than 100 years since 1877, and it is not always possible to trace the specimens on which Siebke based the records of the Enumeratio. The Bombyliidae of the ZMO collection have been worked through by Soot-Ryen, who began a revision of the Norwegian species of this and some other families, which he regrettably never completed.

The genus *Villa* Lioy, 1864, known to parasitize the larvae of different genera of moths (*Mamestra, Panolis, Agrotis, Dichromia, Taeniocampa*, according to Lyneborg [1965 a]), seems to be represented in the Norwegian fauna by 6 species. However, the identification of these species is based on external characters which are both variable and easily destroyed. We have therefore excluded this genus from the present survey.

MATERIAL AND METHODS

We have included the Norwegian University Museum collections of Oslo (ZMO), Bergen (ZMB) and Tromsø (TM) as well as the private collections of Morten Falck, Terje Jonassen, Sjernarøy, Tore R. Nielsen, Sandnes and Knut Rognes, Stavanger. The material consists of 895 specimens, belonging to 10 species, 6 genera and 4 subfamilies. Apart from Zetterstedt's record of *G. arctica* from Alta, no record is included unless we have seen the specimen, or received reliable information from a collector known to us.

Most of the material has been caught by net, and some in Malaise traps. Alcohol fixation, however, ruins much of the scales and hair clothing on many species, and is especially badly suited for *Villa* spp.

The records are referred to the grid zones of the European Invertebrate Survey (EIS), and to A. Strand's Norwegian reference system (Økland 1981).

List of abbreviations:

Collectors and private collections: AB: Alf Bakke, AF: Arne Fjellberg, AFH: Arne Fjellberg &, Oddvar Hanssen, AH: A. Hamstad, AN: Alf-Jacob Nilsen, BB: Bjørnar Borgersen, BH: Yngvar Berg & Lars Ove Hansen, BID: O. Bidenkap, BS: Bjørn A. Sagvolden, BØ: Bjørn Økland, ED: Hallvard Elven & Anders Dahl, EH: Erik Heibo, ESM: Lauritz Esmark, FH: Morten Falck & Lars Ove Hansen, FM: Fred Midtgaard, GRI: Grimsgaard, GS: Geir E. E. Søli, HH: Lars Ove Hansen &

Oddvar Hanssen, HL: Erik Heibo & Ole Lønnve, HS: Lars Ove Hansen & Bjørn Sagvolden, HOS: Lars Ove Hansen & Ove Sørlibråten, IN: Ingunn M. Nielsen, IS: Ivar Stokkeland, JHS: Jan Henrik Simonsen, JN: J. Nystrøm, JS: John Skartveit, KB: Kai Berggren, KM: Kai Myhr, KR: Knut Rognes, LA: Leif Aarvik, LE: L. Eikaas , LG: Lita Greve, LN: Leif Reinhardt Natvig, LOH: Lars Ove Hansen, MF: Morten Falck, MH: Reidar Mehl & Lars Ove Hansen, OH: Oddvar Hanssen, OL: Ole Lønnve, OS: Ove Sørlibråten, PT: Per Tallaksrud, RC: Rune Christensen, RL: Roy A. Lanto, RM: Reidar Mehl, SCH: Wilhelm Maribo Schøyen, SIE: Johan H. S. Siebke, SL: Stig E. Lanto, SS: Svein Svendsen, TJ: Terje Jonassen, TN: Tore R. Nielsen, TSR: Tron Soot-Ryen, WA: H. Warloe, ØB: Øistein Berg.

Institutions: TM: Tromsø Museum, ZMB: Museum of Zoology - University of Bergen, ZMO: Museum of Zoology - University of Oslo.

Methods: wt: Window trap, cn: Car net, mt: Malaise trap.

LIST OF SPECIES

Glabellula arctica (Zetterstedt, 1838)

List of records: **AK** Lørenskog: Losby (EIS 29), 21 May-21 June 1991 1 ♀, wt, leg. BØ. **BØ** Drammen: Underlia (EIS 28), July 1992 1 ♀, mt leg. LOH. **BV** Rollag: Bråtåsen (EIS 35) July 1994 1 ♂ 1 ♀, mt, coll. ZMB, Rollag: Vårviken, July 1994 1 ♂, 2 ♀♀, mt, leg. BS. Rollag: Tråen saga, July 1994 3 ♀♀, leg. BS, coll. ZMO. Rollag: Veggli 29 June 1995 1 ♀♀, 3 hours of cn, leg. BS. **VE** Tjøme: Mostranda (EIS 19), 14 July 1986 1 ♂. **HOI** Voss: Mjølfjell, Solbakken (EIS 41) 670 m a.s.l., 8 June-13 July 1986 1 ♀, mt operated all through the summer. **STI** Oppdal: Lønset (EIS 79), 20 May-1 June 1992 1 ♀, 1-12 June 1992 1 ♂ 1 ♀, 2 mts, 24 June-17 July 1993 1 ♂, 2 mts in southern exposed pine forest at 450 and 520 m a.s.l., 24 June-17 July 1993 1 ex., mt in southern exposed pine forest approximately 500 m a.s.l., leg. OH, coll. ZMB.

The species was described from Finnmark, «Skaaddavaara in Alten», by Zetterstedt (1838) (as *Platygaster arcticus*) - (**FV** Alta: Skåddefjellet (EIS 173)). Siebke (1877) gives this record under the name *Sphaerogaster arcticus* Zett., and it is also referred to by Bidenkap (1900). Before the present survey, this was the only published Norwegian record.

The distribution of *G. arctica* is shown in Map 1. Dates of records cover the period from the end of May to middle of July.

The records indicates that the species is widely distributed and has a wide range of habitats. The few records are probably due to its small size, dull colour and lack of conspicuous hair coating.

The species is recorded from Sweden and Finland, Northern and Central Russia, Western Siberia, the Netherlands and the former Chechoslovakia (Zaitzev 1989). Zaitzev also lists it from Denmark, but it is not mentioned by Lyneborg (1965 b) or Rald (1975).

François (1969) qoutes De Meijere, who suspects it to parasitize *Formica* (Hymenoptera, Formicidae). Andersson (1974) describes the premature stages and the development of the species. He records the larva as predator on the larvae of *Formica exsecta* Nyl., *F. polyctena* Foerst., *F. nigricans* Em. and *F. aquilonia* Yarr., and the adult flies to be looked for in or in the the vicinity of the nests of these. All of the mentioned hosts are recorded from Norway (Collingwood 1979). Its myrmecophilous life might be an additional reason why this species is so rarely recorded.

Phthiria pulicaria Mikan, 1796

Records: **Ø** Hvaler: Kirkøy, Ørekroken (EIS 12), 18 July 1986, 1 ex., coll. ZMB, 20 June 1994, 1 ♀, leg and coll. MF. **VE** Tjøme: Fynstranda (EIS 19), 9 July 1983, 1 ex., Tjøme: Sandøy, 2 July 1984, 1 ex., 25 July 1984 1 ex., 9 June 1993 2 exx., coll. ZMB. **TEY** Kragerø: Jomfruland (EIS 11), 20 June 1993, 1 ♂, 1 ♀, leg. AF, coll. ZMB. **VAY** Mandal (EIS 2), 5 July 1935 1 ♂ leg. Soot-Ryen, coll. TM. **RY** Hå: Ogna (EIS 3), 28 May 1988, 4 ♂♂, 1 ♀, leg. and coll. TJ. Klepp: Øksnevad (EIS 7), 12 July 1955, 1 ♀, coll. ZMB. Klepp: Orresanden, 5 July 1983, 3 ♂♂, 1 ♀, leg. and coll. KR.

Key to the Norwegian species of Bombyliidae

1. Posterior margin of eyes with a distinct indentation, a clear dividing line separating the upper and lower facets of the eye. Base of antennae well separated. Proboscis shorter than head. ..... (Subfam. Anthracinae) 7

- Posterior margin of eyes evenly arcuate, never with a dividing line separating the facets of the eye. Base of antennae close. Proboscis longer than head, prominently projecting forwards 2

2. The veins of the anterior margin of wings, including R, much thicker than the other veins, which are weakly developed. Minute, black species (up to 2 mm) ..... *Glabellula arctica*

- All veins equally strongly developed. If small (up to 4,5 mm), then with greyish dusting 3

3. Not larger than 4-4,5 mm. In the wings cell R5 open, anal cell (Cu2) closed. Tibiae with short, even pubescence and no bristles. Tergits grey ..... *Phthiria pulicaria*
[The species *P. canescens* Loew, 1846 has been recorded from Bornholm and Southern Sweden. It is discernible from *P. pulicaria* in having the first one or two tergits more or less yellow. (Lyneborg, 1965 a, Hedström 1986, 1991) Rare, probably not in Norway]

- Larger than 4 mm. Cell R5 closed, anal cell Cu2 open. Tibiae with 3-4 rows of bristles in addition to pubescence. Normally larger species 4

4. The combined length of the scape and the pedicel (the two basal joints of the antenna) shorter than the first flagellomere. The anterior basal cell (R) longer than the posterior one (M) ..... (*Bombylius*) 5

- The combined length of the scape and the pedicel longer than the first flagellomere. The basal cells (R and M) of even length ..... *Systoechus ctenopterus* (Mikan, 1796)
[Recorded from Denmark and Sweden. May be found in Norway]

5. Anterior colouring of wings sharply defined from posterior hyaline area ..... *Bombylius major*

- Anterior brown colouring of wings not sharply defined, gradually fading into a posterior hyaline area 6

6. Wings with distinct brown spots in the hyaline area ..... *Bombylius medius*

- Wings mostly hyaline, with no brown spots in this area ..... *Bombylius minor*

7. Stylus of antennae ending in a bristle surrounded by a circle of fine hairs, the stylus itself clearly separated from the bulbous, basal part of 3. antennal joint. Metaplerua bare. Pulvilli present ..... (*Anthrax*) 8

- Stylus of antennae without a circle of fine hairs surrounding the distal bristle. Metapleura hairy. Pulvilli present or absent 10

8. Both basal cells (R and M) as well as discal cell uniformly brown coloured. Hyaline part of wing without brown spots ..... *Anthrax anthrax*

- Both basal cells with hyaline spots. Discal cell predominantly hyaline. Hyaline part of wing with brown spots 9

9. Dark brown part of wing not broken by hyaline spots. Hyaline part of wings with two dark brown spots ..... *Anthrax trifasciatus leucogaster*

- Dark brown part of wing broken by hyaline spots. Hyaline part of wing with three dark brown

spots ..... *Anthrax varius*

10. Wings predominantly hyaline, face receding. Thorax and most of abdomen covered with yellow pile ..... (*Villa*)
[Not treated in the present paper]

- Wings partly dark brown to black, face protruding. Black species, sometimes with bands of white hairs 11

11. Face strongly protruding. First flagellomere elongate conical. Pulvilli absent. Brown areas of wings with hyaline «windows» ..... *Thyrianthrax fenestratus*

- Face less protruding. First flagellomere with a short, conical basal part and a long, pointed end. Pulvilli present or not. Black areas of wings without hyaline spots ..... (*Hemipenthes*) 12

12. Pulvilli present. Abdomen totally black. Cell M2 hyaline .. *Hemipenthes morio* (Linnaeus, 1758)
[May be found in Norway]

- Pulvilli absent. Abdomen black with two bands of white hairs. Cell M2 partly dark brown .....
..... *Hemipenthes maurus*

New to Norway. The records seems to indicate a distribution all along the south-eastern coastline westwards to the Stavanger area. The species is small and grey, and easily overlooked.

