FAUNA NORVEGICA

~~No. 1~~
1981

SER. B VOL. 28 NO. 1
Norwegian Journal of Entomology

PUBLISHED BY
NORSK ZOOLOGISK TIDSSKRIFTSENTRAL
OSLO

Fauna norvegica Ser. B
Norwegian Journal of Entomology
Norsk Entomologisk Forenings tidsskrift

Appears with one volume (two issues) annually
Utkommer med to hefter pr. år.

Subscription

Members of Norw.Ent.Soc. will recieve the journal free. Membership fee N.kr. 50,- should be paid to the Treasurer of NEF: Lise Hofsvang, Brattvollveien 107, Oslo 11. Postgiro 5 44 09 20. Questions about membership should be directed to the Secretary of NEF. Trond Hofsvang, P.O. Box 70, N-1432 Ås - NLH. Members of NOF receive the journal by paying N.kr. 35,—, non-members by N.kr. 55,— to: NZT, Zoological Museum, Sarsgt. 1, N-Oslo 5. Postgiro 2 34 83 65. Outside Fennoscandia: Additional postage Nkr. 5,— per year (surface mail).

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Adresse: Zoologisk museum, Sarsgt. 1, Oslo 5.
Postgiro 2 34 83 65.

Kristiansen & Wøien, Oslo. ISSN 0332-7698

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Distribution and Ecology of Norwegian Water-bugs (Hem., Heteroptera)

JOHN THOMAS JASTREY

Jastrey, J.T. 1981. Distribution and ecology of Norwegian Water-bugs (Hem., Heteroptera). *Fauna norv. Ser. B. 28,* 1—24.

Field work in southern Norway in 1977—1979 yielded 36 species of Water-bugs, one of which had not previously been recorded from Norway (*Sigara scotti* (Fieber, 1868)). The number of reported species from Norway is now 44. Information on distribution, and habitat preferences is given for each species. Most species can be considered widely distributed in southern Norway. Distributional maps are also included.

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INTRODUCTION

Apart from the work of Warloe (1924), little information exists on the biogeographical status of the Water-bugs (consisting of the families Mesovelidae, Hebridae, Hydrometridae, Veliidae, Gerridae, Nepidae, Aphelocheiridae, Notonectidae and Corixidae) found in Norway. This paper is meant to clarify this situation, and includes a list of all species recorded from Norway plus some that have had an uncertain status. Also, there is included information on the ecology of each species, especially on habitat preferences.

MATERIAL AND METHODS

The collection of the material was done in the years 1977—1979, and was concentrated mostly in the Jæren and Bergen districts. However, a field trip was completed during the summer of 1978, in which southern Norway north to Trondheim was visited.

On most of the locations, only one site has been subject to sampling. This seems to be adequate for getting a picture of the constellation of Water-bugs at that location, except in some larger lakes where the variation can be larger, due to greater variation of the habitat.

The sampling was done with the aid of a pond net, 40 cm in diameter, with a mesh width of 1.0 mm. This was attached to a shaft of 1.5 m lenght, which could be extended when required. No form of quantitative sampling has been attempted, other than sampling over a time period of approximately 30 minutes at each site. Collecting was mostly concentrated on areas on the shoreline with some vegetation. Few species are generally found outside this area.

In all, 208 localities were investigated, 178 of these contained one or more species of Water-bugs. The material consists of 36 species and 5551 individuals. The nomenclature follows Kloet & Hincks (1964).

The different locations are classified into habitat-types, in all 14. Information on this is to be found in Appendix I. Here is also listed data about: the geographical site of each location following Strand (1943) and the UTM-method as described by Økland (1977), date of collection and altitude.

Identification keys used for adults are found in Stichel (1956), Poisson (1957), Soós (1961), Macan (1976) and for the larvae Mitis (1937), Poisson (1957), Brinkhurst (1959c) and Jansson (1969).

In addition to own collected material, some material was borrowed from the Museum of Zoology, University of Oslo.

The collections are preserved at the Museum of Zoology, University of Bergen.

SYNOPSIS OF THE SPECIES

The first information on Norwegian Water-bugs is from the early 18th century, written by Zetterstedt (1828, 1838) and Fallén (1829). Siebke (1874) was the first to compile all available information pertaining to Norwegian insects, and he lists a total of 18 Water-bugs from 4 families. Schøyen (1879) and Sahlberg (1880) contributed to the knowledge on the distribution of some species. In several publications from 1880—1884, Reuter described the distribution of Scandinavian insects. In 1889, Schøyen added some more species to Siebke's list, and at

this time 27 species from 6 families were known from Norway. Strand (1899 a,b, 1902, 1905, 1912) and Schneider (1901) made their additions to this list, and in 1912, 31 species had been published.

The last publication giving a complete picture of the distribution of Norwegian Water-bugs is by Warloe (1924). Here are listed 41 species. In 1976, Coulianos & Ossiannilsson listed Norwegian Water-bugs in their catalogue, and this list includes 43 species.

Little work has been accomplished in later years by Norwegian scientists on this group of insects. Økland (1964, 1977) has published information on Nepidae. Small notes on the Corixidae and Notonectidae were published by Dolmen & Aagaard (1973), Dolmen & Olsvik (1977) and Dolmen (1977). One new species of Corixidae is added in the following list. The total amount of Norwegian Water-bugs is now known to be 44 species. All of these are listed, and also some with previously uncertain status.

For each species is given the locality numbers where it was found in the study. Also, the general distribution and notes on ecology are listed. The notes on distribution are based on: for Scandinavia Vepsäläinen (1973) and Coulianos & Ossiannilsson (1976), for Europe and World Nieser (1978).

Mesovelidae

Mesovelia furcata Mulsant & Rey, 1852.

Found in 11 localities (74, 82, 93, 94, 103, 111, 115, 128, 136, 171, 178). Previously recorded by Warloe (1924). Found from Stavanger to Hedmark. In Sweden, north to Lappmark, present in Finland. Widespread in Europe, northern Africa and Siberia.

The listed records are mainly from oligotrophic lakes with fairly rich vegetation. Macan (1976) states that it is found on floating leaves; this correlates with the rich vegetation in the habitats.

All present records are of the apterous form. Macan has recorded winged individuals from England.

Hebridae

Hebrus pusillus (Fallén, 1807).

Listed by Stichel (1956) as Norwegian. Spread through southern Sweden, also in Finland and Denmark. Known from all of Europe and North Africa.

The ecology of this species is little known, but seems to be similar to the following species.

Hebrus ruficeps (Thomson, 1871).

First listed for Norway by Strand (1912) and Warloe (1924). Widely distributed in southern Scandinavia and Finland. Found in most of Europe.

Usually found in wet moss (*Sphagnum* spp.) in swamps (Warloe, 1924; Macan, 1976. Wesenberg-Lund (1943) writes that it can be found on floating leaves such as *Nymphaea* sp.

Hydrometridae

Hydrometra gracilenta Horvàth, 1899.

Only one Norwegian record by Warloe (1924). Found in southern Sweden, also in Finland and Denmark. Distributed in most of Europe and also Ethiopia (Poisson, 1957).

Hydrometra stagnorum (L. 1758).

Found in 5 localities (11, 118, 150, 154), and Kørrilen, Sotra, HOy: Fjell (1 ♂, 2 ♀ ♀, 6 July 1977; Leg. B. Meidell). Other Norwegian records by Strand (1905) and Warloe (1924). In Sweden, more south-western than *H. gracilenta*, also found in Finland and Denmark. Found throughout Europe and northern Africa and Central Asia.

Macan (1976) describes the habitat preferences of the species as emergent vegetation in still and flowing waters. Though the vegetation in the listed localities is sparse, the species was always found in secluded areas in shallow water.

Veliidae

Velia caprai Tamanini, 1947.

Found in 2 localities (19, 33). Previous Norwegian records by Scneider (1901) and Warloe (1924) are listed under *Velia currens* Fabricius 1794. This is another species, found in southern Europe (Nieser, 1978). Found north to Bergen. Southern Scandinavian distribution, found through Europe and northern Africa.

Andersen & Kaiser (1964) state that *V. caprai* prefers smaller creeks and rivers. It can also be found on the shoreline of lakes (Brinkhurst, 1959 b).

Velia saulii Tamanini, 1947.

Coulianos & Ossiannilsson (1976) have listed the species as Norwegian. In Sweden, one record from Gotland, also a restricted distribution in Denmark (Andersen & Kaiser, 1964). Spread throughout Europe.

The main reason for the few Scandinavian records is probably that the species is night-active, and the adults have only been found under stones by large lakes and rivers (Andersen & Kaiser, 1964). The juveniles, however, are known to run on open waters.

Microvelia reticulata (Burmeister, 1835).

Found in 8 localities (89, 111, 113, 114, 120, 121, 122, 126). Previous records by Warloe (1924) under the name *Microvelia schneideri* Schltz. Southern Norwegian distribution, widespread in Sweden, reported from Finland and Denmark. Found throughout Europe and also Siberia.

A common factor to the locations where the species was found is fairly thick vegetation. *M. reticulata* lives on the surface of water, and thus seems to prefer rich vegetation. This is also noted by Macan (1976).

Warloe (1924) reports both apterous and macropterous individuals. All records in this study are of apterous specimens.

Gerridae

Gerris lateralis Schummel, 1832.

Found in 15 localities (2, 4, 7, 8, 20, 51, 53, 56, 63, 66, 67, 70, 71, 75, 143). Previous Norwegian records are found under the name *Gerris asper* Fieber 1861, by Sahlberg (1880), Strand (1899b), Schneider (1901) and Warloe (1924). *G. asper* is proven to be a species confined to southern Europe (Nieser, 1978). *G. lateralis* shows a wide Norwegian distribution, also found in all of Sweden and reported from Denmark and Finland. Spread throughout Europe and Siberia.

The species shows a clear preference for small, often temporary bodies of water. Only three of the 15 localities are lakes. Studies from Finland by Vapsäläinen (1973) confirm these results. A wider range of habitats in northern Finland is explained by that the species has a boreo-alpine distribution, and is thus in its optimal habitat area in this district. Information from Europe shows that *G. lateralis* is greatly specialized in the sub-optimal areas. Vepsäläinen has also noted a clear trend in preference for luxuriant shore vegetation. This is not yet confirmed for Norway. Both the macropterous and the apterous forms have been found in this study.

Gerris thoracicus Schummel, 1832.

Found in 2 localities (115, 172). Warloe (1924) has listed previous Norwegian records. Found few places in southern Norway, also southern Sweden, Finland and Denmark. Spread throughout Europe, northern Africa and Siberia.

Some information on habitat preferences can be found in Vepsäläinen (1973). The interesting fact noted is that in Finland, the species is almost always found on brackish waters and on rock pools on the coast. In Central Europe a wider range of habitats are utilized, due to that this is more the optimal range of the species. We note that one of the locations above (115) is brackish water. The other record (172) is situated only 1 km from the coast. However, locations listed by Warloe from Laurgård in Sell and Dovre, both inland, indicate that further research is needed to establish the range in Norway.

Gerris argentatus Schummel, 1832.

Found in 5 localities (101, 112, 120, 121, 122). One previous record from Norway by Warloe (1924). Eastern Norwegian distribution, found through southern Sweden, Finland and Denmark. Widely spread in Europe, Palearctic distribution, subspeciated in Mandchuria and Japan.

From Vepsäläinen (1973) we find that the species shows a preference for medium-sized bodies of water, with rich vegetation. Fairly abundant vegetation is also a trend in the described habitats from Norway.

Gerris lacustris (Linné, 1758).

Found in 83 localities (4, 6, 7, 11, 14, 15, 16, 18, 19, 20, 21, 23, 26, 28, 29, 31, 33, 34, 35, 36, 41, 42, 43, 51, 52, 55, 58, 62, 64, 65, 73, 74, 77, 80, 81, 82, 83, 84, 85, 87, 88, 89, 90, 91, 92, 93, 95, 99, 100, 102, 103, 104, 105, 106, 108, 109, 110, 112, 113, 114, 117, 118, 123, 124, 125, 126, 129, 130, 133, 134, 139, 140, 141, 143, 150, 156, 157, 160, 161, 164, 167, 176, 178). Widely spread throughout Norway, previous records listed by Warloe (1924) and Ossiannilsson (1942). Found in all of Scandinavia and Finland. Wide European distribution; Palearctic, subspeciated.

G. lacustris was found in close to half of the locations mentioned in this study. The species thus seems to be the one most often found in Norwegian bodies of water.

It seems clear that *G. lacustris* has a wide ecological amplitude, and can be found in all sorts of water. This has also been noted by Brinkhurst (1959b). It has fairly often been found together with other species of Gerridae.

The species is known to be bivoltine in Scandinavia (Andersen, 1973), and shows great seasonal alary polymorphism.

Gerris odontogaster (Zetterstedt, 1828).

Found in 34 localities (7, 20, 53, 57, 59, 64, 66, 69, 72, 73, 77, 82, 83, 85, 86, 87, 89, 97, 111, 120, 131, 132, 137, 146, 147, 148, 150, 158, 159, 160, 162, 172, 175). Previous Norwegian records listed by Warloe (1924), widely distributed in Norway. Spread in all of Scandinavia and Finland. Found in most of Europe, Siberia and Japan.

This species shows a wide ecological amplitude, as *G. lacustris*, but can be considered even more eurytopic. It has been found in mountain areas and by the sea in slightly brackish waters. Also highly polluted habitats are utilized.

