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Phenological adaptations in *Patrobus atrorufus* and *P. assimilis* (Col., Carabidae)

DAGFINN REFSETH

Refseth, D. 1986. Phenological adaptations in *Patrobus atrorufus* and *P. assimilis* (Col., Carabidae). *Fauna norv. Ser. B, 33,* 57–63.

In central Norway *Patrobus atrorufus* (Strøm) and *P. assimilis* Chaud. have biennial life cycles, even at low altitudes. Compared with the conditions at lower latitudes the sexual maturation of the females is induced by longer critical photoperiods, corresponding to the latitudinal increase in daylength. The seasonal times of breeding and egglaying are displaced according to variations in the duration of the vegetation period. Such phenological flexibility is assumed to be of great adaptive significance, promoting dispersal and species differentiation.

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INTRODUCTION

The life cycles of carabid beetles, including their seasonal reproductive rhythms, are greatly influenced by ambient light and temperature conditions. Laboratory experiments have for example shown that daylength is a key factor for the induction of gonadal development and the onset and termination of larval and adult diapauses in several species (Krehan 1970, Thiele 1969, 1971, 1975, 1977, Ferenz 1975, 1977). Because of latitudinal variations in daylength and mean annual temperature, a species' ability of dispersal to and survival in high latitudes highly depends on its phenological adaptability. Ferenz (1975) compared the response to light and temperature of two populations of *Pterostichus nigrita* F., one from Cologne, W. Germany, and the other from northern Sweden. In the northern population the development and growth was faster, and there was a shift toward long-day in the critical photoperiod for gonadal maturation, reflecting adaptations to the subarctic light and temperature conditions.

In contrast to *P. nigrita,* which is a spring breeder throughout its geographical range (Lindroth 1945, Thiele 1977), *Patrobus atrorufus* (Strøm) is an autumn breeder in Germany (Thiele 1977) while in central Norway both spring and autumn breeding populations occur (Refseth 1980).

P. atrorufus thus seems to possess considerable phenological flexibility, and as an attempt to reveal some of the adaptive mechanisms underlying such a flexibility a thorough examination of the life cycles of *P. atrorufus* and its close relative *P. assimilis* was carried out.

MATERIAL AND METHODS

The material was collected by pitfall trapping at five locations in central and southern Norway (Table 1). The traps were emptied several times during the growing season to provide information on the times of breeding activity of the beetles.

The seasonal activity patterns of *P. atrorufus* at three of the locations (Melhus, Tiller and Budalen) have been described in an earlier paper (Refseth 1980), but to reveal any annual variations in the activity patterns the results from later samplings at Melhus and Budalen are presented.

Additional information on possible phenological variations along the climatic gradient from the lowlands to the subalpine site at Budalen was obtained from sampling at Rognes, a site situated between those mentioned above (cf. Table 1). *P. assimilis* occurred at Tiller and Budalen, moreover data from Sjodalen in the Jotunheimen mountains (Refseth 1977) were included. The seasonal patterns of sexual maturation and the approximate times of egg-laying and of adult emergence were determined by examining female gonads. According to the degree of gonadal development the females were classified as immature, developing, mature (with ripe eggs), or spent (cf. Luff 1973). Larval material provided valuable additional information on the life cycles. The larval stages were separated by measuring the head widths (Houston and Luff 1975).

The phenologies of the species were related to the duration of the vegetation periods and the seasonal changes in daylengths. The vegetation

Table 1. Geographical and climatic characters of the study sites.

Location	Altitude (m)	Latitude	Annual mean temperature (°C)	Vegetation period
Melhus	20	63°16'	5.3	30 Apr. — 17 Oct.
Tiller	120	63°21'	4.9	2 May — 14 Oct.
Rognes	160	62°59'	3.5	11 May — 4 Oct.
Budalen	830	62°43'	1.1	25 May — 19 Sept.
Sjodalen	980	61°36'	—0.1	1 June — 9 Sept.

period is defined as the period when the daily mean temperature exceeds 6°C (Bruun 1967). Information on annual temperatures and the duration of the vegetation periods were partly taken from Bruun (1967) and partly provided by The Norwegian Meteorological Institute (pers. comm.). The temperature at each study site was estimated by intra- and extrapolations from the nearest meteorological stations, considering that an increase in altitude of 100 m involves a decrease in the mean temperature of 0.6°C (The Norwegian Meteorological Institute, pers. comm.).

The relationship between the duration of the vegetation periods and the annual mean temperatures of 21 meteorological stations selected to represent the range of climatic conditions of Norway, was found to be positive and linear, the correlation being highly significant ($r = 0.98$, $p < 0.001$). The duration of the vegetation periods at the locations in concern was then calculated from the regression equation $y = 102.0 + 13.0\ x$, which was obtained by the correlation analysis.

Data on seasonal and latitudinal variations in daylength were provided by Beck (1980) and Universitetet i Oslo (1982). The daylength is defined as the time elapsing between sunrise and sunset, excluding twilights.

RESULTS AND DISCUSSION

Life cycles

P. atrorufus had its main period of activity in August at Melhus, in July at Tiller, and in June—July at Rognes and Budalen (Fig. 1, cf. Refseth 1980).

At all the study sites immature females were found mainly during late summer and autumn and in spring, and from the occurence of tenerals it is evident that they emerged in July—August (Table 2). Developing females appeared from late May, and the maturation was completed during June, July and early August. The occurrence of spent females showed that egg-laying varied between June—July at Budalen and July—August at Melhus. At Budalen and Melhus second stage larvae occurred from August to October and third stage larvae in Oc-

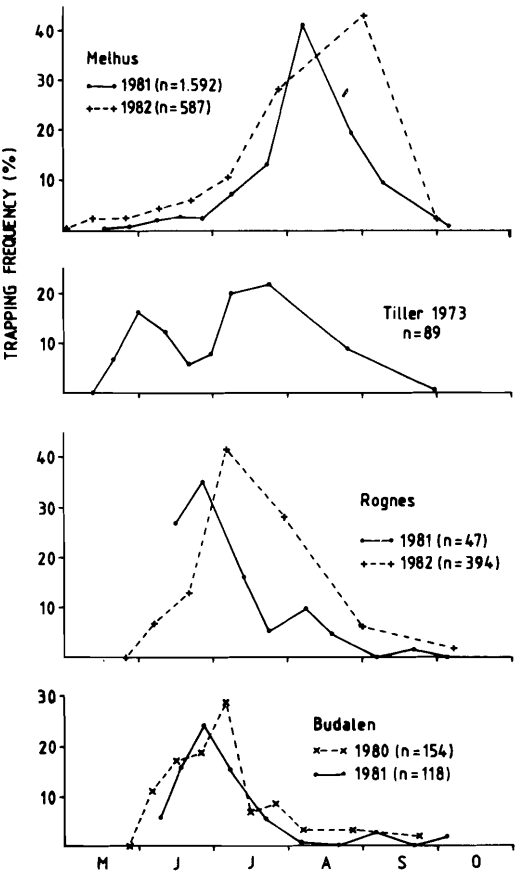

Fig. 1. Seasonal variations in the trapping frequencies (%) of *P. atrorufus* at Melhus, Tiller (redrawn from Refseth (1980)), Rognes and Budalen. n = the total number of specimens caught each year.

Table 2. The seasonal distribution of the developmental classes of the gonads of dissected females of *P. atrorufus* (numbers). (I: immature, D: developing, M: mature, S: spent).

	May		June		July		Aug.		Sept.		Oct.	
	I	II	I	II	I	II	I	II	I	II	I	II
I		2	2		1*		1*	4	3	3		
D			13	3	3		5					
M					2		4	8				
S								5	3			
I		3	1						1			
D		2	5		3		1					
M			4	1	4		2					
S							1		5			
I				2			3*	2				
D			6	5								
M				1	10	1	2					
S					2	2	1		5			
I		3				1*	3*		2	1	4	
D		2	11									
M			1	12	9	2						
S					1	2	1					

*: Tenerals

Melhus
Tiller
Rognes
Budalen

Table 3. The seasonal distribution of the catches of *P. atrorufus* larvae.

	April		May		June		July		Aug.		Sept.		Oct.	
	I	II	I	II	I	II	I	II	I	II	I	II	I	II
L1													1	
L2		(7)								1	1		2	
L3		(4)	1	2									1	
L3			3											
L2										1		1	1	
L3					2									1

Melhus
Rognes
Budalen

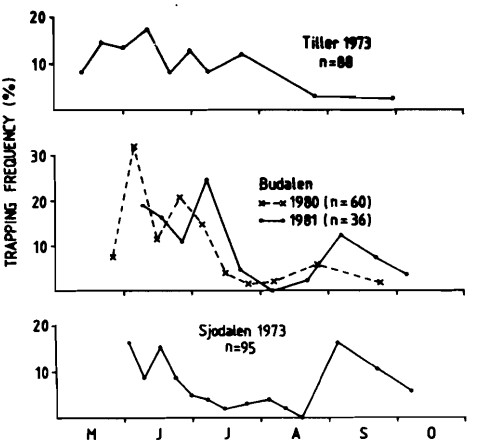

Fig. 2. Seasonal variations in the trapping frequencies (%) of *P. assimilis* at Tiller, Budalen and Sjodalen (redrawn from Refseth (1977)). n = the total number of specimens caught each year.

tober and May—June (Table 3). Also at Rognes a few third stage larvae were trapped in May. At Melhus both second and third stage larvae were caught in traps which had been left out under the snow during the winter and were emptied in spring, a few days after snow-melting.

Despite some variation in the activity patterns the life cycles of *P. atrorufus* are very similar at the four sites. The larvae hatch in the late summer and hibernate mainly at the third, but possibly also at the second stage. The adults emerge next summer and hibernate in an immature state, and the maturation of adults, breeding and egg-laying take place in the following summer. Thus the species has a biennial life cycle at all these locations.

At Sjodalen and Budalen *P. assimilis* has its main period of activity in June, even if some activity was recorded in September (Fig. 2). The low trapping frequencies in June at Budalen reflect periods with cold weather, as the mean daily temperature fell to −0.5°C on 13 June 1980 and to −2.1°C on 19 June 1981. The development of female gonads shows that breeding and egglaying takes place in June—July at both sites (Table 4). Tenerals occurred in July—August and the high trapping frequencies in September were obviously due to immature specimens having a period of activity prior to hibernation.

At Sjodalen two third stage larvae were caught in late May and 11 in the period October 1973—May 1974 (Refseth 1977). At Budalen one first stage larvae was found in early Septem-

Table 4. The seasonal distribution of the developmental classes of the gonads of dissected females of *P. assimilis* (numbers). (I: immature, D: developing, M: mature, S: spent).

	May		June		July		Aug.		Sept.		Oct.	
	I	II	I	II	I	II	I	II	I	II	I	II
I	3	2						1	3		1	
D	1		2									
M			3	2	3	2						
S						4	1	1				
I		2					1*	1	1		1	
D		2	2	1								
M			3	3	3	2						
S					1	1	1					
I			3			1*	2*		15	2	4	
D			1									
M			2	3								
S				1		1	1				1	

*: Tenerals

Tiller
Budalen
Sjodalen

ber, and third stage larvae occurred in early June (2), late September (1) and early October (3).

P. assimilis obviously hibernates both as larvae and immature adults, and the life cycle is biennial, being almost identical to that of *P. atrorufus* at Budalen.

At Tiller the species has a longer period of activity, extending from late May to late July (Fig. 2), but breeding takes place in July, when the maturation of the female gonads is completed and spent females appear (Table 4). No larvae were found at this site, but the occurrence of immature females both in the autumn and in spring indicates a breeding pattern similar to that being found at Sjodalen and Budalen, the life cycle probably being biennial also at this site.

According to the current «classification» of carabid life cycle patterns (Larsson 1939, Lindroth 1945, 1949, Thiele 1977) biennial life cycles have been considered to occur only under rather extreme climatic conditions. Lindroth (1945) suggested that *P. assimilis*, and other species, might be biennial in northern and alpine areas. This was confirmed by Forsskåhl (1972) who studied the phenologies of several carabid species in northern Sweden. In the Austrian mountains both *P. assimilis* and most other carabid species are biennial and have seasonal activity patterns quite similar to that of *P. assimilis* described in the present study (DeZordo 1979).

While *P. assimilis* is a boreal species, being widely distributed and common in northern and alpine areas of Scandinavia, *P. atrorufus* is mainly confined to western and south-western parts of Europe (Lindroth 1945), obviously preferring an atlantic climate. *P. atrorufus* is described as being exclusively annual, with autumn breeding and chiefly larval hibernation (e.g. Larsson 1939, Thiele 1977). However, since both *P. assimilis* and *P. atrorufus* take two years to develop even in the lowlands of central Norway, the temperature limit for the occurrence of biennial life cycles seems to be higher than hitherto assumed.

In fact, *Pterostichus niger* (Schall.) and *P. melanarius* (Illig.) have biennial life cycles in Denmark (Jørum 1980) and certainly also in most parts of their distributional range in Scandinavia. Also in other species, e.g. *Carabus glabratus* Payk., *C. violaceus* L., *C. problematicus* Herbst (Houston 1981, Refseth 1984) and *Pterostichus madidus* (F.) (Luff 1973) biennial life cycles have been documented to occur in parts of their area of distribution. Biennial life cycles thus appear to be more common than previously assumed, even at lower latitudes and altitudes.

Phenological variations

According to the decrease in the annual mean temperature with increasing altitude the difference in the duration of the vegetation period between Melhus and Sjodalen is ca. two months (Table 1). The spring activity of *P. atrorufus* commences in early May at Melhus and in late May at Budalen, corresponding to the initial dates of the vegetation periods (Fig. 1, Table 1). Similarly, in the autumn most acitivity ceases in September—October, by the end of the vegetation period. The temperature limit for adult acitivity thus seems to be ca. 6°C, a value which is in accordance with the results of van der Drift (1959).

At all locations the maturation of female gonads commences in late May or early June (Table 2, Table 4). However, along the altitudinal gradient the times of breeding are displaced about three weeks in *P. assimilis* and six weeks in *P. atrorufus*, corresponding to the displacement of the final date of the vegetation period (Fig. 3). This is obviously the result of an adaptation to the shorter growing season of high altitudes, ensuring that the adequate time for larval

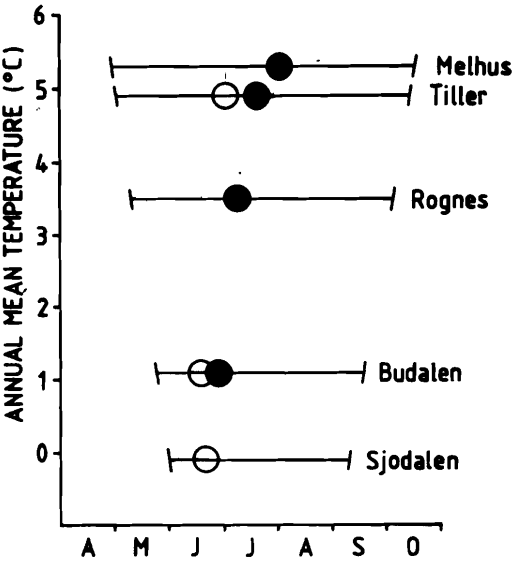

Fig. 3. The duration of the vegetation periods at the study sites in relation to the annual mean temperatures, with the times of breeding of *P. atrorufus* (filled circles) and *P. assimilis* (open circles) indicated.

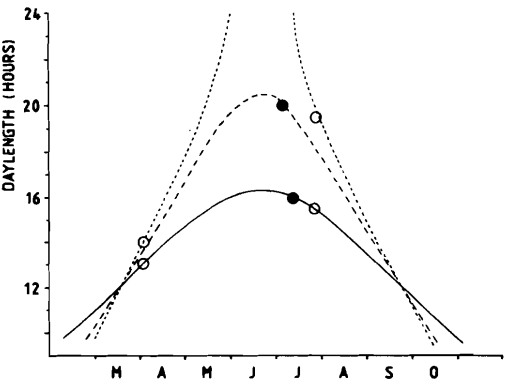

Fig. 4. The seasonal variations in the daylength (excluding twilights) at three selected latitudes: -----: Bodø (67°N), — — — —: Trondheim (63°N), ——: Cologne (51°N). The critical photoperiods for maturation in *P. nigrita* (open circles) and *P. atrorufus* (closed circles) at different latitudes are indicated.

growth and development before hibernation is retained.

Since daylength is a major factor governing the sexual maturation and the onset and termination of diapauses in carabids (Thiele 1977), seasonal variations in the times of breeding must imply some alterations of the species' physiological response to light. In females of *Pterostichus nigrita* the early maturation of the gonads (previtellogenesis) is induced by a change om long-day to short-day, the critical photoperiods being 15.5 hours at Cologne (ca. 51°N) and 19.5 hours at Messaure in northern Sweden (ca. 66°N) (Ferenz 1975). Comparison of the seasonal variations in daylength at different latitudes shows that daylengths of 15.5 hours at 51°N and 19.5 hours at 66°N both appear at the same time of the year, i.e. ca. 1 August (Fig. 4). Correspondingly, the critical photoperiods for the final part of the maturation process (vitellogenesis), which where found to be 13.1 hours at Cologne and 14 hours at Messaure (Ferenz 1975), occur in early April at both sites (Fig. 4). Apparently this change in the species' response to photoperiods provides the maturation to commence at the same time of the year at all latitudes, and enough time will be available for the species to complete the maturation before the time of reproduction.

The adults of *P. assimilis* seem to have a pattern of activity and development very similar to that of *P. nigrita*. The maturation of the females commences in spring and is induced by and completed under long-day conditions.

Since maturation in *P. assimilis* seems to be delayed by ca. one month compared with *P. nigrita* a longer critical photoperiod for maturation is probably required by the former species. This may partly explain why *P. assimilis*, in contrast to *P. nigrita*, is a common species in alpine and arctic areas, where activity and development in spring is impeded by low temperatures and corresponding late snow-melt.

In *P. atrorufus*, however, the pattern seems to be more complex, as the time of reproduction varies between June and August, although the light conditions experienced by the populations are almost identical. Laboratory experiment have shown that at Cologne the maturation (probably vitellogenesis) in *P. atrorufus*, which in contrast to *P. nigrita* is an autumn breeder, is induced by a shift from long-day to short-day, with a critical photoperiod of ca. 16 hours (Thiele 1977). Such conditions occur ca. 15 July (Fig. 4), which is consistent with the facts that the species needs about one month to mature (in short-day) and that the egg-laying takes place from the middle of August (Thiele 1969, 1977).

At Melhus the eggs are laid in July—August, and the vitellogenesis, which includes the yolk formation and the ripening of the eggs prior to deposition, commences in June—July (Table 2). According to the latitudinal variation in the day-length the corresponding critical photoperiod should be ca. 20 hours (Fig. 4).

At the other locations, however, the maturation is almost completed in July. Consequently, long-day prevails during the vitellogenesis, which seems very strange since the experiments of Thiele (1969) showed that the gonadal development was suppressed if the females were exposed to long-day. The observed change in the breeding pattern must therefore have involved considerable alterations of the species' physiological response to photoperiods.

Ferenz (1975) claims that the German and the Swedish populations of *P. nigrita* represent different physiological races, judging from their different demands concerning the value of the critical photoperiod for maturation. The norwegian populations of *P. atrorufus* differ even more regarding their response to photoperiods, hence it seems highly appropriate to apply the concept of physiological races also in this species.

CONCLUSION

The occurrence of biennial life cycles in carabids is evidently the result of adaptations to colder climates, i.e. shorter periods available for growth and development. Even if a prolonged life-span involves increased mortality, selection favours the ability of further growth and the eventual production of larger and more viable offspring. It is reason to believe that most arctic and alpine species need two years to develop, at least those being of some size, as the present results show that medium-sized species are biennial even in the lowlands of central Norway.

Phenological flexibility obviously increases a species' adaptability, allowing it to disperse to and exist within a wide range of light and temperature conditions. Accordingly, the life cycle patterns of a species may include several of the breeding types described by Thiele (1977). *P. atrorufus*, for instance, is an annual autumn breeder, a biennial autumn breeder and a biennial spring breeder, respectively, within its geographical range. A classification of carabid species according to breeding categories therefore seems inappropriate unless geographical variations in the species' life cycles are considered.

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The Rhinophoridae or woodlouse-flies (Diptera) of Norway[1)]

KNUT ROGNES

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Rhinophorid material from Norway in the museum collections of the Universities in Bergen, Oslo and Tromsø and in author's collection has been revised and records of the 9 species known from Norway are presented.

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INTRODUCTION

The Rhinophoridae, termed woodlouse-flies by Crosskey (1977), is a very small family of calypterate Diptera whose larval stages in general are endoparasitic in terrestrial isopods, although a Nearctic species, *Angioneura obscura* (Townsend), is reported as parasitic in snails (Reinhard 1929). It is the only Diptera group to parasitise crustaceans (Crosskey 1977). It occurs mainly in the Western Palaearctic Region (absent from Iceland), but there are representatives also in the Nearctic, Oriental and Afrotropical Regions, with an immigrant form in the Neotropical Region (Crosskey 1977). Crosskey (1977) lists 23 genera with about 85 species in the world fauna. The group has previously been listed in whole or in part as a subgroup of the Calliphoridae (Emden 1954, Herting 1961, Downes 1965) or the Tachinidae (Sabrosky & Arnaud 1965, Guimarães 1971), but has usually been given separate family status in recent times (Hennig 1973, Crosskey 1977, 1980, Kugler 1978).

In the North European fauna the Rhinophoridae can be separated from related calyptrates with a row of setae on the meron (hypopleuron) by the following combination of characters: a small and tongue-like lower squama, the inner edge of which diverges from long axis of fly; posterior spiracle with lappets of subequal size; a weakly or undeveloped postscutellum; prosternum, propleuron, suprasquamal ridge, postalar wall, subalar bulla, basisternum (in front of hind coxae) bare; the bend of m_1 in the wing without appendix or fold; body colour not metallic blue or green.

The developmental stages of some European species have been described by Thompson (1934) and Bedding (1973).

Zetterstedt (1838, 1844), Siebke (1877), Storm (1896), Ringdahl (1944a, 1944b, 1952) and Rognes (1981) have given records of Rhinophoridae from Norway, and a total of 8 species have previously been recorded. The present revision lists 9 rhinophorids from Norway.

MATERIAL AND METHODS

The present study is based upon the examination of 134 specimens partly in my own collection and partly in the museum collections in Bergen, Oslo and Tromsø. I have not seen the Trondheim collection revised by Ringdahl (1944a). For identification of species I have used the works of Lundbeck (1927), Ringdahl (1954b), Emden (1954), Herting (1961) and Stackelberg (1970). The generic names adopted are those of Crosskey (1977), the specific ones those of Herting (1961). Specific synonyms, taken from Ringdahl (1954a) and Herting (1961), have been cited when based on types from Scandinavian localities or have been used in literature dealing with the Norwegian fauna. Recent information on host species has been cited for each species. Note that nothing is known about the biology of Rhinophoridae in this country. I have also given an indication of the world distribution in broad terms as well as information on the North European distribution. My sources for these data have been Lundbeck (1927), Ringdahl (1951, 1952), Herting (1961), Draber-Mońko (1966, 1971, 1978), Pont (1975)

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and Hackman (1980). For details regarding the presentation of the faunistical data, see Rognes (1984).