The distribution of *P. pulicaria* is shown in Map 2. Dates of records cover the period from 28 May to 25 july, with a peak in July.

All the Norwegian localities are sandy sea-shore localities with a warm and sunny climate. Ardö (1957) mentions the species in his study of Diptera from the marine dunes, and lists several dune localities in southern Sweden. Cogan (in Stubbs & Chandler 1978) mentions the species from «Fixed dunes», and states that it «may be swept from flowers (where its larvae lie in wait for their hosts, flower-attending aculeates).» However, Yeates & Greathead (1997) summarizes the known host records of this genus as «Ex Gelechiidae & Tortricidae».

Recorded from Denmark, Sweden, Finland and Great Britain. In Sweden from the southern parts only. Zaitzev (1989) records a distribution from south of Great Britain to Italy and Portugal to Poland, and records it from Morocco and through the southern and middle Russia and Siberia, and Western Asia to Mongolia.

Bombylius major Linnaeus, 1758

Records: 14 May 1851, 3 ♂♂ leg. ESM, without locality, coll. ZMO. **Ø** Råde: Åven (EIS 19), 18 May 1997, 1 ♂, leg. & coll. RC. **AK** Oslo (Kr.ania) (EIS 28), 1 ♀ without date, leg. SIE, coll. ZMO, 1 ex. in coll. TM. Oslo: Aker, 1 ♂ leg. SCH, coll. ZMO. Oslo: V. Aker, aspen forest, 14 May 1932, 2 exx., coll. ZMB. Oslo: Østmarka, 2. May 1965, 1 ♀, 2 May 1980, 1 ♂, 3 ♀♀, 11 May 1980 3 ♀♀ (loc.: Nøklevann), 30 May 1984 2 ♀♀ (loc.: Sarabråten), 19 May 1985 1 ♂ (loc.: Bremsrud). Oslo: Østensjøvann, 27 April 1982 1 ♀, 14 May 1982 1 ♀, 10. May 1996 2 ♀♀, leg. and coll. MF. Østensjøvann, Oppsalskrenten, June 1996 3 ♂♂, 1 ♀♀, Østensjøvann, Manglerud, June 1996 1 ♀, mt, leg. FH, coll. ZMO. Østensjøvann, Abildsø, June 1997 1 ♂, mt, leg. MF, coll. ZMO. Oslo: Skullerud, 29 April 1984 1 ♂, 1 ♀, Tveita, 1 May 1984 2 ♀♀, Rustad, 11 May 1984 1 ♀, leg. and coll. MF. Oslo: Rødtvedt, 3 May 1980, 3 ♀♀, leg. JHS, coll ZMO. Oslo: Gressholmen, 3 May 1981, 1 ♀, leg. FM, coll. TN. Oslo: Bygdøy, 18 May 1985 2 ♂♂, leg. & coll. KR. AK, Bærum 1 ♀ without date, leg, SCH, coll ZMO, 1 ex. without date, coll. ZMB. Bærum: Kalvøya, 7 May 1990, 1 ♂ leg. ØB, coll MF. Bærum: Ostøya, 12-30 May 1984 1 ex., mt A, 1 ex., mt C, leg. FM, coll. ZMB,17 June 1989 1 ♀ leg. MF, 23 May 1992 2

♀♀ leg. ØB, coll. MF, 28 April-12 May 1984 1 ♂, mt B, 2 ♂, mt A, 11 June 1983 1 ♀, 30 May-10 June 1984 1 ♀, mt A, leg. FM, in coll. TN, 2 June 1981 1 ♀, 30 May 1984 1 ♂ 3 ♀♀, 31 May 1984 2 ♂♂, leg. and coll. TN, 6 July 1996 1 ♀, leg. LOH, coll. ZMO. Asker: Brønnøya, 18 May 1980, 1 ♂, leg. and coll. MF, 15 June 1984, 1 ♀, leg. and coll. TN, 12 May 1985, 3 ♀♀ leg. MF, coll. ZMO. Asker: Hval, 30 May 1995, 2 ♂♂, 2 ♀♀, leg. ØB, coll. MF. Asker: Sem, 20 April 1949, 1 ex. in coll. ZMB, Semsvann, 6 May 1990, 1 ♂, leg. and coll. MF, 4 May 1991 1 ex., leg. and coll. RC, 31 May 1992 1 ♀, leg. and coll. MF. Asker: Heggedal, 2 June 1986 1 ♀, leg. and coll. TN. Nesodden: Fagerstand, Levanger, Nesset, 4 March 1973 1 ♀, leg. AH, coll. ZMO. Kolbotn, 1 ♀ without date, leg. RM, coll. ZMO. Frogn: Håøya, 5 June 1984 2 ♂♂, leg. FM, coll. TN, 3-16 June 1 ex., mt A, leg. FM, coll. ZMB. Frogn: Drøbak, 1 May 1983, 1 ♂ leg. FM, coll. TN. Frogn: S. Hallangen, 24 May 1980, 1 ex., coll. ZMB, Akershus (without further locality), 23 May 1943 2 ♀♀, ex coll. O. Kvalheim, in coll. ZMO. Enebakk: Nordre Bøler (EIS 29), May 1996 1 ♂, mt, coll. ZMB. Rælingen: Hektner, 8 May 1985 1 ex. Rælingen: Åmot, 10 May 1993 4 exx., 24 May 1993 1 ex., leg. & coll. RC. Fet: Fetsund, S. Bjanes, 22 May 1995 1 ♂, 14 June 1996 1 ♀, leg. MF. Sørum: Lørenfallet, Egner (EIS 37), May 1994 1 ♂, mt, leg. HOS, coll. MF. **OS** Lillehammer: Smestad (EIS 54), 20 May 1979 1 ♂, 1 ♀, leg. SS, coll. TN. Sør-Fron: Frya (EIS 63), 24 May 1982 1 ♂, Ringebu: Tollmoen, 24 May 1982 1 ♀, leg. KM, coll. MF. **BØ** Hurum: Verket, Verksøya (EIS 28),

Figur 1. *Bombylius major* Linnaeus, 1758, a common spring species. Photo: Carll Goodpasture.

9 May 1992, 1 ♂, leg. ØB, coll. MF. Hurum: Filtvet, 2 June 1982, 1 ♂, 3 May 1983, 1 ♀, leg. FM, coll. TN, 22 May 1984 1 ex., coll. ZMB. Hurum: Tofte, 13-18 May 1985 1 ex., 18 May-2 June 1985 3 exx., 2-17 June 1985 4 exx., 17 June-17 July 1985 2 exx., mt, leg. FM, coll. ZMB. Røyken: Hyggen, 14 April-2 May 1 ♀, 28 May-6 June 1 ♂, mt in south faced slope, leg. LOH. Nedre Eiker: Mjøndalen, Hagatjern, Ryghsetra, May 1994, 1 ♀, mt A, leg. BH. Drammen: Underlia, May 1993, 2 ♂♂, May 1994 1 ♂, May 1994 1 ♂, 1 ♀, mt, leg. LOH, coll. MF, 28 May 1994 2 exx. leg. LOH, coll. ZMB. Ringerike: Nærstad (EIS 36), 1 ♀ without date, leg. Seip, coll. ZMO. **BV** Rollag (EIS 35),14 May 1984 1 ♀ leg. RL, coll. MF. Rollag: Rollag, 13 May 1985, one ex., leg. BS, coll. ZMB. Rollag: Vårviken, 1-31 May 1992, 1 ♀, mt, leg. BS, coll. MF. Rollag–Veggli, 12 May 1996 1 ♀, 7 May 1997 1 ♀, cn, leg. BS, coll. ZMO, **VE** 9 exx. without further localities, two of them labelled resp. 10 May 1891 and 16 May 1901, the rest without dates, leg. BID, coll. ZMB, Sande: Galleberg st. (EIS 28), 1 ♀ without date, leg. LE, coll. ZMO, Våle: Langøya (EIS 19), 2 May 1991 1 ♂, 2-28 May 1991 2 ♂♂, 15 ♀♀, mt in calcareous meadow at seashore, 28 May 1991 1 ♀, leg. LOH, coll. MF. Borre: Adalstjern, June 1997, 1 ♂, mt, leg. LOH, coll. ZMO. Tjøme: Kjære, 1 May 1967 1 ex., 16 May 1966 1 ex. labelled «meadow edge». Lardal: Brufoss (EIS 18), 16 May 1992 2 exx., coll. ZMB. **TEY** Porsgrunn: Skjelsvik (EIS 11), 9 June 1996, 1 ♂, 10 June 1996 1 ♂ 1 ♀, leg. GS, coll. ZMO. Kragerø: Barlandskilen, 3 June 1995 1 ♂ 5 ♀♀, leg. & coll. MF. **AAY** Risør (EIS 11), 1 May 1910 1 ♀, 6 June 1909 1 ♂, leg. WA, coll. ZMO. **RY** Stavanger, Sørmarka: Ullandhaug (EIS 7), 2 May 1978, 3 ♀♀ leg. KR. Sandnes: Sandved, 29 April 1987, 1 ♂ leg. IN, coll. TN. Stavanger: Krossberg, 7 April 1977 1 ♂, 10 April 1977 1 ♂, 1 May 1980 1 ♂, 1 ♀, 15 April 1981 1 ♂, 6 April 1982 1 ♂. Byhaugen, 29 April 1978 2 ♀♀. Ullandhaug, 2 May 1978 7 ♀♀, 1 May 1979 1 ♂. Klepp: Orresanden, behind the dunes, 18 April 1982 1 ♂, leg. & coll. KR. Finnøy: Kyrkjøy (EIS 14), 20 May 1986, 1 ♀, leg. & coll. TJ. Sevheim, 30 April 1995 1 ex., leg. JS, coll. ZMB. Strand: Årdal, Årdal, 7 May 1935 1 ex., coll. ZMB. **RI** Forsand: Songesand (EIS 7), 17 April 1981 1 ♀, 23 April 1983 1 ♂, 5 May 1983 1 ♂, 1 ♀, leg. and coll. TJ. Suldal: Bråtveit, Århus (EIS-square uncertain, locality in the intersection between squares no. 14, 15, 23 and 24), 25 May 1934 1 ex., and 6, 7 and 10 April 1945 1 ex. each day. Sauda: Saudasjøen (EIS 23 or 24 - uncertain), 18 May 1935 1 ex. **HOY** Bergen (EIS-square uncertain), June 1908 1 ex., May 1907 1 ex. Bergen: Natland, Fana (EIS 30), May 1908 3 exx., June 1908 4 exx. Fana, Sanddalen, 14 May 1971 2 exx. Fana, Skjold, 1 May 1985 4 exx., 2 May 1937 1 ex. Fana, Tveiterås, May 1907 2 exx., May 1908 1 ex. Fana, Sandtveit v/Kalandvann (EIS 31), 4 May 1936 6 exx. Solbakken, May 1944 1 ex. Muséhagen (EIS 39), 25 April 1939, 1 ex. Åsane, Hellesnes, 19 April 1905 1 ex. Åsane, golfbanen, 24 May 1976 1 ex. Åsane, Kistebakkane, 11 April 1989 1 ex. Osterøy: Litland (EIS 40), 3 May 1981, 1 ex., **HOI** Kvinnherad: Rosendal, Baroniet (EIS 31), 5 May 1975 1 ex. Ullensvang: Djønno (EIS 41), 19 June 1934 1 ex., 19 June 1935 1 ex. Ulvik: Bruravik, 13-24 April 1982 2 exx., mt. Granvin: Granvin, 13-24 April 1982 1 ex., mt, coll. ZMB.