It can be noted that only apterous and macropterous individuals were found. This agrees well with findings of other authors. The species is bivoltine in Scandinavia, and the first generation is predominantly macropterous in the spring and mostly apterous in early summer. For further discussion, see Brinkhurst (1959a), Vepsäläinen (1971) and Andersen (1973).

Aquarius najas (DeGeer, 1773).

Found in 1 locality (119). Three other Norwegian records, all in Warloe (1924), restricted south-eastern distribution. More widely distributed in Sweden, north to Lappmark, only southern records from Finland (Vepsäläinen, 1973). Spread throughout Europe and northern Africa.

The Finnish material is all from rivers (Vepsäläinen, 1973). Macan (1976) writes that it also can be found on large bodies of water. The one record above is from a small creek outlet into the sea, where the water in periods was brackish.

Mitis (1937) and Brinkhurst (1959a) describe *A. najas* as univoltine. Brinkhurst has also noted that mostly apterous individuals are found. This can be due to the fact that the species is mainly found in permanent habitats.

Aquarius paludum (Fabricius, 1794).

Found in 2 localities (90, 98). The Norwegian records by Warloe (1924); south-eastern distribution. Southern distribution in Scandinavia and Finland. Spread throughout Europe, Palearctic.

Vepsäläinen (1973) writes that the species usually inhabits large lakes and ponds. It is also found further from shore than other species of Gerridae.

Limnoporus rufoscutellatus Latreille, 1807.

Found in 4 localities (84, 89, 99, 100). Warloe (1924) lists other Norwegian records; south-eastern distribution. Widespread in Sweden and in Finland. Widely spread in Europe.

Vepsäläinen (1973) states that the species prefers strongly insolated ponds and lakes with rich vegetation. Adults can also be found on brackish water.

Nepidae

Nepa cinerea L. 1758.

Found in 16 localities (1, 93, 95, 102, 103, 117, 122, 139, 144, 149, 160, 161, 162, 167, 170, 171). Warloe (1924) and Økland (1964, 1977) list the Norwegian distribution. Widely spread along the southern coast. Widely spread in Scandinavia, found throughout Europe, Siberia and western China.

N. cinerea is dependent on shallow waters and fairly rich vegetation, as it has a respiratory tube which must protrude the surface. It has been reported from both large and small lakes and ponds, and also ditches. It is a predator (Wesenberg-Lund, 1943).

Ranatra linearis (L. 1758).

Found in 1 locality (122). First Norwegian records by Warloe (1924); Økland (1977) has gathered known information. See also Hansen & Jacobsen (1978). South-eastern Norwegian distribution. North to Hälsingland in Sweden, reported from Finland. Found in all of Europe, northern Africa, Siberia and China.

Due to its similar way of life, *R. linearis* shows similar preferences with regards to habitats as *N. cinerea*. It is usually found in shallow parts of lakes and ponds with fairly rich vegetation (Wesenberg-Lund, 1943; Økland, 1977).

It is a predator, and feeds preferably on insects found on the surface near the shore.

Aphelocheiridae

Aphelocheirus aestivalis (Fabricius, 1794).

Found by Warloe (1924) in Lillesand. Recorded from southern Sweden and Finland, spread throughout Europe and western Siberia.

The one Norwegian record is from a river, and Macan (1976) writes that it is mostly found on stony bottoms in rivers.

Notonectidae

Notonecta glauca L. 1758.

Found in 16 localities (23, 26, 28, 31, 34, 36, 37, 40, 55, 86, 113, 143, 145, 160, 161, 162). Previous Norwegian records by Warloe (1924) and Dolmen & Olsvik (1977). Widely distributed in southern Norway north to Kristiansund. Found throughout Sweden, reported from Finland. Reported from all of Europe, northern Africa and Siberia.

Due to that nymphs of the two Notonectidae can not yet be distinguished, the list above is short. In all, 34 locations have included nymphs of *Notonecta* spp., but are not listed here.

N. glauca is found in a great variety of habitats, but has not been found in the visited mountain districts.

The species is a predator, and feeds on other insects and also smaller fish and fish-larvae (Wesenberg-Lund, 1943).

Notonecta lutea Müller, 1776.

Found in 4 localities (9, 86, 89, 131). Warloe (1924) and Dolmen & Aagaard (1973) list the Norwegian records; widely distributed. Found in all of Scandinavia. Reported from few places in Central Europe, spread through Siberia, Central Asia and Japan.

The species is the only Norwegian Waterbug to over-winter in the egg stage.

The records listed are few, but we find that the species was twice found in dystrophic ponds. This was also noted by Dolmen & Aagaard (1973). Found once in a eutrophic habitat, Østensjøvannet, Oslo, together with *N. glauca*.

Corixidae

Micronecta poweri (Douglas & Scott).

Found in 3 localities (79, 103, 162). First Norwegian reports by Dolmen (1977). Now reported from five localities north to Sør-Trøndelag. Same northern border in Sweden, but found further north in Finland (Jansson, 1976). This species shows a more northern distribution than other species of Micronectinae, and is spread through most of Europe (Nieser, 1978).

Because of the small size of *M. poweri* (adults about 2 mm), it can easily escape detection, and can also slip through the net. It is probably not as rare as the few findings might indicate.

Macan (1976) writes that the species is regularly distributed in stagnant and running waters with a bottom substrate of sand and stones. All Norwegian records are from such localities.

Wroblewski (1958) has found that *M. poweri* needs a fairly great saturation of oxygen, and is therefore often to be found by falls and rapids in smaller rivers. This has not been verified from Norwegian rivers.

Jansson (1977 a,b) has published two papers on the Micronectinae as indicators of water quality in Finland. He has found that *M. poweri* is the only species found in purely oligotrophic waters. It can also be found in slightly eutrophic lakes.

Special for this group of Water-bugs is that they live through the winter as larvae in the 4th instar, and sometimes in the 3rd (Wroblewski, 1958; Kaiser, 1966).

Micronecta minutissima (L. 1758).

This species was published from Ogna on Jæren and Hitterdal by Warloe (1924). The district around Ogna has now been thouroughly investigated, and only *M. poweri* has been found from one locality. It is therefore probable that the findings of Warloe are based on misidentifications, and that *M. minutissima* is not yet found in Norway. The record from Hitterdal, though, has not been checked.

Cymatia bonsdorffi (Sahlberg, C., 1819).

Found in 16 localities (1, 2, 31, 32, 33, 38, 42, 64, 89, 116, 127, 137, 141, 142, 152, 160). Previous Norweigan records are listed by Warloe (1924). Found throughout southern Norway north to Trøndelag. Widespread in Sweden, reported from Finland. Found in most of Europe, excluding the Balkan, and also from Siberia.

C. bonsdorffi is described by Macan (1976) as a carnivore. It is often found in waters with a wall of vegetation. In the Norwegian records, rich vegetation is not a general trend, and the species has often been found in oligotrophic lakes with sparse vegetation. Frequently, it was found together with other species of Corixidae.

Cymatia coleoptrata (Fabricius, 1776).

One Norwegian record from Dovre by Ossiannilsson (1947). Found in southern Sweden, reported from Finland. Spread through Europe, northern Africa and Siberia. The record from Dovre falls outside the main distributional pattern in Scandinavia. Further investigations are necessary.

Macan (1976) describes the habitat preferences as the same as *C. bonsdorffi*, lakes and rivers with a vertical wall of vegetation.

Glaenocorisa propinqua (Fieber, 1860).

Found in 15 localities (2, 33, 42, 46, 48, 49, 53, 54, 76, 107, 116, 127, 141, 145, 148). Previous Norwegian records by Lundblad (1923) and Warloe (1924). Few published records, but clearly a wide Norwegian distribution. Following Jaczewski & Lansbury (1961), the species is split in two sub-species, *G. propinqua propinqua* (Fieber) and *G. propinqua cavifrons* (Thomson). Both are reported from southern and northern Sweden, respectively. Also, both are found in Finland. In Central Europe it is considered a glacial relict; circumpolar distribution.

Previous Norwegian records are found under the name *G. cavifrons* Thomson. This name must be considered a sub-species of *G. propinqua*, but since the taxonomic problems around this species were not sufficiently clarified before 1961, these records do not give information on which subspecies had been found. The present records are all of the sub-species *G. propinqua cavifrons*.

The records listed show that *G. propinqua* is mainly found in oligotrophic lakes and ponds, and is regularly found in mountain districts. It is normally found in deeper waters than most species, and is also recorded in great numbers in acid waters (Raddum et al., 1979).

Callicorixa praeusta (Fieber, 1848).

Found in 4 localities (86, 159, 174, 175). due to the fact that in the beginning of this century, the specific name *C. praeusta* was considered a species group consisting of many sub-species and «varieties», the true nature of relationship in this genus was not sufficiently clarified until Lundblad (1927). Poisson (1957) lists *Corixa sodalis*

(Douglas & Scott, 1870) as a synonym of *C. praeusta*. The first Norwegian records of this species are listed under this synonym, and the records before 1927 under the name *C. praeusta* are disregarded in this study. Previous Norwegian records are found in Warloe (1924). Wide Norwegian distribution, found throughout Sweden and Finland. Northern European distribution, spread in Siberia east to Mongolia.

The locations in which the species was found have in common that they are polluted. Østensjøvannet and Frøylandsvannet are well-known due to this. Macan (1976) mentions that the species requires plenty of vegetation, and this is also found in three of the four listed localities. The fourth lies near large belts of vegetation (Frøylandsvatnet, Klepp). In a previous publication, Macan also notes that *C. praeusta* is closely correlated with polluted waters (Macan, 1954a). He also noted that it is a ready flier, and one of the first inhabitants of new habitats.

Callicorixa wollastoni Douglas & Scott, 1865).

Found in 16 localities (27, 28, 31, 32, 38, 42, 44, 54, 75, 76, 81, 105, 107, 111, 154). Also found in Øvre Heimdalsvann, On: Vågå: 18 Sep. 1972, 6 ♂♂, 7 ♀♀; 19 Sep. 1972, 5 ♂♂, 13 ♀♀; 20 Sep. 1972, 3 ♂♂, 7 ♀♀; 25 Oct. 1972, 3 ♀♀; 4 Oct. 1977, 2 ♂♂; 1 Dec. 1977, 1 ♀; 24 Mar. 1978, 1 ♂. Leg. Zoological Museum, Oslo.

Fi: Vardø, Kongsdalen. 9 Jul. 1974, 1 ♂, 1 ♀. Leg. Zool. Mus., Oslo.

Previous Norwegian record by Ossiannilsson (1947). Widely distributed in Norway, also in Sweden. Siberian distribution, reported from Great Britain, Scandinavia and Siberia.

The species shows a preference for smaller bodies of water in mountain districts, but is also found in small lakes and ponds on the coast of western Norway. Macan (1976) characterizes the habitat of the species as peat pools, most often found in mountain districts in England.

Callicorixa producta Reuter, 1880.

Found in 31 localities (2, 23, 24, 26, 28, 29, 30, 32, 33, 34, 42, 44, 46, 47, 49, 53, 56, 61, 62, 63, 66, 67, 70, 71, 72, 97, 127, 141, 142, 147, 148). Other Norwegian records by Ossiannilsson (1942). Widely distributed throughout Norway, also in Sweden. Holarctic distribution, found in Scandinavia, Siberia and Canada.

Information on *C. producta* in rock pools on the baltic coast of Finland is given by Pajunen (1970). He finds that the adaptation to these temporary, brackish pools is due to the fact that the species has a high capacity for dispersal and a high reproductive capacity.

In the present material, the species has been found in a great number of habitats of different types. It is recorded from fairly rich lakes and ponds and oligotrophic lakes on the coast of western Norway, and also from smaller bodies of water in mountain districts. It clearly has a wide ecological amplitude.

A number of collections were made in 1978 in Myravatnet, Bergen, in order to determine the life-cycle of some species of Corixidae. The results for *C. producta* are shown in fig. 1. Adults were found in spring, and then again 3 July and 23 July. This, together with second instar being found 9 July gives reason to believe that there are two generations per year.

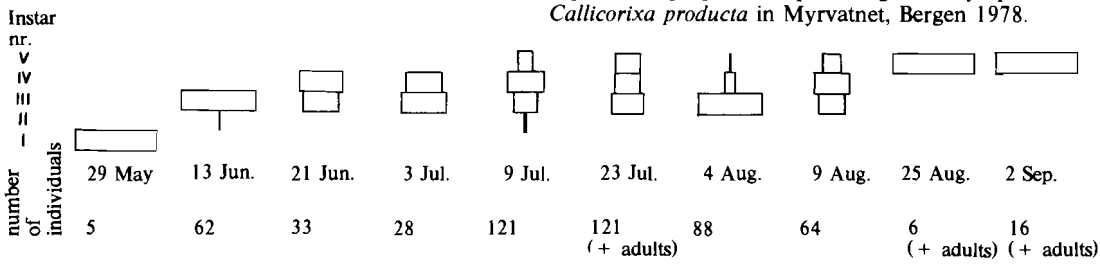
Corixa dentipes (Thomson, 1869).

Found in 15 localities (2, 10, 23, 25, 28, 29, 31, 32, 34, 38, 86, 127, 138, 141, 152). Warloe (1924) lists previous Norwegian records. Found in southern Norway, from Bergen to Oslo. Also, southern Scandinavian distribution. Reported from Central Europe and Siberia.