SYSTEMATIC LIST

1. *Angioneura acerba* (Meigen)
Medoria acerba Meigen, 1838; *Dexia pygmaea* Zetterstedt, 1844; *Angioneura acerba:* Herting 1961.
Material: AK, Ås: ?loc. 1 ♀ 27 April 1983 (F. Midtgaard) EIS 28.
Hosts: Unknown.
Distribution. Europe. British Isles. Finland, Sweden (Skåne, Öland, Gotland, Östergötland).
Note. The present species is unique among Rhinophoridae in having a posteriorly broad calliphorid-like lower squama, the inner edge of which converges backwards with long axis of fly (Herting 1961, Crosskey 1977). My specimen also has the prosternum and basisternum prominently hairy and a distinctly operculate posterior spiracle, two further calliphorid-like features apparently overlooked so far. An operculate posterior spiracle has also been reported from *Baniassa fascipennis* Kugler (Kugler 1978). I have also seen specimens of *Angioneura fimbriata* (Meigen) with hairs on the prosternum. Crosskey (1977) only lists *Melanomya* Rondani among the Rhinophoridae as exceptionally having a lateral hair on the posternum.

2. *Melanomya nana* (Meigen)
Dexia nana Meigen, 1826; *Musca minima* Zetterstedt, 1838; *Dexia minima:* Zetterstedt 1844; *Melanomyia nana:* Herting 1961.
Note. *Musca minima* was described partly on the basis of a male from «Dowre» (Boheman leg.) (ON, Dovre: ?loc., EIS 71?, probably Dovre mountains). I have not seen the type specimens which have been revised by Ringdahl (1945a).
Material: AK, Oslo: Oslo 1 ♂ (Siebke). HES, Åsnes: Hof 1 ♂ (Siebke). OS, Lillehammer: near Gausa river by Flåkåli bru 5 km W of Fåberg 2 ♂♂ 14 July 1982 (K. Rognes). BØ, Ringerike: Norderhov 2 ♂♂ (Siebke). RY, Hå: Brusand 1 ♂ 3 July 1935 (Soot-Ryen). HOI, Ullensvang: Lofthus 2 ♂♂ 26 June 1935 (Soot-Ryen); Granvin: Eide 1 ♂ 25 June 1935 (Soot-Ryen), Seim 1 ♂ 30 May 1936 (N. Knaben). SFI, Aurland: S of Skjerdal near river Volda 1 ♂ 20 July 1981 (L. Greve), Vassbygda 1 ♀ 18 June 1939 (N. Knaben), 3 ♂♂ 16 Aug. 1941 (N. Knaben). EIS 3, 28, 32, 36, 41, 47, 51, 54, 71?
Hosts: Unknown.
Distribution. Europe. North Kazakhstan. British Isles. Finland, Sweden (north to Norrbotten). In Sweden also from above tree-line on Hamrafjället in Härjedalen (Ringdahl 1951).

3. *Morinia melanoptera* (Fallén)
Musca melanoptera Fallén, 1820; *Anthracomyia melanoptera:* Herting 1961.
Material: ON, Sel: Lårgård (?) 1 ♂ 1 ♀ 27 June 1861 (Siebke), 1 ♂ 3 ♀ ♀ 10 July 1873 (Siebke), ? date 3 ♀ ♀ (Siebke). EIS 71.
Hosts: Unknown.
Distribution. Europe. Not on the British Isles. Finland, Sweden (north to Lycksele Lappmark).
Note. The postalar wall has a few long stiffish hairs in this species, a unique and previously overlooked character which suggests that the species in fact may belong in the Calliphoridae.

4. *Paykullia brevicornis* (Zetterstedt)
Leucostoma brevicornis Zetterstedt, 1844; *Euplesina ringdahli* Villeneuve, 1934; *Chaetostevenia brevicornis:* Herting 1961.
Material: Ø, Sarpsborg: ? loc. 1 ♀ Aug. 1865 (Grimsgaard leg., cf. Siebke 1866: 396, 406; Siebke 1877: 91). EIS 20.
Note. The specimen has been examined by Ringdahl and carries his identification label «Plesina brevicornis Zett.».
Hosts: Unknown.
Distribution. Previously only known from Sweden (Skåne, Småland, Östergötland).

5. *Paykullia maculata* (Fallén)
Ocyptera maculata Fallén, 1820; *Chaetostevenia maculata:* Herting 1961.
Material: See Rognes (1981:112). Additional material: VAY, Kristiansand: Stangenes 1 ♂ 27 July 1981 (Svendsen); Lindesnes: Jørgenstad 1 ♀ 23 July 1982 (T.R. Nielsen). RY, Stavanger: Sunde 1 ♀ 10 Aug. 1981 (K. Rognes, Malaise-trap), 1 ♀ 14 Aug. 1981 (A. Rognes, indoors), 1 ♂ 3—4 Aug. 1982 (K. Rognes, indoors). EIS 1, 2, 7.
Hosts: *Oniscus asellus, Porcellio scaber, Protracheoniscus politus* and *Tracheoniscus ratzeburgi* (sources in Herting 1961, see also Sutton 1972).
Distribution. Europe. British Isles. Denmark, Sweden (north to Bohuslän).

6. *Phyto cingulata* (Zetterstedt)
Tachina cingulata Zetterstedt, 1844; *Phyto cingulata:* Herting 1961.
Material: See Rognes (1981:112). EIS 20.
Hosts: Unknown.
Distribution. Europe. Not on the British Isles. Sweden (north to Bohuslän).

7. *Stevenia atramentaria* (Meigen)
Tachina atramentaria Meigen, 1824; *Stevenia atramentaria:* Herting 1961.
Material: See Rognes (1981:112). Additional material: ? loc. 1 ♂ (Siebke). EIS 28, 36.
Hosts: *Oniscus asellus, Tracheoniscus arcuatus, Philoscia affinis* (Herting 1961) and *Trachelipus rathkei* (Sutton 1972).
Distribution. Europe. British Isles. Finland, Sweden (north to Gästrikland).

8. *Stevenia umbratica* (Fallén)
Ocyptera umbratica Fallén, 1820; *Rhinophora lugubris* Zetterstedt, 1855; *Stevenia umbratica:* Herting 1961.
Material: See Rognes (1981:112). Additional material: AK, Oslo: «Kongshavn» (now in the city of Oslo) 1 ♂ 28 June 1851 (Siebke). VAY, Kristiansand: Flekkerøya 1 ♀ 17 June 1983 (Svendsen). SFI, Årdal: Utladalen in Øvre Årdal 1 ♀ 10 July 1939 (N. Knaben). EIS 2, 4, 28, 51?
Hosts: Unknown.
Distribution. Europe. Not on the British Isles. Denmark, Sweden (north to Bohuslän).

9. *Tricogena rubricosa* (Meigen)
Tachina rubricosa Meigen, 1824; *Tachina trilineata* Meigen, 1824; *Tachina hirticornis* Zetterstedt, 1844; *Tachina nigritarsis* Zetterstedt, 1844; *Dexia tachiniformis* Zetterstedt, 1844; *Frauenfeldia rubricosa:* Herting 1961.
Material. See Rognes (1981:112). Additional material: AAY, Arendal: Hasselåsen 37 ♀ ♀ 15 June—15 Sept. 1981 (T. Solhøy, pitfall traps); Tromøy 1 ♀ 26 July 1935 (Soot-Ryen). VAY, Mandal: Mandal 2 ♂ ♂ 11 July 1935 (Soot-Ryen); Flekkefjord: Drągøy (Hidra) 2 ♀ ♀ 5—12 Aug. 1981 (A.-J. Nilsen), Lindesnes: Ytre Jørgenstad 1 ♂ 6 Aug. 1981 (T.R. Nielsen & K. Rognes). RY, Stavanger: Sunde 1 ♂ 7 Aug. 1982 (Ø. Rognes, on dog faeces); Hå: Brusand 1 ♀ 3 July 1935 (Soot-Ryen); Randaberg: Børaunen 25 ♂ ♂ 4 ♀ ♀ 7 July 1981 (K. Rognes); Rennesøy: Vikevåg 2 ♂ ♂ 5 July 1983 (T. Jonassen). EIS 1, 2, 3, 4, 6, 7, 14.
Hosts: *Porcellio scaber* (Herting 1961, Sutton 1972), *Oniscus asellus* (Séguy 1941, error?, cf. Thompson 1934:380).
Distribution. Europe. British Isles. Denmark, Finland and Sweden (north to Södermanland).

DISCUSSION

Table 1 shows the distribution of the 15 North European species of Rhinophoridae. Two species, *Phyto discrepans* Pandellé and *P. melanocephala* (Meigen), occur on the British Isles, but not in the Nordic countries. Four species, *Angioneura cyrtoneurina* (Zetterstedt), *A. fimbriata* (Meigen), *Melanophora roralis* (L.) and *Rhinophora lepida* (Meigen), occur in some Nordic countries, but have not yet been captured in Norway. Of these, *A. cyrtoneurina* and *M. roralis,* both of which are known north to Uppland in Sweden, very probably occur in Norway also. *R. lepida* (north to Skåne in Sweden) and *A. fimbriata* (Finland) may also ultimately turn up in this country, though with somewhat less probability.

Table 1. Distribution of North European Rhinophoridae. N = Norway, DK = Denmark, SF = Finland, S = Sweden, GB = British Isles. Sources are Lundbeck (1927), Hackman (1980), Ringdahl (1952) and Pont (1975) for DK, SF, S and GB, respectively.

	N	DK	SF	S	GB
1. *Angioneura acerba*	x		x	x	x
Angioneura cyrtoneurina (Zett.)		x		x	x
Angioneura fimbriata (Meig.)			x		
2. *Melanomya nana*	x		x	x	x
Melanophora roralis (L.)		x	x	x	x
3. *Morinia melanoptera*	x		x	x	
4. *Paykullia brevicornis*	x			x	
5. *Paykullia maculata*	x	x		x	x
6. *Phyto cingulata*	x			x	
Phyto discrepans Pand.					x
Phyto melanocephala (Meig.)					x
Rhinophora lepida (Meig.)		x		x	x
7. *Stevenia atramentaria*	x		x	x	x
8. *Stevenia umbratica*	x	x		x	?
9. *Tricogena rubricosa*	x	x	x	x	x
Total	9	6	7	12	10

Too few specimens have been captured in Norway to allow definitive statements as to the distribution of the species within the country. At present they are known mostly from the lowlands in the southern and south-eastern parts of the country. A few have also been taken in the lowlands in the inner parts of Western Norway.

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A check-list of Norwegian Tachinidae (Diptera) [1]

KNUT ROGNES

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Tachinid material from Norway in the museum collection of the Universities in Bergen, Oslo and Tromsø and in author's collections has been revised and a check-list of the 190 species known at present from Norway is presented.

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The check-list presented below, which replaces the previously published lists of Siebke (1877), Schøyen (1889), Bidenkap (1892, 1898, 1901) and Ringdahl (1944b, 1952), is based upon a revision of the material of parasite-flies (Tachinidae) from Norway in the museum collections of the Universities in Bergen (mainly O. Bidenkap, A. Fjellberg, L. Greve, A. Løken, N. Knaben, T.R. Nielsen leg.), Oslo (mainly J. Knaben, R. Krogerus, J.H.S. Siebke leg.) and Tromsø (mainly T. Soot-Ryen leg.) (about 950 specimens) and in my own collection (about 1350 specimens). In addition a few small private collections have been examined (K. Berggren, Kristiansand, B. Sagvolden, Rollag, J.H. Simonsen, Oslo). I have not seen the V. Storm collection in DKNVS-Museet, Trondheim revised by Ringdahl (1944a). Occasional specimens in foreign collections (coll. Ringdahl, Lund, coll. Boheman, Stockholm) have also been examined. I have examined specimens from Norway of all the species listed except 2. My reasons for listing these are given in the annotations to the list at the end of the paper.

Ringdahl (1952) listed 101 species from Norway on the basis of his published revisions of the Tromsø and Trondheim collections (Ringdahl 1944a, 1944b), his unpublished examination of parts of the Oslo collection and his knowledge of the Boheman and Zetterstedt collections in Sweden (Ringdahl 1934, 1945) which contain specimens (including types) from Norway. Nevertheless, many records have apparently been taken directly from e.g. Siebke (1877) and Bidenkap (1892, 1898) without reexamination of the specimens involved. Ringdahl (1954) added 6 species and Rognes (1981, 1982, 1983a, 1983b) 31, bringing the total to 138 species. The present revision lists 190 species from this country. In comparison 196 species have been published from Denmark (Lundbeck 1927), 202 from Finland (Hackman 1980, as Tachinidae and Phasiidae), 257 from Sweden (Ringdahl 1952) and 238 from the British Isles (Crosskey 1975). Many species therefore undoubtedly still await discovery in this country.

The subfamilial and tribal classification adopted are based on Crosskey (1973, 1975, 1976, 1977, 1980). The tribes Phaniini, Eriothrixini, Digonochaetini, Eryciini and Goniini are not mentioned by Crosskey or are not equivalent to groups similarly named in his work. They correspond to Phaniina of Mesnil (1966:882), Eriothrixina of Mesnil (1966: 882; 1975: 1310), Digonochaetina of Mesnil (1966: 882; 1973: 1211), Eryciini (minus Winthemina) of Mesnil (1975: 1382) and Goniini of Mesnil (1975: 1375), respectively. Generic limits generally follow Mesnil (1944—1975, 1980) and (for Siphonini) Andersen (1983). Spellings of generic and specific names follow Crosskey (l.c.). Emendments and variant spellings, though numerous in the literature, have not been included. Generic synonyms are included when based on nominal type-species belonging to the Norwegian fauna (i.e. occuring in the list as valid names or synonyms). Several specific synonyms have been included, many used in scandinavian tachinid literature, mainly to aid in recognition of the species involved. Synonyms have been taken from Lundbeck (1927), Mesnil (see references in Rognes 1981), Ringdahl (1945), Crosskey (l.c.) and the numerous revisions of the European fauna published by Herting (mainly in Stuttgarter Beiträge zur

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Naturkunde) (see Zoological Record or other abstracting publication for references). In the list generic and specific synonyms are indented relative to valid names. Superscript numbers refer to the numbered annotations at the end of the list

Family Tachinidae

Subfamily Phasiinae

Tribe Phasiini
Alophora Robineau-Desvoidy, 1830
Hyalomya Robineau-Desvoidy, 1830
Paralophora Girschner, 1887
Alophorella Townsend, 1912
obesa (Fabricius, 1798)
flavipennis (Zetterstedt, 1844)
pusilla (Meigen, 1824)
Gymnosoma Meigen, 1803
Rhodogyne Meigen, 1800, suppressed
Cistogaster Latreille, 1829
Pallasia Robineau-Desvoidy, 1830
clavatum (Rodendorf, 1947)
verbekei (Mesnil, 1952)
globosum (Fabricius, 1775)
nudifrons Herting, 1966[1]
Subclytia Pandellé, 1894
rotundiventris (Fallén, 1820)

Tribe Catharosiini
Catharosia Rondani, 1856
pygmaea (Fallén, 1820)
nana (Fallén, 1820)

Tribe Cylindromyiini
Cylindromyia Meigen, 1803
Ocypterula Rondani, 1856
Ocyptera: authors, not Latreille (misidentification)
brassicaria (Fabricius, 1775)
interrupta (Meigen, 1824)
pusilla (Meigen, 1824)
Lophosia Meigen, 1824
fasciata Meigen, 1824

Tribe Cinochirini
Cinochira Zetterstedt, 1845
atra Zetterstedt, 1845

Tribe Phaniini
Phania Meigen, 1824
Weberia: authors, not Robineau-Desvoidy (misidentification)
thoracica (Meigen, 1824)

Subfamily Dufouriinae

Tribe Dufouriini
Anthomyiopsis Townsend, 1916
Ptilopsina Villeneuve, 1920
nigrisquamata (Zetterstedt, 1838)
nigrisquama (Zetterstedt, 1844)
pullula (Zetterstedt, 1844)
nitens (Zetterstedt, 1852)
Dufouria Robineau-Desvoidy, 1830
Minella: authors, not Robineau-Desvoidy (misidentification)
chalybeata (Meigen, 1824)
Freraea Robineau-Desvoidy, 1830
Gymnopeza Zetterstedt, 1838
gagatea Robineau-Desvoidy, 1830
albipennis (Zetterstedt, 1838)
denudata (Zetterstedt, 1844)
Rondania Robineau-Desvoidy, 1850
dimidiata (Meigen, 1824)
opaca (Zetterstedt, 1838)
ruficeps (Zetterstedt, 1838)
fasciata (Macquart, 1834)

Subfamily Dexiinae (Proseniinae)

Tribe Dexiini (Proseniini)
Billaea Robineau-Desvoidy, 1830
Sirostoma Rondani, 1862
Gymnodexia Brauer & Bergenstamm, 1891
triangulifera (Zetterstedt, 1844)[?]
Dexia Meigen, 1826
Dexillina Kolomiets, 1969
vacua (Fallén, 1817)
Dinera Robineau-Desvoidy, 1830
Phorostoma Robineau-Desvoidy, 1830
Myocera Robineau-Desvoidy, 1830
Myocerops Townsend, 1916
carinifrons (Fallén, 1817)
ferina (Fallén, 1817)
grisescens (Fallén, 1817)
Estheria Robineau-Desvoidy, 1830
bohemani Rondani, 1862
Murana Meigen, 1824
alpina (Meigen, 1824)
caerulescens (Meigen, 1824)
lapponica (Zetterstedt, 1838)
limbata (Zetterstedt, 1838)
obscura (Zetterstedt, 1838)
Prosena Le Peletier & Serville, 1828
Callirhoe Meigen, 1800, suppressed
siberita (Fabricius, 1775)
Trixa Meigen, 1824
variegata Meigen, 1824
oestroidea (Robineau-Desvoidy, 1830)

Subfamily Tachininae

Tribe Campylochetini
Campylocheta Rondani, 1859
Frivaldzkia Schiner, 1861
Elpe Robineau-Desvoidy, 1863
Hypochaeta Brauer & Bergenstamm, 1889
inepta (Meigen, 1824)
pectinata (Zetterstedt, 1844)
praecox (Meigen, 1824)
pantherina (Zetterstedt, 1844)

Tribe Voriini
Athrycia Robineau-Desvoidy, 1830
Blepharigena Rondani, 1856
Paraplagia Brauer & Bergenstamm, 1891
curvinervis (Zetterstedt, 1844)
ruficornis (Zetterstedt, 1844)
impressa (Wulp, 1869)
trepida (Meigen, 1824)
subcincta (Zetterstedt, 1844)
Chaetovoria Villeneuve, 1920
Pseudovoria Ringdahl, 1942
antennata (Villeneuve, 1920)
Cyrtophleba Rondani, 1856
ruricola (Meigen, 1824)
Klugia Robineau-Desvoidy, 1863
Ptilopareia Brauer & Bergenstamm, 1889
marginata (Meigen, 1824)
Voria Robineau-Desvoidy, 1830
Plagia Meigen, 1838
ruralis (Fallén, 1810)

Tribe Wagneriini
Aphelogaster Aldrich, 1934
alpina (Villeneuve, 1910)
Peteina Meigen, 1838
erinaceus (Fabricius, 1796)
Ramonda Robineau-Desvoidy, 1863
Ateria Robineau-Desvoidy, 1863
latifrons (Zetterstedt, 1844)
prunaria (Rondani, 1861)
carbonaria: authors, not Panzer (misidentification)
ringdahli (Villeneuve, 1922)
spathulata (Fallén, 1820)
Wagneria Robineau-Desvoidy, 1830
Carbonia Robineau-Desvoidy, 1863
costata (Fallén, 1820)

Tribe Phyllomyini
Phyllomya Robineau-Desvoidy, 1830
Sericocera Macquart, 1834
Melania Meigen, 1838, preocc.
Melanota Rondani, 1857
volvulus (Fabricius, 1794)

Tribe Eriothrixini
Blepharomyia Brauer & Bergenstamm, 1889
pagana (Meigen, 1824)
amplicornis (Zetterstedt, 1844)
piliceps (Zetterstedt, 1859)
collini Wainwright, 1928
Eriothrix Meigen, 1803
Olivieria Robineau-Desvoidy, 1830
Feria Robineau-Desvoidy, 1830
prolixa (Meigen, 1824)
rufomaculata (De Geer, 1776)
lateralis (Fabricius, 1781)
monochaeta Wainwright, 1928

Tribe Thelairini
Thelaira Robineau-Desvoidy, 1830
nigripes (Fabricius, 1794)
lateralis (Fallén, 1817)
nigrina (Fallén, 1817)
solivaga (Harris, 1776)
abdominalis Robineau-Desvoidy, 1830

Tribe Microphthalmini
Dexiosoma Rondani, 1856
caninum (Fabricius, 1781)

Tribe Digonochaetini
Triarthria Stephens, 1829
Bigonicheta Rondani, 1845
setipennis (Fallén, 1810)
spinipennis (Meigen, 1824)

Tribe Macquartiini
Cleonice Robineau-Desvoidy, 1863
Steinia Brauer & Bergenstamm, 1893, preocc.
Steiniella Berg, 1898, preocc.
callida (Meigen, 1824)
rotundicornis (Zetterstedt, 1838)
protuberans (Zetterstedt, 1844)
congenita (Zetterstedt, 1859)
Macquartia Robineau-Desvoidy, 1830
Albiniola Mesnil, 1972
nudigena Mesnil, 1972
tenebricosa (Meigen, 1824)
nitida (Zetterstedt, 1838)
Pelatachina Meade, 1894
Hyria Robineau-Desvoidy, 1863, preocc.
tibialis (Fallén, 1810)
Pseudopachystylum Mik, 1891
goniaeoides (Zetterstedt, 1838)
Zophomyia Macquart, 1835
Erebia Robineau-Desvoidy, 1830, preocc.
temula (Scopoli, 1763)

Tribe Loewiini
Loewia Egger, 1856
Fortisia Rondani, 1861
foeda (Meigen, 1824)
phaeoptera (Meigen, 1824)[2]

Tribe Nemoraeini
Nemoraea Robineau-Desvoidy, 1830
pellucida (Meigen, 1824)
vulnerata (Zetterstedt, 1849)

Tribe Germariini
Germaria Robineau-Desvoidy, 1830
Atractochaeta Brauer & Bergenstamm, 1889
Atractogonia Townsend, 1932
ruficeps (Fallén, 1820)

Tribe Leskiini
Aphria Robineau-Desvoidy, 1830
longilingua Rondani, 1861
longirostris (Meigen, 1824)
abdominalis Robineau-Desvoidy, 1830
soror (Zetterstedt, 1844)
Demoticus Macquart, 1854
plebejus (Fallén, 1810)