B. major (Fig. 1) is one of the two most common Norwegian Bombyliidae species. Siebke (1877) records it from Oslo, Hønefoss, Sarpsborg, Nes in Hallingdal and Øyer in Gudbrandsdal. Bidenkap (1892) reports it from Vestfold and states that it is numerous in dry places, especially in spring. There are a great many records from coastal areas from Oslo along the coast as far North as the Bergen area (HOY, EIS 39), and inland up through the Gudbrandsdalen Valley to Ringebu (OS, EIS 63).

The distribution of *B. major* is sho wn in Map 3. Dates of records ranges from 6 April to 19 June, with one record as early as the beginning of March.

The lack of records from Østfold, most of Telemark and the southern tip of the coastline is curious. Probably the records do reflect the activity of collectors in the early spring season more than the real distribution of the species. The fact that the fly did occur in numbers when collected at TEY Kragerø: Barlandskilen in June 1995 seems

to conform this suspicion. According to R. Christensen, who collected the single male recorded from Østfold, the species was abundant at the place and has been observed in numbers in the district for several years. It was also observed by one of the authors (M.F.) in Ø Hvaler: Kirkøy, Arekilen (EIS 12) in May 1995.

In an interesting paragraph on the developement of the species, O'Toole (in Stubbs & Chandler, 1978, p. 160 ff.) records *B. major* as an external parasite of solitary bees, usually of the genus *Andrena* (Hymenoptera, Andrenidae), and he lists the species *A. labialis, A. bicolor, A. chrysosceles, A. clarkella*. Yeates & Greathead (1997) records the host species *Andrena fulva* and *Halictus farinosus*. This seems to be confirmed by Norwegian observations (Knut Rognes, pers. comm.). One of the females from TEY Kragerø: Barlandskilen was observed flying low among the grasses and herbs around the nest openings of the solitary bee *Anthidium punctatum* Latr (Hym., Megachilidae).

B. major is the only Norwegian Bombyliidae species with a holarctic distribution (D. Yeates, pers. comm.). It is widely distributed, in Norway, Sweden and Finland to the North African countries, from Great Britain through the European countries and eastward throughout Turkey, Iran, Afghanistan, Mongolia and Siberia (Zaitzev 1989).

Bombylius medius Linnaeus, 1758

Records: **AK** Oslo: Bækkelaget (EIS 28), July 1836, 1 ♂ leg. SIE, Oslo (Christiania), 1 ♂ labelled «Christiania», leg. SIE. Bærum, 1 ♀ leg. SCH. Bærum: Ostøya, 6 June 1948 1 ♂, **AAY** Grimstad (EIS 6), Aug. 1953, 1 ♂ leg. Hvidbergskår, coll. ZMO. Further, the ZMB collection contains 3 exx. from **VE** (probably EIS 19), without further data, leg. BID.

Reported by Siebke (1877) from the botanical garden of Oslo - possibly the specimen labelled «Christiania» in the ZMO collection. Bidenkap (1892) reports having taken a single male specimen in Vestfold during the summer of 1891 - probably one of the Bidenkap specimens in the ZMB collection, and Strand (1903) reports it from the Oslo region («Omegnen av Kristiania»).

The distribution of *B. medius* is shown in Map 4. Dates of records cover the period from the beginning of June until August.

The species seems to be confined to the Oslofjord area in South-Eastern Norway and the South-Eastern coastline, and the few records of this large and remarkable fly clearly shows its rareness. Despite extended collecting activities in many coastal areas throughout the last decades, the last record is from 1953, indicating that the species is either extinct or very rare. An observation of a large *Bombylius* sp. at Ø Hvaler: Vesterøy EIS 20, in late August 1998 (O. Sørlibråten, pers. comm.) might probably have been this species.

The species is recorded from Sweden, but not from Finland, Denmark and Great Britain (Hedström 1986, 1991, Hackman 1980, Lyneborg 1965 b, Chandler 1998). Accørding to Zaitzev (1989) the European distribution covers the «south of Europe» from Portugal to Poland.

Bombylius minor Linnaeus, 1758

Records: **Ø** Hvaler: Kirkøy, Ørekroken (EIS 12), 8 July 1994 1 ♀, Arekilen, 19 July 1995 2 ♂♂ on flowering *Senecio viscosus*, 4 August 1995 5 ♂♂, 3 ♀♀ on flowering *Senecio viscosus* and *Lysimachia vulgaris*, 21. July 1996 1 ♀, leg. MF. Halden: Ystehede (EIS 20), 22 July 1996 1 ♂, leg. LOH, coll. MF. Marker: Øymark, Flagghytta (EIS 21), 7 August 1935, 1 ex. leg. TSR, coll. TM. Moss: Jeløy, Fuglevik (EIS 19) 16 July 1996 1 ♂, leg. LOH, coll. MF. **AK** Oslo (Kr.ania) (EIS 28), 1 ♂, 2 ♀♀, leg. SIE, coll. ZMO, 1 ex. in coll. TM. Oslo: Brovold, 28 June 1870 1 ♀ leg. SIE, coll. ZMO. Bærum: Ostøya, 1-24 July 1984 2 exx., mt A, leg. FM, coll. ZMB. **HES** Elverum (EIS 55), 1 ♀, Aamot, 1 ♀, leg. SIE. **BØ** Lier (EIS 28), 1 ♂ leg. ESM. Ringerike (EIS 36), 24 July 1909 1 ♂, 1 ♀, leg. WA, coll. ZMO. Drammen: Underlia (EIS 28), July 1995 1 ♀, mt, leg. LOH, coll. MF.

Siebke (1877) reports observations of the species from the vicinity of Kvam in the Gudbrandsdalen valley (EIS 62), «nec non ad Grundset et Aaset Østerdaliæ» (But not at Grundset and Åset in the

Østerdalen valley), which is not in correspondence with the specimens from Åmot and Elverum not far from Grundset.

The distribution of *B. minor* is shown in Map 5. Dates of records cover the period from 8 July to 7 August.

B. minor also seems to be a rare species, with a limited distribution in Norway. While there exists old records from inland localities, all the records made in modern times are from the areas around the Oslofjord, with no locality very far from the coastline. This may reflect the activities of the collectors more than the real distribution of the species. However, the modern records seems to indicate a certain distribution within this limited area, and at Hvaler the species was observed and collected in numbers. In addition to the flowers mentioned, it has been observed to feed from flowers of *Potentilla erecta* and *Valeriana sambucifolia*, indicating a preference for yellow flowers. The fly is shy and has a very rapid flight, making it sometimes difficult to catch.

Oldroyd (1969) records the species from the cells of the solitary bees *Colletes daviesanus* and *Andrena clarkella*.

The species is recorded from Sweden, Denmark, Finland and Great Britain (Hedström 1986, 1991, Hackman 1980, Lyneborg 1965 b, Chandler 1998). Zaitzev (1989) records it from south and central Europe and Finland, and eastwards to Mongolia.

Bombylius pumilus Meigen, 1820

Siebke (1877) records this species from a female specimen taken at «Brovold in Christianiam 28. Juni 1870». The specimen still exists in the ZMO collection, labelled «Brovold 28. 6. 1870» and «Siebke», and carrying a white label printed «Gl 680 Z.M.Oslo». The specimen clearly belongs to *B. minor*, for which *B. pumilus* Zett., 1842 is a synonym (Zaitzev 1989). Thus the proper *B. pumilus* Meigen, 1820 has never been a member of the Norwegian fauna, and is to be deleted from the Norwegian list.

Anthrax anthrax (Schrank, 1781)

Records: **AK** Oslo, «Kr.ania» (EIS 28), 2 ♂♂ leg. ESM, 1 ♂, 1 ♀ leg. SIE, coll. ZMO, 1 ex. coll. TM, Bekkelaget («Bæklag»), 30 June 1847 1 ♂, Tøyen, 24 June 1847 1 ♂, leg. SIE. Bærum, 1 ♀ without date. **HES** Odalen: Sør-Odal (EIS 37), 26 June 1887 1 ♂ leg. SCH, coll. ZMO. Eidskog: Leirsjøen (EIS 38), 24 June 1992, 1 ♂, 1 ♀, leg. LOH, coll. MF. **HEN** Åmot («Aamot») (EIS 55), 1 ♀, leg. SIE. Rendalen: Ytre Rendal, Solbakken (EIS 64), 29. June 1948, 1 ♂, leg. LN, coll. ZMO. **OS** Lunner: Sverigetjern (EIS 36), 6 August 1989 1 ♂, leg. OL, coll. MF. Land (EIS 45), 1 ♂. Aurdal (EIS 53), 1 ♀. Øyer («Øier») (EIS 54), 1 ♂, leg. SIE. **ON** Sel: Laurgard (EIS 71), 1 ♂, 2 ♀♀, leg. SCH. **BØ** Øvre Eiker: Ulleland (EIS 28), 5 August 1979 1 ♂ leg. & coll. KR. **BV** Rollag: Rollag (EIS 35), 16 June 1992 1 ♂, leg. SL, 20 June 1992 2 ♂♂ leg. BS, coll. MF, 9 June 1993, 1 ex., leg. BS, coll. ZMB. Rollag: Bråtåsen, July 1994 2 ♂♂ 1 ♀, mt, leg. HS. Rollag: Tråen saga, July 1994 1 ♂, mt, leg. BS, coll. MF. Sigdal: Halvorset, 8 July 1999 1 ♂, leg. JS, coll. ZMB. **VE** Sem: Fjugstad (EIS 19), 1 ex. without date. Jarlsberg, 26 July 1890 1 ex. Stang 22 July 1890 1 ex., leg. BID (in addition there is a specimen from Vestfold without further data, also leg. BID), coll. ZMB, **TEI** Notodden: Lisleherad, fire area (EIS 27), 22 June-6 Aug. 1993 1 ♀, mt, Sample 3, leg. AB, coll. MF. Sauherad: Nordagutu (EIS 18), 26 July 1979 1 ♂ leg. KR. Kviteseid: Kviteseid gml. kirke (EIS 17), 26 June 1980 1 ♂. Tokke: Krossli, 10 July 1980 1 ♀, leg. & coll. KR, **SFI** Sogndal: Valeberget (EIS 50 or 51) (uncertain), 7 July 1939 1 ex. Balestrand: Flesje (EIS 50), 3 July 1935 1 ex., **STI** Oppdal, Lønset (EIS 79), 1-12 June 1992, 1 ex., mt in south faced pine forest, 450 or 520 m above sea level, coll. ZMB.

Siebke (1877) records this species under the name of *Anthrax aethiops Fall.* from Christiania, Staværn, Skøyen in Land, Fagernes in Aurdal, the vicinity of Øyer and Fron in the Gudbrandsdal valley, «nec non in Elverum et Aamodt Østerdaliæ.» This statement is contradicted by the Åmot specimen in the ZMO collection. Schøyen (1889) corrects the determination of Siebke, and states

that the correct name is *Argyromoeba sinuata* Fall., which is used by subsequent authors. Bidenkap (1892) reports it from Vestfold and states that it is «rather common along stone fences and at open places in the woods». Storm (1907) records it from Trondheim. However, parts of Storm's collection has been lost or destroyed, and the collections of the University of Trondheim does not contain any Bombyliidae specimens.

The distribution of *A. anthrax* is shown in Map 6. Dates of records extend from the beginning of June to the beginning of August, with a peak in July.

Known to parasitize Hymenoptera, Apoidea of the genera *Anthophora* (Anthophoridae), *Osmia* and *Calicodoma* (Megachilidae), and *Hoplomerus* (Lyneborg, 1965 a, Yeates & Greathead, 1997).