The habitat of *C. dentipes* is described as rich ponds, but also less luxuriant localities (Macan, 1976). The Norwegian records are from diverse habitats, both small and rich ponds, and larger, oligotrophic lakes. It was often found with a number of other species of Corixidae.

Collections from Myravatnet, Bergen give reason to believe that the species has one full generation per year (fig. 2). The figure might seem to give evidence of two generations by looking at findings 21 June and 3 July. but since the records from 21 June were based on only four specimens, it is probably that also

Fig. 1. The proportions (percentages) of nymphs of *Callicorixa producta* in Myrvatnet, Bergen 1978.



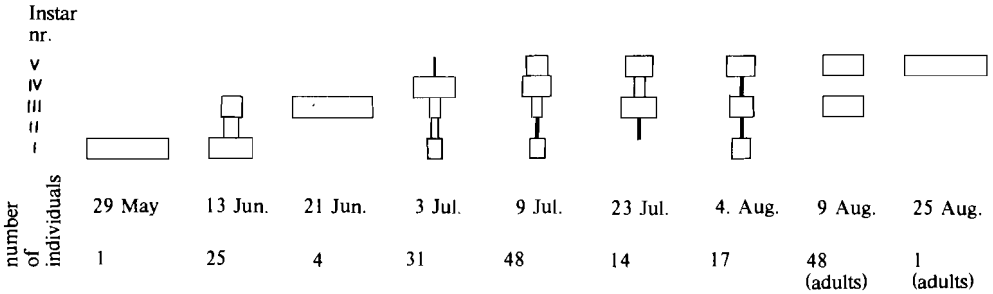


Fig. 2. The proportions (percentages) of nymphs of *Corixa dentipes* in Myravatnet, Bergen in 1978.

at least first and second instar larvae are present. Adults were found first 16 April and not again until 9 August. Thus, it is concluded that *C. dentipes* has one generation per year, but with a long egg-laying period.

Corixa punctata (Illiger, 1807).

Not found in this study. Few Norwegian records, all under the name *Corixa geoffroyi* Leach, 1817, are listed by Warloe (1924). South-eastern Norwegian distribution, recorded from southern Sweden. Widely distributed in Europe (missing in Finland), and Central Asia.

This species is most often referred to in textbooks on Norwegian insects as the representative of the Corixidae. *C. punctata* was not found in this study, and seems to be fairly rare in the Norwegian fauna. Its habitat is described as rich ponds, where it is often found with many other species (Macan, 1954a, 1976). Further investigations in such localities in eastern Norway will probably increase the amount of records.

Hesperocorixa linnei (Fieber, 1848).

Found in 14 localities (4, 5, 6, 10, 11, 16, 18, 37, 89, 102, 138, 161, 167). Other Norwegian records by Warloe (1924), southern distribution. Found in southern Sweden. Wide distribution in Europe, - also North Africa and Siberia.

A general tendency in the records above is habitats with rich vegetation, both lakes and ponds. This is also noted by Macan (1976). Macan (1954a) has noted a trend in that *H. linnei* often precedes *Hesperocorixa sahlbergi* (Fieber, 1848) in bodies of water with accumulating amounts of organic matter.

Hesperocorixa sahlbergi (Fieber, 1848).

Found in 25 localities (2, 8, 18, 19, 25, 27, 28, 29, 31, 34, 40, 51, 56, 58, 59, 66, 86, 99, 140, 143, 156, 161, 2, 164, 173). Previous Norwegian records by Warloe (1924). Distributed throughout southern Norway north to Trøndelag. Found in southern Sweden, wide European distribution, northern Africa and Siberia.

The species occupies a variety of habitats, but shows a preference for smaller bodies of water with rich vegetation. It is often found in waters with rotting leaves on the bottom, and is usually the dominating species here. Brown (1951) and Popham (1964) have reported that *H. sahlbergi* is a ready flier, but not of those species which are most apt to fly. This accounts partly for the occurrence of the species in semi-permanent and temporary bodies of water.

Hesperocorixa castanea (Thomson, 1869).

Found in 8 localities (8, 57, 120, 137, 138, 151, 156, 157). Also, HOy: Austevoll, Selbjørn, 15 Sep. 1978. 1 ♀. Leg. R. Klubnes. Previously uncertain status in Norway (Coulianos, 1976. Found on the western and southern coast of Norway, also in southern Sweden. Reported from Central and western Europe.

The species prefers smaller bodies of water, often with thick vegetation. Macan (1954a) has noted a tendency towards preference of acid waters. Two of the present findings were from dystrophic waters.

Hesperocorixa moesta (Fieber, 1848).

Reports of this species are listed by Warloe (1924). Such early records have been checked in Sweden and Finland (Coulianos, 1976), and have proven to be *H. castanea*. The results of Colianos show that *H moesta* is a more southern species, found recently only in the extreme south of Sweden. Older Norwegian records must be checked to confirm this almost certain misidentification.

Arctocorisa carinata (Sahlberg, C., 1819).

Found in 16 localities (33, 42, 47, 48, 49, 50, 53, 60, 63, 70, 96, 97, 106, 127, 135, 159). Previous Norwegian records by Warloe (1924); wide distribution, found throughout the country. Patchy range in Europe, distinct populations in southern and northern Scandinavia, Iceland (only species on the island), Faeroe Isles, British Isles, Swiss Alps and the Pyrenees (Jansson, 1978; Jansson & Pajunen, 1978). Jansson completed tests with indivuduals from these different populations, and

found clear genetic differences between them. Mostly inviable progeny were produced by crossing specimens from the Swiss Alps with individuals from Iceland and Finland.

Considering habitat preferences of this species, Jansson is consulted. He splits it into ecological groups which coincide well with different isolated populations. The Norwegian results agree well with Jansson's arctic group, where a preference for large and deep lakes is found. On the Atlantic coast, *A. carinata* is also found in smaller bodies of water under varying conditions. Three records are from brackish pools, which is also mentioned by Jansson. He gives evidence for adaption to these diverse environments, shown by morphological variation.

Arctocorisa germari (Fieber, 1848).

Found in 37 localities (1, 2, 3, 4, 5, 10, 12, 13, 14, 23, 24, 31, 32, 33, 34, 37, 42, 54, 62, 64, 81, 87, 88, 89, 90, 102, 112, 116, 127, 128, 131, 136, 137, 141, 150, 164, 174). Also from On: Vågå, Øvre Heimdalsvann, 13 Aug. 1972, 1 ♀. Leg. Zool. Mus., Oslo. Other Norwegian records by Warloe (1924), widely distributed in southern Norway north to Trondheim. In Sweden, records from extreme north and south. Northern European distribution, the British Isles, Scandinavia and Siberia.

Observations on the biology of *A. germari* have been made by Crisp (1962 a,b), and he states some special attributes to the species. In the lake studied, individuals showed a marked tendency to be found at greater depths (1 m) than other species. It also had a preference to lay its eggs on stones on the bottom, while plant stems are chosen by a number of other species (Leston, 1955). Both of these observations fit well with the Norwegian records. The great majority of these are large lakes, often with sparse vegetation. *A. germari* has been shown not to be a ready flier. Due to these preferences, *A. germari* is often found in the same habitats as *G. propinqua,* where both often are found in deep waters.

Collections from Myravatnet, Bergen in 1978 (fig. 3) show evidence for two generations per year. Adults were found in spring and also 3 July and 23 July. Second instar was present 13 June and then again 9 July. We also note that third instar increases in number in the period 9 July—23 July, and fifth instar decreases from 3 July—23 July.

Sigara dorsalis (Leach, 1817).

Found in 26 localities (17, 19, 21, 22, 30, 32, 40, 56, 58, 150, 153, 154, 155, 156, 161, 162, 164, 167, 169, 170, 171, 172, 174, 177, 178). Found only on the western coast of Norway. One previous Norwegian record by Coulianos & Ossiannilsson (1976).

Recorded once from Sweden (Macan, 1954a). Western European distribution, also in Italy and Greece. The distribution of this species is badly known due to confusion with *Sigara striata* L. 1758. Not until Macan (1954 b,c) was this problem sufficiently clarified.

Macan has described the typical habitat as larger lakes and rivers with little organic matter in the bottom substrate, and small amounts of vegetation. This coincides well with the Norwegian records, where 21 of the 26 locations fit this description.

A number of collections were made in Bjårvatnet, Hå, in order to describe the life-cycle of this species. During these investigations, it became clear that the larvae are found in shallower and more heavily vegetated areas than the adults.

The investigations show generations per year for the species in Bjårvatnet. Newly emerged adults, which can be recognized by their pale color and soft exosceleton, were found 9 July, and the following sample 16 July contained one female with eggs, plus younger instars. 23 July fifth instar was absent, but there were large amounts of empty exuviae. (Fig. 4)

Young has discussed life cycles in England (Young, 1965), and he has found a pattern with one generation and a partial second.

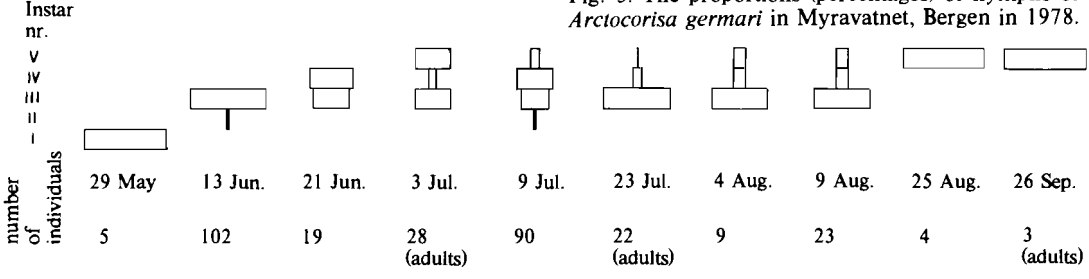


Fig. 3. The proportions (percentages) of nymphs of *Arctocorisa germari* in Myravatnet, Bergen in 1978.

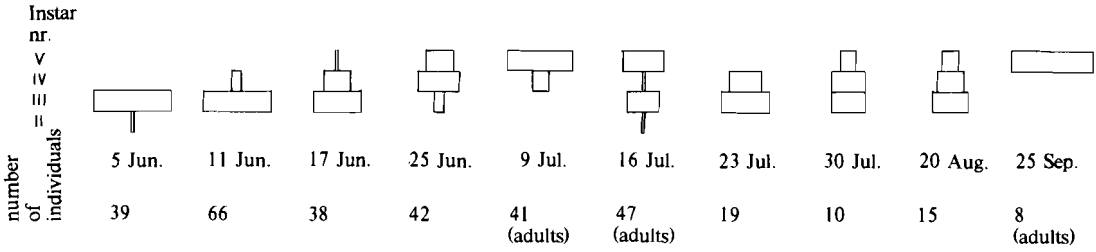


Fig. 4. The proportions (percentages) of nymphs of *Sigara dorsalis* in Bjårvatnet, Brusand in 1978.

Sigara striata (L. 1758).

Found in one locality (86). also, AK: Oppegård, Gjersøelva, 16 Mar. 1971, 1 ♂. Leg Zool. Mus. Oslo. Badly known in Norway, due to confusion with *S. dorsalis*. Previous Norwegian records by Warloe (1924), eastern distribution. Found in all of Sweden, reported from Europe, northern Africa and Siberia.

Macan (1976) describes the habitat preferences of the species as larger lakes with sand bottom, but mostly richer than those inhabited by *S. dorsalis*. The two species have never been found together.

Sigara distincta (Fieber, 1848).

Found in 43 localities (1, 10, 16, 17, 19, 21, 23, 24, 25, 26, 28, 30, 31, 32, 33, 34, 37, 55, 58, 61, 71, 82, 86, 123, 141, 142, 145, 150, 154, 155, 160, 161, 162, 163, 164, 165, 166, 168, 169, 170, 174, 175, 178). Previous Norwegian records by Warloe (1924); wide Norwegian distribution south of Skogn in Nord-Trøndelag. Found north to Lule Lappmark in Sweden. Widely distributed in Europe, but missing from the south-western areas. Reported from Siberia.

S. distincta was found in about 1/4 of the locations in this study. It is found in a great variety of habitats, but is missing in the mountain districts. specimens have been found in small, temporary ponds and in oligotrophic and eutrophic lakes. Macan (1976) describes its habitat as reed belts in lakes, where there is some accumulation of organic material, and also in ponds. This description generally fits a great number of habitats.

In 18 localities, *S. distincta* was found with *S. dorsalis*. As *S. dorsalis* was only found in 26 locations, this gives a close correlation between the species. Indeed, in most larger oligotrophic lakes where *S. dorsalis* was found, *S. distincta* was present, often in smaller numbers.

Sigara falleni (Fieber, 1848).

Found in 2 localities (81, 87). Also, AK: Hurdal, Prestegårdshagen, 10 May 1970, 1 ♂. Leg. Zool. Mus., Oslo.

Previous Norwegian records by Warloe (1924), south-eastern distribution. Widespread in Sweden, found throughout Europe, northern Africa and Siberia.

Macan (1976) describes the habitat of this species as about the same as *S. distincta*, but is more regularly found in rich waters. This could account for its eastern distribution in Norway, as most eutrophic localities are located here.

Sigara fossarum (Leach, 1818).

Norwegian records listed by Warloe (1924). Widely distributed in Sweden, reported from Central and northern Europe, and Siberia. Due to that the species *Sigara scotti* (Fieber, 1868) has not been recognized in the Norwegian fauna, it is necessary to check previous records of *S. fossarum* to determine possible misidentifications. Since this has not been done, all records are disregarded.