Leskia Robineau-Desvoidy, 1830
aurea (Fallén, 1820)
Solieria Robineau-Desvoidy, 1849
Myobia Robineau-Desvoidy, 1830, preocc.
Anthoica Rondani, 1861
Micromyiobia Brauer & Bergenstamm, 1891
pacifica (Meigen, 1824)

Tribe Ernestiini
Appendicia Stein, 1924
truncata (Zetterstedt, 1838)
Ernestia Robineau-Desvoidy, 1830
Panzeria Robineau-Desvoidy, 1830
rudis (Fallén, 1810)
Eurithia Robineau-Desvoidy, 1844
Erigone Robineau-Desvoidy, 1830, preocc.
Varichaeta Speiser, 1903
anthophila (Robineau-Desvoidy, 1830)
radicum: authors, not Linnaeus (misidentification)
caesia (Fallén, 1810)
connivens (Zetterstedt, 1844)
consobrina (Meigen, 1824)
vivida (Zetterstedt, 1838)
Gymnocheta Robineau-Desvoidy, 1830
Chrysosoma Macquart, 1834, preocc.
viridis (Fallén, 1810)
Hyalurgus Brauer & Bergenstamm, 1893
Parastauferia Pokoli, 1893
crucigerus (Zetterstedt, 1838)
alpina Pokoli, 1893
lucidus (Meigen, 1824)

Tribe Linnaemyini
Linnaemya Robineau-Desvoidy, 1830
Micropalpis Macquart, 1834
perinealis Pandellé, 1895
vulpina (Fallén, 1810)
Lydina Robineau-Desvoidy, 1830
aenea (Meigen, 1824)
crassitarsis (Zetterstedt, 1838)
grossicornis (Zetterstedt, 1838)
simplicitarsis (Zetterstedt, 1838)
Lypha Robineau-Desvoidy, 1830
Aporomyia Rondani, 1859
Micronychia Brauer & Bergenstamm, 1889
Eversmania: authors, not Robineau-Desvoidy (misidentification)
dubia (Fallén, 1810)
umbrinervis (Zetterstedt, 1844)
ruficauda (Zetterstedt, 1838)
maculipennis (Zetterstedt, 1844)

Tribe Tachinini
Nowickia Wachtl, 1894
alpina (Zetterstedt, 1849)[3]
marklini (Zetterstedt, 1838)
regalis (Rondani, 1859)
Peleteria Robineau-Desvoidy, 1830
rubescens (Robineau-Desvoidy, 1830)
nigricornis (Meigen, 1838)

Tachina Meigen, 1803
Larvaevora Meigen, 1800, suppressed
Echinomye Duméril, 1800, unavailable (vernacular)
Echinomya Latreille, 1805
fera (Linnaeus, 1761)
grossa (Linnaeus, 1758)
tessellata (Fabricius, 1794)
vernalis (Robineau-Desvoidy, 1830)
magnicornis (Zetterstedt, 1844)

Subfamily Goniinae

Tribe Neaerini
Elfia Robineau-Desvoidy, 1850
Craspedothrix Brauer & Bergenstamm, 1893
Procraspedothrix Townsend, 1932
cingulata (Robineau-Desvoidy, 1830)[4]
minutissima (Zetterstedt, 1844)[4]
Phytomyptera Rondani, 1845
nigrina (Meigen, 1824)
nitidiventris (Rondani, 1845)

Tribe Siphonini
Actia Robineau-Desvoidy, 1830
Thryptocera Macquart, 1834
Entomophaga Lioy, 1864
Gymnophthalma Lioy, 1864
Gymnopareia Brauer & Bergenstamm, 1889
crassicornis (Meigen, 1824)
dubitata Herting, 1971
lamia (Meigen, 1838)
frontalis (Macquart, 1845)
maksymovi Mesnil, 1952
nigroscutellata Lundbeck, 1927
nudibasis Stein, 1924
pilipennis (Fallén, 1810)
Asiphona Mesnil, 1954
verralli (Wainwright, 1928)
Ceromya Robineau-Desvoidy, 1830
bicolor (Meigen, 1824)
Peribaea Robineau-Desvoidy, 1863
Herbstia Robineau-Desvoidy, 1851, preocc.
Strobliomyia Townsend, 1926
fissicornis (Strobl, 1910)
Siphona Meigen, 1803
Crocuta Meigen, 1800, suppressed
Bucentes Latreille, 1809
boreata Mesnil, 1960
collini Mesnil, 1960
confusa Mesnil, 1961
cristata (Fabricius, 1805)
palpina Zetterstedt, 1859
flavifrons Stæger, 1849
geniculata (De Geer, 1776)
minuta (Fabricius, 1805)
grandistyla Pandellé, 1849[5]
maculata Stæger, 1849
mesnili Andersen, 1982
nigricans (Villeneuve, 1930)
hokkaidensis Mesnil, 1957
silvarum Herting, 1967

paludosa Mesnil, 1960
pauciseta Rondani, 1865
delicazula Mesnil, 1960
rossica Mesnil, 1961
setosa Mesnil, 1960

Tribe Blondeliini
Belida Robineau-Desvoidy, 1863
Aporotachina Meade, 1894
angelicae (Meigen, 1824)
futilis (Zetterstedt, 1844)
Blondelia Robineau-Desvoidy, 1830
nigripes (Fallén, 1820)
Istocheta Rondani, 1859
Hyperecteina Schiner, 1861
longicornis (Fallén, 1810)
Leiophora Robineau-Desvoidy, 1863
Arrhinomyia Brauer & Bergenstamm, 1889
Apatelia Stein, 1924, preocc.
innoxia (Meigen, 1824)[6]
spathulaeformis (Zetterstedt, 1838)
spathulaecornis (Zetterstedt, 1844)
cylindracea (Zetterstedt, 1844)
Medina Robineau-Desvoidy, 1830
Degeeria Meigen, 1838
Mollia Robineau-Desvoidy, 1863
Velocia Robineau-Desvoidy, 1863
Amedoria Brauer & Bergenstamm, 1889
collaris (Fallén, 1820)
luctuosa (Meigen, 1824)
separata (Meigen, 1824)
Meigenia Robineau-Desvoidy, 1830
Spylosia Rondani, 1856
dorsalis (Meigen, 1824)
discolor (Zetterstedt, 1838)
pilosa Baranov, 1927
mutabilis (Fallén, 1810)
bisignata (Meigen, 1824)
Oswaldia Robineau-Desvoidy, 1863
Phaedima Robineau-Desvoidy, 1863
Dexodes Brauer & Bergenstamm, 1889
muscaria (Fallén, 1810)
sordidisquama (Zetterstedt, 1844)
spectabilis (Meigen, 1824)
albisquama (Zetterstedt, 1844)
Policheta Rondani, 1856
Pericheta Rondani, 1859
unicolor (Fallén, 1820)[7]
funebris (Zetterstedt, 1838)
Staurochaeta Brauer & Bergenstamm, 1889
albocingulata (Fallén, 1820)
Trichopareia Brauer & Bergenstamm, 1889
Admontia Brauer & Bergenstamm, 1889
blanda (Fallén, 1820)
grandicornis (Zetterstedt, 1849)
laticornis (Zetterstedt, 1838), preocc.
albicincta (Zetterstedt, 1838)
Zaira Robineau-Desvoidy, 1830
Fabricia Meigen, 1838, preocc.
Sitophaga Gistl, 1848
Biomya Rondani, 1856
Viviania Rondani, 1861
cinerea (Fallén, 1810)
usta (Zetterstedt, 1844)

Tribe Exoristini
Chetogena Rondani, 1856
Salia Robineau-Desvoidy, 1830, preocc.
Spoggosia Rondani, 1859
obliquata (Fallén, 1810)
gramma (Meigen, 1824)
echinura (Robineau-Desvoidy, 1830)
occlusa (Rondani, 1859)
Exorista Meigen, 1803
Zelleria Robineau-Desvoidy, 1863
Adenia Robineau-Desvoidy, 1863
Guerinia: authors, not Robineau-Desvoidy (misidentification)
Tachina: authors, not Meigen (misidentification)
fasciata (Fallén, 1820)
nitidiventris (Zetterstedt, 1859)
mimula (Meigen, 1824)
verax (Robineau-Desvoidy, 1863)
minor (Wainwright, 1932)
nigricans: Emden, 1954, not Egger (misidentification)
rustica (Fallén, 1810)
Phorocera Robineau-Desvoidy, 1830
obscura (Fallén, 1810)
vernalis Robineau-Desvoidy, 1830

Tribe Winthemiini
Nemorilla Rondani, 1856
maculosa (Meigen, 1824)
Rhaphiochaeta Brauer & Bergenstamm, 1889
breviseta (Zetterstedt, 1838)[8]
vulneraticornis (Zetterstedt, 1859)
Timavia Robineau-Desvoidy, 1863
Omotoma Lioy, 1864
Nemosturmia Townsend, 1926
Chetoliga: authors, not Rondani (misidentification)
amoena (Meigen, 1824)
Winthemia Robineau-Desvoidy, 1830
bohemanni (Zetterstedt, 1844)
erythrura (Meigen, 1838)
quadripustulata (Fabricius, 1794)

Tribe Goniini
Allophorocera Hendel, 1901
Erycina Mesnil, 1955, preocc.
Erycilla Mesnil, 1957
ferruginea (Meigen, 1824)
Bothria Rondani, 1856
Chariclea Robineau-Desvoidy, 1863
frontosa (Meigen, 1824)
pascuorum Rondani, 1859
coxalis (Robineau-Desvoidy, 1863)
subalpina Villeneuve, 1910
Brachicheta Rondani, 1861
strigata (Meigen, 1824)
hystrix (Zetterstedt, 1844)
spinigera Rondani, 1861
Cyzenis Robineau-Desvoidy, 1863

Monochaeta Brauer & Bergenstamm, 1889
albicans (Fallén, 1810)
perturbans (Zetterstedt, 1844)
Elodia Robineau-Desvoidy, 1863
Pentamyia Brauer & Bergenstamm, 1889
ambulatoria (Meigen, 1824)
convexifrons (Zetterstedt, 1844)
cloacellae (Kramer, 1910)
morio (Fallén, 1820)[9]
tragica (Meigen, 1824)
Erynnia Robineau-Desvoidy, 1830
ocypterata (Fallén, 1810)
nitida Robineau-Desvoidy, 1830
ocypterina (Zetterstedt, 1838)
Eumea Robineau-Desvoidy, 1830
Epimasicera Townsend, 1912
linearicornis (Zetterstedt, 1844)
westermanni (Zetterstedt, 1844), preocc.
spernenda (Zetterstedt, 1844)
locuples Robineau-Desvoidy, 1863
Frontina Meigen, 1838
laeta (Meigen, 1824)
laetabilis (Zetterstedt, 1844)
Gonia Meigen, 1803
Salmacia Meigen, 1800, suppressed
Reaumuria Robineau-Desvoidy, 1830
capitata (De Geer, 1776)
ornata Meigen, 1826
lateralis Zeller, 1842
sicula Robineau-Desvoidy, 1830
fasciata Meigen, 1826, preocc.
picea Robineau-Desvoidy, 1830
Myxexoristops Townsend, 1911
blondeli (Robineau-Desvoidy, 1830)
arctica (Zetterstedt, 1838)
pexops (Brauer & Bergenstamm, 1891)
stolida (Stein, 1924)
nox (Hall, 1937)
Ocytata Gistl, 1848
Roeselia Robineau-Desvoidy, 1830, preocc.
Racodineura Rondani, 1861
pallipes (Fallén, 1820)
antiqua (Meigen, 1824)
Onychogonia Brauer & Bergenstamm, 1889
cervini (Bigot, 1881)
flaviceps (Zetterstedt, 1838)
interrupta (Rondani, 1859)
Platymya Robineau-Desvoidy, 1830
fimbriata (Meigen, 1824)
nemestrina (Meigen, 1824)
hyalinipennis (Zetterstedt, 1838)
tricingulata (Zetterstedt, 1838)
hyalipennis (Zetterstedt, 1844)
Zenillia Robineau-Desvoidy, 1830
libatrix (Panzer, 1798)

Tribe Eryciini
Aplomya Robineau-Desvoidy, 1830
confinis (Fallén, 1820)
bicingulata (Zetterstedt, 1844)
Cadurciella Villeneuve, 1927
tritaeniata (Rondani, 1859)
Carcelia Robineau-Desvoidy, 1830
Paraexorista Brauer & Bergenstamm, 1889
atricosta Herting, 1961
lucorum (Meigen, 1824)
cheloniae (Rondani, 1859)
gnava: authors, not Meigen (misidentification)
Drino Robineau-Desvoidy, 1863
Phorcida: authors, not Robineau-Desvoidy (misidentification)
lota (Meigen, 1824)
vicina (Zetterstedt, 1848)
Epicampocera Macquart, 1850
succincta (Meigen, 1824)
Huebneria Robineau-Desvoidy, 1848
affinis (Fallén, 1810)
Lydella Robineau-Desvoidy, 1830
ripae (Brischke, 1885)
stabulans (Meigen, 1824)
Madremyia Townsend, 1916
clausa (Villeneuve, 1937)
Nilea Robineau-Desvoidy, 1863
Lylibaea Robineau-Desvoidy, 1863
Himera Robineau-Desvoidy, 1863, preocc.
hortulana (Meigen, 1824)
innoxia Robineau-Desvoidy, 1863
lethifera (Pandellé, 1895)
rufiscutellaris (Zetterstedt, 1859)
temeraria (Robineau-Desvoidy, 1863)
tomentosa (Robineau-Desvoidy, 1863)
abnormis (Brischke, 1885)
boettcheri (Villeneuve, 1919)
Periarchiclops Villeneuve, 1924
scutellaris (Fallén, 1820)
abbreviata (Zetterstedt, 1859)
Phebellia Robineau-Desvoidy, 1846
Melibaea Robineau-Desvoidy, 1847, preocc.
glauca (Meigen, 1824)
aurulenta (Robineau-Desvoidy, 1847)
glaucoides Herting, 1961
strigifrons (Zetterstedt, 1838)[10]
diligens (Zetterstedt, 1844)
lapponica (Ringdahl, 1942)
stulta (Zetterstedt, 1844)
obesa (Zetterstedt, 1859)
quadriseta (Villeneuve, 1910)
cotei (Grilat, 1915)
villica (Zetterstedt, 1838)
aestivalis Robineau-Desvoidy, 1846
ingens (Brauer & Bergenstamm, 1891)
Phryxe Robineau-Desvoidy, 1830
magnicornis (Zetterstedt, 1838)
longicauda Wainwright, 1940
vulgaris (Fallén, 1810)
praetervisa (Zetterstedt, 1844)
rotundaticornis (Zetterstedt, 1844)
Pseudoperichaeta Brauer & Bergenstamm, 1889
palesioidea (Robineau-Desvoidy, 1830)
trizonata (Zetterstedt, 1844)
major Brauer & Bergenstamm, 1889
hirta: authors, not Bigot (misidentification)
Senometopia Macquart, 1834

Eucarcelia Baranov, 1934
bombycivora (Robineau-Desvoidy, 1830)
separata (Rondani, 1859)
pollinosa (Mesnil, 1941)
obesa (Boheman, 1863), preocc.
obesa: authors, not Zetterstedt (misidentification)
rutilla: authors, not Rondani (misidentification)
Tlephusa Robineau-Desvoidy, 1863
cincinna (Rondani, 1859)
honesta (Robineau-Desvoidy, 1863)
diligens: authors, not Zetterstedt (misidentification)
Xylotachina Brauer & Bergenstamm, 1891
diluta (Meigen, 1824)
ligniperdae Brauer & Bergenstamm, 1891

Unrecognised species
Micra Zetterstedt, 1838
trixina Zetterstedt, 1838[11]

Annotations

(1) *Gymnosoma nudifrons* Herting. Material reported as *Gymnosoma rotundatum* (L.) by Rognes (1981) belongs to *nudifrons*.

(2) *Loewia phaeoptera* (Meigen). Based on a single male in the Oslo collection labelled «Loewia ? phaeoptera Meig.» by Herting.

(3) *Nowickia alpina* (Zetterstedt). Material reported as *Nowickia marklini* (Zetterstedt) by Rognes (1981) belongs to *alpina*.

(4) *Elfia cingulata* (Robineau-Desvoidy) and *Elfia minutissima* (Zetterstedt). Stig Andersen (Copenhagen) has examined and identified the available material (in litt. 5.ix.1983).

(5) *Siphona grandistyla* Pandellé. Not seen. Included on the basis of a record in Andersen (1982).

(6) *Leiophora innoxia* (Meigen). I have only seen the holotype « ♂ » of *Tachina spathulaeformis* Zetterstedt, 1838: 637 and (automatically) *Tachina spathulaecornis* Zetterstedt, 1844: 1065 from Norway (Dovre, Boheman leg.), which according to Ringdahl (1934, 1945) belongs to the present species. B. Herting has given the specimen a holotype label and an identification label reading «Leiophora innoxia Meig. ♀ B. Herting det.»

(7) *Policheta unicolor* (Fallén). The holotype ♀ of *Tachina funebris* Zetterstedt, 1838: 647 is from Norway (Dovre, Boheman leg.). This is a synonym of *Tachina unicolor* Fallén, 1820 according to Zetterstedt (1844: 1166—1167 and Mesnil (1961: 660). I have examined 4 ♂ ♂ from Dovre in the Boheman collection previously seen by Zetterstedt (1844: 1166—1167, as ♀ ♀). The holotype of *funebris* is probably among them but cannot be recognised as such on the basis of the labels (3 specimens labelled «Nv.alp.» and 1 «Dv.»). All agree with Mesnil's (1961) concept of *unicolor* Fallén. I have not seen further Norwegian material.

(8) I have examined a ♂ syntype of *Tachina breviseta* Zetterstedt, 1838: 645 from Dovre (labelled «Nv.alp.») in the Boheman collection, which agrees with Mesnil's (1949) concept of *breviseta*. I have also seen a male from Aurland in Museum of Zoology, Lund (Ringdahl leg.) (cf. Ringdahl 1954).

(9) *Elodia morio* (Fallén). Recorded from Norway by Zetterstedt (1838: 639—640, 1844: 1076—1077) and Ringdahl (1952). I have examined a male specimen from Dovre (Boheman leg.) in Zetterstedt's Insecta Lapponica collection in Museum of Zoology, Lund. No further Norwegian material has been available.

(10) *Phebellia strigifrons* (Zetterstedt). Not seen. Holotype ♂ of *Tachina strigifrons* Zetterstedt, 1838 and lectotype ♀ of *Tachina diligens* Zetterstedt, 1844 (cf. Herting 1982) are both from Norway.

(11) *Micra trixina* Zetterstedt. Holotype ♂ from Norway (cf. Zetterstedt 1838: 631) is apparently lost (cf. Mesnil 1975: 1369) and its identity unknown.

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A check-list of Norwegian Muscidae (Diptera)[1]

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Muscid material from Norway in the museum collections of the Universities in Bergen, Oslo and Tromsø, in my own collection and some other collections has been revised and a check-list of 289 species known at present from Norway is presented. Three new synonymies are established: (1) *Aricia umbrata* Storm, 1896 = *Hebecnema umbratica* (Meigen, 1826), (2) *Helina loekenae* Lavčiev, 1983 = *Helina bohemani* (Ringdahl, 1916), and (3) *Spilogona hardangervidensis* Lavčiev, 1983 = *Spilogona depressiuscula* (Zetterstedt, 1838). *Coenosia flaviseta* Huckett, 1965 is recorded from the Palaearctic Region for the first time.

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The check-list of Muscidae presented below covers Norway with exclusion of Svalbard and replaces the previously published lists of Siebke (1877), Schøyen (1889, 1895), Bidenkap (1892, 1898, 1901) and Ringdahl (1944a, 1944b, 1952). *Fannia* and its allies are now usually treated as a family separate from the Muscidae proper and this practice is followed here. The list is based upon a revision of the material of muscids from Norway in the museum collections of the Universities in Bergen (mainly O. Bidenkap, A. Fjellberg, L. Greve, A. Løken, N. Knaben, T.R. Nielsen leg.) (parts of the material collected at Hardangervidda during the IBP project have been included, see Fjellberg 1972), Oslo (mainly J. Knaben, R. Krogerus, J.H.S. Siebke leg.) and Tromsø (mainly T. Soot-Ryen, but some also O. Ringdahl leg.) (about 7800 specimens) and in my own collection (about 7900 specimens). In addition a few small private collections have been examined (B. Sagvolden, Rollag, J.H. Simonsen, Oslo). I have not seen the V. Storm collection in Trondheim revised by Ringdahl (1944a) (except for the Storm types, rediscovered in the Tromsø collection, see below). Occasional specimens in foreign collections have also been examined (coll. Zetterstedt, Lund, coll. Becker, Berlin, coll. Ringdahl, Lund). I have also examined some unidentified material from Norway collected by P. Ardö, H. Andersson and R. Dahl (in Lund). I have examined specimens from Norway of all the species listed except 8. My reasons for listing these are included among the annotations at the end of the list.

The following type-material from Norway has been examined: *Aricia semipellucida* Zetterstedt, 1845: 1523 (♂ syntype labelled «Suul» in Zetterstedt's hand in the Oslo collection) (= *Lophosceles mutatus* Fallén), *Anthomyza lineatipes* Zetterstedt, 1845: 1676 (♀ syntype from Alstahaug 8 July 1840), *Aricia maculipennis* Storm, 1896: 238 (holotype ♂ in Tromsø Museum) (= *Phaonia pratensis* Rob.-Desv.), *Aricia anthomyzoides* Storm, 1896: 239 (holotype ♂ in Tromsø Museum) (= *Thricops longipes* Zett.), *Aricia propinqua* Storm, 1896: 239 (holotype ♂ in Tromsø Museum) (= *Helina cinerella* Wulp), *Aricia umbrata* Storm, 1896: 238 (2 ♂ ♂ syntypes in Tromsø Museum) (= *Hebecnema umbratica* Meigen, N.SYN.), *Phaonia norvegica* Ringdahl, 1928 (1 ♂ syntype from Tromsø in Tromsø Museum) (= *Phaonia zugmayeriae* Schnabl), *Helina loekenae* Lavčiev, 1983: 101 (holotype ♂ in the Bergen collection) (= *Helina bohemani* Ringdahl, N.SYN.), *Spilogona hardangervidensis* Lavčiev, 1983: 104 (holotype ♂ in the Bergen collection) (= *Spilogona depressiuscula* Zett., N.SYN.).