The species is widespread with an inland distribution. It is reported from Denmark, Sweden and Finland (Lyneborg 1965 b, Hedström 1986, 1991, Hackman 1980). Zaitzev (1989) records it throughout Europe from Great Britain to Italy and from Spain to Portugal and eastwards throughout Europe and Asia south of 70 degrees North, as well as from Africa north of Sahara and from the Canary Islands. Chandler (1998) removes it from the British list, but states that there are specimens recorded as British in British museum collections.

Anthrax trifasciatus leucogaster Wiedemann in Meigen, 1820

Records: **AAY** Hisøy (EIS 6), 22. July 1935, 2 exx., leg. TSR, coll. TM, Tvedestrand : Gjeving, 17. July 1979, 1 ♂, 19. July 1979, 1 ♀, leg. & coll. MF.

New to Norway. The specimens corresponds to the color plate of Meigen (Morge 1975), and also fit the descriptions in Paramonov (1936b) and Engel (1937). Wahlgren (1907) keys it under the name of *Argyramoeba aethiops,* which is clearly an error. Engel treats it as a subspecies of *Anthrax trifasciatus Meigen, 1804*, but it is treated as a separate species by Paramonov (1936b), though he remarks that the male genitalia of *A. trifasciatus* is «like *A. leucogaster*». François (1966, 1969) treats the two forms as conspecific. So do Greathead, who, in studying material from southern Europe and Arabia (Greathead, 1989) found no consistent differences between these two forms, and no discernible differences in the male genitalia. His conclusion is that *leucogaster* is probably a cline within *A. trifasciatus*, and at best represents a northern form of this species. (Greathead, pers. comm.) Although recent authors from Sweden and Finland, as well as Zaitzev (1989) treat *leucogaster* as a good species, we find it reasonable to follow Engel, François and Greathead, and view it as a subspecies of *trifasciatus*. Further collecting and analysis of this form throughout its range may confirm the suspicion that it is not even a definite subspecies, but a cline.

The distribution of *A. trifasciatus/leucogaster* is shown in Map 7. Dates of records go from 17 July to 22 July, but very little can be said of the flight period from just three records.

According to Greathead (1989) the species is parasitic in the nests of wasps and solitary bees (Hymenoptera: Sphecidae and Megachilidae).

Not recorded from Denmark and Great Britain. Until the specific status is clarified, the range of this species can not be given, but Zaitzev records both *A leucogaster* and *A. trifasciatus* from a wide range through Europe, Asia and Africa north of Sahara.

Anthrax varius Fabricius, 1794

Records: **Ø** Hvaler: Kirkøy, Ørekroken (EIS 12), 20 June 1994, 3 ♂♂, 5 ♀♀, 10 July 1995 2 ♂♂. Arekilen, 20 June 1994 1 ♀, 8 July 1994 1 ♀, leg. & coll. MF. Halden: Ystehede (EIS 20) , 25 July 1996, 1 ♀, leg. LOH. Sarpsborg, 14 July 1869, 2 ♂♂ leg. GRI, labelled «Siebke», and respectively «Sp.brg.» and «Srpsbg.» (=Sarpsborg), coll. ZMO. **AK** Bærum: Fornebu (EIS 28), 27 June 1996 1 ♀, leg. BS, coll. ZMB. Bærum: Ostøya, 28 July 1995 1 ♂, leg. & coll. MF. Borøya, 28 June–9 Sept. 1995 1 ♂, mt, leg. LOH. **BØ** Hurum: Verket, 6 June–8 July 1995, 3 ♂♂, 3 ♀♀, mt in

sandy slope, leg. HH, coll. ZMO. Drammen: Underlia, 1-31 July 1992 1 ♀, mt, leg. LOH, coll. MF, June 1994 1 ♂, mt, June 1994 1 ♀, mt, coll. ZMB, Aug. 1994 1 ♀, July 1995 1 ♀, mt, leg. LOH, coll. ZMO. Øvre Eiker: Ulleland, 5 August 1979 1 ♂, leg. & coll. KR. **VE** Borre: Adalstjern (EIS 19), June 1997, 1 ♂, mt, leg. LOH, coll. ZMO. Tjøme: Kjære skog, 30 June 1977 1 ♀. Mo, 7 June 1992 2 ♂♂, 2 ♀♀, 8 June 1992 1 ♂ 2 ♀♀. Hvasser, Fyn, 10 June 1992 1 ♀. Sandøy, 16 June 1991 1 ex., 7 June 1992 4 exx., coll. ZMB, 3 ♂♂ leg. LOH, 2 ♂♂, leg. ØB, 8 June 1992 1 ♂, 2 ♀♀, leg. ØB. Hvasser, 1 ♂ (ex. pupa 6 November 1991), leg. ØB. Moutmarka, 14 June 1994 1 ♂, leg. MF, coll. MF. **TEI** Tokke: Lårdal, Triset (EIS 17), 2 July 1975, 1 ex., coll. ZMB. Sauherad: Sanden (EIS 18), 11 June 1994 1 ♂, leg. ØB, coll MF. **VAY** Kristiansand: Strai (EIS 2), 14 July 1972, 1 ♂, leg. & coll. TN.

Siebke (1877) mentions this species as «Ad Hornnæs prope Sarbsborg 14 Juli 1869 in copula a Dom. Grimsgaard capta.» However, the two specimens in the ZMO collection are both ♂♂.

The distribution of *A. varius* is shown in Map 8. Dates of records range from 7 June until 5 August, with a peak in June and the first days of July.

The species seems to occur throughout the Oslofjord area southwards along the coast. There is only one record from the previous century, however in recent years there are many records. Of special interest is the male specimen from Tjøme: Hvasser, 6. November (1991), which is pinned together with an exuvium, and labelled «Ex. snailshell with *Osmia* sp.». Øistein Berg collected *Osmia* (Hymenoptera, Megachilidae) pupae, mostly *O. (Anthocopa) spinulosa* Kirby, and from one of them hatched *A. varius*. This seems to be the first record concerning the host of this species.

Recorded from Sweden, Finland and Denmark (Bornholm only) (Hedström 1986, 1991, Hackman 1980, Lyneborg 1965 b). Zaitzev (1989) records it from Europe (Spain to Bulgaria, Sweden to Greece), the central and southern parts of Russia, Caucasus, Turkey, Iran and from Algeria, Morocco and the Canary Islands.

Hemipenthes maurus (Linnaeus, 1758)

Records: **Ø** Hvaler: Kirkøy, Ørekroken (EIS 12), 1. June 1994, 2 ♂♂. Vesterøy: Løkker (EIS 20), 6. July 1993, 1 ♂, leg. & coll. MF. Vauer, Guttormsvauen, 29. July 1984 3 ♂♂, 31. July 1984 1 ♀, leg. & coll. KR, 6. August 1993 1 ♂, Halden («Fr.hald») 1 ♂ leg. SIE, 2 ♀♀, leg. SCH. Halden: Tistedal, June 1889 1 ♂, 1 ♀ leg. SCH, coll. ZMO. Halden: Bergheim, 30. July 1970, 1 ex., coll. ZMB. Fredrikstad: Onsøy, Foten, 18. June 1981 2 ♂♂, leg. & coll. MF. Råde: Åven (EIS 19), 9-11 June 1996 1 ♀, mt, leg. LOH, coll. ZMO. Moss: Jeløy, Alby, 28. May 1994 1 ♀, leg. & coll. MF. Jeløy, Statsberget, 4. July 1977 2 exx., coll. ZMB. Askim: Øyerud (EIS 29), 6. July 1976, 1 ♀, leg. & coll. TN, **AK** Oslo: («Kr.ania») (EIS 28), 18 exx., leg. ESM, 2 exx. leg. SIE, Oslo: Homannsbyen, 1871, 1 ♀ labelled «72» and «Homansby 1871» in Siebke's handwriting, 1 ex. labelled «Aker» (now within Oslo), coll. ZMO. Oslo: Brannfjell, 23. June 1969, 1 ♂, 1 ♀. Østmarka, 2. July 1978 1 ♀. Ullevålseter, 30. July 1978 2 ♀♀. Lutdalen, 3. July 1994 1 ♀, leg. & coll. MF. Ammerud, 14 July 1982 1 ♂, leg. JHS. Østensjøvannet, Manglerud, 24 June-9 July 1995 1 ♀, mt, leg. MF, coll. ZMO. Hovedøya, 29. June 1981, 1 ex. coll. ZMB, 13 July 1982 1 ♀ leg. FM, coll. TN. Sognsvann, 31 July 1935 3 exx., Tåsen, 1 August 1935 1 ex., leg. TSR, coll. TM, 3 July 1949 1 ex. coll. ZMB. Bygdøy, 25 June 1979 3 ♂♂, 1 ♀ leg. & coll. KR. Bygdøy, Hengsenga, 24 June 1986 1 ♂, leg. MF. Røa, 7 July 1995 1 ♂, leg. ØB, coll. MF. Frogn: Degerud, 8 August 1935 6 exx., 9 August 1935 1 ex., 10 August 1935 1 ex., leg. TSR, coll. TM. Hallangen, 4 July 1976 1 ex., coll. ZMB. Ås, 18 June 1978, 1 ♂. Ås: Rustad, 10 June 1980 1 ♂, leg. RM. Bærum, 2 exx. leg. SCH. Bærum: Ostøya, 22 May 1960 1 ♀, head missing, 16 June 1996, 1 ♂, leg. LOH,12 June 1998 4 ♂♂, 1 ♀, leg. OS, coll. ZMO, 14. June 1983 1 ♂, 2 ♀♀ leg. FM, 30. May 1984 1 ♂, 31. May 1984 2 ♀♀, 2. June 1984 1 ♂, coll. TN, 1. June 1984 1 ex., 10 June-1 July 1984 8 exx., mt A, 1.-12. July 1984 1 ex., mt A, 24 July-12 August 1984 6 exx., mt A, August-September 1984 3 exx., mt A, leg. FM, coll. ZMB, 17. June 1989 1 ♂, 1 ♀, 20. July 1994

1 ♀, leg. OS. Oksenøya, 17 June 1997 1 ♀, leg. HL, Borøya, 8 July 1983, 1 ♀, leg. MF. Kalvøya 11 July 1995 1 ♂, leg. ØB. Tanum, 5. June 1992, 1 ♂, 1 ♀, leg. ØB, coll. MF. Kolsås, 13 July 1983, 1 ♂, leg. JHS, coll. ZMO. Steinshøgda, 29 July 1977 2 ♀♀. Nordby gård, 21 June 1979 1 ♂, 1 ♀. Østerås, 15 July 1981 1 ♂, leg. & coll. KR. Høvik, 18 June 1935 3 exx. leg. TSR, coll. TM. Asker: Brønnøya, 15 June 1981 1 ♂ leg. & coll. TN. Sem, 18 June 1981 1 ♀, leg. JHS, coll. ZMO. Semsvann, 31. May 1992 1 ♂ leg. ØB, coll. MF. Konglungen, 4 June 1997 1 ♂, leg. GS. Bjerkås, 4 June-2 July 1995 3 ♂♂, 7 ♀♀, mt, 2 July-24 August 1995 2 ♂♂, 2 ♀♀, mt, leg. HH, coll. ZMO, 1 ♀, mt, leg. HH, coll. ZMB, 23 July 1995 1 ♂, leg. LOH, coll. ZMO. Nes: Tjernsmo (EIS 37), 15 June 1983 1 ♂, leg. FM, coll KR, **HES** Eidskog, Magnor (EIS 38), 5 July 1997, 1 ♀. Vestmarka, 5 July 1997 1 ♂, leg. HL, coll. MF. Ringsaker: Brumunddal (EIS 45), 9 July 1974 1 ♂, leg. & coll. TN (EIS 54), 8 June 1992, 3 ♂♂, 2 ♀♀, leg. KM, coll. MF. **HEN** Åmot: W. of Åsta bru (EIS 55), 30 June 1998 1 ♀, leg. LG, coll. ZMB, **OS**, Lunner: Grindvoll (EIS 36), 11 June 1990 1 ♂. Jevnaker: Vang 11 June 1990 1 ♂, leg. OL. Gjøvik: Rambekk (EIS 45), 2 July 1971, 1 ♂ leg. LA, coll. MF. Lillehammer: Flåkåli, v/ Gausa, 5 km W of Fåberg (EIS 54), 14 July 1982, 1 ♂ leg. A. & Ø. Rognes, coll. KR. Gausdal: Follebu, 29. July 1980 1 ex., coll. ZMB. Ringebu («Rngbo») (EIS 63), 1 ♀, leg. SCH, coll. ZMO. Ringebu krk. 9 July 1978 1 ♂, leg. & coll. TN.