The habitat of the species is described by Macan (1976) as lakes and rivers and rich ponds.

Sigara scotti (Fieber, 1868).

Found in 14 localities (1, 4, 17, 120, 122, 139, 143, 153, 154, 156, 160, 162, 167, 170). Not previously recorded from Norway. South-western Norwegian distribution. Found on the south and south-western coast of Sweden, misssing from Finland. Mainly a western European distribution.

Nine of the fourteen localities in this study have the same general characteristics, larger bodies of water with little organic material in the bottom substrate. In seven of these habitats, *S. dorsalis* was also found. This species is known as a frequent inhabitant of such places (Macan, 1976), and this seems to be true for *S. scotti* as well. Macan also adds its preference towards pools under all conditions, and states the necessity of sparse vegetation.

Sigara lateralis (Leach, 1818).

Found in 4 localities (4, 138, 151, 156). One previous record from Norway by Warloe (1924) under the name *Sigara hieroglyphica* Dufor 1833. Western Norwegian distribution. Found in southern Sweden, missing in Finland. Widely dis-

tribution in Europe, northern Africa, Siberia and China.

In England the species is known to prefer brackish water and waters fouled by animals (Macan, 1976). We notice that two of the records above are from dystrophic ponds.

Sigara nigrolineata (Fieber, 1848).

Found in 6 localities (4, 27, 28, 66, 159, 162). Previous Norwegian records by Warloe (1924) under the name *Corisa fabricii* (Fieber, 1851). Widespread in southern Norway, north to Trondheim. Southern Swedish distribution, recorded from all of Europe.

The records give evidence of a preference for smaller bodies of water, a trend also noted by Macan (1976). It is known to be a ready flier (Popham, 1964), so the tendency to be found in small pools is not surprising.

Sigara semistriata (Fieber, 1848).

Found in 26 localities (4, 23, 26, 27, 33, 34, 38, 53, 55, 57, 59, 66, 78, 86, 89, 105, 107, 109, 111, 129, 131, 136, 141, 145, 156, 160). Also, HOy: Austevoll, Selbjørn, 15 Sep. 1978, 2 ♂♂, 1 ♀, 3 juv. Leg. R. Klubnes. Previous Norwegian records are listed by Warloe (1924), widespread in southern Norway, north to Trondheim. Found throughout Sweden, reported from all of Europe, northern Africa and Siberia.

This species clearly occupies a great variety of different habitats, but is missing from the larger, oligotrophic lakes. A number of the listed localities are temporary and semi-permanent ponds, often in swamps, and often with a peat bottom. Macan (1976) has also noted this tendency.

Sigara hellensi (Sahlberg, C., 1819).

One Norwegian record from Eidsvoll (Warloe, 1924). Found only in southern Sweden, distributed in Central and northern Europe, excluding the British Isles.

Little is known of the habitat preferences of this species.

DISCUSSION

HABITAT PREFERENCES

A large amount of work has been done on habitat preferences for the Water-bugs, especially for the Corixidae and the Gerridae. Some useful references are: Brown (1951), Macan (1938, 1954a, 1962, 1965), Mitis (1937), Popham (1943), Young (1965).

This discussion is based upon tab. 2—6.

Oligotrophic species

A number of species of Corixidae were regularly found in large, oligotrophic lakes. *Sigara scotti* was often found under such conditions, and together with this species were often *S. dorsalis* and *S. distincta*. *Micronecta poweri* was found in three large lakes on a sandy or stone substrate under exposed conditions. *S. lateralis* was recorded a few places.

Oligotrophic mountain lakes and ponds contain very few species, and three have often been found together, *Glaenocorisa propinqua, Callicorixa producta* and *Arctocorisa carinata*. On the Hardangervidda, only these three were found. Outside this area, *A. germari* and *Cymatis bonsdorffi* were found in similar barren habitats, and *C. wollastoni* could also occur.

In larger lakes with moderate vegetation, some more species occur, and many are found in smaller numbers, such as *C. bonsdorffi, Hesperocorixa linnei* and *H. sahlbergi*.

Of other Water-bugs, many have been found in oligotrophic lakes and ponds, those occurring most frequently being *Gerris odontogaster, G. lacustris, G. lateralis, Mesovelia furcata* and *Nepa cinerea*.

Mesotrophic species

The great majority of species found in oligotrophic waters also occur in mesotrophic waters. But it is typical that a larger amount of species are found here than in larger, poorer habitats. *S. semistriata, H. sahlbergi, Corixa dentipes, H. castanea* and *S. nigrolineata* of the Corixidae and *Notonecta glauca* come in addition to those mentioned above.

The smaller lakes with fairly large amounts of vegetation (type C) have contained the greatest variety of species of Corixidae. In one such lake, Myravatnet, Bergen, nine species were found, while in other similar lakes, seven or eight were recorded.

Eutrophic species

Very few typically eutrophic localities were visited during this study. Some general remarks will, however, be made.

A number of species found in oligotrophic water are also recorded from eutrophic localities. Of the Corixidae, *C. praeusta* and *S. semistriata* have occurred in the largest amounts, while many others are found in smaller numbers (tab. 3, 5). Two species of Corixidae, *S. falleni* and *S. striata* were found only in eutrophic habitats. This is also true for *Notonecta lutea*, but this species was also found in dystrophic waters.

Table 1. Polymorphism among some of the species of Water-bugs. M-macropterous, sM-sub-macropterous, B-brachypterous, sB-sub-bracypterous, m-micropterous, A-apterous. For the definitions, see Brinkhurst (1959a).

Species	M		sM		B		sB		M		A	
	♂♂	♀♀	♂♂	♀♀	♂♂	♀♀	♂♂	♀♀	♂♂	♀♀	♂♂	♀♀
Mesovelia furcata											20	12
Hydrometra stagnorum											4	2
Velia caprai											2	
Microvelia reticulata											1	11
Gerris lateralis	10	7									29	34
G. thoracicus		1										
G. lacustris	85	88	2	30	3	41	45	2	21			
G. odontogaster	46	24	2								5	5
Aquarius najas											1	1
A. paludum	1											
Limnoporus rufoscutellatus		3										

Dystrophic species

No species was found only in dystrophic waters, but a number of species were recorded a few times. The species found in largest amounts were *H. castanea* and *G. lacustris*.

A mixotrophic swamp pond (type H) contained some more species, *S. semistriata, A. germari, N. lutea, Limnoporus rufoscutellatus* and *G. odontogaster*.

Species in brackish waters

Only six species were found in brackish waters, those occurring in the largest amounts were *C. producta* and *A. carinata*. Also, *Aquarius najas* and *Mesovelia furcata* were recorded in fairly large numbers. Two other Gerridae, *G. thoracicus* and *G. odontogaster* were found once in a brackish habitat.

DISTRIBUTIONAL TYPES

The distributional maps of the species are found in the Appendix II. Several different patterns can be sorted out; western coast species, eastern species and species with a wide distribution.

Three species of Corixidae can be considered to have a western distribution, *Sigara scotti, S. dorsalis* and *Hesperocorixa castanea*. The European distributions of these species are also western, and each of them have a closely related species with a more continental distribution. This might be explained by a sisterspecies relationship, where the two species previously showed a continuous distribution. The possible sister- species are respectively *S. fossarum, S. striata* and *H. moesta*. These speculations need confirmation by methods of phylogenetic systematics (Hennig, 1966).

Species with an eastern distribution in Norway are *S. striata* and *S. falleni*. A number of species have a south-eastern distribution, and probably have entered Norway from southern Sweden. The species are *Gerris argentatus, Aquarius najas, A. paludum, Limnoporus rufoscutellatus* (Gerridae), *Ranatra linearis* (Nepidae), *Hydrometra gracilenta* (Hydrometridae) and *Aphelocheirus aestivalis* (Aphelocheiridae). Reason for this distributional type can be of both ecological and biogeographical character. Certain habitat types are largely situated in eastern Norway. Also, species under invasion after the glaciation periods might not have had sufficient time to spread further in the country. Most of the Gerridae are largely found on permanent large lakes, and are usually apterous. Development of macropterous individuals in the waterbugs is normally preceded by deterioration of the habitat and expanding populations (Järvinen & Vepsäläinen, 1976). Such situations are probably rare in stable habitats, and this can slow down the dispersal rate.

The remaining species can be grouped under widely distributed species. Two species show a boreo-alpine distribution in Europe, *Arctocorisa carinata* and *Glaenocorisa propinqua*. The rest of the species are widely distributed in Europe, and have different northern borders in Norway. The reason for the uncertainly about the northern borders is that very little work has been done on Water-bugs north of Trøndelag. In fact, only five species of the Water-bugs are reported further north than this.

Table 2. List of species of Water-bugs collected in southern Norway in 1977—1979. The data given is: number of localities where the species was found, number of indivduals, sex ratio and juveniles and number of localities in different habitats. The habitats are classified in the Appendix I.

Species		Nr. of localities Ind.	♂♂♀♀ juv.	Habitat type A	B	C	D	E	F	G	H	I	J	K	L	M	N
Mesovelia furcata	11	54	20/ 12/ 22	3	1	4	—	2	—	—	—	—	—	—	—	1	—
Hydrometra stagnorum	5	6	4/ 2/ 0	2	—	—	—	—	—	—	—	1	—	1	—	—	—
Velia caprai	2	2	2/ 0/ 0	1	—	1	—	—	—	—	—	—	—	—	—	—	—
Microvelia reticulata	8	12	1/ 11/ 0	2	1	3	—	—	—	1	1	—	—	—	—	—	—
Gerris lateralis	15	109	39/ 41/ 29	2	2	1	1	—	—	1	—	2	—	4	2	—	—
G. thoracicus	2	6	0/ 0/ 6	1	—	—	—	—	—	—	—	—	—	—	1	—	
G. argentatus	4	8	0/ 1/ 7	2	—	2	—	1	—	—	—	—	—	—	—	—	—
G. lacustris	83	608	164/158/286	18	9	12	7	6	1	6	1	10	2	8	1	—	1
Aquarius najas	1	19	1/ 1/ 17	—	—	—	—	—	—	—	—	1	—	—	—	(1)	—
A. paludum	2	6	1/ 0/ 5	2	—	—	—	—	—	—	—	—	—	—	—	—	—
Linmoporus rufoscutellatus	4	15	0/ 5/ 10	—	—	—	1	1	—	1	1	—	—	—	—	—	—
Nepa cinerea	16	34	3/ 0/ 31	7	—	2	2	1	—	1	—	1	—	2	—	—	—
Ranatra linearis	1	1	0/ 0/ 1	1	—	—	—	—	—	—	—	—	—	—	—	—	—
Notonecta glauca	16	34	40/ 23/ 00	2	1	5	2	—	1	1	—	—	—	3	1	—	—
N. lutea	4	7	5/ 2/ 0	—	1	—	—	—	1	1	1	—	—	—	—	—	—
Micronecta poweri	3	37	22/ 15/ 0	3	—	—	—	—	—	—	—	—	—	—	—	—	—
Cymatia bonsdorffi	16	162	12/ 12/138	4	4	5	2	—	—	—	1	—	—	—	—	—	—
Glaenocorisa propinqua	15	111	11/ 9/ 91	2	9	3	—	—	—	—	—	—	—	1	—	—	—
Callicorixa praeusta	4	33	16/ 12/ 5	2	—	—	—	—	1	—	—	—	—	1	—	—	—
C. wollastoni	16	77	18/ 21/ 38	2	6	2	—	—	1	1	—	—	—	2	1	—	—
C. producta	31	906	77/ 76/753	6	8	7	2	—	—	—	—	1	—	3	3	1	—
Corixa dentipes	15	242	20/ 35/187	3	2	5	1	—	1	1	—	1	—	—	1	—	—
Hesperocorixa linnei	14	84	12/ 15/ 57	3	2	2	1	—	—	2	1	2	—	1	—	—	—
H. sahlbergi	25	206	64/ 77/ 65	4	3	4	4	1	1	—	—	3	—	4	1	—	—
H. castanea	8	91	11/ 9/ 71	—	2	1	1	—	—	2	—	1	—	1	—	—	—
Arctocorisa carinata	16	182	22/ 29/131	2	7	2	—	—	—	—	—	—	1	1	3	—	
A. germani	37	630	61/ 64/505	9	6	12	1	1	1	1	1	1	2	2	—	—	—
Sigara dorsalis	26	977	97/143/737	16	3	2	2	—	—	—	—	—	—	3	—	—	—
S. striata	1	7	1/ 1/ 5	—	—	—	—	—	1	—	—	—	—	—	—	—	—
S. distincta	43	438	168/249/221	20	3	10	3	—	1	—	—	—	—	4	2	—	—
S. falleni	2	21	1/ 1/ 19	—	—	—	—	—	1	—	—	—	1	—	—	—	—
S. scotti	14	291	82/100/109	8	—	1	2	—	—	1	—	—	—	2	—	—	—
S. lateralis	4	5	0/ 0/ 5	—	1	—	—	—	—	2	—	—	—	1	—	—	—
S. nigrolineata	6	26	7/ 5/ 14	1	—	1	—	—	—	1	—	—	—	2	1	—	—
S. semistriata	26	104	24/ 24/ 56	—	6	7	2	—	1	4	1	1	—	4	—	—	

Table 3. Species of Corixidae listed after their habitat preferences in lakes and rivers, and also dystrophic waters.