Ringdahl (1952) listed 180 species from Norway on the basis of his own collecting activities in Northern Norway, revisions of the Tromsø and Trondheim collections (Ringdahl 1928, 1944a, 1944b), the Zetterstedt collection which contains specimens, including types, from Nor-

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way (Ringdahl 1939), and unpublished examination of parts of the Oslo and Bergen collections (some results published by Soot-Ryen 1943). 2 species, *Hydrotaea capensis* and *Spilogona trianguligera,* published by Schøyen (1895) and Ringdahl (1928), respectively, were not included. Ringdahl (1954a) added 7 species, Ardö (1957) 3, Dahl (1968) 2, Pont (1971) 1, and Rognes (1979, 1982, 1983a, 1983b) 26, bringing the total no. 221. The present revision lists 289 species from Norway. In comparison it may be noted that 213 species have been published from Denmark (Michelsen 1977), 251 from Finland (Hackman 1980), 344 from Sweden (Ringdahl 1952) and 279 from the British Isles (Pont 1975). In view of the high number of species known from Sweden it is safe to conclude that many species still await discovery in Norway.

The classification and nomenclature adopted is the one used by A.C. Pont in his Muscidae contribution to the forthcoming Catalogue of Palaearctic Diptera (editor A. Soos, Budapest). The nomenclature differs in several respects from the one used e.g. by Hennig (1955—1964). A number of generic synonyms are provided to aid in recognition of generic limits. Specific synonyms are included when based on type-specimens from Scandinavian localities, met with in commonly used identification literature (e.g. Ringdahl 1954c, 1956, Hennig 1955—1964 Fonseca 1968), or else occuring in works dealing with the Scandinavian fauna. In the list all synonyms are indented relative to valid names. Superscript numbers refer to the annotations at the end of the list. At the end of the paper is a list of species recorded from Norway in the literature but excluded from the check-list on the basis of presently available evidence.

Family Muscidae

Subfamily Achanthipterinae

Achanthiptera Rondani, 1856
  rohrelliformis (Robineau-Desvoidy, 1830)
    inanis (Fallén, 1825), preocc.

Subfamily Muscinae

Tribe Reinwardtiini
Muscina Robineau-Desvoidy, 1830
  levida (Harris, 1780)
    assimilis (Fallén, 1823)
    borealis (Zetterstedt, 1838)
  pascuorum (Meigen, 1826)
  prolapsa Harris, 1780)
    pabulorum (Fallén, 1817)
  stabulans (Fallén, 1817)

Tribe Azeliini
Azelia Robineau-Desvoidy, 1830
  aterrima (Meigen, 1826)
  cilipes (Haliday, 1838)
    tibialis (Staeger, 1843), preocc.
    staegeri (Zetterstedt, 1845)
  gibbera (Meigen, 1826)
  nebulosa Robineau-Desvoidy, 1830
    macquarti (Staeger, 1843)
  trigonica Hennig, 1956
  triquetra (Wiedemann, 1817)
    nudipes (Zetterstedt, 1849)
  zetterstedtii Rondani, 1866
Thricops Rondani, 1856
  Tricophticus Rondani, 1861
  Alloeostylus Schnabl, 1888
  Hera Schnabl, 1888
  Rhynchotrichops Schnabl, 1889
  Pterocanthus Malloch, 1921
  Lasiops: authors, not Meigen (misidentification)
  aculeipes (Zetterstedt, 1838)
  albibasalis (Zetterstedt, 1849)[1]
  cunctans (Meigen, 1826)
    hirsutula (Zetterstedt, 1838)
    depressiventris (Zetterstedt, 1845)
  diaphanus (Wiedemann, 1817)
    varians (Zetterstedt, 1838)
  foveolatus (Zetterstedt, 1845)
    perpendicularis (Zetterstedt, 1845)
  furcatus (Stein, 1916)
  genarum (Zetterstedt, 1838)
    sundewalli (Zetterstedt, 1845)
  hirtulus (Zetterstedt, 1838)
    subrostrata (Zetterstedt, 1845)
  innocuus (Zetterstedt, 1838)
    pubipes (Zetterstedt, 1845)
  lividiventris (Zetterstedt, 1845)
  longipes (Zetterstedt, 1845)
    atra (Fallén, 1823), preocc.
    anthomyzoides (Storm, 1896)
  nigrifrons (Robineau-Desvoidy, 1830)
    variabilis (Fallén, 1823), preocc.
  nigritellus (Zetterstedt, 1838)
  rostratus (Meade, 1882)
  semicinereus (Wiedemann, 1817)
    hyalinata (Fallén, 1823), preocc.
  separ (Zetterstedt, 1845)
  simplex (Wiedemann, 1817)
    postica (Zetterstedt, 1846)
  sudeticus (Schnabl, 1888)
Drymeia Meigen, 1826
  Pogonomyia Rondani, 1871
  Trichopticoides Ringdahl, 1931
  hamata (Fallén, 1823)
    piligera (Zetterstedt, 1845)
  tetra (Meigen, 1826)
    fuscinervis (Zetterstedt, 1838)
    lanceolata (Zetterstedt, 1838)
    obscuripennis (Zetterstedt, 1838)
  vicana (Harris, 1780)
    decolor (Fallén, 1824)
    innocens (Zetterstedt, 1845)

Hydrotaea Robineau-Desvoidy, 1830
Ophyra Robineau-Desvoidy, 1830
Lasiops Meigen, 1838
Cryptophyra Michelsen, 1978
aenescens (Wiedemann, 1830)
albipuncta (Zetterstedt, 1845)
anxia (Zetterstedt, 1838)
bispinosa (Zetterstedt, 1845)
armipes (Fallén, 1825)
occulta (Meigen, 1826)
borussica Stein, 1899
capensis (Wiedemann, 1818)
anthrax (Meigen, 1826)
cadaverina (Mégnin, 1894)
cyrtoneurina (Zetterstedt, 1845)
dentipes (Fabricius, 1805)
diabolus (Harris, 1780)
ciliata (Fabricius, 1794), preocc.
spinipes (Fallén, 1823), preocc.
bimaculata (Meigen, 1826)
floccosa Macquart, 1835
armipes: authors, not Fallén (misidentification)
glabricula (Fallén, 1825)[2]
ignava (Harris, 1780)
leucostoma (Wiedemann, 1817)
spoliata (Zetterstedt, 1849)
irritans (Fallén, 1823)
meteorica (Linnaeus, 1758)
militaris (Meigen, 1826)
pandellei Stein, 1899
pellucens Portschinsky, 1879
pilipes Stein, 1903
pilitibia Stein, 1916
ringdahli Stein, 1916
scambus (Zetterstedt, 1838)
similis Meade, 1887
velutina Robineau-Desvoidy, 1830
Potamia Robineau-Desvoidy, 1830
Dendrophaonia Malloch, 1923
littoralis Robineau-Desvoidy, 1830
querceti (Bouché, 1834)
platyptera (Zetterstedt, 1849)

Tribe Muscini
Mesembrina Meigen, 1826
Hypodermodes Townsend, 1912
intermedia Zetterstedt, 1849
meridiana (Linnaeus, 1758)
mystacea (Linnaeus, 1758)
Polietes Rondani, 1866
Polietella Ringdahl, 1922
Pseudomorellia Ringdahl, 1929
domitor (Harris, 1780)
albolineata (Fallén, 1823)
lardaria (Fabricius, 1781)
nigrolimbata (Bonsdorff, 1866)
steinii (Ringdahl, 1913)
Musca Linnaeus, 1758
autumnalis De Geer, 1776
domestica Linnaeus, 1758
tempestiva Fallén, 1817
Morellia Robineau-Desvoidy, 1830
aenescens Robineau-Desvoidy, 1830
valga (Wahlberg, 1845)
hortorum (Fallén, 1817)
podagrica (Loew, 1857)
simplex (Loew, 1857)
Neomyia Walker, 1859
Orthellia Robineau-Desvoidy, 1863
Cryptolucilia Brauer & Bergenstamm, 1893
Pseudopyrellia Girschner, 1894
cornicina (Fabricius, 1781)
viridis (Wiedemann, 1824)
caesarion (Meigen, 1826), preocc.
fennica (Frey, 1909)
viridescens (Robineau-Desvoidy, 1830)
cornicina: authors, not Fabricius (misidentification)
Eudasyphora Townsend, 1911
cyanella (Meigen, 1826)
cyanicolor (Zetterstedt, 1845)
zimini (Hennig, 1963)

Tribe Stomoxyini
Stomoxys Geoffroy, 1762
calcitrans (Linnaeus, 1758)
Haematobosca Bezzi, 1907
stimulans (Meigen, 1824)
crassipalpis (Ringdahl, 1926)

Subfamily Phaoniinae

Tribe Phaoniini
Phaonia Robineau-Desvoidy, 1830
Dialyta Meigen, 1826
Wahlgrenia Ringdahl, 1929
Dialytina Ringdahl, 1945
aeneiventris (Zetterstedt, 1845)
cinctinervis (Zetterstedt, 1860)
alpicola (Zetterstedt, 1845)
angelicae (Scopoli, 1763)
basalis (Zetterstedt, 1838: 691), preocc.
angulicornis (Zetterstedt, 1838)
erinacea (Fallén, 1824), preocc.
atriceps (Loew, 1858)
cincta (Zetterstedt, 1846)
consobrina (Zetterstedt, 1838)
marmorata (Zetterstedt, 1860)
errans (Meigen, 1826)
erratica (Fallén, 1825), preocc.
zetterstedti (Bonsdorff, 1866)
biseta Ringdahl, 1935, preocc.
erronea (Schnabl. 1887)
falleni Michelsen, 1977
vagans (Fallén, 1825), preocc.
fuscata (Fallén, 1825)
gobertii (Mik, 1881)[3]
gracilis Stein, 1916
vetula (Zetterstedt, 1845: 1659), preocc.
grandaeva (Zetterstedt, 1845)
abietina Ringdahl, 1926
halterata (Stein, 1893)
hybrida (Schnabl, 1888)

incana (Wiedemann, 1817)
nemorum (Fallén, 1823), preocc.
plumbea (Meigen, 1826)
laeta (Fallén, 1823)
trigonalis (Meigen, 1826)
laetabilis Collin, 1951
latipalpis Schnabl, 1911
umbraticola d'Assis Fonseca, 1957
longicornis Stein, 1916
lugubris (Meigen, 1826)
magnicornis (Zetterstedt, 1845)
morio (Zetterstedt, 1845)
mystica (Meigen, 1826)
vittifera (Zetterstedt, 1845)
pallida (Fabricius, 1787)
pallidisquama (Zetterstedt, 1849)
anthracina (Zetterstedt, 1860)
palpata (Stein, 1897)
perdita (Meigen, 1830)
pratensis (Robineau-Desvoidy, 1830)
maculipennis (Storm, 1896)
laeta: authors, not Fallén (misidentification)
pullata (Czerny, 1900)
rufiventris (Scopoli, 1763)
nugator (Harris, 1780)
testacea (Fabricius, 1781), preocc.
scutellaris (Fallén, 1825), preocc.
populi (Meigen, 1826)
scutellata (Zetterstedt, 1845)
serva (Meigen, 1826)
siebecki Schnabl, 1911
confluens Stein, 1914
steinii (Strobl, 1898)
subfuscinervis (Zetterstedt, 1838)
vicina (Zetterstedt, 1838)
turpis (Zetterstedt, 1838)
inconspicua (Zetterstedt, 1838)
subventa (Harris, 1780)
variegata (Meigen, 1826)
denominata (Zetterstedt, 1855)
trimaculata (Bouché, 1834)
servaeformis Ringdahl, 1916
tuguriorum (Scopoli, 1763)
signata (Meigen, 1826)
erythrostoma (Zetterstedt, 1849)
valida (Harris, 1780)
viarum Robineau-Desvoidy, 1830
villana Robineau-Desvoidy, 1830
mystica: authors, not Meigen (misidentification)
wahlbergi Ringdahl, 1930
zugmayeriae (Schnabl, 1888)
humeralis (Zetterstedt, 1845), preocc.
norvegica Ringdahl, 1928

Lophosceles Ringdahl, 1922
cinereiventris (Zetterstedt, 1845)[4]
cristata (Zetterstedt, 1845)
frenatus (Holmgren, 1872)
hians (Zetterstedt, 1838)
impar (Zetterstedt, 1846)
mutatus (Fallén, 1825)
ochreata (Zetterstedt, 1838)
semipellucida (Zetterstedt, 1845)

Helina Robineau-Desvoidy, 1830
Aricia Robineau-Desvoidy, 1830, preocc.
Spilogaster Macquart, 1835
Enoplopteryx Hendel, 1902
Arctohelina Ringdahl, 1929
Ammitzbollia Ringdahl, 1929
allotalla (Meigen, 1830)
bisignata (Zetterstedt, 1855)
annosa (Zetterstedt, 1838)
atricolor (Fallén, 1825)
denudata (Zetterstedt, 1845)
memnonipes (Zetterstedt, 1860)
bohemani (Ringdahl, 1916)
loekenae Lavčiev, 1983, SYN.N.[5]
celsa (Harris, 1780)
quadrimaculata (Fallén, 1823), preocc.
quadrimaculella Hennig, 1957
ciliata Karl, 1929[6]
ciliatocosta (Zetterstedt, 1845)
cilipes (Schnabl, 1902)
cinerella (Wulp, 1867)
vanderwulpi (Schnabl, 1888)
propinqua (Storm, 1896)
confinis (Fallén, 1825)
confinis (Meigen, 1826), preocc.
anceps (Zetterstedt, 1838)
consimilis (Fallén, 1825)
cineraria (Zetterstedt, 1845)
cothurnata (Rondani, 1866)
obscuripes: Ringdahl 1928: 23, not Zetterstedt (misidentification)
daicles (Walker, 1849)
binotata (Zetterstedt, 1845), preocc.
depuncta (Fallén, 1825)
demigrans (Zetterstedt, 1845)
decorata (Zetterstedt, 1852)
injusta (Zetterstedt, 1860)
evecta (Harris, 1780)
lucorum (Fallén, 1823), preocc.
laetifica (Robineau-Desvoidy, 1830)
nivalis (Zetterstedt, 1838)
flavisquama (Zetterstedt, 1849)
basalis (Zetterstedt, 1838: 663), preocc.
fratercula (Zetterstedt, 1845)
consors (Zetterstedt, 1845)
sororia (Zetterstedt, 1845)
fulvisquama (Zetterstedt, 1845)
impuncta (Fallén, 1825)
binotata (Macquart, 1835)
punctiventris (Zetterstedt, 1845)
latitarsis Ringdahl, 1924
atrata (Zetterstedt, 1845), unavailable
laxifrons (Zetterstedt, 1860)[7]
tinctipennis (Stein, 1916)
longicornis (Zetterstedt, 1838)
luteisquama (Zetterstedt, 1845)
maculipennis (Zetterstedt, 1845)
obscuripes (Zetterstedt, 1845)
obscurata (Meigen, 1826)

sahlbergi (Zetterstedt, 1838)
sordidiventris (Zetterstedt, 1845)
protuberans (Zetterstedt, 1845)
exsul (Zetterstedt, 1845)
pubiseta (Zetterstedt, 1845)
quadrum (Fabricius, 1805)
dignota (Bidenkap, 1890)
reversio (Harris, 1780)
compuncta (Wiedemann, 1817)
duplicata (Meigen, 1826)
communis (Robineau-Desvoidy, 1830)
duplaris (Zetterstedt, 1845)
vilis (Zetterstedt, 1845)
flavogrisea (Zetterstedt, 1860)
setiventris Ringdahl, 1924[8]
sexmaculata (Preyssler, 1791)
uliginosa (Fallén, 1825), preocc.
punctata (Robineau-Desvoidy, 1830)
flavicoxa (Zetterstedt, 1860)
spinicosta (Zetterstedt, 1845)
congenulata (Zetterstedt, 1860)
squalens (Zetterstedt, 1838)
borealis (Zetterstedt, 1838)
subvittata (Séguy, 1923)
rothi Ringdahl, 1939
marmorata: authors, not Zetterstedt (misidentification)
trivittata (Zetterstedt, 1860)
atripes (Meade, 1889)
veterana (Zetterstedt, 1838)
lapponica (Ringdahl, 1918)
vicina (Czerny, 1900)
suecica Ringdahl, 1924
Brontaea Kowarz, 1873
Gymnodia Robineau-Desvoidy, 1863, preocc.
humilis (Zetterstedt, 1860)

Subfamily Mydaeinae

Mydaea Robineau-Desvoidy, 1830
Subphaonia Ringdahl, 1934
affinis Meade, 1891
discimana Malloch, 1920
ancilla (Meigen, 1826)
anicula (Zetterstedt, 1860)
corni (Scopoli, 1763)
princeps (Harris, 1780)
pagana (Fabricius, 1794), preocc.
scutellaris Robineau-Desvoidy, 1830
deserta (Zetterstedt, 1845)
electa (Zetterstedt, 1860)
humeralis Robineau-Desvoidy, 1830
tincta (Zetterstedt, 1845)
nubila Stein, 1916
obscura (Stein, 1898), preocc.
obscurella Malloch, 1921
bengtssoni Ringdahl, 1924
orthonevra (Macquart, 1835)
detrita (Zetterstedt, 1845)
palpalis Stein, 1916
setifemur Ringdahl, 1924
sootryeni Ringdahl, 1928
urbana (Meigen, 1826)
rustica (Fallén, 1825), preocc.
Opsolasia Coquillett, 1910
orichalcea ((Zetterstedt, 1849)
Myospila Rondani, 1856
bimaculata (Macquart, 1834)
hennigi Gregor & Povolný, 1959
meditabunda (Fabricius, 1781)
nora (Walker, 1849)
aluta (Walker, 1849)
Hebecnema Schnabl, 1889
fumosa (Meigen, 1826)
fuscipes (Zetterstedt, 1845)
nigra Robineau-Desvoidy, 1830
halterata Ringdahl, 1941, preocc.
vespertina: authors, e.g. Hennig, not Fallén (misidentification)
nigricolor (Fallén, 1825)
ignobilis (Zetterstedt, 1845)
olivacea (Zetterstedt, 1845)
umbratica (Meigen, 1826)
capucina (Zetterstedt, 1849)
umbrata (Storm, 1896), SYN.N.
vespertina (Fallén, 1823)
nigrita (Fallén, 1823), preocc.
affinis Malloch, 1921
Graphomya Robineau-Desvoidy, 1830[9]
Curtonevra Macquart, 1834
maculata (Scopoli, 1763)
minor Robineau-Desvoidy, 1830
picta (Zetterstedt, 1855)

Subfamily Coenosiinae

Tribe Limnophorini
Spilogona Schnabl, 1911
Limnaricia Schnabl & Dziedzicki, 1911
Coenosites Schnabl & Dziedzicki, 1911
Spilogonoides Ringdahl, 1932
aerea (Fallén, 1825)
rotundiventris (Zetterstedt, 1845)
albisquama (Ringdahl, 1932)
alpica (Zetterstedt, 1845)
arenosa (Ringdahl, 1918)[10]
atrisquamula Hennig, 1959
atrisquama (Ringdahl, 1932), preocc.
baltica (Ringdahl, 1918)
brunneifrons Ringdahl, 1931
dorsata: Ringdahl 1944b: 21, not Zetterstedt (misidentification)
brunneisquama (Zetterstedt, 1845)
carbonella (Zetterstedt, 1845)
contractifrons (Zetterstedt, 1838)
arctica (Zetterstedt, 1838)
fumipennis (Zetterstedt, 1845)
denigrata (Meigen, 1826)
nigrinervis (Zetterstedt, 1845)
depressiuscula (Zetterstedt, 1838)
tristiola (Zetterstedt, 1838)
hardangervidensis Lavčiev, 1983, SYN.N.

depressula (Zetterstedt, 1845)
dispar (Fallén, 1823)
meridionalis Robineau-Desvoidy, 1830
funeralis (Rondani, 1866)
zetterstedtii (Schnabl, 1887)
wilhelmi (Schnabl, 1887)
dorsata (Zetterstedt, 1845)
frigida (Ringdahl, 1920)
falleni Pont, 1984
litorea: authors, not Fallén (misidentification)
litorea (Fallén, 1823)
longipes (Ringdahl, 1918)
malaisei (Ringdahl, 1920)
meadei (Schnabl, 1915)
subalpina (Ringdahl, 1918)
kuntzei: authors, not Schnabl (misidentification)
megastoma (Boheman, 1866)
micans (Ringdahl, 1918)
nigriventris (Zetterstedt, 1845)
nitidicauda (Schnabl, 1911)
jamtlandica (Ringdahl, 1918)
norvegica (Ringdahl, 1932)
novemmaculata (Zetterstedt, 1860)
obscuripennis (Stein, 1916)
opaca (Schnabl, 1915)
freyii (Ringdahl, 1918)
pacifica (Meigen, 1826)
vana (Zetterstedt, 1845)
nupta (Zetterstedt, 1860)
placida (Huckett, 1932)
glaucella (Ringdahl, 1932)
puberula (Ringdahl, 1918)
quinquelineata (Zetterstedt, 1838)
fulgidicauda (Schnabl, 1915)
sanctipauli (Malloch, 1921)
scutulata (Schnabl, 1911)
munda (Tiensuui, 1936)
semiglobosa (Ringdahl, 1916)
septemnotata (Zetterstedt, 1845)
setigera (Stein, 1907)
compuncta: authors, not Wiedemann (misidentification)
setulosa (Ringdahl, 1941)
sjostedti (Ringdahl, 1926)
sororcula (Zetterstedt, 1845)
zetterstedtii (Ringdahl, 1918), preocc.
surda (Zetterstedt, 1845)
tenuis Hennig, 1959
tornensis (Ringdahl, 1926)
seticosta (Ringdahl, 1920), preocc.
triangulifera (Zetterstedt, 1838)
vitticollis (Zetterstedt, 1845)
trianguligera (Zetterstedt, 1838)
insularis (Collin, 1921), preocc.
trigonata (Zetterstedt, 1838)
trilineata (Huckett, 1932)
tundrae (Schnabl, 1915)
tundrica (Schnabl, 1911: 168), preocc.
macropyga (Frey, 1915)
tundrica (Schnabl, 1911)
unicolor (Ringdahl, 1918)
veterrima (Zetterstedt, 1845)
alulata (Zetterstedt, 1855)
Limnophora Robineau-Desvoidy, 1830
Melanochelia Rondani, 1866
Pseudolimnophora Strobl, 1893
Calliophrys Kowarz, 1893
exuta (Kowarz, 1893)
nigripes (Robineau-Desvoidy, 1830)
olympiae Lyneborg, 1965
pandellei Séguy, 1923
lindrothi Ringdahl, 1930
orbitalis: authors, not Stein (misidentification)
riparia (Fallén, 1824)
scrupulosa (Zetterstedt, 1845)
sinuata Collin, 1930
islandica Lyneborg, 1965
tigrina (Am Stein, 1860)
notata (Fallén, 1823), preocc.
triangula (Fallén, 1825)
uniseta Stein, 1916
Lispe Latreille, 1796
litorea Fallén, 1825
pygmaea Fallén, 1825[11]
tenuipalpis Stenhammar, 1846
lacteipalpis (Zetterstedt, 1849)
tentaculata (De Geer, 1776)
uliginosa Fallén, 1825

Tribe Coenosiini
Pseudocoenosia Stein, 1916
Paracoenosia Ringdahl, 1945, preocc.
Coenosiosoma Ringdahl, 1947
abnormis Stein, 1916
solitaria (Zetterstedt, 1838)
longisquama (Zetterstedt, 1845)
longicauda (Zetterstedt, 1860)
Limnospila Schnabl, 1902
albifrons (Zetterstedt, 1849)
Caricea Robineau-Desvoidy, 1830
Lispocephala Pokorny, 1893
alma (Meigen, 1826)
erythrocera Robineau-Desvoidy, 1830
troglodytes (Zetterstedt, 1838)
lacteipennis (Zetterstedt, 1845)
pallipalpis (Zetterstedt, 1845)
spuria (Zetterstedt, 1838)
vitripennis (Ringdahl, 1951)
verna (Fabricius, 1794)
Schoenomyza Haliday, 1833
litorella (Fallén, 1823)
Macrorchis Rondani, 1877
meditata (Fallén, 1825)
Dexiopsis Pokorny, 1893
lacteipennis (Zetterstedt, 1845)
minutalis (Zetterstedt, 1860)
ruficornis (Macquart, 1835)[12]
litoralis (Zetterstedt, 1846)
pallicornis (Zetterstedt, 1846)
Coenosia Meigen, 1826
Limosia Robineau-Desvoidy, 1830
Oplogaster Rondani, 1856
Allognota Pokorny, 1893

Lamprocoenosia Ringdahl, 1945
Leucocoenosia Ringdahl, 1945
Xanthorrhinia Ringdahl, 1945
Caricea: authors, not Robineau-Desvoidy (misidentification)
acuminata Strobl, 1898
annulipes Ringdahl, 1932, preocc.
albicornis Meigen, 1826
lineatipes (Zetterstedt, 1845)[13]
ambulans Meigen, 1826
bilineella (Zetterstedt, 1838)
tarsella (Zetterstedt, 1838)
campestris (Robineau-Desvoidy, 1830)[14]
sexnotata: authors, not Meigen (misidentification)
cingulipes (Zetterstedt, 1849)
dealbata (Zetterstedt, 1838)
fulvicornis (Zetterstedt, 1845)
orbicornis Stein, 1916
femoralis (Robineau-Desvoidy, 1830)
geniculata (Fallén, 1825), preocc.
flaviseta Huckett, 1965[15]
graciliventris Ringdahl, 1954[16]
humilis Meigen, 1826
nana (Zetterstedt, 1845)
intermedia (Fallén, 1825)
means Meigen, 1826
articulata (Zetterstedt, 1845)
mollicula (Fallén, 1825)
biocellata (Zetterstedt, 1845)
octopunctata (Zetterstedt, 1838)
apicalis (Zetterstedt, 1845)
pedella (Fallén, 1825)
decipiens Meigen, 1826
perpusilla Meigen, 1826
pudorosa Collin, 1953
pulicaria (Zetterstedt, 1845)
mucronatella (Zetterstedt, 1845)
pumila (Fallén, 1825)
pygmaea (Zetterstedt, 1845)
nigrifemur (Zetterstedt, 1845)
rufipalpis Meigen, 1826
flavicauda Ringdahl, 1932
testacea (Robineau-Desvoidy, 1830)
tricolor (Zetterstedt, 1846)
alleni d'Assis Fonseca, 1966
tigrina (Fabricius, 1775)
trilineella (Zetterstedt, 1838)
verralli Collin, 1953

Annotations

(1) *Thricops albibasalis* (Zett.) Not seen. Holotype ♂ from Norway.