Figure 2. *Hemipenthes maurus* (Linnaeus, 1758). The most common and widespread Norwegian bee fly species. Photo: Carll Goodpasture.

ON V. Slidre: Fagernes sentrum, 17 July 1998, 1 ♂ leg. OS, coll. MF. **BØ** Lier: Lierskogen (EIS 28), 6 June 1997 1 ♂, leg. HL, 11 July 1997 2 ♂♂, leg. EH. Hurum: Verket, 6 June-8 July 1995 2 ♂♂, 2 ♀♀, mt in sandy slope. Verksøya, 6 June-8 July 1995 1 ♂ 1 ♀, mt at sea shore, leg. HH. Røyken («Røken»), 1 ex., leg. SIE, coll. ZMO, Røyken: Hyggen, 6 July 1991 1 ♂, 11 July 1991 1 ♂, 28 July 1991 1 ♂, Røyken: Hyggen, Kinnartangen 28 May-6 July 1 ♂, 4 ♀♀, 6 July-4 August 1991 4 ♀♀, mt in south faced slope, June 1993 3 ♀♀, July 1993 1 ♀, mt. Drammen: Åssiden, Underlia, 16 May 1991 1 ♂, 1-30 June 1992 1 ♂, 4 ♀♀, mt, 1-31 August 1992 1 ♀, mt, June 1993 2 ♂♂, 2 ♀♀, mt, July 1993 1 ♀, mt, June 1994 1 ♂, 9 ♀♀, mt, leg. LOH, coll. ZMB, 1 ♂ 4 ♀♀, mt, August 1994 1 ♀, mt, leg. LOH, coll. MF, July 1995 2 ♂♂, 4 ♀♀, mt, Aug. 1995 1 ♀, mt, leg. LOH, coll. ZMO, 1 ♂, 3 ♀♀, mt, leg. LOH, coll. ZMB. Nedre Eiker: Mjøndalen, Hagatjern, Ryghsetra, June 1994 1 ♀, July 1994 2 ♀♀, mt A, July 1994 1 ♂, 9 ♀♀, mt B, leg. BH, coll. MF, 13. June 1994 1 ♂, 24 June 1994 1 ♀, leg. PT, coll. ZMO. Øvre Eiker: Ulleland, 5 August 1979 3 ♀♀. Øvre Eiker: Burud 1 August 1979 1 ♀, Flesberg: Belgen (EIS 27), 27 July 1979 1 ♂, leg. & coll. KR. Kongsberg: Kongsberg, 10 July 1976 1 ♂, leg. & coll. TN, 28 July 1979 2 ♂♂, 1 ♀. Kongsberg: Eftelet 6 August 1979 1 ♂, leg. & coll. KR. Modum: Drolsum (EIS 36), 31 July 1982, 1 ♀, leg. & coll. MF. Ringerike, 1 ♀ leg. SCH, coll. ZMO. Ringerike: Hønefoss, leg. SIE,1 ex., coll. TM, 2 exx. coll. ZMO. Ringerike: Klekken, 7 July 1976 2 ♂♂, 1 ♀, leg. & coll. TN. **BV** Rollag: Rollag (EIS 35), 26 June 1979 1 ♂, 3 August 1982 1 ♀, leg. BS, coll. MF, 7 July 1993 1 ex. Rollag: Veggli, 29 June 1995 1 ♀, cn. Rollag: Kjomme (EIS 27), 9 July 1995 1 ♂, leg. BS, coll. ZMB. Gol: Gol (EIS 43), 9 July 1970, 1 ♀ leg. & coll. TN. Rotneim, 19 June 1997 1 ♂, leg. HL, coll. MF. Flå: N of Austvoll (EIS 44), 14 August 1996 1 ♀, mt, leg. LOH, coll. ZMO. **VE** Hof: Thorrud (EIS 28), 28 July 1979 2 ♂♂, 1 ♀, leg. & coll. KR. Sande: Kommersøya (EIS 19), 27 June 1969 1 ♂ leg. MF, 28 May-9 July 1991 1 ♀, 9 July-2 August 1 ♀, mt in west faced slope with limestone, western shore, leg. LOH, coll. MF. Sande: Sandøy, 9 July 1985 1 ex., coll. ZMB. Våle: Langøya 8 July-2 August 1991 1 ♂, 3 ♀♀, mt in calcareous meadow at seashore, leg. LOH, 28 May 1991, 1 ♂, leg. ØB, coll. MF. Borre: Adalstjern, June 1997 1 ♀, mt, leg. LOH, coll. ZMO. Sem: Stang, 22 July 1890 1 ex., 25 July 1890 2 exx., (leg. BID?). Nøtterøy: Herstad, 4. August 1970 1 ex., coll. ZMB. M.-Bolærne, 4-26 July 1995 5 ♀♀, mt, leg. AFH, coll. ZMO, Tjøme: Hvasser, Syd 6 June 1992 1 ♂, 7 June 1993 1 ♂, 1 ♀, leg. MF. Tjøme: Mostranda, glade in forest, 23 June 1995 1 ♂, 24 June 1995 1 ♂. Tjøme: Gon, 24 June 1995 1 ♀ leg. JS, coll. ZMB. Tjøme: Moutmarka, 8 June 1992 1 ♀, leg. ØB, Tjøme: Hvasser, 19 July 1990 1 ♂, leg. & coll. MF. Tjøme: Hulebakk 9 July 1985 1 ex. Tjøme: Kjære, 6 June 1965 1 ex. Tjøme: Mo, 5 July 1970 1 ex. Tjøme: Tjøme, 8 July 1966 1 ex., 27 June 1968 1 ex., 16 June 1969 1 ex., 10 June 1975 1 ex., 29 June 1976 1 ex., coll. ZMB. Larvik: Larvik, 3 July 1911 1 ♀, leg. LN, coll ZMO. Brunlanes: Stavern, 5 July 1980, 1 ex., 6 July 1980 1 ex., coll. ZMB. Larvik: Brunlanes: Bøvre, 22 July 1979 1 ♂, 1 ♀, leg. & coll. MF. Sandefjord: Sandar, Ø. Nes, 29 June 1969 1 ex. Årø 9 July 1970 1 ex. Tjølling: Ula, 8 July 1980 1 ex., coll. ZMB, Tjølling: Bisjord-Heggedal, 17 June 1984 1 ♀. Tjølling: Gon, 11. July 1983 1 ♀, leg. BB, coll. TJ. Lardal: Bergandammen (EIS 18), 4 July 1979 1 ex., coll. ZMB, **TEY** Porsgrunn: Skjelsvik, 8 June 1996 1 ♂, leg. GS, coll. ZMO, Sandøya (EIS 11), 2-17 August 1986 1 ex., coll. ZMB. Bamble: Langøya, 6-31 July 1995 1 ♀, mt at sea shore, leg. MH, coll. ZMO. Skien: Elstrøm, 2 July 1978, 1 ♀, leg. & coll. TN. Kragerø: Portør, 7 July 1976 1 ex. coll. ZMB. Drangedal: Holmen (EIS 17), 23 July 1960, 1 ex., coll. ZMB, **TEI** Bø: Verpe, 1 August 1993 1 ♀, leg. ØB, coll. MF. Kviteseid: Morgedal, Donstad, 3 July 1975 1 ex. Tokke: Lårdal, Triset, 2 July 1975 5 exx., coll. ZMB. Tokke: Lårdal, 4 July 1980 3 ♂♂, 1 ♀. Seljord: To, 28. July 1979 2 ♂♂, 1 ♀, leg. & coll. KR. Seljord: Seljord, 25 June 1984 1 ♂. Nissedal: Nissedal, 26 June 1976 1 ♂. Sauherad: Nordagutu (EIS 18), 19 June 1985 1 ♂, leg. & coll. TN, 26. July 1979 1 ♂. Fyresdal: Aslestad, Slystøyl (EIS 16), leg. & coll. KR. Vinje: Åmot (EIS 25), 13 July 1976 1 ♂. Hjartdal: Øverbø (EIS 26), 12 July 1976 1 ♂, leg. & coll. TN. Seljord: Blika, 5-

8 August 1993 1 ♂, 1 ♀, leg. ED, coll. ZMO. Notodden: Elgsjø (EIS 27), 11 July 1976 1 ♀, leg. & coll. TN. **AAY** Risør: Risør (EIS 11), 11 June 1911, 1 ex. leg WA, coll. ZMO. Risør: Risøya, 8 July 1976, 1 ex. coll. ZMB. Tvedestrand: Dypvåg (EIS 6), 24 July 1960 1 ex., coll. ZMB. Tvedestrand: Gjeving, 17 July 1979 3 ♀♀, leg. & coll. MF. Vik: Bringsvær, 13 July 1977 1 ex., coll. ZMB. Arendal: Flødevigen, 26 July 1935 1 ex. leg. TSR, coll. TM. Tromøy: Tromøy, 9 July 1982 1 ♀, leg. IS. Tromøy: Løvstad, 28 July 1974 1 ♂, 1 ♀, 30 July 1974 1 ♀, leg. & coll. TN. Tromøy: Tromøy krk., 27 July 1983 2 ♀♀, leg. & coll. TJ. Grimstad: Fevik, 25 June 1983 1 ♂. Fevik, Storesand, 22 June 1983 1 ♀. Fevik, Vessøya, 28 June 1978 1 ♂, 3 ♀♀, 29 June 1978 2 ♀♀, leg. MF. Fevik, Randvik, 1 August 1992 1 ♀, leg. ØB. Grimstad: Homborsund, 29 July 1994 1 ♂ leg. & coll. MF. Østerled, 25 July 1976 1 ♀. Lillesand: Høvåg, 16 July 1972 1 ♀. Birkenes: Åmli, 25 July 1976 1 ♀, leg. & coll. TN. **AAI** Åmli: Sandå (EIS 10), 28 June 1978 1 ♀, leg. & coll. KR. Bygland: Heddevika (EIS 9), 4 July 1997 1 ♀, 4-22 July 1997 1 ♀, leg. KB, coll. MF. **VAY** Kristiansand: Kjevik (EIS 5), 18 June 1982, 1 ♂, 1 ♀, leg. & coll. TN. Hamresanden, 19-30 July 1997 3 ♀♀, mt, leg. KB, coll. MF. Marnardal: Laudal, Sveindalgard, 21 July-6 August 1 ex., mt, coll. ZMB. Randesund (EIS 2), 1 ex. lacking tip of abdomen, leg. SCH. Oddernes, 24 June 1967 5 exx., 9 july 1967 1 ex., coll. ZMB. Kristiansand, 9 July 1972 1 ♀. Hamre, 17 June 1972 1 ♂, 18 June 1972 1 ♀. Strai, 14 July 1972 1 ♂. Bjørnestad, 14 July 1972 1 ♂, 1 ♀, 25 July 1977 1 ♂, leg. & coll. TN. Stangenes, 13 July 1977 1 ♀, leg. SS, coll. MF. Søgne, 21 June 1960 1 ex., coll. ZMB. Songdalen: Nodeland, 14 July 1972 1 ♂, leg. & coll. TN. Mandal: Marnarveien at road to Valand, 21 July-6 August 1982 1 ex., mt, leg. AN, coll. ZMB. Mandal: Harkmark, 25 June 1975 3 ♂♂, 1 ♀, leg. & coll. TN. Mandal: Mandal, 6 July 1935 2 exx., 7 July 1935 1 ex., 10 July 1935 1 ex., 11 July 1935 2 exx., 14 July 1935 2 exx., 15 July 1935 3 exx., leg. TSR, coll. TM, 10 July 1978 1 ex. coll. ZMB. Kvisla, 31 July 1935 1 ex. leg. TSR, coll. TM, Lindesnes: Spangereid (EIS 1), 31 July 1977 1 ♀. Reme, 3 June 1978 1 ♂. Jåsund, 3 June 1978 1 ♂, 1 ♀. Lyngdal: Oftedal, 6 August 1975 1 ♀, leg. & coll. TN. Farsund: Lista, 28 June 1978 1 ♀ leg. JN, coll. KR. Einarsneset, 3 June 1995 1 ♂, leg. KB, coll. MF. **RY** Hå: Ogna (EIS 3), 3 July 1960 1 ex., 21 June-17 July 1996 1 ♀, mt, leg. LG, coll. ZMB, Klepp: Orre (EIS 7), 6 June 1960 1 ♂ leg. & coll. TN.