0-1 to 4 records, 00-5 to 9 records, 000-10 to 14 records, 0000-15 or more records, ●-1 mass occurrence, Ø-2 to 5 mass occurrences.

Species	Oligo-trophic	Meso-trophic	Eu-trophic	Dys-trophic
Sigara scotti	*Ø00*			*0*
Micronecta poweri	●			
S. lateralis	0			0
S. dorsalis	Ø000	0		
Glaenocorisa propinqua	Ø00	0		
Callicorixa producta	Ø00	●		
Arctocorisa carinata	Ø0	0		
Hesperocorixa castanea	0	0		Ø
S. distincta	Ø●00	Ø0	0	
A. germari	Ø000	●	0	0
Cymatia bonsdorffi	Ø00	●	0	0
H. linnei	Ø0	0	0	0
H. sahlbergi	Ø0	0	0	
C. wollastoni	●0	0	0	0
Corixa dentipes	00	Ø0	0	0
S. semistriata	●0	0	●	0
S. nigrolineata		●		0
C. praeusta	0		Ø	
S. falleni			●	
S. striata			0	

Table 4. Species Water-bugs (except Corixidae) listed after their habitat preferences in lakes and rivers, and also dystrophic waters.

Species	Oligo-trophic	Meso-trophic	Eu-trophic	Dys-trophic
Hydrometra stagnorum	0			
Gerris thoracicus	0			
Aquarius paludum	0			
Ranatra linearis	0			
Microvelia reticulata	00	0		0
G. lateralis	●	0		0
G. lacustris	●000	00	●	●
G. odontogaster	Ø00	0	0	0
Nepa cinerea	000		0	
Mesovelia furcata	●0	0	0	
Notonecta glauca	0	0	0	0
G. argentatus	0	0	0	
Velia caprai		0		
N. lutea			0	0

Table 5. Species of Corixidae listed after their habitat preferences in ponds, and also brackish waters.

Species	Oligo-trophic	Meso/Eu-trophic	Brackish
Sigara scotti	Ø		
S. distincta	●0		
Hesperocorixa castanea	●		
S. semistriata	00		
S. lateralis	0		
Glaenocorisa propinqua	0		
S. dorsalis	0		
Cymatia bonsdorffi	0		
Callicorixa wollastoni	0		
Corixa dentipes	0		
C. producta	Ø00	0	●
H. sahlbergi	●0	00	
S. nigrolineata	0	0	
Arctocorisa germari	0	0	
A. carinata	0	0	●
H. linnei	0	0	
C. praeusta		0	
S. falleni		0	

Table 6. Species of Water-bugs (except Corixidae) listed after their habitat preferences in ponds, and also brackish waters.

Species	Oligo-trophic	Meso/Eu-trophic	Brackish
Notonecta lutea	0		
Gerris lacustris	●0	00	
G. odontogaster	00	00	0
G. lateralis	Ø	0	
N. glauca	●	●	
Nepa cinerea	0	0	
Hydrometra stagnorum		0	
Aquarius najas			●
Mesovelia furcata			0
G. thoracicus			0

ACKNOWLEDGEMENTS

This study was supported by the University of Bergen. The Museum of Zoology, University of Bergen, has been kind to give me good working facilities necessary to complete this study. I wish to thank Professor Ole A. Sæther for aid in preparing the final manuscript, and Førstelektor Bjarne A. Meidell for guidance during the research period. Also, a thanks to my father, John R. Jastrey, for collecting the material in Bjårvatnet.

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Received 18 Apr. 1980.

APPENDIX I *(pp. 18—21)*

List of localities where Water-bugs were collected in 1977—1979 throughout Southern Norway. The data given in the lists are: number of the locality (cf. Fig. 5), name of the locality by the system of Strand (1943), date of collection, UTM references, altitude and habitat type. The different habitat types are classified below. Most localities are ascribed to one of these types, but some fall into two categories.

A: Moderat to large oligotrophic lakes or large rivers, mostly with sand or gravel bottom. Vegetation usually sparse and consisting mainly of *Lobelia dortmania, Potamogeton* spp., *Equisetum* spp., *Nymphaea* spp. and often some *Phragmites communis.*

B: Small to moderate oligotrophic lakes, mostly situated in barren areas or mountain districts. Sand and/or gravel bottom, vegetation usually sparse, *Carex rostrata, Carex* spp.

C: Small oligotrophic to mesotrophic lakes with varying bottom substrate and usually rich vegetation of *P. communis* and often *Equisetum* sp. Situated in housing or farming areas in western or southern Norway.

D: Small ponds or lakes with mud bottom, often covered with thick layer of rotting leaves. Sparse or no vegetation. Semi-permanent or temporary.

E: Small mesotrophic to eutrophic lakes with rich vegetation, often *P. communis.* Bottom of mud, clay or thick layer of detritus. Found in eastern Norway.

F: Large eutrophic lakes or rivers with rich and varied vegetation.

G: Dystrophic ponds or lakes, mostly in swamp areas. Sheer sides and peat/mud bottom. Vegetation often including *Nymphaea* sp and *Equisetum* sp.

H: Mixotrophic pond with rich vegetation of *Carex rostrata* and *Typha* sp.

I: Small, slow-flowing creeks with varying bottom conditions and often moderate shore vegetation of *Carex* sp.

J: Eutrophic canal in marsh. Clay bottom, rich vegetation of *P. communis, Sparganium* sp. *Butomus umbellatus, Scirpus lacustris.* Situated in eastern Norway.

K: Temporary or semi-permanent ponds or ditches in swamps. Bottom of mud or peat. Vegetation normally sparse, sometimes floating vegetation of *Potamogeton* sp. and *Lemna minor.*

L: Temporary ponds with clay bottom, no vegetation.

M: Brackish waters, usually on cliffs near the sea oversprayed regularly by sea water.

N: Swift-flowing river with vegetation of *Ranunculus peltatus.*

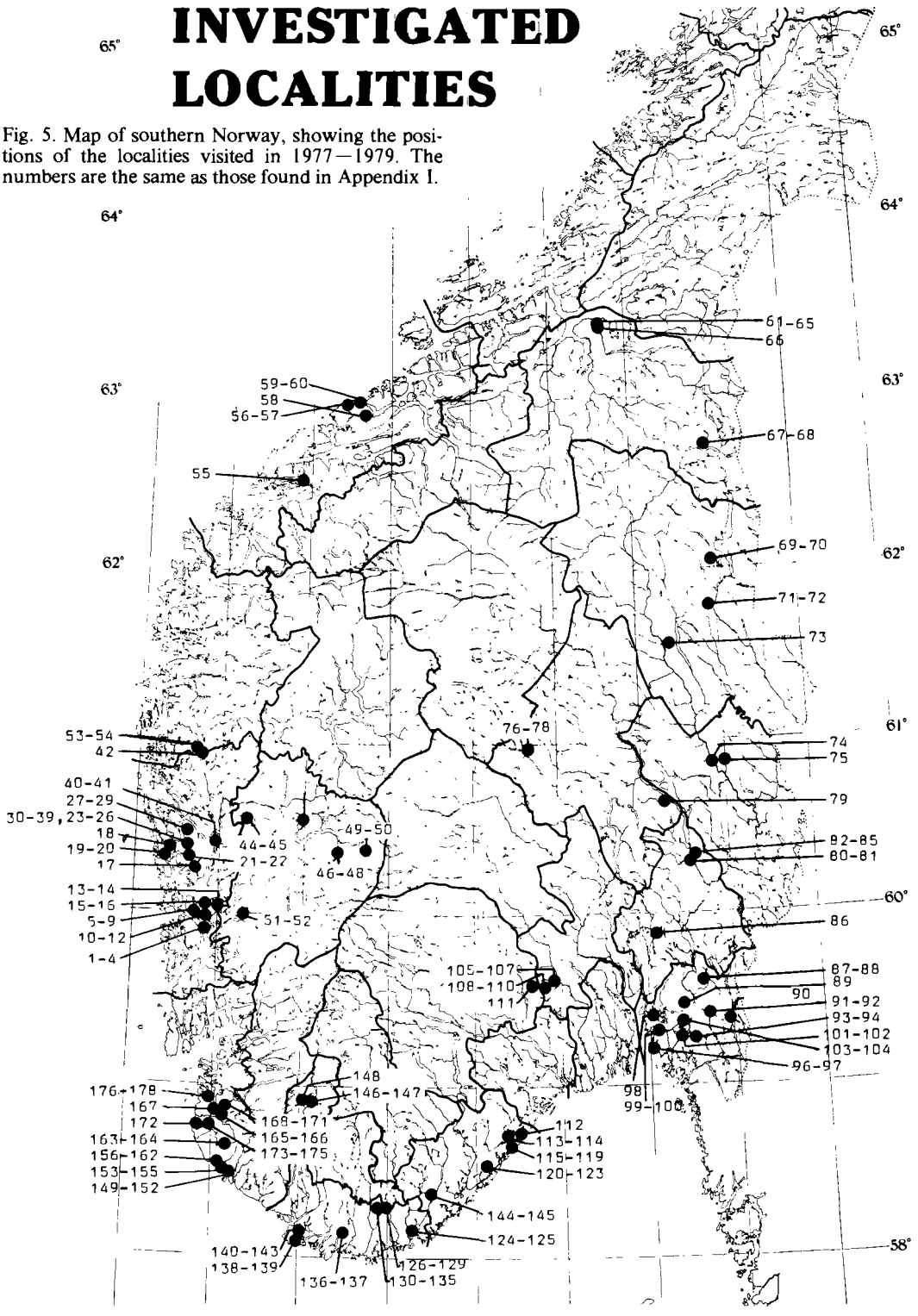
APPENDIX II *(pp. 22—24)*

Maps showing the known distributions of species of Water-bugs in Norway. The maps are in the same sequence as in the text. Three species recorded as Norwegian are not found on any map, the reason for this is that there no known locality for the Norwegian records. All known previous records are included, except those mentioned in the text.

The maps have been made by the EIS-system (Heath, 1973). For exact information on each locality, see Appendix I and the text.

INVESTIGATED LOCALITIES

Fig. 5. Map of southern Norway, showing the positions of the localities visited in 1977—1979. The numbers are the same as those found in Appendix 1.

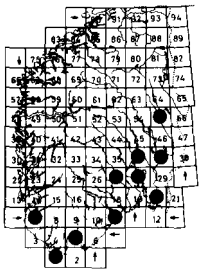


Locality		Date of collection	UTM 32V-	Altitude m.a.s.l.	Habitat type
1. Nordbustadvatnet	HOy:Tysnes	10 Jul.1978	LM068527	44	A
2. Flatråkervatnet	HOy:Tysnes	10 Jul.1978	LM069510	43	A
3. Jælnetjønn	HOy:Tysnes	10 Jul.1978	LM067511	43	A
4. Hovdenestjønn	HOy:Tysnes	10 Jul.1978	LM022563	11	G
5. Li	HOy:Tysnes	10 Jul.1978	LM017541	22	C
6. Li	HOy:Tysnes	10 Jul.1978	LM019542	22	I
7. Tveit	HOy:Tysnes	10 Jul.1978	LM008545	45	A
8. Tveit	HOy:Tysnes	10 Jul.1978	LM008545	45	I
9. Midtvatnet	HOy:Tysnes	10 Jul.1978	KM999556	8	G
10. Kyrkjevatnet	HOy:Tysnes	10 Jul.1978	LM047567	22	C
11. Tjørni	HOy:Tysnes	10 Jul.1978	LM043582	29	A
12. Heievatnet	HOy:Tysnes	10 Jul.1978	LM047582	28	A
13. Gjellefall	HOy:Tysnes	10 Jul.1978	LM075554	65	K
14. Onarheimsvatnet	HOy:Tysnes	10 Jul.1978	LM107527	150	B
15. Vevatnet	HOy:Tysnes	10 Jul.1978	LM133618	50	B
16. Fiskevatnet	HOy:Tysnes	10 Jul.1978	LM129629	5	A
17. Syftelandsvatnet	HOy:Os	7 Aug.1978	LM0381	50	A
18. Arevatnet	HOy:Fjell	9 May 1978	KM874978	16	C
19. Fjell	HOy:Fjell	9 May 1978	KM832945	6	A
20. Ølvesat	HOy:Fjell	9 May 1978	KM8194	20	I
21. Kalandsvatnet	HOy:Bergen	16 Aug.1977	LM016864	53	A
22. Heuglandsvatnet	HOy:Bergen	16 Aug.1977	LM037872	53	A
23. Bjørndalstjernet	HOy:Bergen	28 Aug.1978	KM930978	30	C
24. Gravdalsvatnet	HOy:Bergen	28 Aug.1978	KM944998	12	A
25. Lønborg	HOy:Bergen	7 Aug.1978	KN958063	20	O
26. Åstveit	HOy:Bergen	7 Aug.1978	KN978071	40	O
27. Gaupås	HOy:Bergen	28 Aug.1977	LN024073	68	C
28. Gaupås	HOy:Bergen	28 Aug.1977	LN018078	70	L
29. Kalsås	HOy:Bergen	7 Aug.1978	LN018078	70	I/L
30. Langavatnet	HOy:Bergen	7 Aug.1978	KN996103	90	A
31. Nygårdstjernet	HOy:Bergen	28 Aug.1977	LM043964	73	C
32. Haukelandsvatnet	HOy:Bergen	7 Aug.1978	LM046975	75	A
33. Søylevatnet	HOy:Bergen	28 Aug.1977	LM035962	73	C
34. Myravatnet	HOy:Bergen	16 Apr.1978	KM989943	32	C
35. Birkelandsbakken	HOy:Bergen	28 Aug.1977	KM9894	50	O
36. Tveitavatnet	HOy:Bergen	2 Sep.1978	KM992968	50	A
37. Kronstad	HOy:Bergen	2 Sep.1978	LM986983	36	C
38. Brushytta,Fløien	HOy:Bergen	3 Oct.1977	KN991017	350	B
39. Skomakerdiket	HOy:Bergen	3 Oct.1977	KN991012	350	B
40. Holdhus	HOy:Bergen	21 Sep.1977	LN1800	200	B
41. Gullbotn	HOy:Bergen	21 Sep.1977	LN1602	240	B
42. Botnatjønn	HOy:Masfjorden	25 May 1977	LN0258	250	B
43. Granvinvatnet	HOi:Granvin	21 Sep.1977	LN7415	23	A
44. Svartavatnet	HOi:Vaksdal	21 Sep.1977	LN3518	450	B
45. Røydland	HOi:Vaksdal	21 Sep.1977	LN3318	400	I