(2) *Hydrotaea glabricula* (Fall.). I have examined the female from «. . .Nordlandiae ad Björkvik. . .» referred to by Zetterstedt (1838, 1845). It fits Hennig's (1962) concept of *glabricula*. Zetterstedt (1838, 1845) also refers to a specimen from Bossekop, which I have also examined. It is a female *Fannia* species.

(3) *Phaonia gobertii* (Mik). Two males have been available. Both have the prosternum bare and ST1 hairy.

(4) *Lophosceles cinereiventris* (Zett.). No Norwegian material seen. A male from Alta (Finnmark) is present in the CNC (Ottawa) according to A.C. Pont (pers.comm.).

(5) *Helina loekenae* Lavčiev. The holotype clearly belongs to *bohemani* Ringdahl. The main diagnostic feature used by Lavčiev (1983) concerns the length of the aristal hairs. He appears to rely on Hennig's (1957) description of *bohemani*, which, however, is erroneous as to this particular feature. Hennig, who did not know *bohemani* at first hand, miscites Snyder (1949: 133) as regards the length of the aristal hairs.

(6) *Helina ciliata* Karl. A species of obscure status. To me it appears to be only a dark form of *quadrum*.

(7) *Helina laxifrons* (Zett.). Not seen. Included on basis of the record in Snyder (1949: 124).

(8) *Helina setiventris* Ringdahl. Note deleted.

(9) *Graphomya* Rob.-Desv. The genus is in need of revision in the Palaearctic region. Norwegian material fits Zimin's (as rendered by Hennig 1959) var.a, var.b, var.c and var.e *maculata* (Scop.) appears to be var.a of Zimin. *minor* (Rob.-Desv.) may be var.e of Zimin. I have examined all available Danish material. It belongs to var.a *(maculata)* and var.e (not var.b as given by Michelsen 1977). British material is also var.a and var.e (A.C. Pont pers. comm.).

(10) *Spilogona arenosa* (Ringdahl). Not seen. Included on the basis of record in Dahl (1968: 26).

(11) *Lispe pygmaea* Fallén. Not seen. Included on the basis of record in Ardö (1957: 153).

(12) *Dexiopsis ruficornis* (Macquart). Not seen. Included on the basis of record in Ardö (1957: 154, as *pallicornis*).

(13) *Coenosia albicornis* Meigen. I have only seen the female syntype of *lineatipes* Zetterstedt, 1845: 1676 *(Anthomyza)* taken at Alstahaug 8 July 1840.

(14) *Coenosia campestris* (Rob.-Desv.). Not seen. Included on the basis of records in Zetterstedt (1838: 694, 1845: 1718, 1855: 4745) and Ringdahl (1928, 1952) (all as *sexnotata*). A male specimen which may belong to this species is present in the Siebke collection in the Oslo museum.

(15) *Coenosia flaviseta* Huckett. A female specimen is present in the Tromsø collection taken by Soot-Ryen at Karasjok 9 Aug. 1924 (Finnmark, FI) (EIS 167). This is the first record from the Palaearctic Region. I have compared it with several specimens in the CNC (Ottawa), and A.C. Pont has examined it and agrees with my identification.

(16) *Coenosia graciliventris* Ringdahl. Not seen. The syntypic series was taken at Vågåmo (ON, Vågå) (EIS 71) 11 July 1953 (Ringdahl 1954b).

Species excluded from the Norwegian list

Pyrellia rapax (Harris, 1780). Recorded from Norway by Hennig (1963, as *ignita*) probably because of some misunderstanding. See Rognes (1979: 52) on this matter.

Pyrellia vivida Robineau-Desvoidy, 1830. Recorded with some hesitation by Ringdahl (1928) from Norway (as *cadaverina*). See also Rognes (1979) on this matter. The specimen on which Ringdahl's record was based has been traced in the Tromsø collection. It carries a label with «Pyrellia cadaverina L.?» in Ringdahl's hand. It is a female specimen of *Eudasyphora cyanicolor* (Zetterstedt).

Helina obtusipennis (Fallén, 1823). Recorded by Zetterstedt (1838: 666) from «Björkvik Nordlandiae» and by Zetterstedt (1845: 1425) also from «Næs Verdaliæ». I have examined the latter specimen which is a female *Helina celsa* (Harris).

Spilogona marginifera Hennig, 1959. Recorded from Norway («. . .ad radicem alpium Kälahögar. . .specimen unicum. . .lectum») by Zetterstedt (1845: 1515—1516, as *Aricia marginalis*). No corresponding specimen could be traced in Zetterstedt's collections in Museum of Zoology, Lund (personal visit May 1984).

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The Clusiidae (Diptera) from the islands Håøya and Ostøya in the Oslofjord and a survey of the family in Norway

LITA GREVE AND FRED MIDTGAARD

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Fiftyfive specimens belonging to six species of Clusiidae were collected at the islands Håøya and Ostøya in inner Oslofjord (Norway) 1984. The collection was made with two Malaise traps at Håøya and three Malaise traps at Ostøya. *Clusia flava* (Meigen, 1834); *Clusiodes albimana* (Meigen, 1830); *Clusiodes ruficollis* (Meigen, 1830) and *Clusiodes caledonica* (Collin, 1912) are reported from Norway for the first time; *Clusiodes caledonica* only from Håøya, the others from both islands. *Clusiodes apicalis* (Zetterstedt, 1841) are reported for the first time from southern Norway and the second time from Norway, and *Paraclusia tigrina* (Fallén, 1820) for the second time from southern Norway.

All material, old and new, of Clusiidae in Norwegian collections are included in a survey of the family. The use of Malaise traps seems to be a good collection method for Clusiidae and has largely increased our knowledge of this family in the last years.

Notes are given on ecology, flight periods and taxonomy of some of the species. A checklist of the species found in Norway is given.

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INTRODUCTION

The small family Clusiidae (Diptera) has not been subjected to any survey in Norway. Siebke (1877) presented the first compiled list of Norwegian Diptera and he mentioned two species belonging to this family: *Paraclusia tigrina* Fallén and *Clusiodes geomyzina* Fallén. *Clusiodes geomyzina* had earlier been reported by Zetterstedt (1848) from northern Norway.

Since Siebke the Clusiidae of Norway has been mentioned in short notes only. Ringdahl (1954) reported a third species, *Clusiodes apicalis* (Zetterstedt) from Norway, and Greve (1983) two other species new to Norway viz. *Hendelia beckeri* Czerny and *Clusiodes verticalis* (Collin). Wahlgren (1917) included the Clusiidae in his work on the Swedish flies and Hackman (1980) lists the species recorded from Finland.

The larvae of Clusiidae develope in dead wood. Larvae and pupae can be found under bark or in relatively soft wood. The adults probably prefer shaded localities near the larval habitat, but little is known of the ecology of many species.

Material of Clusiidae was very rare in Norwegian insect collections up to the last years. Also much of the material mentioned by Siebke (1877) does not longer exist today (see below).

MATERIAL AND METHODS

During the summer of 1983 and 1984 insects were collected from the islands Håøya and Ostøya in the inner part of the Oslofjord. The main objective was to registrate the fauna of Hymenoptera Symphyta, but other groups were collected as well. Among the material collected of Diptera a surprisingly high number of species and specimens of Clusiidae were found.

Since no information has been given on this fly family besides short notes on some species, a survey has been made of the distribution of the Clusiidae in Norway and all new material in Norwegian collections has been included in this survey.

The abbreviations for museums where the material are deposited are as follows: TM = Tromsø Museum, University of Tromsø;

ZMB = Zoological Museum, University of Bergen; ZMO = Zoological Museum, University of Oslo and UNIT-Museet = University of Trondheim, the Museum.

If nothing else is mentioned the material is in ZMB.

The geographical divisions follow Økland (1981).

OUTLINE OF THE LOCALITIES

The climate measured at Fornebu (3 km NE of Ostøya and 24 km N of Håøya) is slightly continental with a long and warm summer, and a mean temperature of 18,0°C in July. The winters are comparatively cold, with a mean January temperature of −4,6°C. The rainfall comes evenly through the year, and destructive droughts seldom occur. The climate is subhumid (Bronger 1984).

Håøya is located in Akershus province, Frogn community and EIS square 28. Håøya (570 haa) consists mainly of augen-gneisses, which are granitic in composition and weather slowly. The flora of Håøya has been investigated by Størmer (1938). The steep cliffs dominating the island have a very poor vegetation mainly with *Pinus* and *Calluna*. In areas with marine deposits a much richer vegetation is found. This is the case with the plateau on the top of the southernmost part of the island, where two Malaise traps were placed. The traps were used from 19 April until 16 September 1984 and were emptied 8 times. Trap A was situated in an open decidious forest with *Tilia cordata, Ulmus glabra* and *Querus robur* as dominating speacies. The trap was placed near an old, large oak. North of the trap there was an area with old and dying *Populus tremula*. The ground vegetation must be characterized as rich. The forest in the area has been left untouched by man for a long time and dead trees have not been removed.

The area around trap B is very similar to that at trap A. Trap B was placed near an old dead oak. To the south of trap B some pine, *Pinus silvestris* with several interesting plants as e.g. *Hedera helix* and *Monotropa hypopictys*. Both traps were situated approximately 120 m. above sea level. The trap was destroyed in the last period (Tab. 1). For a closer description of the area see Størmer (1938).

Ostøya is located in Akershus province. Bærum community and in EIS square 28. The bedrock of Ostøya (236 haa) consists of marine sedimentary rocks of Ordovician age. Most of the island is a lowland area eroded into soft shales. In the central and SE'ern part low ridges running NE-SW are formed in harder thinbedded limestones with dark shale interbeds. Trap A and B were placed in this area. The lowermost parts of the island have quaternary deposits of mainly clay (Holtedal & Dons 1952). Trap C was placed in this area.

There have been several botanical investigations of Ostøya, the most recent being that of Bronger (1984). The traps at Ostøya were used from 14 April until 23 September, and divided into 9 sampling periods. Trap A was placed in a meadow dominated by *Geranium sanguineum, Filipendula vulgaris, Origanum vulgare, Polygonatum odoratum* and *Poa compressa*. Near the trap some herbage consisting of *Prunus spinosus, Rosa spp.*, small *Fraxinus excelsior* and *Pinus silvestris*. Not far from the trap a decidious forest with *Tilia cordata, Corylus avellana* and *Acer platanoides*. Trap B was placed on the border between a meadow of the kind described above and a decidious forest where *Ulmus glabra* and *Tilia cordata* were dominating species. In the last sampling period trap B was destroyed (Tab. 2).

Trap C was located in a wet forest dominated by *Alnus glutinosa*. Close to the trap was a small, eutrofic pond (Postdammen). A description of the area can be found in Bronger (1984).

RESULTS

Tab. 1 and 2 show the number of species and specimens collected at Håøya and Ostøya. Six species and thirtythree specimens were collected at Håøya, the number for Ostøya was five species and twentytwo specimens. The species *Clusia flava, Paraclusia tigrina, Clusiodes albimana, C. apicalis* and *C. ruficollis* were collected at both islands. *Clusiodes caledonica* was collected at Håøya only.

Notes on the species:

Clusia flava (Meigen, 1834)
A total material of 1 male and 4 females were found. See Tab. 1 and 2.

New records:

VAY, Flekkefjord: Hidra, Osmundstø, EIS 4, 21. Jun.—3. Jul. 1982, Malaise trap: 1 ♀; RI, Hjelmeland: Jøsneset, Fosså, EIS 14, 13.—20.

Table 1. Malaise trap catches at Håøya in 1984.

SPECIES/TRAP / PERIOD	Clusia flava		Paraclusia tigrina		Clusiodes albimana		Clusiodes apicalis		Clusiodes caledonica		Clusoides ruficollis		Clusiodes (Clusiodes) sp.	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B
19.iV - 5.V														
5.V - 19.V							1♂							
19.V - 3.Vi							(1♀)	1♂(1♀)				3♀♀		
3. -16.Vi	1♂				1♂	1♀		1♂			2♀♀			1♀
16. - 27.Vi	1♀				1♂									1♀
27.Vi - 22.Vii					3♂♂	3♀♀				1♂			1♀	
22.Vii-18.Viii			1♂	1♀	4♂♂								1♀	
18.Viii - 16.iX		-	1♀	-		-		-		-		-		-

Table 2. Malaise trap catches at Ostøya in 1984.

SPECIES/TRAP / PERIOD	Clusia flava			Paraclusia tigrina			Clusiodes albimana			Clusiodes apicalis			Clusiodes ruficollis			Clusiodes (Clusiodes) sp.		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
14. - 28.iV																		
28.iV - 12.V																		
12. - 30.V												3♂♂			1♀			
30.V - 10.Vi										(1♀)		1♂		1♂	1♂			
10.Vi - 1.Vii		2♀♀	1♀						1♂1♀					2♂♂				
1. - 24.Vii									2♂♂1♀									
24.Vii-12.Viii																	1♀	
12.Viii - 1.iX					1♂											1♀		
1. - 23.iX		-			-	1♀		-			-			-			-	

Jun. 1982: 1 ♂, 20. Jun. — 11. Jul. 1982, Malaise trap: 1 ♀; HOY, Bergen: Eidsvåg, Vollane: EIS 39, 9. — 13. Jun. 1978, Collision trap: 1 ♂; 18. Jun. 1980: 1 ♀; HOI, Eidfjord: Tveito, 150 m. above sea level, EIS 33, 24. Jul. 1967: 1 ♀.

These are the first records of *Clusia flava* from Norway. The localities are situated in coastal areas as the locality in RI is located in a fjord north of Stavanger. Adults have been taken mainly in June, and mostly in Malaise traps. The female from Vollane taken on 18 June 1980 was found in a window inside a house. The female from Tveito was netted.

In the field *C. flava* might be taken for a species of Lauxaniidae since the spot at the wing tip often is weakly developed. Wahlgren (1917) reports *C. flava* north to approximately 61°N in Sweden and it is included in the list of Hackman (1980). Stubbs (1982) reports the species to be frequent in southern England.

Paraclusia tigrina (Fallén, 1820)

A total material of 2 males and 3 females were found. See Tab. 1 and 2.

Revised record

AK, Oslo: Tøyen, EIS 28, Jun. 1857: 1 ♀, ZMO (No. 7457) Siebke's (1877) record is the only one previously published from Norway.

The species were caught in four different traps indicating that it might be fairly wide spread on the islands. The first specimens were caught between July and middle of August. Specimens are also flying in September. Thus *P. tigrina* must be considered a late flying species.

P. tigrina is the largest Clusiid in Norway, a fairly large fly with striking wing marks which makes it easy to note in the field. It is probably rare in Norway.

Wahlgren (1917) records this species from

some provinces in Sweden and it is also included in the list of Hackman (1980).

The period of flight found at Håøya and Ostøya is about the same as given by Stubbs (1982) for England (August and September). *P. tigrina* was, according to Stubbs, believed to be very rare in England, but has recently been found to occur at several localities in southern England and South Wales.

The genus Clusiodes.

This is the only genus of Clusiidae which numbers several species in Northern Europe. Keys and figures in Collin (1912); Czerny (1928); Tuomikoski (1933); Stackelberg (1970) and Stubbs (1982) have been used in identification of the material.

The males are identified by the genitalia. The genitalia of females do not give characters for identification. Other characters used are colour of wings, head and body and the number of orbital bristles. Postvertical bristles may be absent in some species, present in others. Still females of certain species can not be determined with certainty. Such females are presented in brackets in our Tab. 1 and 2 and lists.

Siebke (1877) enclosed one species, *Clusiodes geomyzina* (Fallén, 1823), as *Heteroneura geomyzina,* in his list on Norwegian Diptera. He listed several localities, but only one specimen from his original material exists today. This specimen was correctly determined. Several new species of *Clusiodes* have been described from North-West Europe by Collin (1912) and Tuomikoski (1933). Therefore all older material of the genus needs revision. The localities mentioned by Siebke have been left out of the list of records with exception of the one at Tøyen represented by the single specimen in Tromsø Museum mentioned above.

The genus *Clusiodes* is divided into sub.genus *Clusiodes* with a pair of dorso-central bristles in front of suture, and sub.genus *Clusaria* with no bristles in front of suture.

1. Clusiodes (Clusiodes) albimana (Meigen, 1830)

A material of 12 males and 6 females were found. See Tab. 1 and 2. Only females with three pairs of orbital bristles at each side of the head (see Stubbs, 1982) have been refered to this species.

New records:

VAY, Mandal: Malmø, Eskelandsmyra, EIS 6, 6.—22. Jul. 1982, Malaise trap: 1 ♀; RY, Hjelmeland: Førre, EIS 15, 25. Jul. 1970, 100 m. above sea level, Malaise trap: 1 ♂; HOY, Samnanger: Ådland, EIS 40, 16. Jun.—2. Jul. 1982, Malaise trap: 1 ♂.

C. albima is here reported from Norway for the first time. Total material 14 males and 7 females.

C. albimana is distributed in southern and central Sweden (Wahlgren 1917) and it is included in the list of Finnish species (Hackman 1980). Stubbs (1982) reports the species to be common in southern England.

2. Clusiodes (Clusaria) apicalis (Zetterstedt, 1841)

A total material of 7 males (3 females) were found. See Tab. 1 and 2. Females of *C. freyi* Tuomikoski and *C. pictipes* (Zetterstedt) can be confused with females of *C. apicalis,* (Tuomikoski 1933). Since males of neither of the two last mentioned species were found in the material from Håøya and Ostøya there are reason to believe that the female in brackets really are *C. apicalis.*

New records

RI, Forsand: Songesand, EIS 7, 27. May 1984: 1 ♂; HOI, Kvam: Bjerke, EIS 41, 28. May—16. Jun. 1982, Malaise trap: 2 ♂ ♂, (2 ♀ ♀); HOI, Voss: 4 km east of Mjølfjell, EIS 41, 8. Jun.—13. Jul. 1985, Malaise trap: 4 ♂ ♂, (8 ♀ ♀); STI, Oppdal: Kongsvoll, Blesbekken, EIS 79, 1000 m above sea level, 26. May—2. Jun. 1981: 1 ♂, 2.—9. Jun. 1981: 1 ♂, (1 ♀), 16.—30. Jun. 1981: 1 ♂, 7.—14. Jul. 1981: 1 ♂ and 5.—12. Jun. 1980: (3 ♀ ♀). All in Malaise traps. The traps were situated in sub-alpine birch forest. ZMB and UNIT-muséet. No other *Clusiodes* species were found.

C. apicalis was reported by Ringdahl (1954) from Tromsø. This is still the only record from Norway. The finds mentioned here are the first records from southern Norway.

The male from Songesand is the only specimen not caught in a Malaise trap. The Malaise traps at Blesbekken were positioned to catch insects with aquatic larvae. The sites were therefore perhaps not ideal for catching Clusiidae. The traps were operating from May to October. The records here should give good indications of flight periods of *C. apicalis* both in the lowlands,

as Håøya and Ostøya, and in the mountains as Kongsvoll.

Insect populations occurring in the mountains have often a postponed flight period compared to populations of the same species occurring in the lowlands, see e.g. Brinck (1949) who gives data on Plecoptera. No specimens were caught at Håøya/Ostøya later than 16 June, while one specimen was caught at Kongsvoll 7.—14. July nearly one month later.

Tuomikoski (1933) refers to *C. apicalis* as the most common species of *Clusiodes* in Finland. The species is common in northern Sweden (Andersson, H. pers. comm.). Whether *C. apicalis* is common in Norway is difficult to judge from the few records mentioned here, but the species is at least found scattered over a very large area.

C. apicalis is rare on the British Isles and only recorded from the Scottish highlands.

3. Clusiodes (Clusiodes) caledonica (Collin, 1912)
One male caught in Trap B at Håøya. However, some of the females in column *Clusiodes* sp. might belong to this species. They have two pairs of orbital bristles only and may either be *C. caledonica* (Collin); *C. gentilis* (Collin) or *C. albimana* (Meigen), see Stubbs (1982).