H. maurus (Fig. 2) is one of the two most common Bombyliidae species in Norway, along with *Bombylius major*. The conspicuous black and white colouring gives the fly an exotic outlook, and prompts it to be collected also by collectors who are mainly looking for other types of insects. Along with the long flight period, this gives reason to believe that the flight area and period of this species is fairly well known.

Siebke (1877) records it (as *Anthrax maura* L.) from Frederikshald, Sarpsborg, Christiania, Ringerike, Gol in Hallingdal, Aurdal in Valdres, Land, Åmot and Grue in Østerdalen. Bidenkap (1892) records it from Vestfold, and states that it is numerous on warm meadows.

The distribution of *H. maurus* is shown in Map 9. Dates of records extends from 16 May to the middle of August, and the species is abundant throughout June and July.

The species does not appear to go further north along the coast than the Stavanger area, although in inland areas it occurs as far north as Ringebu in Oppland county. In the favourable climate in the Oslofjord area it is very frequent.

According to Lyneborg (1965a) the species of this genus are hyperparasites on parasitic Hymenoptera (*Ophion, Banchus* [Hymenoptera: Ichneumonidae]) and Diptera (*Masicera, Ernestia* [Diptera: Tachinidae]). Sometimes the infestation of *Hemipenthes* is so heavy that the effect of parasitism on serious forestry pests like *Lymantria* and *Panolis* (Lepidoptera) is significantly counteracted.

The species has been recorded from Sweden, Finland and Denmark (Hedström 1986, 1991, Hackman 1980, Lyneborg 1965 b). Zaitzev (1989) records it from all parts of Europe and eastwards from Turkey, Iran and Afghanistan through Siberia to Mongolia and China.

Thyridanthrax fenestratus (Fallén, 1814)

Records: **Ø** Hvaler: Kirkøy, Ørekroken (EIS 12), 20 June 1994 1 ♀, 8 July 1994 1 ♀. Arekilen, 20 June 1994 1 ♂, 19 July 1995 1 ♂, 20 August 1995 1 ♀, 21 July 1996 1 ♂, 1 ♀, leg. & coll. MF. Hvaler: Hvaler (EIS 20), 1 ♂ without date, leg. SCH, coll. ZMO. Vesterøy, Løkker, 6 July 1993 1 ♂, 1 ♀, leg. & coll. MF. Vauer, Guttormsvauen, 29 July 1984 1 ♂. Vauer, Kuvauen, 3 August 1984 1 ♂, leg. & coll. KR. Halden: Tistedal, 1 ♂ dated June 1889, leg. SCH, coll. ZMO. Aremark: Moane, 1,5 km WSW of Årbu (EIS 21), 2 August 1984 1 ♂ leg. & coll. KR. **AK** Oslo: Oslo («Kr.ania») (EIS 28), 1 ♂ leg. ESM, 1 ♀ leg. SCH, coll. ZMO, 1 ♀ leg. SIE, coll. TM. Bærum, 1 ♂ leg. SCH. **HES** Elverum: Grundset (EIS 55), 1 ♂. **OS** Øyer: Øyer (EIS 54), 15 July 1850 1 ♀. **ON** Nord-Fron: «Froen» (EIS 62), 2 August 1850 1 ♀. Kvam («Qvam»), 2 August 1850 1 ♀, without date: 2 ♂♂ 1 ♀, leg. SIE, coll. ZMO, **BØ** Kongsberg: Labru (EIS 27), 28 June 1993 1 ex., coll. ZMB. **BV** Rollag, Tråen saga (EIS 35), June 1998 1 ♀, mt, leg. BS, coll. MF. **VE** Tjøme: Kjære (EIS 19), 2 July 1977 1 ex., 12 July 1977 1 ex., coll. ZMB. **TEY** Bamble: Langøya (EIS 11), 7 July 1997 1 ♂, leg. LOH. Kragerø: Barlandskilen, 5 June 1995, 1 ♂, leg. MF, coll. MF. **TEI** Sauherad: Nordagutu, 26 July 1979 1 ♂. **AAI** Åmli: Sandå (EIS 10), 28 June 1978 1 ♂ 1 ♀ leg. & coll. KR. Birkenes (EIS 9), 25 July 1976 1 ♂ 1 ♀, leg. & coll. TN. Evje & Hornnes: Bjorå, 26 June 1977 1 ♀ leg. SS, coll. MF. **AAY** Risør: Øysang (EIS 11), 27 June 1975 1 ♂ 1 ♀ leg. & coll. TN. Tvedestrand: Gjeving (EIS 6), 17 July 1979 3 ♂♂ leg. & coll. MF. Arendal, July 1838 4 ♂♂ leg. ESM, coll. ZMO. Grimstad: Fevik, 25 June 1983 1 ♂. Vessøya, 28 June 1978 1 ♂ 1 ♀, 29 June 1978 1 ♂ 1 ♀, leg. MF. Lillesand: Grimevann, Buene, 25 June 1995 1 ♂, leg. ØB. **VAY** Kristiansand: Kjevik (EIS 5), 3 June 1980 1 ♀ leg. KB, coll. MF. Mandal (EIS 2), 6 July 1935 1 ex., 7 July 1935 2 exx., 10 July 1935 2 exx., 14 July 1935 2 exx., leg. TSR, coll. TM. «Furulunden» v/Sjøsanden, 10. July 1978 1 ex. coll. ZMB, Harkmark 20 July 1984 1 ♀ leg. & coll. TN.

Siebke (1877) reports this species (as *Anthrax fenestrata* Fall.) from a large area of South-Eastern Norway: Oslo, Frogner and Enebakk in Akershus, Øyer, Fron and Kvam in Gudbrandsdal («nec non ad Grundset», though the ZMO collection contains a specimen labelled «Grundset» and «Siebke»!), and Sarpsborg in Østfold.

The distribution of *T. fenestratus* is shown in map 10. Dates of records extend from the end of June to the end of August, with one aberrant date 3 June. The records from the interior districts of Hedmark and Oppland (EIS 54, 55, 62,) are all from the Siebke material, and need to be confirmed by recent collecting.

O'Toole (in Stubbs & Chandler 1978) says the species «has been seen «shadowing» ♀♀ of the large hunting wasp *Ammophila sabulosa* in the New Forest.» This connection with *A. sabulosa* (Hymenoptera, Sphecidae) corresponds well with the recent records from Norway, which are all within the known range of the host, but the older (Siebke) records from the inland districts are clearly outside the present range of *A. sabulosa*. According to Lyneborg (1965a) it parasitizes the egg pods of grasshoppers.

The species is recorded from Sweden, Denmark (the most common Bombyliidae species, according to Lyneborg [1965a]), Finland and Great Britain (Hedström 1986, 1991, Lyneborg 1965 b, Hackman 1980, Chandler 1998). Zaitzev (1989) records it from Europe, the central and southern parts of Russia, Central Asia, Turkey, Iran, Mongolia and China and from Algeria and Morocco.

DISCUSSION

Ten species, *Glabellula arctica, Phthiria pulicaria, Bombylius major, B. medius, B. minor, Anthrax anthrax, A. leucogaster, A. varius, Hemipenthes maurus* and *Thyridanthrax fenestratus* are recorded from southern, central and northern Norway. Two species, *Phthiria pulicaria* and *Anthrax leucogaster*, are new to Norway. Only the tiny *Glabellula arctica* is distributed all over the country, while among the others *Anthrax anthrax* reach southern Trøndelag province. The

other species have more or less restricted distributional areas in parts of southern Norway. One genus of Bombyliidae, *Villa*, which is present in Norway, is not included in this survey.

Glabellula arctica has a wide distributional area in Norway, the only species found in the northern provinces. However, there are relatively few records. Two of the *Formica* spp. noted as a host by Andersson (1974), viz. *F. aquilonia* Yarr. and *F. exsecta* Nyl. have wide distributional areas in Norway as well, while the other two host species, *F. polyctena* Förster and *F. nigricans* Emery are fairly rare (Collingwood 1979). *G. arctica* is probably overlooked because of its small size and special biology.

Phthiria pulicaria is a character species of sandy shores, found at socalled «fixed dunes», viz. dunes with some plant cover. Lyneborg (1965 a) describes it as very common in Denmark, where suitable habitats are frequent. In Norway, the species is probably restricted to the southern parts, although sand dunes are found all along the coast. Another species, *P. canescens,* has been recorded from Denmark, but very rarely, and is not to be expected from Norway.

Three species, *Bombylius major, Anthrax anthrax* and *Hemipenthes maurus* must all be described as fairly common, with their main distributional areas in SE Norway, but they all reach the western provinces. *B. major* seems to have an abrupt stop in Hordaland province. Here it seems to be fairly common at some localities, and thus the northern border might be further north in the western Norway. The early flight period of this species might explain why it has not been recorded from some areas.