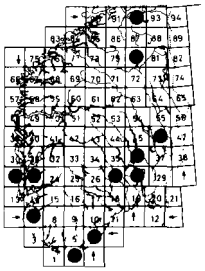
Locality		Date of collection	UTM 32V-	Altitude m.a.s.l.	Habitat type
46. Viveli	HOi:Ullensvang	12 Aug.1978	LM9892	1000	B/K
47. Viveli	HOi:Ullensvang	12 Aug.1978	LM9892	1000	B
48. Viveli	HOi:Ullensvang	12 Aug.1978	LM9892	1000	B
49. Dyranut	HOi:Ullensvang	12 Aug.1978	MM1694	1200	B
50. Dyranut	HOi:Ullensvang	12 Aug.1978	MM1694	1200	B
51. Baroniet	HOi:Kvinnherad	6 May 1977	LM3554	40	D
52. Baroniet	HOi:Kvinnherad	6 May 1977	LM3554	40	K/D
53. Furdalsvatnet	SFy:Gulen	27 May 1977	LN0264	300	B
54. Austgulvatnet	SFy:Gulen	26 May 1977	LN0265	650	B
55. Gåsedammen	MRy:Ålesund	1 Aug.1978	LQ6030	40	K
56. Farstad	MRy:Fræna	31 Jul.1978	MQ0785	10	D/C
57. Sandblåst	MRy:Fræna	31 Jul.1978	MQ1085	20	B
58. Lyngstadvatnet	MRy:Eide	31 Jul.1978	MQ1780	36	A
59. Visnes	MRy:Eide	30 Jul.1978	MQ1882	20	B
60. Klipen, Vevang	MRy:Eide	30 Jul.1978	MQ1487	5	M
61. Litlvatnet	STi:Trondheim	29 Jul.1978	NR7929	148	A
62. Sæterbakken	STi:Trondheim	29 Jul.1978	NR7632	181	C
63. Skistua	STi:Trondheim	29 Jul.1978	NR6435	500	C
64. Theisendammen	STi:Trondheim	29 Jul.1978	NR6833	156	C
65. Kyvatn	STi:Trondheim	29 Jul.1978	NR6832	186	A
66. Sjetnemyra	STi:Trondheim	28 Jul.1978	NR6926	160	K
67. Hitterdal	STi:Røros	28 Jul.1978	PQ3646	690	K
68. Hitterdal	STi:Røros	28 Jul.1978	PQ3646	690	K
69. Galtsæter	HEn:Engerdal	27 Jul.1978	PP4568	640	K
70. Galtsæter	HEn:Engerdal	27 Jul.1978	PP4568	640	L
71. Sølenstua	HEn:Engerdal	27 Jul.1978	PP4562	640	L
72. Holsæter	HEn:Rendalen	27 Jul.1978	PP3252	600	K
73. Kjemsjøen	HEn:Stor-Elvdal	27 Jul.1978	PP1128	400	B
74. Sagtjernet	HEs:Elverum	27 Jul.1978	PN395541	180	C
75. Årtjernskjølen	HEs:Elverum	27 Jul.1978	PN435538	220	K
76. Damtjønn	Os :Nord-Aurdal	25 Jul.1978	NN2257	500	B
77. Aurdal fjellkirke	Os :Nord-Aurdal	25 Jul.1978	NN233579	607	G
78. Susfjord	Os :Nord-Aurdal	15 Oct.1977	NN1562	700	G
79. Mjøsa, Årsby	Os :Østre Toten	25 Jul.1978	PN1425	300	A
80. Risa	AK :Eidsvoll	26 Jul.1978	PM225855	130	N
81. Andelva	AK :Eidsvoll	26 Jul.1978	PM239889	150	F
82. Jønsjøen	AK :Eidsvoll	26 Jul.1978	PM284909	197	A
83. Holsjøen	AK :Eidsvoll	26 Jul.1978	PM295943	200	E
84. Holsjøen	AK :Eidsvoll	26 Jul.1978	PM294942	200	G
85. Ørekyttjernet	AK :Eidsvoll	26 Jul.1978	PM281953	250	E
86. Østensjøvannet	AK :Oslo	24 Jul.1978	PM0341	107	F
87. Hersetsjøen	Ø :Trøgstad	24 Jul.1978	PM3517	130	J
88. Hæra	Ø :Trøgstad	24 Jul.1978	PM3517	130	J
89. Bjørnemyr	Ø :Aremark	23 Jul.1978	PL5178	100	H
90. Bøensfjorden	Ø :Marker	23 Jul.1978	PL5081	107	A

Locality		Date of collection	UTM 32V-	Altitude m.a.s.l.	Habitat type
91. Holmetjønn	Ø :Rakkestad	23 Jul.1978	PL3993	100	E
92. Sæterdalen	Ø :Rakkestad	23 Jul.1978	PL3993	180	D
93. Ertevannet	Ø :Rakkestad	23 Jul.1978	PL3578	104	E
94. Kjennertjern	Ø :Rakkestad	23 Jul.1978	PL3083	100	E
95. Lund	Ø :Skiptvedt	23 Jul.1978	PL1996	150	K
96. Stensholmen	Ø :Onsøy	12 Jul.1979	PL0160	5	M
97. Stensholmen	Ø :Onsøy	12 Jul.1979	PL0160	10	M
98. Vannsjø	Ø :Moss	12 Jul.1979	NL9588	25	A
99. Tomb jordbruksskole	Ø :Råde	12 Jul.1979	PL0377	30	E
100. Tomb jordbruksskole	Ø :Råde	12 Jul.1979	PL0377	25	D
101. Isesjøen	Ø :Skjeberg	23 Jul.1978	PL2976	38	A
102. Isoa	Ø :Skjegerg	23 Jul.1978	PL2876	38	I
103. Tunevatnet	Ø :Tune	23 Jul.1978	PL1875	12	A
104. Mingevatnet	Ø :Tune	23 Jul.1978	PL1782	25	A
105. Austre Sarlinddalen	Bø :Kongsberg	22 Jul.1978	NM3214	350	C
106. Nydammen	Bø :Kongsberg	22 Jul.1978	NM3115	621	B
107. Nydammen	Bø :Kongsberg	22 Jul.1978	NM3115	621	K
108. Steingrunnsvatnet	Bø :Kongsberg	22 Jul.1978	NM2810	329	B
109. Svarttjern	Bø :Kongsberg	22 Jul.1978	NM2708	400	C
110. Øksne	Bø :Kongsberg	22 Jul.1978	NM2708	390	I
111. Tinnemyr	TEi:Notodden	22 Jul.1978	NM1605	300	B
112. Tjerndalstjernet	AAy:Risør	20 Jul.1978	NL115098	30	E
113. Bossviktjernet	AAy:Risør	20 Jul.1978	NL059089	20	C
114. Hammartjønn	AAy:Risør	20 Jul.1978	NL033094	20	C/D
115. Sandnesfjorden	AAy:Tvedestrand	20 Jul.1978	NL041052	0	M
116. Gulspettvatnet	AAy:Tvedestrand	20 Jul.1978	NL050030	56	B
117. Svinbutjern	AAy:Tvedestrand	20 Jul.1978	NL052013	50	C
118. Geving, Hagen	AAy:Tvedestrand	19 Jul.1978	NL064011	20	I
119. Geving	AAy:Tvedestrand	19 Jul.1978	NL073013	0	I/M
120. Åltjønn	AAy:Moland	20 Jul.1978	MK964931	30	C
121. Kollakstjønn	AAy:Moland	20 Jul.1978	MK971902	100	C
122. Bramshølen	AAy:Moland	20 Jul.1978	MK912891	20	A
123. Fløystad	AAy:Moland	20 Jul.1978	MK908898	80	K
124. Hemmingsvatnet	VAy:Kristiansand	19 Jul.1978	MK431529	10	A
125. Vollevatnet	VAy:Kristiansand	19 Jul.1978	MK432479	20	A
126. Venneslafjorden	VAy:Vennesla	19 Jul.1978	MK3860	38	A
127. Drivenesvatnet	VAy:Vennesla	19 Jul.1978	MK3762	168	A
128. Tjåvatn	VAy:Vennesla	19 Jul.1978	MK3662	170	C
129. Langevatn	VAy:Vennesla	19 Jul.1978	MK3066	90	I
130. Histøl	VAy:Vennesla	19 Jul.1978	MK2865	250	B
131. Frustølåsen	VAy:Vennesla	19 Jul.1978	MK2765	335	B
132. Frustølåsen	VAy:Vennesla	19 Jul.1978	MK 2764	330	D
133. Jinningstjern	VAy:Vennesla	19 Jul.1978	MK2760	200	I
134. Rolleivstad	VAy:Vennesla	19 Jul.1978	MK2759	179	I

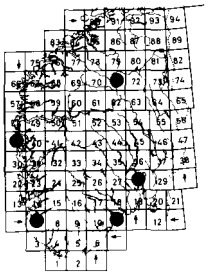
Locality		Date of collection	UTM 32V-	Altitude m a.s.l.	Habitat type
135. Hægelandsvatnet	VAy:Vennesla	19 Jul.1978	MK2859	200	A
136. Udland, Vigeland	VAy:Lindesnes	18 Jul.1978	LK952423	50	C
137. Gulltjørn	VAy:Lyngdal	18 Jul.1978	LK911471	50	D
138. Eikvåg	VAy:Farsund	18 Jul.1978	LK707390	20	G
139. Hanangervatnet	VAy:Farsund	18 Jul.1978	LK655396	10	A
140. Åmdal	VAy:Farsund	18 Jul.1978	LK636444	40	I
141. Ulgjellvatnet	VAy:Farsund	18 Jul.1978	LK648474	200	C
142. Lake by Ulgjellvatnet	VAy:Farsund	18 Jul.1978	LK647474	200	C
143. Ulgjell	VAy:Farsund	18 Jul.1978	LK647474	200	K
144. Øygardstjernet	VAy:Birkenes	8 Sep.1977	MK5666	25	G
145. Høgklaivvann	VAy:Birkenes	8 Sep.1977	MK5768	200	C
146. Svartevatn	VAi:Sirdal	17 Jul.1978	LL7630	550	B
147. Pond by Svartevatn	VAi:Sirdal	17 Jul.1978	LL7630	550	B/C
148. Halsen, Valen	VAi:Sirdal	17 Jul.1978	LL7233	700	B/C
149. Slettebøvatnet	Ry :Egersund	10 Jul.1977	LK268849	10	C
150. Gjermestad	Ry :Egersund	10 Jul.1977	LK202899	200	K
151. Spjødavatnet	Ry :Egersund	5 Jul.1977	LK179879	200	B
152. Litlatjørni	Ry :Egersund	5 Jul.1977	LK178886	200	B
153. Ognaelva	Ry :Hå	3 Jul.1977	LK1494	2	A
154. Helgåvatnet	Ry :Hå	3 Jul.1977	LK1493	10	A
155. Sirevåg	Ry :Hå	3 Jul.1977	LK1488	10	B
156. Ogna camping	Ry :Hå	15 Jul.1978	LK1392	10	K
157. Ogna camping	Ry :Hå	15 Jul.1978	LK1392	20	G
158. Røyrvatnet	Ry :Hå	16 Jul.1977	LK1695	200	K
159. Holmestø	Ry :Hå	20 Aug.1978	LK0994	2	K
160. Hedland	Ry :Hå	20 Aug.1978	LK1095	50	D/K
161. Bøe	Ry :Hå	29 Jun.1977	LK1194	10	K
162. Bjårvatnet	Ry :Hå	30 Apr.1978	LK1194	5	A
163. Kota	Ry :Hå	10 Jul.1977	LL1602	350	B
164. Mellomstrandsvatnet	Ry :Time	10 Jul.1977	LL2305	250	B/C
165. Figgjoelva	Ry :Sandnes	10 Jul.1977	LL1720	50	A
166. Bråsteinvatnet	Ry :Sandnes	10 Jul.1977	LL1523	40	A
167. Gisketjernet	Ry :Sandnes	18 Aug.1978	LL1129	50	D
168. Dybingen	Ry :Sandnes	13 Jul.1977	LL1528	27	A
169. Lutsivannet	Ry :Sandnes	13 Jul.1977	LL176296	27	A
170. Kyllesvatnet	Ry :Sandnes	13 Jul.1977	LL189285	27	A
171. Horvevatnet	Ry :Sandnes	13 Jul.1977	LL242347	25	A
172. Orrevatnet	Ry :Klepp	14 Jul.1977	KL9917	4	A
173. Øksnevadtjernet	Ry :Klepp	10 Jul.1977	LL1020	20	D
174. Frøylandsvatnet	Ry :Klepp	10 Jul.1977	LL1019	24	A
175. Frøylandsvatnet	Ry :Time	10 Jul.1977	LL0716	24	A/F
176. Stokkavatnet	Ry :Stavanger	14 Jul.1977	LL0940	10	A
177. Litle Stokkavatnet	Ry :Stavanger	14 Jul.1977	LL1041	10	A
178. Mosvatnet	Ry :Stavanger	14 Jul.1977	LL1140	20	C