New record:

RY, Sandnes; Melshei, near brooklet, EIS 7, 6. Jul. 1982: 1 ♂. These are the first records for Norway. Wahlgren (1917) do not mention this species from Sweden. Hackman includes it in his list from Finland (1980). *C. caledonica* is recorded from the Scottish highlands and from Ireland (Speight & Cogan, 1979).

4. Clusiodes (Clusaria) geomyzina (Fallén, 1823)
C. geomyzina was not found on Håøya or Ostøya.
Revised record:
AK, Oslo: Tøyen, EIS 28, 29. Jul. 1851: 1 ♀, TM.
New records:
VAY, Flekkefjord: Gyland, Store Eikås; EIS 4, 21. Jun.—6. Jul. 1982, Malaise trap: 1 ♀; RY, Sandnes: Melshei, EIS 7, on timber of *Picea abies*, 14. Jun. 1982: 1 ♀; RI, Forsand: Songesand school, EIS 7, 29. May 1984: 1 ♂; HOY, Samnanger: Ådland, EIS 40, 28. May—5. Jun. 1982: 1 ♂, 1 ♀, 2.—17. Jul. 1982, Malaise trap: 1 ♂; HOI, Granvin: Granvin, EIS 41, Malaise trap: 28. May—16. Jun. 1982: 13 ♂ ♂, 16 ♀ ♀; HOI, Ulvik: Hallanger, EIS 41, 28. May—16. Jun. 1982, 220 m. above sea level, Malaise trap: 1 ♀; HOI, Kvam: Bjerke, EIS 41, 28. May—16. Jun. 1982, Malaise trap: 2 ♂ ♂, 1 ♀; HOI, Voss: 4 km. east of Mjølfjell, EIS 41, 8. Jun.—13. Jul. 1985, Malaise trap: 6 ♂ ♂, 3 ♀ ♀.

Even though there are no records from either Håhøya and Ostøya, *C. geomyzina* might be a fairly common species in parts of Norway. Nearly all the specimens have been caught in Malaise traps. We have not seen the material mentioned by Zetterstedt (1848) from Bjerkvik, Nordland province and his record is therefore not included here. *C. geomyzina* is easy to separate from other species of *Clusiodes* on account of the extended clouding of the wing front. The Malaise trap at Granvin yielded the total number of 29 specimens which is highest number of any species of Clusiidae from Norway taken at one locality at a certain period of time. The Malaise trap was only operating from 12 April until 16 June, emptied three times. The trap at Ådland further west in the Hordaland province operated all summer from April until October 1982. The locality at Granvin is a sloping meadow near a small brocklet. Decidious trees with some fruit-trees near the trap, further away there were *Pinus silvestris*. Close by an area had been clear cut. The trap near Mjølfjell was located at 670 m. above sea level in a birch forest.

5. Clusiodes (Clusaria) ruficollis (Meigen, 1830)
A total of 4 males and 6 females was found, see Tab. 1 and 2.

New records

VE, Tjøme: Kjære, EIS 19, E.P. in rotten *Quercus* sp., 7 Mar. 1965: 1 ♀; VAY, Kristiansand: Stangenes, EIS 2, E.P. in rotten *Populus tremula*, 25 May 1982: 1 ♀. These are the first records of *C. ruficollis* from Norway. Collin (1912) described *C. fascialis* from southern England. Collin figures the male genitalia. There are no good figures of the male genitalia of *C. ruficollis* Meigen (Stubbs, 1982). Since these species are very similar *C. fascialis* might turn out to be a synonym for *C. ruficollis*. The female from Stangenes has a slightly dusky face and would be a doubtful *C. fascialis* according to the key of Stubbs. The colour of the material from Håøya and Ostøya vary as to colour of face from yellow to dusky.

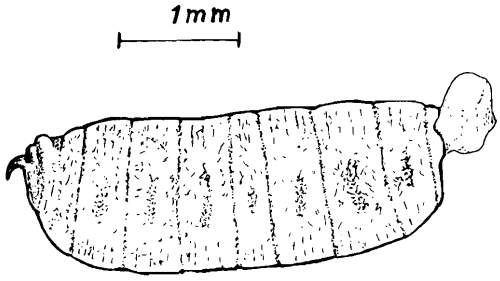

Fig. 1. Puparium after emergence of the adult fly. Length appr. 4 mm, breath appr. 2,5 mm. Colour medium, somewhat reddish brown. The surface is glistening and at higher magnification finely sculptured. One hook broken off. Smith (1950) shows a figure of *Clusia flava* with two similar hooks as the one figured. Hooks are also mentioned in the description of the puparium of *Clusiodes albimana*. The puparium in this species should be yellowish.

The puparium was found in rotten *Populus tremula*. The reared adult has a slightly dusky face and would, according to the key in Stubbs (1982), be a doubtful *C. fascialis* (Collins, 1912). It was collected in VAY, Kristiansand: Stangenes by S. Svendsen and hatched 25 May 1982.

Most specimens are collected in June at Håøya. We do not know if the two individuals were hatched indoors. The puparium of the specimen from Stangenes is figured in Fig. 1.

6. Clusiodes (Clusiodes) verticalis (Collin, 1912)
No specimens were found on Håøya or Ostøya.

New record:

AAY, Grimstad: Landvik, Skiftenes, EIS 6, on ferns, 29. Jun. 1971: 2 ♂ ♂; HOI, Etne: Austrheim, EIS 23, 26.—30. Jun. 1985, Malaise trap: 1 ♂. Hitherto only reported from Western Norway (Greve, 1983). *C. verticalis* is recorded from Sweden (Andersson, 1971).

7. Hendelia beckeri Czerny, 1903.
No specimens were found on Håøya or Ostøya.

New records:

HOY, Samnanger: Ådland, EIS 40, 16. Jun.—2. Jul. 1982, Malaise trap: 1 ♀; HOI, Kvam: Bjørke, EIS 40, 28. May—16. Jun. 1982, Malaise trap: 3 ♀ ♀. Hitherto recorded only once from Norway from HOY (Greve, 1983).

DISCUSSION

Up to approximately 1980 less than ten specimens of Clusiidae were known from Norwegian insects collections. Our survey numbers are based on 143 specimens out of which 131 has been collected in Malaise traps. The increasing use of such traps in later years has proved to be a very efficient way to collect Clusiidae.

Haenni & Matthey (1984) in their survey of works where Malaise traps have been used note that Malaise traps are in fact very useful for certain insect groups and based on the results presented here Clusiidae can be added to their list.

Håøya and Ostøya, where five traps were used, yielded a total material of six species with 55 specimens. Note should be made to the fact that from Håøya 33 specimens were obtained, and two traps were operated. From Ostøya 22 specimens were obtained from three traps. Both traps at Håøya were in old forest, undisturbed by forestry, leaving rotten and dying trees as breeding material for Clusiidae larvae. Trap A at Ostøya was the trap which were standing in the most open locality (not surrounded by trees). This trap collected two specimens only, the number for B = 7, C = 13; åt Håøya A = 19, B = 14.

The *Clusiodes apicalis* at Kongsvoll was found in a sub-alpine birch forest and therefore *Betula verrucosa* is very likely the host for the larvae, see Stubbs (1982). However, *Salix* spp. should not be overlooked as a host either. *C. ruficollis* is represented by one specimen bred from *Quercus robur*. There is also a female *C. ruficollis — C. fascialis* bred from rotten *Populus tremula*. Clusiidae are mostly encountered singly or few specimens together. One Malaise trap, however, yielded 29 specimens of *Clusiodes geomyzina*, the highest number by far encountered in one period. The numbers of the different species is fairly small, but might give good indications as to flying periods for the different species.

A Check list of Norwegian Clusiidae.
1. *Clusia flava* (Meigen, 1834)
2. *Paraclusia tigrina* (Fallén, 1820)
3. *Clusiodes (Clusiodes) albimana* (Meigen, 1830)
4. *Clusiodes (Clusiodes) caledonica* (Collin, 1912)
5. *Clusiodes (Clusaria) apicalis* (Zetterstedt, 1841)
6. *Clusiodes (Clusaria) geomyzina* (Fallén, 1823)
7. *Clusiodes (Clusaria) ruficollis* (Meigen, 1830)
8. *Clusiodes (Clusiodes) verticalis* (Collin, 1912)

9. *Hendelia beckeri* (Czerny, 1903).

Species likely to be encountered in the future might be *Clusiodes (Clusaria) freyi* Tuomikoski, 1933 and *C. (Clusaria) pictipes* (Zetterstedt, 1855).

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Studies on *Capnia vidua* Klapalek (Capniidae, Plecoptera) populations in Iceland

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In the absence of other stonefly species in Iceland, *Capnia vidua* has occupied a vide variety of habitats, which elsewhere are occupied by a number of species. In Iceland *C. vidua* had an unsyncronized nymphal growth and a prolonged emergence. Adults were present from Mid-March to early August.

The close resemblance in taxonomical characters to the Great Britain population indicates that the species is a postglacial immigrant from Great Britain.

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INTRODUCTION

Capnia vidua Klapálek is the only stonefly recorded from Iceland. It was first described as *Capnia atra brachyptera* by Tuxen (1938). Hynes (1955a) examined nymphs from the River Laxá, the outlet of Lake Mývatn, and concluded that they belonged to the species *C. vidua*. He also examined the collection of Icelandic stoneflies from the Zoological Museum in Copenhagen and compared it with the geographical races described by Aubert (1950), and named the Icelandic specimens *C. v. brachyptera* Tuxen.

Later, *C. vidua* was recorded from Scandinavia by Meinander (1965) and by Lillehammer (1972), who also examined the subspecies *brachyptera* and *angalica* and concluded that the variation in the characters of the Fennoscandian material was so large that it overlapped many of the subspecies described by Aubert (1950).

HABITAT DESCRIPTIONS

Iceland (63°24'—66°32'N and 13°29'—24°32'W) is just south of the arctic circle and has an oceanic climate. Most of Iceland is a plateau with a narrow zone of lowlands (average 1—2 km) along the coast with the exception of the South and South-West (where lowland extends 20—50 km from the coast) and valleys in the North and East. These lowland areas have higher temperatures than the highlands, and in the warmest month, July, the mean monthly temperature exceeds 10°C, and in the South and the South-West it exceeds 11°C (Erythorsson and Sigtryggsson 1971).

C. vidua nymphs were found in several types of habitats; e.g. run-off rivers and streams, springfed rivers and streams, lake-outlets, a small ditch and lakes. These habitats show great differences in reference to water temperature and chemical composition.

Run-off rivers dominate the basaltic rock formation in West and East Iceland due to low permeability of the base rock. In general their discharge is greatest in spring and in autumn with a marked minimum in summer and winter. Their flows are very variable and they can flood in early winter and spring. The water temperature is greatly affected by the air temperature. Anchor ice forms on their beds soon after the air temperature falls below freezing, greatly reducing the flow. Drifting snow can also affect the flow. The pH of run-off rivers is usually between 6 and 7 and specific conductance 40—60μS/cm at 25°C.

Spring-fed rivers are found in the palagonite (móberg) region, which stretches from the South-West to the North-East across the country. The palagonite is very permeable, and precipitation which seeps into it may emerge in springs far away from the place where it fell. These rivers are very stable, the discharge is even and the temperature normally 3—5°C all the year round near the source. A few of the rivers are

partly fed by hot water, which brings their temperature up, and they are not colder than 7—8°C in winter and are about 20°C in summer. Spring-fed streams never freeze near the source. Their pH is between 7.5—9 and specific conductance 80—100μS/cm at 25°C. Lake outlets are similar to spring-fed streams, but have greater fluctuations in temperature and are richer of particulate organic matter. The beds of streams and rivers varies from sand and gravel to firmly embedded stony substratum, sometimes covered with moss.

Lakes are of various depths, most of them are shallow (< 5 m), but some are over 100 m deep. The shores are usually stony, but vegetated shores are present at some places. The chemical composition of the lake water depends on the origin of the water; pH is usually above 7, and often up to pH 9.

The vegetation at the localities where *C. vidua* occurred was sparce, but grass, sedges and occationally *Salix* bushes predominated. In some places, especially around the run-off rivers, the banks were without any vegetation.

MATERIAL AND METHODS

The material was collected by several persons in 39 localities (Table 1). Adults were collected by sweep-netting in the vegetation and collected under stones at banks of streams. 21 adults were available for measurements. 198 nymphs were collected from benthos by different methods. The body length of the majority of nymphs was measured under a binocular microscope with an eye piece graticule to the nearest 0.1 mm. However, about 60 nymphs were wo twisted and in such bad condition, that only the head width could be measured. Therefore the body length and head width of 6 nymphs from Daelisá (coll. 20. May 1982) and 15 nymphs from Geithellnar, Alftafjördur, were measured in order to find the relationship between the body length and the head width (Fig. 1). The correlation was found to be highly significant. Head width was then used to find the length of the nymphs in cases were they were badly conserved or in bad condition. These head capsules measured were within the variation width of the material used in the regression analyses.

RESULTS AND DISCUSSION

Morphology

The measurements of 9 ♂ ♂ and 12 ♀ ♀ showed that the adult females had a body length between 4.5 and 8.6 mm and adult males between 4.8 and 7.4 mm. The front wings of females were between 2.4 and 4.2 mm, and male front wings were between 0.6 and 1.0 mm. The smallest female had the shortest wings.

The body length of adult females and males of *C. vidua* from Iceland is similar to the Norwegian specimens (Lillehammer 1972), but the wings are significantly shorter (Norway: female wings 4.17—6.00 mm, male wings 0.96—1.04). However, none of the Icelandic females had micropterous wings as found in specimens from Great Britain (Aubert 1950). The form of the subgenital plate was similar to that of specimens from Great Britain and continental Europe (Aubert 1950) and variations were small. This is in contrast to the large variations seen in Norwegian material (Lillehammer 1972, 1974), which also included the Iceland/Great Britain types. The incurvation of the seventh terga of males is deeper in the specimens from Iceland and Great Britain than in the Fennoscandian material (Lillehammer 1972).

The male epiproct is of the same type as previously described by Lillehammer (1972) for the different subspecies of *C. vidua*.

Nymphs of *C. vidua* are similar to those occurring in Great Britain and described by Hynes (1955b). They can be separated from the two common northern European *Capnia* species, *C. atra* Morton and *C. pygmaea* Zetterstedt on the short bristles on the cercies, which also is a character of *C. bifrons* (Newman). However, the bristles on all three femura of *C. vidua* are shorter than on *C. bifrons* as shown by Hynes (1977).

The morphological characters of the nymphs were also much like the British nymphs described by Hynes (1955b).

Biology

Nymphs have been recorded in all months except November to January (Table 1, Tuxen 1938), when sampling was less intensive. In July, 2 nymphs have been recorded, one 0.9 mm long and the other 5.9 mm. In August, nymphs were 1.0—1.6 mm long (Table 1, Tuxen 1938). Mature nymphs were found in March, females measured 5.3—8.8 mm and males 5.5—7.7 mm. In May mature female nymphs had a body length of 5.0—7.7 mm while male nymphs were 4.0—5.7 mm. They occurred together with immature nymphs of both sexes with a body length between 3.3 and 4.8 mm (Table 1).

The large differences in development seen in

Table 1. Records of adults and nymphs (N) of Capnia vidua in Iceland not previously published. E.=. = E. Ólafsson, G.M.G. = G.M. Gíslason, H.B. = H. Björnsson, H.K. = H. Kjartansson, H.S. = H. Sigurjónsdóttir, J.K. = J. Kristjánsson, K.A. = K. Adalsteinsdóttir, M.J. = M. Jóhannson, V.J. = V. Jóhannson.

	Body length m.m.	Collected at:	Col.by:	Habitat:
2♀♀	5,3 5,3	2.5.74.Bugda,Reykjavik,64°06'N,21°47'W	(G.M.G.)	Stream bank.
1N.		4.4.71.Ellidvatn,Reykjavik,64°04'N,21°47'W	(E.O.)	Bank of a dam.
2♂♂	6,6 6,6	2.4.84.Grafalækur,Kjos,64°07'N,21°48'W	(G.M.G.)	Bank of small stream.
2N	7,3 7,3	2.4.84.Grafalækur,Kjos,64°07'N,21°48'W	(G.M.G.)	Bank of small stream.
1N	8,3	23.3.74.Ulfarsá,Kjos,64°08'N,21°46'W	(G.M.G.)	Lake outlet stony river.
3♀	6,2 - 6,7	8.5.74.Hafravatn,Kjos,64°08'N,21°40'W	(E.O.)	
18N(♂)	5,3-8,3	23.3.74.Hafravatn,Kjos,64°08'N,21°40'W	(J.K.)	Stream.
11N(♂)	5,5-7,7	23.3.74.Hafravatn,Kjos,64°08'N,21°40'W	(J.K.)	Stream.
1♂		18.3.72.Reykir,Kjos,64°10'N,21°36'W	(E.O.)	
4♂♂,2♀♀	4,8-5,5 + 6,2-6,5	14.4.73.Reykir,Kjos,64°10'N,21°36'W	(H.S.)	
1♂,1♀		7.6.80.Bugda,Kjos,64°19'N,21°38'W	(M.J.)	Salmon parr stomach
1N	5,9	6.7.80.Bugda,Kjos,64°19'N,21°38'W	(M.J.)	Salmon parr stomach
2♀♀,2♂♂	8,4 8,6 - 6,7 7,4	16.4.85.Bugda,Kjos,64°19'N,21°38'W	(G.M.G.)	Lake outlet,with gravel.
2N	5,0 5,8	16.4.85.Sandá,Kjos,64°18'N,21°35'W	(G.M.G.)	Run off river,sand gravel.
56N	3,4 -7,2	20.5.82.Dælisá,Kjos,64°19'N,21°21'W	(V.J.)	Salmon parr stomach
3♀♀		9.7.83.Dælisá,Kjos,64°19'N,21°21'W	(M.J.)	Stream gravel
1N	5,0	25.5.83.Laxá,Stilflisadalur,Kjos,64°15'N,21°21'W	(V.J.)	Near a lake outlet.
2N		17.10.79.Reykjadælsá,Reykjholt,Kjos,64°13'N,21°17'W	(G.M.G.)	Large river,sand,gravel.
1N	2,3	4.9.74.Frodarheid,Kjos,64°50'N,23°35'W	(E.O.)	
1N		1.7.79.Dalsá,N.Isl.66°05'N,22°34'W	(H.K.)	Stream.
1N		18.9.79.Dalsá,N.Isl.66°05'N,22°34'W	(H.K.)	Stream.
1♀		5.6.52.Bær,Strand,65°17'N,21°12'W	(H.B.)	
1N		14.4.78.Vidlimyrá,Skag,65°32'N,19°31'W	(G.M.G.)	Stream,gravel.
1N	1,4	31.8.81.Hrappstadáa,Eyjafj.65°44'N,18°12'W	(K.A.)	Stream,gravel.
2N	1,1 2,1	16.9.81.Eyjafjardara,Eyjafj.65°38'N,18°03'W	(K.A.)	Stream,gravel.
1N	1,6	10.8.81.Brunna,Eyjafj.65°38'N,18°06'W	(K.A.)	Stream,gravel.
16N	1,6 - 2,7	9.9.81.Lon,Eyjafj.65°41'N,18°08'W	(K.A.)	Stream,gravel.
1N	0,9	7.7.84.Skardsá,S.Mul,65°27'N,15°57'W	(G.M.G.)	400m a.s.l.
3♀		6.7.83.Skogdalur,S.Mul,65°00'N,14°22'W	(H.B.)	Near a stream.
5♀		4.8.79.Snaefellsnes,S.Mul,65°08'N,15°26'W	(E.O.)	Stream bank,600m a.s.l.
2N	5,7 7,7	23.5.74.Sudurdalur,S.Mul,64°58'N,14°38'W	(G.M.G.)	Smal stony springfed stream,200m a.s.l.
2♀		24.6.80.Bruardalur,S.Mul,64°52'N,15°51'W	(E.O.)	Springfed stream.
1♀ 17N	5,5 + 3,3 - 6,9	23.5.74.Geithellnar,Alftarfjørdur,S.Mul,64°35'N14°35'W	(G.M.G.)	Spring with sandy bottom and smal pebbles.
		23.5.74.Geithelnar,Alftarfjørdur,S.Mul,64°35'N14°35'W	(G.M.G.)	Spring with sandy bottom and smal pebbles.
14N	3,4 - 7,3	23.5.74.Geithellnar,Alftarfjørdur,S.Mul,64°35'N14°35'W	(G.M.G.)	Stony spring fed stream with Fontinalis.
2N	5,2 5,5	19.5.74.Geithellnar,Alftarfjørdur,S.Mul,64°35'N14°35'W	(G.M.G.)	Stony spring fed stream with Fontinalis.
1N	4,3	17.5.74.Geithelnar,Alftarfjørdur,S.Mul,64°35'N14°35'W	(G.M.G.)	Stony spring fed stream with Fontinalis.
1N	4,8	23.5.74.Geithellnar,Alftarfjørdur,S.Mul,64°35'N14°35'W	(G.M.G.)	Stony river.
1♀	4,5	23.5.74.Lonsfjordur,A.Skaft,64°26'N,14°39'W	(G.M.G.)	Small stony stream.
2♂		17.6.77.Steinadalur,A.Skaft,64°10'N,16°00'W	(E.O.)	Small stony stream.
1♂		12.6.77.Nupstadaskogar,V.Skaft,64°02'N,16°27'W	(E.O.)	Small stony stream.
1N	6,7	24.5.74.Seljaland,Rang,64°36'N,20°00'W	(G.M.G.)	Stony spring fed stream.
1♂		14.5.74.Thveva,Rang,63°45'N,20°12'W	(G.M.G.)	River,gravel.
1♂ 2♀♀		5.5.83.Hella,Rang.63°50'N,20°25'W	(E.O.)	River,gravel.
2♀♀		24.7.85.Stora-Laxa. Arn,64°18'N,19°54'W	(M.J.)	Run of river
37N		31.10.78.Thingvallavatn,Arn,64°10'N,21°04'W	(G.M.G.)	Large lake,gravel.
4N	5,7 6,3 7,7	23.3.74.Varma,Arn,64°00'N,21°12'W	(G.M.G.)	Run of river with warm water.
1♀		10.7.83.Varma,Arn,64°00'N,21°12'W	(M.J.)	At a run of stream.