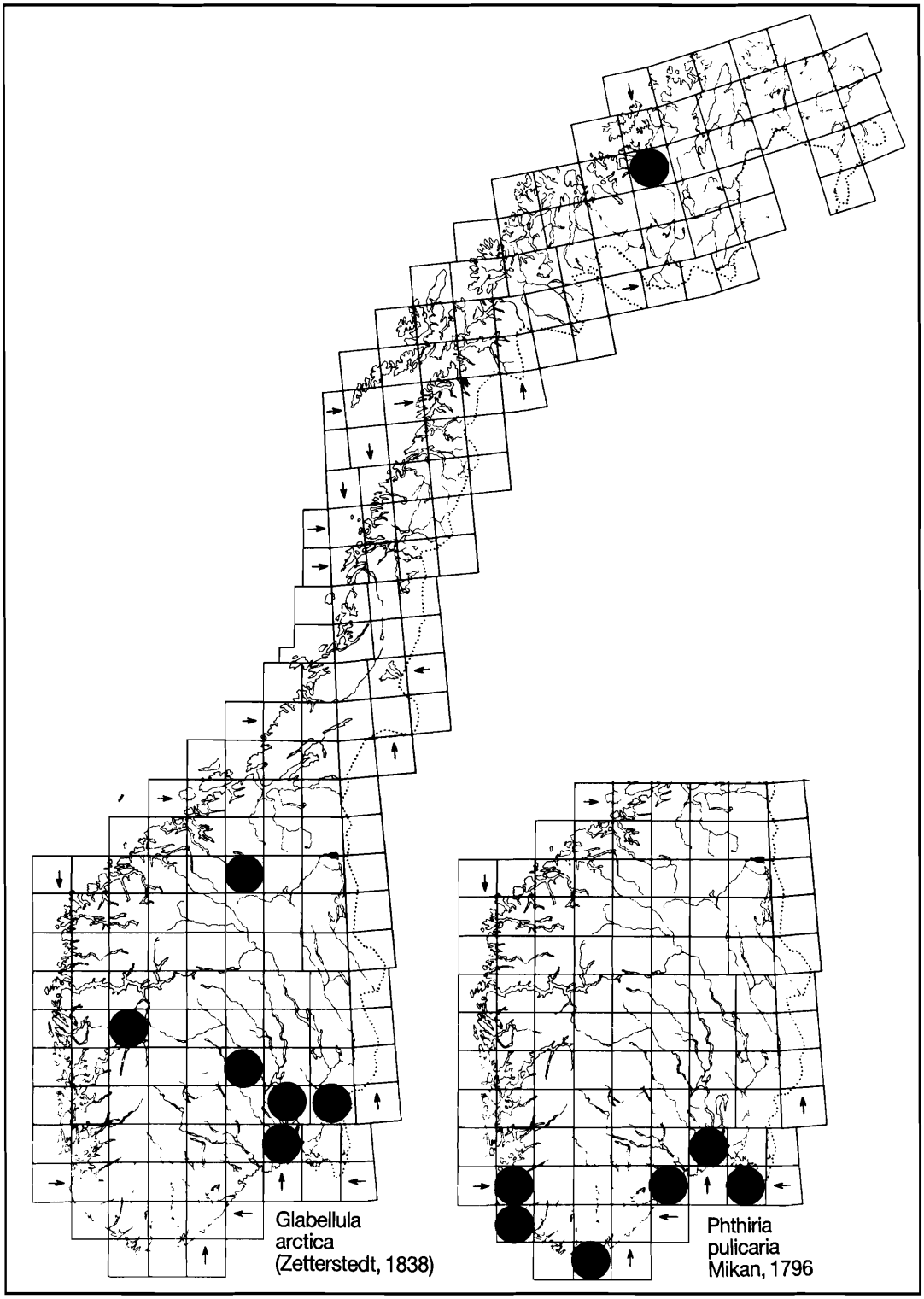
In W. Norway, *A. anthrax* is recorded only once from inner Sogn and Fjordane. This pattern, a distribution in SE Norway and occurence in the parts around the inner fjords of western Norway, is found in many insects, and such species demand higher summer temperatures and/or less rain than in the coastal parts of western Norway. The distribution of eventual hosts is also very important for Bombyliidae. The localities at Lønset (STI) can be described as xerotherm and they also represent the northernmost localities for some thermophilic beetle species (Greve & Hanssen 1994). This record is the only verified from central Norway. Note should be made of the fact that Storm (1907) records this species from Trondheim, thus further north and in an area with less warm summers.

H. maurus is very common in South-eastern Norway, but does not penetrate along the west coast further north than Stavanger. Some other insects have a similar distribution.

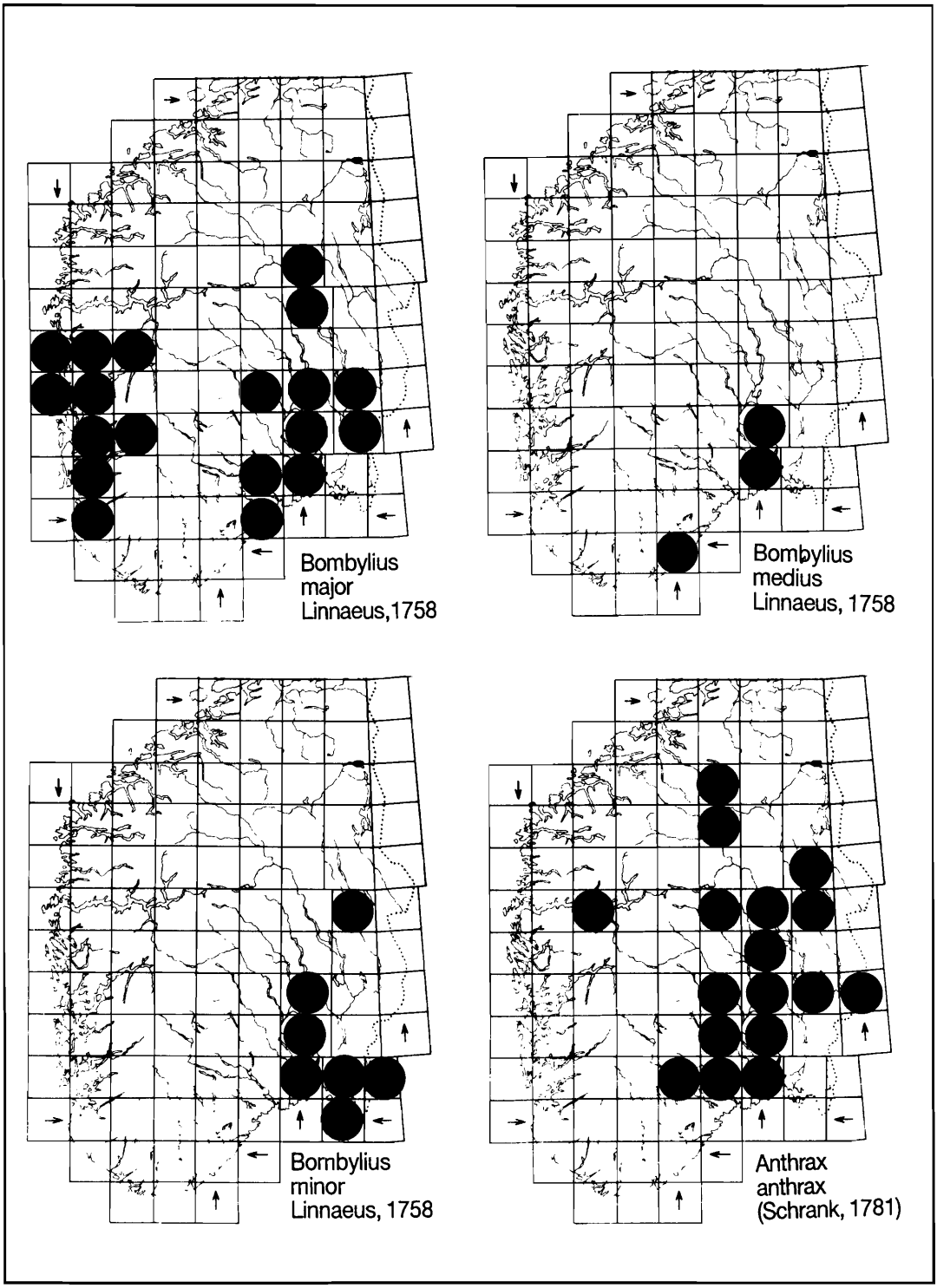
The remaining five species can be divided into two groups. *Anthrax varius* and *Thyridanthrax fenestratus* are rather common with fairly large distributional areas in SE Norway. *Bombylius medius, B. minor* and *Anthrax trifasciatus leucogaster* are on the other hand all very rare species, with scattered records in SE Norway. *B. medius* has been recorded from three provinces, two records are from the middle of this century. *B. minor* has totally been recorded from four provinces and in this century from three provinces and five localities only. *A. trifasciatus leucogaster* from one province only, three records from two localities. Thus these three species do represent a special faunistic group and should probably all be on a Norwegian Red data list as endangered. *B. minor* can definitely be said to exist in Norway today, as well as *A. trifasciatus leucogaster*. As for *B. medius,* this species was not collected at Ostøya during recent investigations there, and it is uncertain if it is present in Norway today. Many of the old localities represented with material in Zoological Museum, Univ. of Oslo, are probably not useful for insect collection today, and this species should be sought after to prove that it is still a member of the Norwegian fauna.

Hemipenthes morio (Linnaeus, 1758), known from Sweden and Denmark, might turn up in Norway, as might *Systoechus ctenopterus* (Mikan, 1796), which has been recorded along the West coast of Sweden.

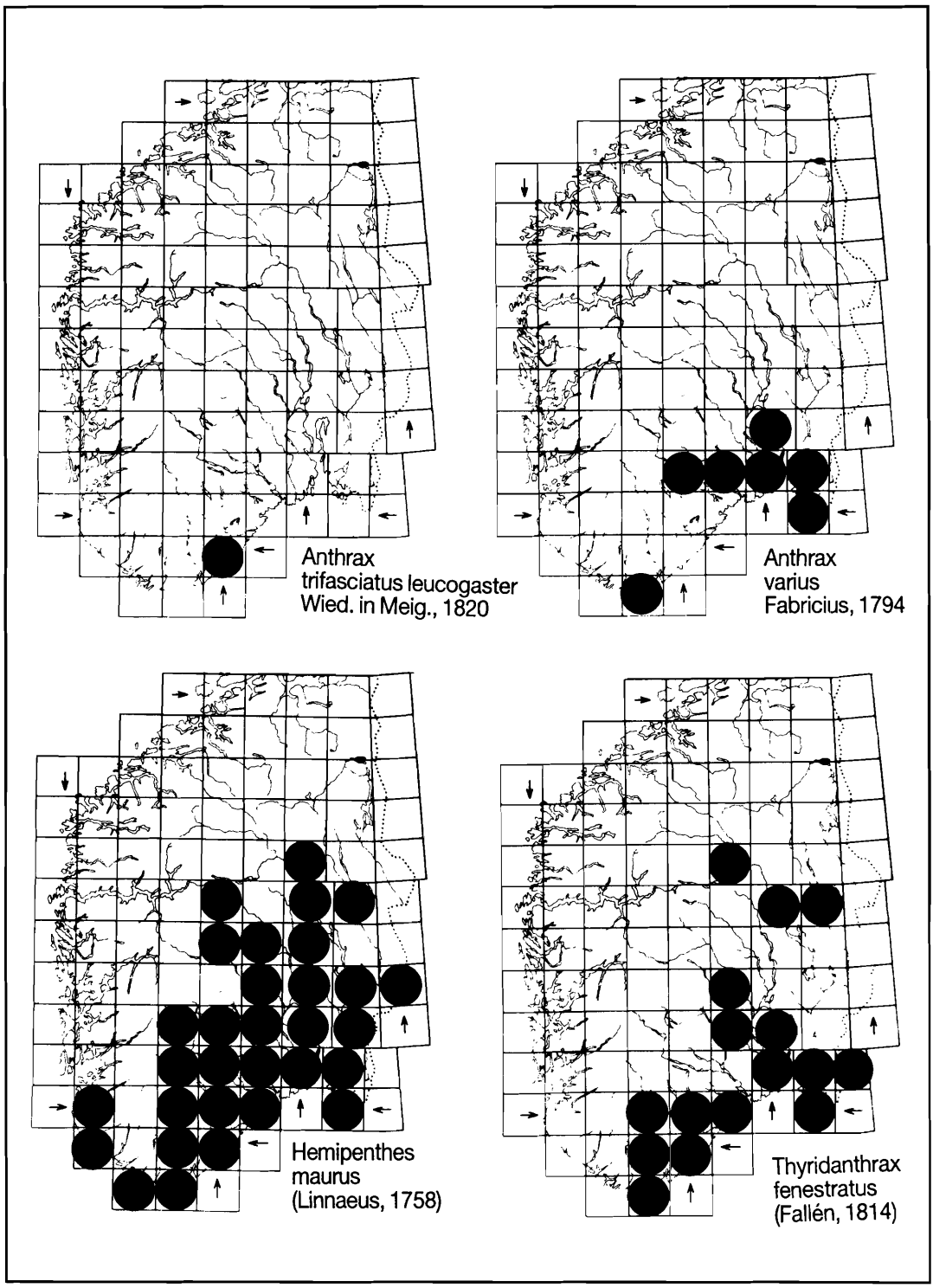
We would like to point out that this survey gives a picture of some provinces, like Aust-Agder and Vest-Agder, having abundant records compared to others like Hedmark. This might reflect the popularity of the former areas as summer resorts,



Map 1-2. Distribution of Norwegian Bombyliidae: Map 1. *Glabellula arctica*; Map 2. *Phthiria pulicaria*.