MESOVELIA FURCATA MULSANT & REY

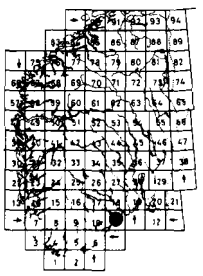


HEBRUS RUFICEPS (THOMSON)

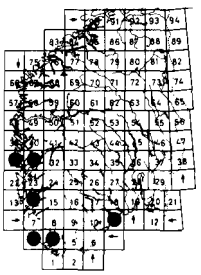


GERRIS THORACICUS SCHUMMEL

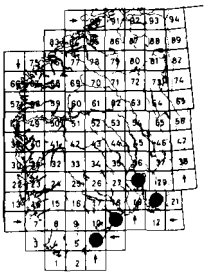
GERRIS LACUSTRIS (LINNE)



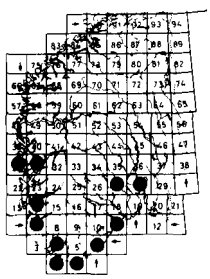
HYDROMETRA GRACILENTA HORVATH



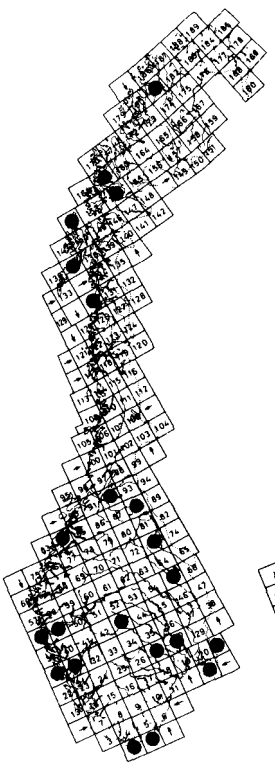
HYDROMTRA STAGNORUM (LINNE)



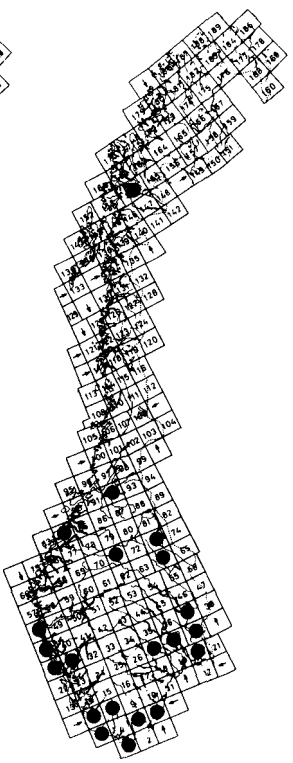
GERRIS ARGENTATUS SCHUMMEL



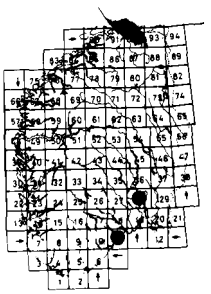
VELIA CAPRAI TAMANINI



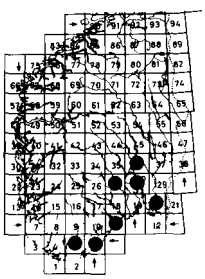
GERRIS LATERALIS SCHUMMEL



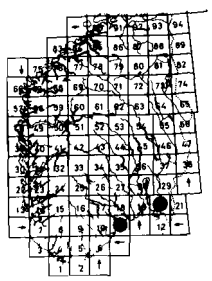
GERRIS ODONTOGASTER (ZETTERSTEDT)



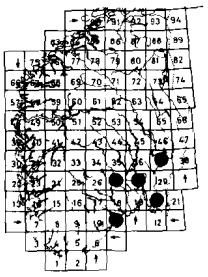
AQUARIUS NAJAS (DE GEER)



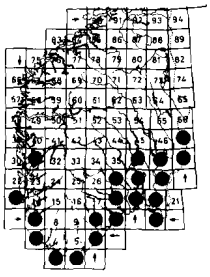
MICROVELIA RETICULATA (BURMEISTER)



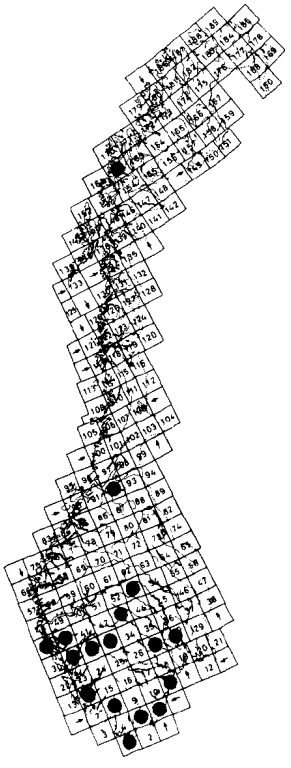
AQUARIUS PALUDUM (FABRICIUS)

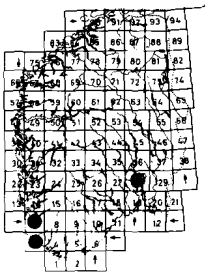


LIMNOPORUS RUFOSCUTELLATUS (LATREILLE)

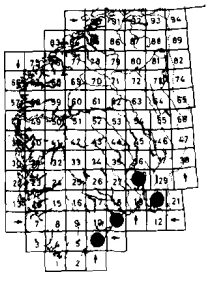


NEPA CINEREA LINNE

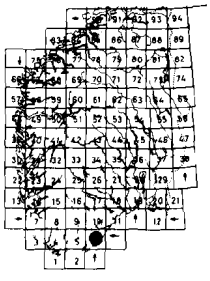




CALLICORIXA PRAEUSTA (FIEBER)

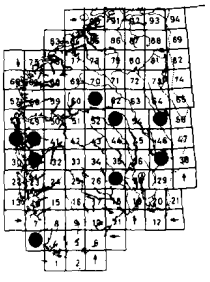


RANATRA LINEARIS (LINNE)

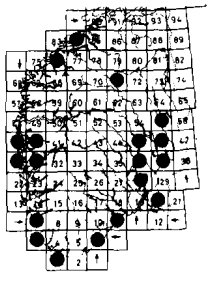


APHELOCHEIRUS AESTIVALIS FABRICIUS

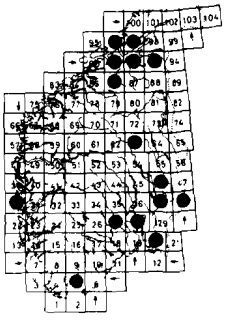
GLAENOCORISA PROPINQUA (FIEBER)



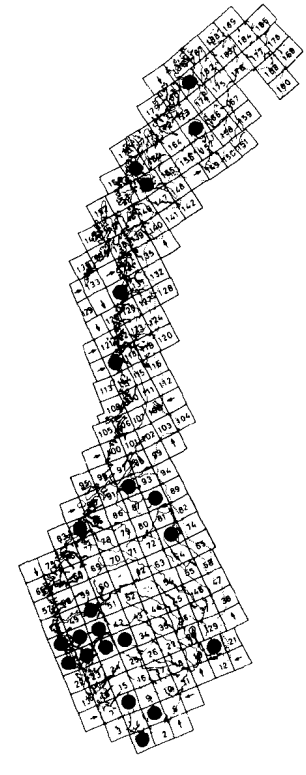
CALLICORIXA WOLLASTONI (DOUGLAS & SCOTT)

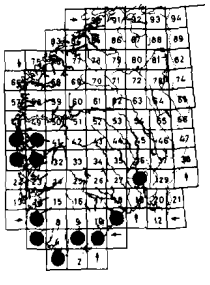


NOTONECTA GLAUCA LINNE

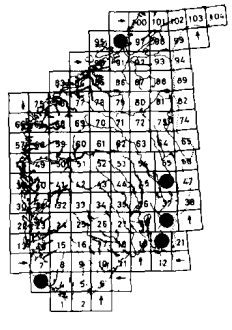


NOTONECTA LUTEA MULLER

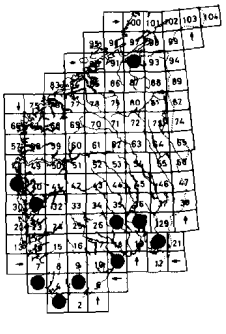




CORIXA DENTIPES (THOMSON)

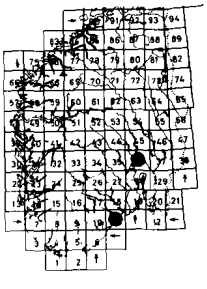


MICRONECTA POWERI (DOUGLAS & SCOTT)

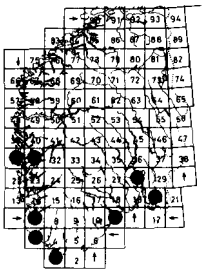


CYMATIA BONSDORFFI (C. SAHLBERG)

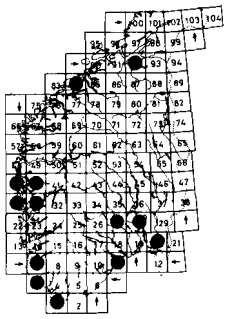
CALLICORIXA PRODUCTA (REUTER)



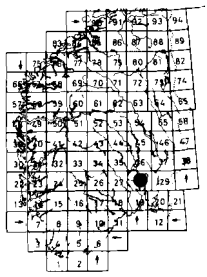
CORIXA PUNCTATA (ILLIGER)



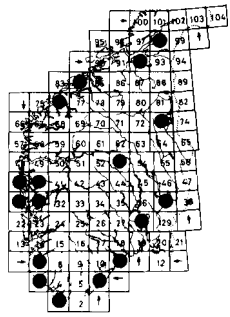
HESPEROCORIXA LINNEI (FIEBER)



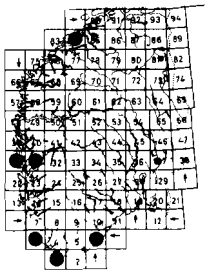
HESPEROCORIXA SAHLBERGI (FIEBER)



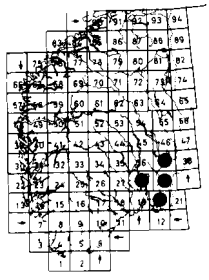
SIGARA STRIATA (LINNE)



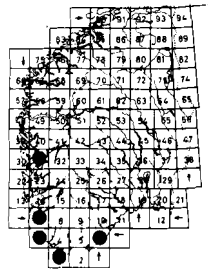
SIGARA DISTINCTA (FIEBER)



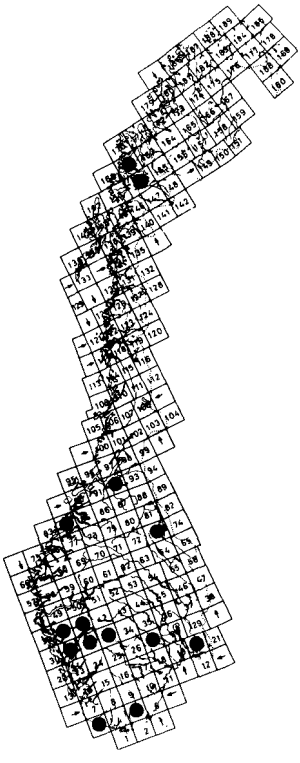
HESPEROCORIXA CASTANEA (THOMSON)



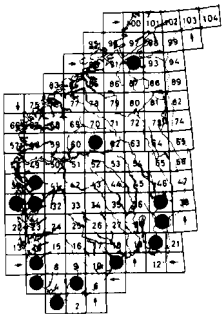
SIGARA FALLENI (FIEBER)



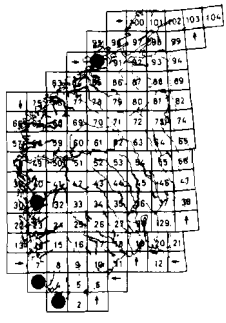
SIGARA SCOTTI (FIEBER)



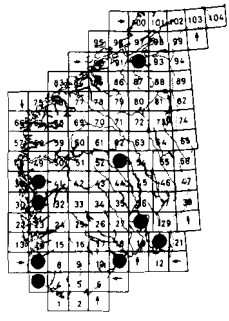
ARCTOCORISA CARINATA (C. SAHLBERG)



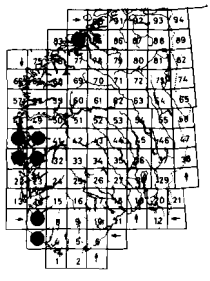
ARCTOCORISA GERMARI (FIEBER)



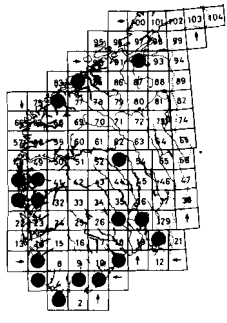
SIGARA LATERALIS (LEACH)



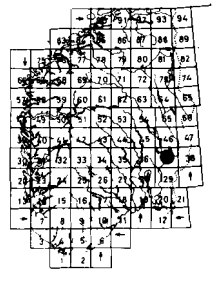
SIGARA NIGROLINEATA (FIEBER)



SIGARA DORSALIS (LEACH)



SIGARA SEMISTRIATA (FIEBER)



SIGARA HELLENSI C. SAHLBERG

Studies on the arthropod fauna of a Norwegian apple orchard

HALFDAN T. SKÅNLAND

Skånland, H.T. 1980. Studies on the arthropod fauna of a Norwegian apple orchard. *Fauna norv. Ser. B. 28*, 25—34.