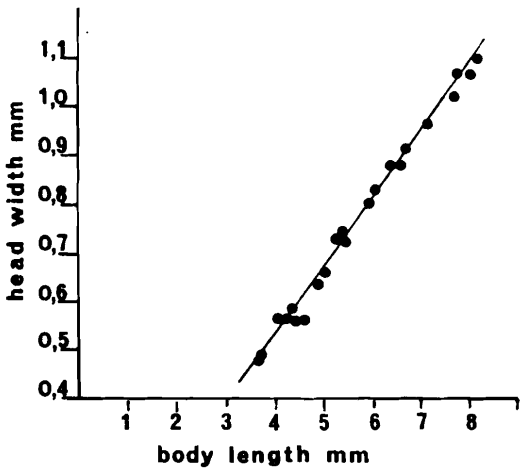

Fig. 1. The relationship between body length and head width of nymphs of *Capnia vidua* in Iceland, N = 21. Y = 0.121 + 7.251 (± 0.615)·X. r = 0.985. p < 0.001.

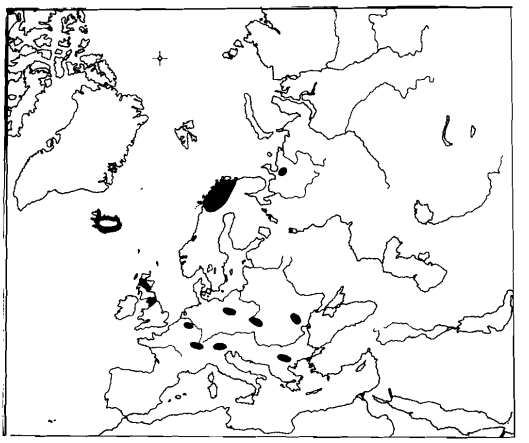

Fig. 3. The European distribution of *Capnia vidua*, excluded the populations in the Pyrénées.

the material of nymphs from some localities indicate an unsyncronized growth, which may be favourable in Iceland, where *C. vidua* is the sole stonefly species. There is no competition from related species and the species can utilize the resources available throughout the season. This can also give a prolonged emergence compared to Fennoscandia and Great Britain.

In Iceland, adults were present from mid-March to early August, while in Great Britain they were only recorded in March and April (Hynes 1977) and in northern Fennoscandia in June and July (Lillehammer 1972, Meinander 1965, 1980). The Icelandic material gives no information that indicates semivoltine life cycles, and they seem to be univoltine as in Fennoscandia.

Distribution

The nymphs of *C. vidua* were mostly found in run-off and spring-fed streams and rivers (Table 1), but were never common. It was only found in a few of the streams in the North and East, but found in relativily more streams in the South and South-West (Fig. 2). In a survey on the

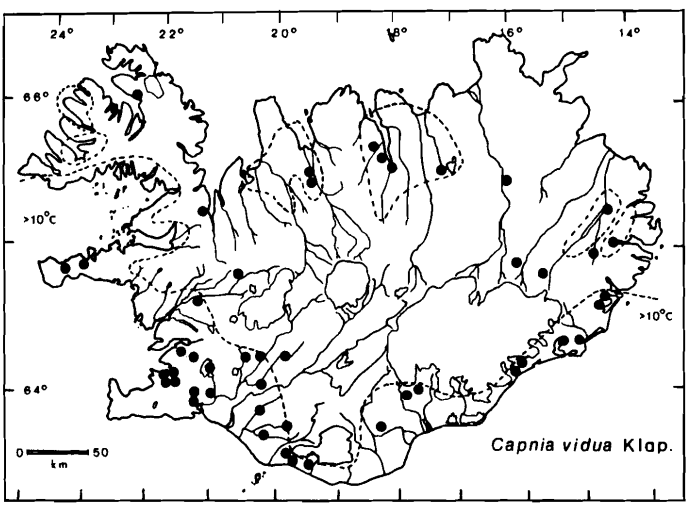

Fig. 2. The distribution of *Capnia vidua* in Iceland based on records shown in Table 1 and on Lindroth (1931), Tuxen (1938), Gudmundsson & Gigja (1941), Hynes (1955a), Lindroth et al. (1973), Sigurjónsdóttir (1974), Tómasson (1975), Lindegaard (1979), Gislason (1980), Jónsson (1980) and Antonsen (1983). The broken line indicate the 10°C Isotherm line for Jyly. Areas enclosed within these lines have a mean July temperature above 10°C.

distribution of Tirchoptera in Iceland (Gislason 1981), *C. vidua* was only found at 15 running waters of 153 sampled all over Iceland and in a survey of rivers in the North-East in 1984, *C. vidua* was only found in 1 out of 15 rivers and streams searched. It was only found among gravel and sand. In lake Thingvallavatn, the nymphs were found burried 25 cm down into the gravel. In rivers influences by hot water, they have only been found above the inlets of hot streams (Gislason 1980). *C. vidua* was found at different altitudes, from sea level to about 600 m a.s.l.

In Fennoscandia and Great Britain *C. vidua* was only found in small streams (Meinander 1965, Lillehammer 1972, 1974, Hynes 1977). In Iceland, the absence of other stonefly species may permit *C. vidua* to occupy several types of habitats, from small streams and ditches to large rivers and lakes.

C. vidua was found in all parts of Iceland (Fig. 2), but mainly in areas with mean July temperature over 10°C (Eythorsson and Sigtryggsson 1971). In northern Fennoscandia, *C. vidua* has also been recorded in areas where the mean July temperature is higher than 10°C, even though all the records are north of the arctic circle. Since nearly all weather stations in Iceland are distributed along the coast line, it is difficult to estimate the local temperatures in sheltered areas, where *C. vidua* has been recorded outside the 10°C isothermal line for July. The distribution in relation to climate seems similar in Iceland and Fennoscandia.

The distribution of *C. vidua* in northern Europe (Fig. 3) indicates a relict distribution. Brinck (1952) suggests that the species was in refugia during the last glaciation. The clear resemblance in morphological characters of Icelandic and British specimens indicates that the Icelandic populations were postglacial immigrants from the south. The Fennoscandian populations must have immigrated from the northeast and upheld a large variation in taxonomical characters (Lillehammer 1972). The distribution of *C. vidua* in Europe indicates that the different populations, included the Pyrénéan have been separated at least since the last glaciation period except the Icelandic and British populations.

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Spiders (Araneae) in Malaise traps from two islands in the Oslofjord, Norway

ERLING HAUGE AND FRED MIDTGAARD

E. Hauge & F. Midtgaard 1986. Spiders (Araneae) in Malaise traps from two islands in the Oslofjord, Norway. *Fauna norv. Ser. B, 33*, 98—102.

A list containing 50 spider species is presented. Three species, *Dipoena melanogaster* (C.L. Koch), *Clubiona brevipes* Blackwall, *Chiracanthium onchognathum* Thorell, are reported for the first time in Norway.

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INTRODUCTION

A sampling programme for insects with Malaise traps (spring—autumn 1984) at the islands Ostøya and Håøya in the Oslofjord, resulted in a collection of 50 spider species. The islands are situated in an area with a rich and luxurious vegetation. The area is of interest from a zoogeographical point of view for some other invertebrate groups (Midtgaard & Aarvik 1984). In spite of a rather unusual sampling technique for spiders, there are several interesting finds, representing the northernmost limit of the distribution areas for some of the species. The field work has been carried out by F. Midtgaard, E. Hauge is responsible for the identification of the species.

OUTLINE OF THE LOCALITIES

Ostøya, belongs to Bærum comunity (Akershus), EIS: 28. The island (236 haa) is situated in the innermost part of the Oslofjord, 3 km SW of Fornebu airport. The bedrock of the island consists of marine sedimentary rocks of Ordovician age. Most of the islands is a lowland area eroded into soft shales. In the central and SE'ern part low ridges, running NE-SW, are formed in harder thinbedded limestones with dark shale interbeds. The highest hill on the island, in its central western part, is underlain by calcarerous sandstone (Holtedal & Dons 1952). The climate is subhumid and slightly continental (Martonne's humidity index = 42 and Conrad's index = 27). Relatively cold winters with a mean January temperature of —4.6°C. July is the warmest month (18°C mean temperature). (Climatic data from the nearest meteorological station, Fornebu).

There have been several botanical investigations of Ostøya, the most recent being that of Bronger (1984). Latin names of plants follows Lid (1974).

Loc. A. The trap was placed at the border between a rich meadow and a dry slope dominated by *Geranium sanguineum, Seseli libanotis, Filipendula vulgaris, Origanum vulgare, Polygonatum odoratum* and *Poa compressa*. Partly much *Dracocephalum ruyschiana, Cotoneaster intergerrimus* and *Rosa* spp. Next to the trap, eastwards, a thicket dominated *Prunus spinosa* and *Rosa* spp., and also some *Pinus*, with a field layer consisting of the herbs mentioned above and of *Polygala vulgaris*. Westwards there is a forest dominated by *Tilia cordata, Fraxinus excelcior, Acer platanoides* and *Corylus avellana*.

Loc. B. The trap was placed in a rich forest (Ulmo-Tilietum). The field layer is composed of *Actaea spicata, Corydalis intermedia, Viola mirabilis, Sanicula europaea, Carex digitata, Melica nutans, Lathyrus vernus, Campanula trachelium*.

Loc. C. The trap was placed in a narrow, heterogenous transition zone next to a bog with a small pond (Postdammen) surrounded by small brushes and trees *(Alnus glutinosa, Salix nigricans, S. caprea, Betula pubescens)*. The field layer is composed of species like *Scirpus sylvaticus, Comarum palustre* and *Calla palustris*. The bog itself is rich and heterogenous, dominated by *Typha latifolia, Sparganium minimum, Carex rostrata, C. pseudocyperus, Lysimachia thyrsiflora* and *Alisma plantago-aquatica*. The pond beds are surrounded with *Iris pseudaco-*

rus, Sparganium erectum, Lythrum salicaria and *Rumex aquaticus.*

Håøya, belongs to Frogn (Akershus), EIS: 28. The island (570 haa) is situated further south in the narrowest part of the Oslofjord, NW of Drøbak. In the south the island is dominated by Augen-gneisses with zones of leptite and amphibolite. The gneiss and leptite rocks are granitic in composition and weather slowly. The amphibolites are rich in dark minerals and weather more easily. In the lover parts of the island there are marine deposites (shells, etc.) with content of carbonates. Here is also found a rich thermophilous forest (Rolf Sørensen, pers. comm.). The less rich areas are covered with pine forest. The climate is as described for Ostøya. The island has been investigated botanically by Størmer (1938).

Loc. A. The trap was placed next to a large oak in an open *Tilia-Ulmus-Quercus* forest with a rich bottom vegetation, as e.g. *Anemone ranunculoides.* The forest has remained undisturbed for a long time, with lots of fallen branches and dead trees. Approximately 30 m north of the trap there is an area with many large dieing aspens *(Populus tremula).*

Loc. B. The trap was placed next to a large oak in an open *Quercus-Ulmus-Tilia* forest with a bottom vegetation rich in rare orchids.

The traps on Ostøya were operating from April 14 to September 23 1984, the traps on Håøya from April 19 to September 16 1984. The traps were emptied at intervals varying from 2 to 3 weeks. Sampling periods for each species are given with dates (arabic numbers) and months (roman numbers).

List of species

Linyphiidae

Entelecara acuminata (Wider). Ostøya: Loc. B, C; Håøya: Loc. A, B. Total 10 ♂♂ + 11 ♀♀, V—VI. Previously reported from Møre & Romsdal and Trøndelag (Hauge 1972) (males and females in July/August).

Dismodicus bifrons (Blackwall). Håøya: Loc. A 1 ♂ 19.V.—3.VI.

Dicymbium nigrum (Blackwall). Ostøya: Loc. C 1 ♂ 12.—30.V., 1 ♀ 10.VI.—1.VII.

Diplocephalus latifrons (O.P.-Cambridge). Håøya: Loc. A 2 ♀♀ 27.VI.—22.VII.

Pocadicnemis pumila (Blackwall). Ostøya: Loc. B 1 ♂ 30.V.—10.VI.

Gongylidium rufipes (Sundevall). Ostøya: Loc. C 3 ♂♂ + 2 ♀♀ 12.—30.V.; Håøya: Loc. A 1 ♂ 19.V.—3.VI., 1 ♀ 16.—27.VI.

Minyriolus pusillus (Wider). Håøya: Loc. B, 1 ♀ 3.—16.VI.

Meioneta saxatilis (Blackwall). Ostøya: Loc. C 1 ♂ + 1 ♀ 30.V.—10.VI; Håøya: Loc. B 1 ♀ 3.—16.VI.

Porrhomma pygmaeum (Blackwall). Ostøya: Loc. A 1 ♀ 1.—24.VII. Previously reported from Ringsaker and Nordland (Holm 1944, Waaler 1972).

Bathyphantes parvulus (Westring). Håøya: Loc. B 1 ♀ 3.—16.VI.

Bolyphantes alticeps (Sundevall). Håøya: Loc. B 1 ♀ 27.VI.—22.VII.

Lepthyphantes mengei Kulczynski. Håøya: Loc. A 1 ♂ 18.VIII.—16.IX.

Linyphia triangularis (Clerck). Ostøya: Loc. A, B, C; Håøya: Loc. A. Total 6 ♂♂ + 2 ♀♀ from late July to about medio September.

Neriene clathrata (Sundevall). Håøya: Loc. A 1 ♂ 3.—16.VI.

Helophora insignis (Blackwall). Ostøya: Loc. A 1 ♀ 1.—24.VII.

Theridiidae

Dipoena melanogaster (C.L. Koch). Håøya: Loc. A 1 ♂ 3.—16.VI. New to Norway. Reported north to Denmark and Sweden (Bonnet 1956) and Poland (Proszynski & Starega 1971), but is not listed from Finland up to 1977 (Palmgren 1977). In England is it found only in the southern part, but considered extremely rare (Locket & Millidge 1951).

Anelosimus vittatus (C.L. Koch). Håøya: Loc. A 1 ♂ 3.—16.VI., 1 ♂ 27.VI.—22.VII. Previously reported from Son (Akershus) (Waaler 1976). Obviously it is absent from Finland (see Palmgren 1977), but is reported from Denmark and Sweden (Bonnet 1959, Almquist 1973). The records in SE Norway might represent the northern limit of the distribution of the species. This is supported by its distribution pattern in the British Isles (see Locket & al. 1974, map 257).

Theridion tinctum (Walckenaer). Ostøya: Loc. A, B, C 2 ♂♂ in V, 1 ♂ in VI, 8 ♀♀ VI—VIII; Håøya: Loc. A, B 2 ♂♂ 19.V.—3.VI., 2 ♀♀ in VI. Also this species is probably near its northern limits in this area. It has previously been reported from Østfold and Akershus (Waaler 1967). It is absent from Scotland (Wiehle 1937, Locket et al. 1974). In Finland distributed in the southernmost part of the country (Palmgren 1977, Lehtinen et al. 1979), and in Sweden known from Skåne (Almquist 1973).

T. varians Hahn. Ostøya: Loc. C 1 ♂ in July; Håøya: Loc. B 2 ♂♂ June—medio July. In

Norway it is found occasionally north to Finnmark.

T. sisyphium (Clerck). Håøya: Loc. B 1 ♀ 3.—16.VI. Scattered records north to Trondheim.

T. bimaculatum (L.). Ostøya: Loc. A, B 3 ♂ ♂ in June. The species has been reported from Son (Akershus) (Waaler 1976), but also found in HES: Nord-Odal EIS 46, 1 ♂ + 1 ♀ in spruce forest 2.VIII. 1970 (E. Hauge leg.)

T. pallens Blackwall. Håøya: Loc. A 1 ♀ 16.—27.VI. Previously a few scattered records north to Trøndelag.

Enoplognatha ovata (Clerck). All localities, total 72 ♂ ♂ + 54 ♀ ♀. Most numerous at Håøya (Loc. A) (50 ♂ ♂ + 30 ♀ ♀) and at Ostøya (Loc. C) (20 ♂ ♂ + 13 ♀ ♀). The majority of the specimens (♂ + ♀) are caught from late June to late July, a few ♀ ♀ also in August. Previously recorded only from Drammen (Buskerud) and Oslo (Strand 1904a), but has also been found at AK: Hovedøya (Oslofjord) EIS 28, (10 ♀ ♀ 27.VII. 1937, H. Tambs-Lyche leg., E. Hauge det.) and VAY: Kristiansand, EIS 2 (1 ♂ + 1 ♀ 15. and 23.VII. 1972, T. Nilsen leg.)

Araneidae

Araneus sturmi (Hahn). Ostøya: Loc. B 1 ♀ 12.—30.V. Known north to Snåsa (N. Trøndelag).

Nuctenea umbricata (Clerck). Håøya. Loc. A 1 ♂ 18.VIII—16.IX.

Araniella cucurbitina (Clerck). Ostøya: Loc. B; Håøya: Loc. A, B. Total 6 ♂ ♂ + 1 ♀ in VI (most specimens) and in early VII.

Metidae

Meta segmentata (Clerck). Ostøya: Loc. A, C 6 ♂ ♂ + 3 ♀ ♀ 12.VIII—23.IX.; Håøya: Loc. B 1 ♂ 3.—16.VI.

Tetragnathidae

Tetragnatha montana Simon. Ostøya: 1 ♀ 31.V.

Pachygnatha clercki Sundevall. Ostøya: Loc. B 1 ♂ 14.—28.IV.

Gnaphosidae

Callilepis nocturna (L.). Ostøya: Loc. B 1 ♂ 30.V.—10.VI. Previously reported from Kongsberg and Vestre Aker (Strand 1900, 1904b) and from Aust-Agder (Platnick 1975).

Sparassidae

Micrommata virescens (Clerck). Ostøya: Loc. A, C 7 ♂ ♂ + 1 ♀ 12.V.—10.VI.; Håøya: Loc. A 3 ♂ ♂ + 1 ♀ 12.V.—27.VI. Previously reported from a few localities in Norway (Hedmark, Halden, Oslo, Lillesand, Stavanger) (Collett 1876, Strand 1898, Hauge & Kvamme 1983).

Anyphaenidae

Anyphaena accentuata (Walckenaer). All localities. Total 8 ♂ ♂ + 2 ♀ ♀ 19.V.—10.VI.

Clubionidae

Clubiona lutescens Westring. Ostøya: Loc. C 2 ♀ ♀ 10.VI.—1.VIII. Previously known from Oslo and Romsdal (Strand 1904b).

C. pallidula (Clerck). Ostøya: A, B, C 7 ♂ ♂ 12.V.—1.VIII, 1 ♀ 30.V.—10.VI. The species is known in S. Norway north to Trondheim.

C. terrestris Westring. Håøya: Loc. A, B 2 ♂ ♂ 19.V.—3.VI., 1 ♂ 18.VII.—16.IX, 9 ♀ ♀ 19.V.—18.VIII. Previously reported from Hordaland only.

C. brevipes Blackwall. Håøya: Loc. A, B 4 ♂ ♂ 19.V.—27.VI., 2 ♀ ♀ 16.VI.—22.VII. The species is new to Norway and obviously close to the northern limit of the distribution of the species, together with a Swedish record from Uppsala (Tullgren 1946). It has not been reported from Finland up to 1977 (see Palmgren 1977), but has reached the northern part of Scotland (Locket et al. 1974).

Clubiona sp. Ostøya: Loc. C 1 ♀ 12.—30.V.

Hyloclubiona compta (C.L. Koch). Ostøya: Loc. B 3 ♀ ♀ 28.IV.—1.VII.; Håøya: Loc. B 1 ♀ 16.—27.VI. The species is known in S. Norway from Bergen along the coast to the Hvaler islands in Østfold (Hauge & al. in prep.).

Gauroclubiona coerulescens (L. Koch). Ostøya: Loc. B, C; Håøya: Loc. A, B. Total 4 ♂ ♂ + 6 ♀ ♀ 19.IV.—10.VI. This species has, compared to *C. brevipes*, a more northern (and eastern) distribution, being reported in Norway from Hallingdal (Strand 1899), in Sweden north Jämtland (Tullgren 1946), in Finland up to 62—63°N (Palmgren 1943), and east to Siberia and Japan (Bonnet 1956).

Chiracanthium onchognathum Thorell. Ostøya: Loc. A, B 2 ♂ ♂ + 1 ♀ 12.V.—10.VI. The species is new to Norway, and seems to be close to its northern border of distribution. It is known in a few southern counties in Sweden, north to Närke and Södermannland (Tullgren 1946) and in the very southern parts of Finland (Palmgren 1943, Lehtinen & al. 1979).

Thomisidae

Xysticus audax (Schrank). Ostøya: Loc. A, B; Håøya: Loc. A, B. Total 4 ♂♂ 12.V.—16.VI.

Coriarachne depressa (C.L. Koch). Ostøya: Loc. B 1 ♂ 30.V.—10.VI., loc. C 1 ♂ 14.—28.VI. Previously reported from Asker (Collett 1876) and Trondheim (?) (Storm 1898).

Philodromidae

Philodromus cespitum (Walckenaer). Ostøya: Loc. A, B 3 ♂♂ 10.—24.VII., 1 ♀ 24.VII.—12.VIII.; Håøya: Loc. B 1 ♂ 27.VI.—22.VII. The species has with certaincy been reported from Norway by Waaler (1970) and Tveit & Hauge (1983) (as *P. aureolus caespiticolus*). Otherwise *P. aureolus* (Clerk) has been reported from several localities, as far north as from Finnmark. For some of these records there probably will be difficulties in tracing the original materiale.

P. dispar Walckenaer. Håøya: Loc. A, B 3 ♂♂ + 1 ♀ 3.VI.—22.VII., 1 ♀ 22.VII.—18.VIII. The species has previously been reported from Oslo and Vestfold (Strand 1901) and from Trondheim (Storm 1898).

P. emarginatus (Schrank). Ostøya: Loc. A 1 ♂ 10.VI.—1.VII.

Salticidae

Salticus cingulatus (Panzer). Håøya: Loc. A 1 ♂ 19.V.—3.VI.

Evarcha falcata (Clerck). Ostøya: Loc. B 1 ♂ 10.VI.—1.VIII., 1 ♀ 12.—30.V.; Håøya: Loc. A, B 2 ♂♂ 19.V.—3.VI.

Euophrys erratica (Walckenaer). Ostøya: Loc. B 2 ♀♀ 10.VI.—1.VIII., 1 ♂ 24.VII.—12.VIII.

Heliophanus cupreus (Walckenaer). Ostøya: 1 ♀ 31.V.

Lycosidae

Trochosa terricola (Thorell). Ostøya: Loc. A 1 ♂ 12.VIII.—1.IX.

Amarobiidae

Amaurobius fenestralis (Stroem). Ostøya: Loc. C 1 ♂ 1.—23.IX.

DISCUSSION

The species list is, as might be expected, biased because of the unconventional sampling methode used, and is dominated by relatively many species or groups of species (families) that are usually considered to inhabit the higher vegetation strata, and is as such not likely to be much representative of the total spider fauna present in the localities. However, the list gives us some small hints similar to what have been observed earlier in this area on other invertebrate groups (Midtgaard & Aarvik 1984): Namely that these islands (and especially Ostøya), as well as the whole geographical area around the Oslofjord, are of special interest zoogeographically. Many of the European species seem to be at or near their northern or north-western range of distribution in this area. Future sampling programmes by means of other sampling techniques in these areas would be very interesting, and might add to the list valuable data on such species. Another aspect is that the area around the Oslofjord contains the heaviest human concentration in Norway and therefore represents a wear and tear on the landscape due to different human activities which might not be to the benefit of certain types of habitats and their fauna. Ostøya and Håøya represent some of the few still rather undisturbed localities of their kinds in this area.