Map 3-6. Distribution of Norwegian Bombyliidae: Map 3. *Bombylius major*; Map 4. *Bombylius medius*; Map 5. *Bombylius minor*; Map 6. *Anthrax anthrax*.



Map 7-10. Distribution of Norwegian Bombyliidae: Map 7. *Anthrax trifasciatus leucogaster*; Map 8. *Anthrax varius*; Map 9. *Hemipenthes maurus*; Map 10. *Thyridanthrax fenestratus*.

while inland provinces like Hedmark is less visited by collectors. Thus more collecting for Bombyliidae in the future is expected to increase the distributional areas of most of the species and perhaps bridge gaps presented here.

There is still much to be done to get to know the biology of the different species of Bombyliidae. This aspect has not actively been exploited in this survey. However, note should be made of the host for *Anthrax varius*, beeing a solitary bee of the genus *Osmia*, probably *O. spinulosa* Kirby, as observed by Øistein Berg.

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New records of Psylloidea and Auchenorrhyncha (Homoptera) from Norway

Thor Jan Olsen

Olsen, T.J. 1999. New records of Psylloidea and Auchenorrhyncha (Homoptera) from Norway. Norw. J. Entomol. 46, 110.

Eupterycyba jucunda (Herrich-Schäffer) is recorded for the first time in Norway. Some other interesting records are also presented.

Key words: *Eupterycyba jucunda*, Psylloidea, Auchenorrhyncha

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Psylloidea

The distribution of Psylloidea in Norway is reviewed by Ossiannilsson (1992). The following species have not previously been reported from Østfold.

Craspedolepta latior Wagner. Ø Hvaler: Akerøya (EIS 20), 6 June 1992. Few records in Norway.

Psyllopsis fraxini (Linné). Ø Moss: Jeløy, Alby (EIS 20), 28 June 1993.

Cacopsylla melanoneura (Foerster). Ø Fredrikstad: Øra (EIS 20), 21 April 1996.

Cacopsylla pulcra (Zetterstedt). Ø Fredrikstad: Borge Varde (EIS 20), 24 April 1992. The species is previously only recorded twice from Norway.

Bactericera curvatineris (Foerster). Ø Sarpsborg: Borgarsyssel (EIS 20), 8 June 1993.

Auchenorrhyncha

Eupterycyba jucunda (Herrich-Schäffer). Ø Sarpsborg: Hafslund (EIS 20), 29 July 1994. New to Norway. In the Nordic countries this species has been found in Denmark and Southern Sweden (Ossiannilsson (1983).

Diplocolenus bohemmani (Zetterstedt). Ø Aremark: Bøensetra (EIS 21), 18 July 1992. The only previous record in Norway is from Oppland (Ossiannilsson 1983).

Chloriona glaucenscens Fieber. Ø Fredrikstad: Torsnes, Nes (EIS 20), 17 June 1993. Not previously reported from Østfold.

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The 25th Nordic-Baltic Congress of Entomology

Vestfold, Norway 2000

As announced previously the 25th Nordic-Baltic Congress of Entomology, organized by the Norwegian Entomological Society & the University of Oslo (Zoological Museum), will be held 28 June – 2 July 2000 at Melsomvik (Melsom School of Agriculture) near Tønsberg and Sandefjord in Vestfold, Norway.

Topics of the symposia:

Section 1.
NORDIC-BALTIC ENTOMOLOGY
Key lecturers: Arne Fjellberg, Tjøme and Antti Pekkarinen, Helsinki

- General entomology
- Special sections and workshops (Lepidoptera, Coleoptera, Diptera, Hymenoptera, Aquatic insects, etc.)

Section 2.
NORDIC-BALTIC FAUNISTICS, COLLECTION MANAGEMENT AND USE OF DATABASES
Key lecturer: Kimmo Saarinen, Tiuruniemi

Section 3.
THREATENED INSECTS AND CONSERVATION STRATEGIES IN THE NORDIC-BALTIC COUNTRIES
Key lecturers: Bengt Ehnström, Uppsala and Kaare Aagaard, Trondheim

For the opening plenary session of the congress we have invited four lecturers:

- Barbara Ekbom, Swedish University of Agricultural Sciences, Uppsala
- Eduardas Budrys, Institute of Ecology, Vilnius
- Kauri Mikkola, Finnish museum of Natural History, Helsinki
- Voldemars Spungis, University of Latvia, Riga

We invite participants to present their contribution as lectures/posters on the sections as suggested above. Each lecture should be 15 min (+ 5 min for discussion). The language of the Congress is English.

Excursions:

Excursions to interesting insect habitats will be arranged; see map at http://www.toyen.uio.no/NBCE2000/

Tjøme: (Organizer: Arne Fjellberg). Seashores and dry meadows; localities for rare Lepidoptera and Hymenoptera. Possibly night collecting with light traps.

Farris: (Organizer: Torstein Kvamme). Forest localities for rare Coleoptera and Diptera. Possibly night collecting.

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Publishing:

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On the next page you will also find the registration scheme. Fill in a copy and return no later than February 1, 2000 to:

Organizing Committee of the XXV Nordic-Baltic Congress of Entomology c/o
Zoological Museum, University of Oslo,
Sarsgt. 1, N-0562 Oslo, Norway
E-mail: j.e.raastad@toyen.uio.no

REGISTRATION FORM

Please tick the appropriate box, use block letters:

Mr. ☐ Ms. ☐

Family name:_____
First name:_____
Postal address:_____

Telephone:_____
Telefax:_____
E-mail:_____

Accompanying person:

Mr. ☐ Ms. ☐

Family name: _____
First name: _____

☐ I would like to present a paper at the symposium

☐ I would like to present a poster

Section:_____

Title:_____

Author(s):_____

Congress partipication fee:

- before March 15, 2000 NOK 450 (accomp.pers. NOK 100)
- before May 15, 2000 NOK 500 (accomp.pers. NOK 100)

Accomodation:

In Melsomvik from June 28 to July 2

☐ I prefer accomodation at the congress site in double room (plain comfort); 5 nights NOK 1750,-

☐ With whom (if preference excist) do you want to share room?_____

☐ I prefer hotel comfort (available at Åsgårdstrand hotel) at approx. NOK 700 per night.

☐ I will arrange privat accomodation and understand that I have to pay for meals; 5 days NOK 1250,-

Deadlines:

Preliminary registration:	May 30, 1999
Final registration:	February 1, 2000
Abstract deadline:	March 15, 2000,
Manuscript deadline:	June 28, 2000 (at Congress Registration Center)

Accomodation and congress fee must be paid before March 15, 2000 (May 15, at higher price) to NBCE

- Bank Acount Number 1594.22.91393.

Please fill in the form, post or fax it no later than February 1 to:

The 25th Nordic-Baltic Congress of Entomology,
c/o Zoological Museum, University of Oslo, Sarsgt. 1,
N-0562 Oslo, Norway.

Please specify special requests or comments.

The 25th Nordic-Baltic Congress of Entomology

Vestfold, Norway 2000

As announced previously the 25th Nordic-Baltic Congress of Entomology, organized by the Norwegian Entomological Society & the University of Oslo (Zoological Museum), will be held 28 June – 2 July 2000 at Melsomvik (Melsom School of Agriculture) near Tønsberg and Sandefjord in Vestfold, Norway.

Topics of the symposia:

Section 1.
NORDIC-BALTIC ENTOMOLOGY
Key lecturers: Arne Fjellberg, Tjøme and Antti Pekkarinen, Helsinki

- General entomology
- Special sections and workshops (Lepidoptera, Coleoptera, Diptera, Hymenoptera, Aquatic insects, etc.)

Section 2.
NORDIC-BALTIC FAUNISTICS, COLLECTION MANAGEMENT AND USE OF DATABASES
Key lecturer: Kimmo Saarinen, Tiuruniemi

Section 3.
THREATENED INSECTS AND CONSERVATION STRATEGIES IN THE NORDIC-BALTIC COUNTRIES
Key lecturers: Bengt Ehnström, Uppsala and Kaare Aagaard, Trondheim

For the opening plenary session of the congress we have invited four lecturers:

- Barbara Ekbom, Swedish University of Agricultural Sciences, Uppsala
- Eduardas Budrys, Institute of Ecology, Vilnius
- Kauri Mikkola, Finnish museum of Natural History, Helsinki
- Voldemars Spungis, University of Latvia, Riga

We invite participants to present their contribution as lectures/posters on the sections as suggested above. Each lecture should be 15 min (+ 5 min for discussion). The language of the Congress is English.

Excursions:

Excursions to interesting insect habitats will be arranged; see map at http://www.toyen.uio.no/NBCE2000/

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INSTRUCTIONS TO AUTHORS

The language is English or occasionally Norwegian with an extended English summary.

Manuscripts, double spaced on one side of the paper must be submitted in duplicate. Separate sheets should be used for (1) title page with authors names, (2) abstract followed by the name(s) and postal address(es) of the author(s), (3) tables, (4) numbered figures and (5) legends to figures. *Acknowledgements* should be gathered under a single heading at the end of the text. 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. A list of up to five *key words* may be added on a separate line below the abstract.

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

Figures must be numbered consecutively and all figures must be referred to in the text. Write "Figure" in full. Names(s) of the author(s) should be written in the margin of each figure. The size of the figure must not exceed 210 x 290 mm (standard A4). The author should take into consideration that most figures have to be reduced. In *line drawings* the line thickness should not be less than 0.25 mm after reduction, and capital letters not smaller than 2.0 mm. Choose contrasting patterns and avoid fine tone rasters. *Photographs* must be in black and white and 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 34, 167–178, and preferably the EIS number should be added in brackets.

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 papers

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

Book

Hågvar, E.B. 1998. Det zoologiske mangfoldet. Dyregruppenes systematikk, bygning og levevis. 2. utgave. 384 pp. Universitetsforlaget, Oslo

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.

Computer files. After acceptance the author(s) will be asked to submit a computer disc (3.5") containing the final version of the paper along with the revised manuscript itself. Operating systems and word processing program must be written on the disc. Further details will be supplied by the editor.

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

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Articles

Short communications

Announcements

The present issue 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 the present volume (Volume 46), the journal will be published as **Norwegian Journal of Entomology** by the Norwegian Entomological Society. New editor is Professor Lauritz Sømme, University of Oslo.