ACKNOWLEDGEMENT

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Short communications

BIBIO MARCI (L. 1758) *(DIPT., BIBIONIDAE)* NEW TO THE NORWEGIAN FAUNA.

LITA GREVE

Abstract

Bibio marci (L. 1758) is reported for the first time from Norway. Two specimens were caught at Fyn, Hvasser, Tjøme on 24 May 1976; four specimens were caught at Mostranda, Tjøme between 26 May—6 JUne 1985. Both localities are in Vestfold province EIS 19.

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In 1877 Siebke reported thirteen species of the genus *Bibio* (using the name *Hirtea)* from Norway. However, while working on a material of *Bibionidae* from Kongsvoll in the Dovrefjell mountains (Greve, Solem & Olsen 1984), we became aware of the fact that since the time of Siebke few researchers have dealt with the Norwegian *Bibionidae.* The distribution of the family is not well known in Norway, and older material needs revision.

On male and one female of *Bibio marci* (L. 1758) were captured at Fyn, Hvasser, Tjøme (EIS 19) in Vestfold province by Arne Fjellberg on 24. May 1976. The material was determined by the author. In 1985 three males and one female from Mostranda. Tjøme (EIS 19) were collected in a yellow water trap between 24 May and 6 June. Nothing is known about the locality at Fyn, but the yellow water trap at Mostranda was standing on a lawn near oak trees in a private garden. All specimens are deposited in the collections of Zoological Museum, University of Bergen.

B. marci ranges among the largest species of Norwegian March-flies. It is about the same size as *B. pomonae* (Fabr.) viz. a bodylength of approximately 9—10 mm. The forepart of the wings are characteristically darkened in both sexes. The rest of the male wing is fairly clear, the rest of the female wing is smoky, and rather dark, body and legs including the hairs on the thorax and the abdomen are black.

Duda (1930) considered *B. marci* as a sub-species of *B. hortulanus* (L. 1758), but recent authors like Pecina (1965) and Verbeke (1971) consider both *B. hortulanus* and *B. marci* as good species. *B. hortulanus* L. 1758) is included in the list of Siebke (1877) from one locality in Norway, viz. the Botanical garden at Tøyen, Oslo. In the collections of Zoological Museum, University of Oslo there is one specimen labelled «Tøyen» which belongs to the true *B. hortulanus.* Thus the reecords of *B. marci* mentioned above are the first and second Norway.

Judged from the two records the flight period in Norway probably is the last weeks of May, the first week of June. Further south in Europa *B. marci* appears in April (Pecina 1965, Verbeke 1971). *B. marci* flies in May in England (Ismay 1978).

B. marci is included in the list of Finnish Diptera (Hackman 1980) and it is reported from south and middle Sweden by Wahlgren (1919). The species is also reported from England (Ismay 1978). Duda (1930) gives the distribution mainly as Europe while Pecina (1965) reports it as a very common species in middle Europe. Peina (1971) records *B. marci* from Spain. *B. marci* is also reported from parts of Asia by Krivocheina (1969).

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ZABRACHIA MINUTISSIMA (ZETTERSTEDT, 1838) (DIPT., STRATIOMYIDAE) NEW TO NORWAY

LITA GREVE

Abstract

Zabrachia minutissima (Zetterstedt, 1838) is reported new to Norway. One female was hatched from bark on logs of *Picea abies* L., collected in Buskerud province, Hønefoss county, near Hønefoss, EIS 36, 22 March 1973.

Rozkošný (1983) in his survey of the European *Pachygasterinae* records six species in six different genera from Europe. Krivosheina & Rozkošný (1985), however, resurrects *Zabrachia tenella* (Jaennicke) from synonymy under *Z. minutissima* (Zett.). Thus the genus *Zabrachia* has two species in Europe, and a third species is known from the Canary Islands. Krivosheina & Rozkošný (1985) give a key to the three species.

Zabrachia minutissima (Zett.)
Locality: BØ (Province of Buskerud), Hønefoss county, near Hønefoss EIS 36. Hatched from bark on logs of spruce *(Picea abies L.)* 22 March 1973, leg. H. Pettersen. Pettersen's investigations (1976) were made to collect parasites *(Hym. Chalcidoidea)* on bark beetles.

Z. minutissima and *Z. tenella* are according to Krivosheina & Rozkošný (1985) found to be sympatric in greater parts of Europe and Asia. In Scandinavia they record both species from Sweden, and *Z. minutissima* also from Finland.

The female *Z. minutissima* from Hønefoss represents the first record from Norway. The number of *Pachygasterinae* known from Norway is thus three, see Fjeldså & Greve (1984). One could also expect to find *Z. tenella* in Norway.

Rozkošný (1983) reports larvae of *Zabrachia minutissima/tenella* from several species of trees both coniferous and decidious. This record verify association of *Zabrachia minutissima* (Zett.) with *Picea abies* L.

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I would like to express my thanks to H. Pettersen, Ås who collected the female *Z. minutissima* and Fred Midtgaard, Ås who sent me the fly for identification. I am also greatful to Prof. Dr. R. Rozkošný who verified my determination and made me aware of the revision of the genus *Zabrachia*.

Litterature

Fjeldså, Arild & Greve, L. 1984. *Neopachygaster meromaelaena* (Dufour, 1841) and *Praomyia leachii* (Curtis, 1824) (Dipt., Stratiomyidae) new to Norway. *Fauna norv. Ser. B. 31,* 110.

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SPIDERS (ARANEAE) FROM VESTFOLD, SOUTH-EAST NORWAY

ERLING HAUGE

Abstract

Hauge, E. 1986. Spiders (Araneae) from Vestfold, South-East Norway. *Fauna norv. Ser. B, 33,* x—x.

A list of 16 spiders whose distribution in Norway is relatively little known is presented with short summaries on their distribution. One species, *Philodromus poecilus* Thorell, is recorded for the first time in Norway.

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Two collections from Vestfold, now deposited at the Zoological museum, University of Bergen, have been studied. The first collection comprises specimens collected in 1968 by Arne Fjellberg, mainly labelled Tjøme, but also some from Sem. The second collection comprises specimens caught during the summers 1983—85 by Arild Fjeldså, mostly in the southern parts of Tjøme.

Among the species identified one is previously not found in Norway, and for several there are only one or a few Norwegian records. The fact that the sampling sites are situated in the south-eastern part of Norway, an area which seems to represent the northern or north-western limits of distribution of many Europaean spiders, makes material from this area particularly interesting.

I am indepted to the collectors for their permission to publish on the materiale. Arild Fjeldså's field work was partly financed by The applied ecology research programme (Økoforsk), University of Trondheim, The Museum.

Species list

Walckenaera unicornis (O.P.-Cambridge). Mostranda, May 26—June 6 1985, 1 ♂ (A. Fjeldså coll.). The species is previously recorded only once in Norway (Hauge 1971), but it certainly has a wider range as it is distributed north to Lappland in both Sweden and Finland.

Micrargus subaequalis (Westring). Sem, August 7 1968, 1 ♀ in humid deciduous forest (A. Fjellberg coll.). Previously there is one record from Østfold (Waaler 1971). In Sweden there are very few records from Uppland and Øland (Tullgren 1955) and in Finland it seems restricted to the most southern counties (Palmgren 1976).

Lepthyphantes nebulosus (Sundevall). Tjøme, August 12 1968, 1 ♀ indoors (A. Fjellberg coll.). Previously recorded from Trøndelag (Trondheim) (Storm 1898) and Hallingdal (Buskerud west) (Strand 1899).

L. minutus (Blackwall). Sem, August 11 1968, 1 ♂ in deciduous forest (A. Fjellberg coll.). Previously a few records from Akershus (Waaler 1967), Trondheim (Storm 1898), Finnmark and Hallingdal (Strand 1899).

Zygiella atrica (C.L. Koch). Tjøme, August 7 1968, 1 ♀ in an humid area (A. Fjellberg coll.). Seems to be distributed along the coast from Oslo to Stavanger and in inner Sogn & Fjordane (Collett 1876). There are, however, no other recent records of this species.

Singa hamata (Clerck). Mo, Tjøme, June 28 1985, 1 ♂ (A. Fjeldså coll.). Previously reported from Drammen, Asker and Oslo (Collett 1876).

Mangora acalypha (Walckenaer). Moutmarka, Tjøme, July 4 1983, 3 ♀ ♀ (A. Fjeldså coll.). Recorded once from Kristiansand (Collett 1876). Probably a southern species in Fennoscandia as it is not included in Palmgren's lists from Finland (Palmgren 1977).

Theridion impressum L. Koch. Mo, Tjøme, June 28 1968 (A. Fjellberg coll.). Previously known from Østfold and West Buskerud. The species is recorded as far north as Lappland in Finland (Palmgren 1974), thus a wider distribution in Norway should be expected.

Philodromus poecilus Thorell. Kjære, June 26 1968, 1 ♀ on conifers (A. Fjellberg coll.). The species is previously not recorded in Norway. Rare in Southern Finland (Palmgren 1950), but in Sweden as far north as Jämtland (Tullgren 1944).

P. dispar Walckenaer. Mostranda, Tjøme, late May/early June 1985, 1 ♂ (A. Fjeldså coll.). Previously recorded in a few Norwegian localities (see Hauge & Midtgaard in press).

P. collinus C.L. Koch. Mostranda, Tjøme, July 6 1985, 1 ♂ (A. Fjeldså coll.). Previously recorded from Namdalen (North Trøndelag) (as *P. auronitens* Auss.) (Strand 1901).

Coriarachne depressa (C.L. Koch). Kjære, June 26 1968, 1 ♂ (A. Fjellberg coll.). A few east-Norwegian records (see Hauge & Midtgaard in press).

Attulus cinereus (Westring). Sandøy NNW, August 9 1984, 1 ♂ + 4 ♀ ♀ (A. Fjeldså coll.). Known from Farsund (Vest-Agder) (Klausen 1974).

A. saltator (Simon). Sandøy, *Calluna* heath, August 10 1984, 1 ♀ (A. Fjeldså coll.). Previously one record from Østfold (Klausen 1974).

Sitticus floricola (C.L. Koch). Mostranda, Tjøme, July 26 1984, 1 ♂ + 1 ♀ (A. Fjeldså coll.). A few old Norwegian records only (Collett 1875, Strand 1900).

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NOTES ON NEW AND RARE SPIDERS (ARANEAE) IN NORWAY

ERLING HAUGE

Abstract

A list of 18 spider species is presented with comments on their distribution in Norway. Three species, *Theridion melanorum* Hahn, *Xysticus kochi* (Clerck) and *Hygrolycosa rubrofasciata* (Ohlert), are reported for the first time in Norway.

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An unidentified collection of spiders (mostly collected by Hans Tambs-Lyche in the 1930's) has been deposited at the Zoological Museum, Bergen. Some of the species are new or relatively rare in Norway, and are presented here as a contribution to the general knowledge of the Norwegian spider fauna.

Species list

Moebelia penicillata (Westring). BØ: Drammen, 28.VI.1936, 1 male + 1 female on the bark of spruces (Tambs-Lyche coll.). Apart from being reported once from Trøndelag (Hauge & Furunes 1976), there also is a record from Western Norway: HOI: Kvam, Kvamskogen, 460 m a.s.l., 10.IV.1975, 2 females in lichens on a pine (Torstein Solhøy coll.). Distributed far north to Lappland in both Sweden and Finland (Tullgren 1955, Palmgren 1976).

Agyneta innotabilis (O.P. Cambridge). AK: Oslo, Movatn, 24.VII.1937, 1 female (Tambs-Lyche coll.). Previously there also is one record from Akershus (Hauge 1972).

Theridion melanorum Hahn. The specimens (1 male + 3 females) were labelled *Lofthus,* probably in Ullensvang, Hardanger (Western Norway), 18.VII.1938, in a pile of stone (H. Tambs-Lyche coll.). The species is reported for the first time in Norway.

Achaearanea lunata (Clerck). AK: Oslo, Østensjø, 1 female, 30.VIII.1937 (Tambs-Lyche coll.); AAY: Arendal, 1 female, 10.VI.1936 (Tambs-Lyche coll.).

The species has been reported from Trondheim (Storm 1898) (in a greenhouse!), but seems to be a southern species as it in Finland is restricted to the southernmost part of the country (Palmgren 1974). There are also some records from Sørlandet (Lyngør) and Western Norway (Suldal and Eidfjord) (Strand, 1898, 1902, Cooke 1967).

Araneus marmoreus pyramidatus Clerck. A large fullgrown female was labelled Hadeland, Kvitingby, Kutjern, 2.IX.1937 (Ruud leg.). *A. marmoreus* is previously reported to occur as far north as Finnmark (Collett 1876). Strand (1899) reports *A. pyramidatus* from Hallingdal and (referring to Westring, Storm and Collett) that this species is distributed north to Finnmark.

Singa hamata (Clerck). Ø: Hvaler, Arekilen, 16.V.1936, 1 male + 1 female (Tambs-Lyche coll.). In Norway there are a few records from Tjøme (Vestfold) to Oslo (Hauge in press).

Xysticus kochi Thorell. AAY: Moland, Flostad (north of Arendal), 1 female 20.VI.1937 (Wiborg coll.). The species is new to Norway, and this record represents a north-western out-post of a species with a south-eastern distribution (according to Palmgren 1950). In Sweden recorded north to Uppland (Tullgren 1944).

Philodromus collinus C.L. Koch. AK: Aker, Ø. Skytterlag, 10.VIII.1937, 2 females on lichens on spruce (Tambs-Lyche coll.). A few previous records in Norway (Hauge & Midtgaard in press).

P. dispar Walckenaer. AAY: Moland, Flostad (north of Arendal), 20.VI.1937, 1 male (Wiborg coll.). A few earlier records in Norway (Hauge & Midtgaard in press).

Heliophanus dubius C.L. Koch. Ø: Hvaler, Kirkøy, 15.—16.VI.1936, 1 male (Tambs-Lyche coll.). One previous record from Akershus (Waaler 1967).

Bianor aurocinctus (Ohlert). Ø: Hvaler, Kirkøy, 16.V.1936, 1 male (Tambs-Lyche coll.). Previously known from around Oslo (Collett 1875) and from Vassfaret (Hauge & Wiger 1980).

Pellenes tripunctatus Walckenaer. Ø: Hvaler, Kirkøy, 17.V.1936, 1 male (Tambs-Lyche coll.). The species has previously been reported from Hallingdal (Strand 1899) as Yllenus *v-insignatus* (Clerck), with reference to L. Koch and *Euophrys quinquepartita* (in parenthesis), which (according to Roewer 1954) is *P. tripunctatus* (Walck.)

Sitticus terebratus (Clerck). AK: Bærum, Blommenholm, 27.VIII.1935, 1 male (Tambs-Lyche coll.?). Previously a series of older records in S. Norway north to Trondheim (Collett 1876; Storm 1898; Strand 1899, 1900).

Apostenus fuscus Westring. AK: Bærum, Kolsås, 5.IX.1937, 1 male (Tambs-Lyche coll.). Previously known from Ostøya (Bærum) (Strand 1904).

Micaria subopaca Westring. AK: Oslo, Zoologisk Museum, 14.V.1937, 1 female (Helene Tambs-Lyche coll.). Previously known only from Setesdalen (Tveit & Hauge 1984).

Alopecosa accentuata (Latreille). Ry: Sola, Vigdel, 12.VI.1938, 1 female (H. Holgersen coll.). Previously there is one record from Rogaland (Suldal) and one from Nordland (Hadsel) (Smith, in E. Strand 1912).

A. inquilina (Clerck). AK: Bærum, Kolsås, 5.IX.1937, 1 female (Tambs-Lyche coll.). The species is previously recorded in south-eastern Norway from Gudbrandsdalen to Kristiansand (Collett 1875). The record from Trondheim (Storm 1898) was by Tambs-Lyche (1942) corrected to be *Arctosa alpigena* (Doleschal).

A. trabalis (Clerck). AAY: Moland, Flostad (north of Arendal), 1 male (date not given) (Wiborg coll.). The species is previously known from 3 localities (Oslo, Asker, Skien) (Collett 1875).

Hygrolycosa rubrofasciata (Ohlert). Ø: Hvaler, Kirkøy, 15.—16.V.1936, 1 male (Tambs-Lyche coll.). The species is new to Norway.

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Bokanmeldelser

PALM, E. 1986. *Nordeuropas pyralider.* 287 pp. + 8 fargeplansjer. *Fauna Bøger, København.* (Bestilles fra Apollo Bøger, Lundbyvej 36, DK-5700 Svendborg, Danmark. Pris 400 DKK + porto. Ved abonnement på serien Danmarks Dyreliv gis en rabatt på 15%).

Blant lepidopterologer har småsommerfuglene vært relativt lite påaktet. Dette til tross for at de er både vakre og interessante. En årsak kan ha vært mangelen på dekkende litteratur. Pyralidene danner, siden de er større enn de andre, på sett og vis inngangsporten til småsommerfuglene. Takket være Palms bok blir pyralidene lettere tilgjengelige for studium, og kanskje den også vil bidra til å vekke interesse for de øvrige småsommerfuglfamilier.

Foran i boka er det generelle kapitler der bygningstrekk hos imago og tidligere stadier beskrives. Videre er det kapitler om arter av økonomisk betydning, utbredelsesforhold i Nord-Europa og Danmark samt klassifikasjon.

Systematikk og nomenklatur er bragt helt up to date, og det har skjedd svært mange navneendringer siden Karsholt & Nielsens «Systematisk fortegnelse over Danmarks sommerfugle» kom ut for 10 år siden.

I den spesielle delen behandles grundig de 219 artene som er kjent fra Danmark, Norge, Sverige og Finland under følgende tre punkter: Kjennetegn, utbredelse og bionomi. Det er i tillegg kart som viser utbredelsen i de faunistiske distrikter i Nordeuropa samt prikkart over utbredelsen i Danmark. I mange tilfeller er det genitaltegninger og vingetegninger som framhever viktige kjennetegn. Det er ikke bestemmelsesnøkler til slekter og arter, men artsbestemmelsen vil normalt likevel gå greit når en kombinerer bruk av fargeplansjer, tekst og tekstfigurer.

De fotografiske fargeplansjene er skarpe og av langt høyere kvalitet enn hos forgjengeren i serien, «Nordens Målere».

Jeg ville likevel ha foretrukket at dyrene på tavle 5 og 6 hadde vært fordelt på tre plansjer slik at de kunne vært forstørret.

Til slutt i boka er det en fyldig litteraturliste og kildehenvisninger samt register.

Selvfølgelig finnes det en del småting å sette fingeren på: Fig. 180 og 181 er for mørke, en del lokalitetsnavn er stavet feil; f.eks. er Tjønnefoss, Nissedal på side 134 blitt til «Tjørnefors, Vissedal».

Boka er solid innbundet og velutstyrt. Den anbefales på det varmeste, og må sies å være uunnværlig for alle sommerfuglinteresserte. Vi ser fram til flere bind i samme serie.

Leif Aarvik

LINDROTH, C.H. 1985. *The Carabidae (Coleoptera) of Fennoscandia and Denmark. Faun. ent. Scand. 15 Part 1.*

This part is the first one of two volumes dealing with the Carabid beetles of Fennoscandia and Denmark. The manuscript for the present volume was only partly ready when the author passed away and contribution from a number of additional persons was therefore necessary to finish the manuscript for publication.

The work is based on the revision by Lindroth of the ground beetles of Sweden which appeared in Svensk Insektfauna in 1942 (2nd. ed. in 1961). The keys and discriptions of species are also almost identical in the two works whereas a new key to genera has been made by T.L. Erwin. Many new figures have been added and the many buitful drawings of the male copulation organs of closely related species is of very great value to ensure a correct identification of critical species. Besides habitus drawings there are also colour photos of about 130 species which certainly also helps the beginner in his identifications.

As a taxonomic work this volume is probably unique by its emphasis on the biology of the species. The habitat descriptions are very good and are often equally detailed as, or even more detailed than, in Lindroth's famous work: Die fennoskandischen Carabidae. Life history and other biological characteristics of the species are also briefly considered. A catalogue of the distribution of the species is given at the end of the volume. The area is divided in provinces according to the same system as in Catalogus Coleopteroum Fennoscandiae et Daniae (1960). With some exceptions (e.g. some *Bembidion* species) this catalogue seems to be up-to-date, giving the present known distribution of the species.

The work is much recommended for everybody working with Coleoptera.

Johan Andersen

GUIDE TO AUTHORS.

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References. *In the text:* Black (1979), Black & Blue (1973:100), or «as noted by Green (1978) and Black (1979)». Multiple references should be given in chronological order, i.e. (Black & Blue 1973, Green 1976, 1979, Black 1978).

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Examples:

Journal:

Løken,A. 1962. Social wasps in Norway (Hymenoptera, Vespidae). *Norsk ent. Tidsskr. 12,* 191 - 218.

Book:

Mayr, E. 1913. *Animal species and evolution.* Harvard University Press. Cambridge, Mass.

Fittkau,E.J. 1962. Die Tanypodinae (Diptera, Chironomidae). Die Tribus Anatopyniini, Macropeloponi und Pentaneurini. *Abh. Larvalsyst. Insekten* 6, 453 pp.

Chapter:

Whitman, I. 1951. The arthropod vectors of yellow fever, pp 229—298 in: Strode, K. (ed.) *Yellow Fever.* Mc. Graw - Hill, New York & London.

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Content

Fauna norvegica Ser. B. Vol. 33, No. 2

Refseth, D.: Phenological adaptations in *Patrobus atrorufus* and *P. assimilis* (Col., Carabidae) 57
Rognes, K.: The Rhinophoridae or woodlouse-flies (Diptera) of Norway 64
Rognes, K.: A check-list of Norwegian Tachinidae (Diptera) 69
Rognes, K.: A check-list of Norwegian Muscidae (Diptera) 77
Greve, L. & Midtgaard, F.: The Clusiidae (Diptera) from the islands Håøya and Ostøya in the Oslofjord and a survey of the family in Norway 86
Lillehammer, A., Johannsson, M., & Gislason, G.M.: Studies on *Capnia vidua* Klapalek (Capniidae, Plecoptera) populations in Iceland 93
Hauge, E. & Midtgaard, F.: Spiders (Araneae) in the Malaise traps from two islands in the Oslofjord, Norway 98

Short communications

Greve, L.: *Bibio marci* (L. 1758) (Dipt., Bibionidae) new to the Norwegian fauna 103
Greve, L.: *Zabrachia minutissima* (Zetterstedt, 1838) (Dipt., Stratiomyidae) new to Norway 104
Hauge, E.: Spiders (Araneae) from Vestfold, South-east Norway 104
Hauge, E.: Notes on new and rare spiders (Araneae) in Norway 105

Bokanmeldelser — *Book reviews*

Aarvik, L. 108
Andersen, J. 108