During 1976 and 1977, from May to October, the arthropod fauna was studied in an apple orchard at Sem, Eastern Norway.

The number of specimens within orders and some dominating families and their percentages of the total number of specimens collected are presented. Representatives of twelve orders were found. Most of the specimens were collected from the orders Homoptera and Heteroptera. From 1976 to 1977 the Heteroptera had the greatest increase in number of specimens collected. The Homoptera had the greatest decline in the same period.

The number of species within the orders Heteroptera, Neuroptera and the family Coccinellidae, and the number of specimens collected in the orchard are presented.

In 1976 *Atractotomus mali* (Meyer-Dür) was the dominating Heteroptera species with about 21 percent of the material, while in 1977 *Malacocoris chlorizans* (Panzer) represented 62 percent. *Chrysopa carnes* (Stephens) was the dominating Neuroptera species in both years, while *Coccinella septempunctata* (L.) was most common among the Coccinellidae.

Histograms are presented that do show the number of specimens, nymphs and imagines, collected at each date of sampling for the seven most common Heteroptera species; *Anthocoris nemorum* (L.), *Atractotomus mali*, *Blepharidopterus angulatus* (Fallén), *Campylomma verbasci* (Meyer-Dür), *Malacocoris chlorizans*, *Orthotylus marginalis* (Reuter) and *Psallus ambiguus* (Fallén), as well as for *Chrysopa carnea* and *Coccinella septempunctata*.

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INTRODUCTION

Before the use of integrated control in fruit orchards it is necessary to know the fauna, especially the major pest groups and their natural enemies, as well as the fluctuations within these populations.

Investigations from different localities in Norway (Sørum 1977, Baeschlin & Taksdal 1979, Austreng & Sømme 1980) has shown that the species dominating within the Heteroptera may vary greatly. There can also be great variations in the fauna within the same orchard from year to year. These variations can be found both among beneficial species and insect pests.

Most of the Heteroptera species found in apple orchards are predators. This is also the case with the coccinellids and the chrysopids (Asgari 1966). These groups should therefore be given special attention.

Reliable information on the fauna will make it easier to predict the kind of action that is needed in the integrated control program (Steiner & Bosch 1968). Information about the fauna in fruit orchards can be provided by regular faunistic investigations. The purpose of the present investigation was to collect more information about the fauna of fruit orchards by regular sampling from an apple orchard at Sem, Eastern Norway.

MATERIAL AND METHODS

The investigation was carried out in 1976 and 1977 in an apple orchard at Sem, approximately 20 kilometers west of Oslo. The orchard used consisted of 95 trees of the cultivar «Ingrid Marie» and 110 trees of the cultivar «Gravenstein». The trees were well-kept, and they were all planted in 1951.

The summer was warmer and dryer than normal in 1976, and about normal in 1977. The balloon stage and opening of sideflowers took place in the last ten days of May in 1976 and about five days later in 1977. The fungicide Mancozeb was applied to the orchard in 1976 on 10 May and the fungicide Dobin on 12 June. In 1977 the Dobin and the systemic insecticide Dimethoat were applied to the orchard on 14 May.

By using the beating method (Steiner 1962) the arthropods were collected at regular intervals from the end of May to the beginning of October. At each date of sampling one branch of each of 33 trees were beaten three times, and the falling arthropods collected in a net with an opening frame of 0.25 m^2. The branches that were beaten were taken from both the sunny side and the shady side of the trees. Every collection took place between 9.00 and 11.00 a.m., and the trees were used alternatively between the different dates of sampling.

The material was taken to the laboratory and identified to order or lower taxa, with special emphasis on Heteroptera, Neuroptera and Coccinellidae.

RESULTS AND DISCUSSION

A total of 3768 arthropods were collected in 1976 and 3620 in 1977. In 1976 there were eight samples and in 1977 ten. The number of specimens from each order and from some dominating families, as well as their percentages of the total number of specimens collected, are shown in Table I.

The number of specimens collected from the orders Acarina and Collembola do not indicate their real number. These arthropods are small and difficult to collect by the beating method. Other small arthropods, mainly nymphs and larvae, are also often difficult to collect by this method.

From 1976 to 1977 there were only a small difference in the number of specimens collected that belonged to the order Araneae. Specimens were found in every sample, but greatest numbers were found from late May to the middle of June and in the last part of September.

The increase from 1976 to 1977 in specimens belonging to the order Coleoptera was mainly caused by the family Lathridiidae, which was dominating this order. The family Coccinellidae was greatly reduced from 1976 to 1977. This reduction might be connected with the small number of aphids, which is the main diet for the coccinellids, in 1977.

Only three specimens were collected from the order Dermaptera, all of them in 1977. The earwigs are largely nocturnal in habit and hide during the day in cracks, cervices, under bark and in similar places (Lamb 1975).

Table I. Number of arthropods, and their percentages of the total fauna, from different taxonomic groups collected by the beating method. Based on material from apple trees during the summer of 1976 and 1977 at Sem, Eastern Norway.

	1976		1977	
Order/Family	No. of specimens	Percent of total fauna	No. of specimens	Percent of total fauna
ACARINA	50	1.3	35	1.0
ARANEA	271	7.2	274	7.6
COLEOPTERA	168	4.5	198	5.5
Coccinellidae	46	1.2	20	0.6
Lathridiidae	108	2.9	126	3.5
COLLEMBOLA	3	0.1	26	0.7
DERMAPTERA	0		3	0.1
Forficulidae	0		3	0.1
DIPTERA	34	0.9	198	5.5
HETEROPTERA	610	16.2	1111	30.7
Anthocoridae	86	2.3	57	1.6
Miridae	506	13.4	1036	28.6
HOMOPTERA	2142	56.9	1303	36.0
Aphididae	432	11.5	56	1.6
Cicadidae	146	3.9	37	1.0
Psyllidae	1564	41.5	1210	33.4
HYMENOPTERA	85	2.3	126	3.5
Formicidae	52	1.4	12	0.3
LEPIDOPTERA	191	5.1	261	7.2
NEUROPTERA	72	1.9	42	1.2
Chrysopidae	72	1.9	42	1.2
THYSANOPTERA	142	3.8	43	1.2

The percentages of Diptera, Lepidoptera and Hymenoptera were all higher in 1976 than in 1977. Diptera were found in every sample both years, evenly distributed through the seasons. The Lepidoptera were mainly collected as larvae. Most of them were found from the end of May to the middle of June. The family Formicidae dominated the Hymenoptera. Aphid colonies were found in the trees in 1976 and the formicides were mainly found together with the aphids. The decline in number of aphid specimens in 1977 was followed by a decrease in the population of Formicidae this year.

Number of specimens of Heteroptera increased greatly from 1976 to 1977. More than 80 percent of the bugs belonged to the family Miridae. A great dominance of this family has also been found in other investigations (Leski 1967, Austreng & Sømme 1980).

There were a great reduction in number of specimens of Homoptera from 1976 to 1977. The greatest reduction were within the families Aphididae and Cicadidae. In both years much fewer aphids were collected than expected when compared with the results from other investigations (Lord 1972, Baeschlin & Taksdal 1979). The reason may have been the effect of a well developed fauna of aphid predators, and the effect of the insecticide Dimethoat, used in May 1977.

Table II. List of species of the order Heteroptera and Neuroptera and the family Coccinellidae collected on apple trees during the summer of 1976 and 1977 at Sem, Eastern Norway.

Species	No of specimens 1976	1977
HETEROPTERA		
Anthocoridae		
Anthocoris nemorum (L.)	39	51
A. nemoralis (Fabricius)	18	3
Orius sp.	29	3
Miridae		
Atractotomus mali (Meyer-Dür)	127	37
Blepharidopterus angulatus (Fallén)	58	89
Campylomma verbasci (Meyer-Dür)	21	23
Malacocoris chlorizans (Panzer)	103	686
Orthops basalis (Costa)	0	1
Orthops sp.	0	4
Orthotylus marginalis Reuter	69	108
Phytocoris tiliae (Fabricius)	6	4
P. ulmi (L.)	0	4
Phythocoris sp.	4	2
Pilophorus perplexus Douglas & Scott	4	1
Pilophorus sp.	1	6
Psallus ambiguus (Fallén)	111	71
Stenodema holsatium (Fabricius)	2	0
Nabiidae		
Nabiidae sp.	4	1
Pentatomidae		
Pentatoma rufipes (L.)	1	0
Pentatomidae sp.	13	17
NEUROPTERA		
Chrysopida		
Chrysopa carnea (Stephens)	71	42
Chrysopa septempunctata (Wesmael)	1	0
COLEOPTERA		
Coccinellidae		
Adalia bipunctata (L.)	2	0
Anatis ocellata (L.)	2	1
Calvia quatuordecimguttata (Mulsant)	3	1
Coccinella quinquepunctata (L.)	1	0
C. septempunctata (L.)	35	9
Propylea quatuordecimpunctata (L.)	3	7
Psyllobora vigintiduopunctata (L.)	0	2

Of all the groups in Table I the family Psyllidae was dominating both in 1976 and 1977. The family was strongly dominated by the apple sucker *Psylla mali* Schmidberger.

In the order Neuroptera there was also a great reduction in number of specimens, more than 40 percent, from 1976 to 1977. The reason for this reduction may be the same as for the reduction of the family Coccinellidae, a low number of aphid specimens in 1977. All the specimens collected belonged to the family Chrysopidae.

According to Baeschlin & Taksdal (1979) the greastest number of specimens from the order Thysanoptera is collected during the flowering period. Similar observations were made during the present investigation. The great reduction in number of specimens from 1976 to 1977 may be related to smaller number of apple-flowers in 1977 compared to 1976.

The different species belonging to the orders Heteroptera and Neuroptera and the family Coccinellidae, and their number of specimens, are presented in Table II.

Heteroptera

Fourteen species of bugs have been identified. The unidentified material consisted of between five to ten species. The family Miridae was strongly dominating in both seasons, representing 83.0 and 93.3 percent of the bugs in 1976 and 1977 respectively.

The occurrence of seven species that were found in greatest number is given a closer description. Of all the bugs collected these seven species represented a percentage of 86.6 in 1976 and 95.5 in 1977.

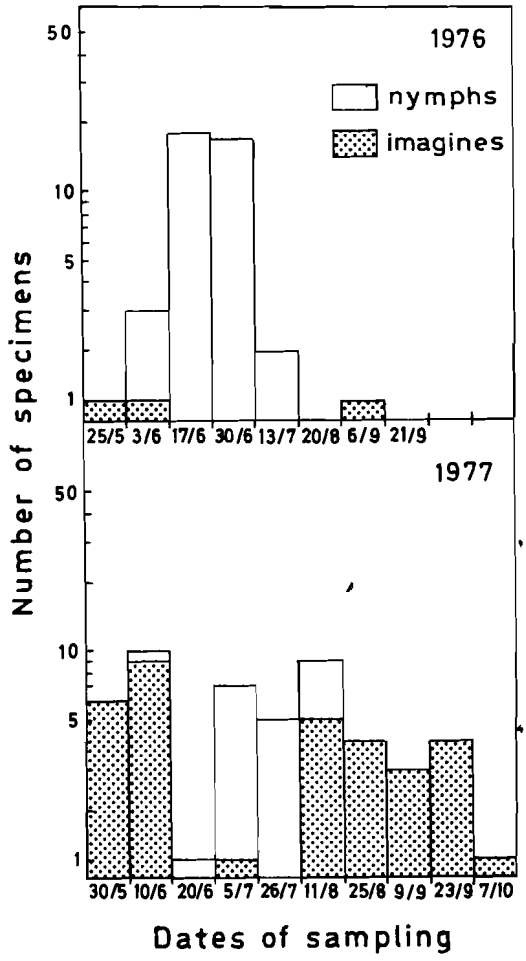

Fig. 1 Catches of *Anthocoris nemorum* on apple trees, from each date of sampling, during the summer of 1976 and 1977 at Sem, Eastern Norway.

Anthocoris nemorum **(L.)**

A. nemorum is one of the most common predatory bugs in Europe. It is found all over Europe and in parts of Africa and Asia (Butler 1923). The species is found in fruit orchards and on many other plants (Southwood & Leston 1959).

A. nemorum overwinter as adults (Collyer 1967), and adults were found on the first date of sampling both years, at the end of May (Fig. 1). The first nymphs were collected in the beginning of June. In 1976 there was a marked top in the population in the last weeks of June, while the population were more evenly distributed through the season in 1977. Other investigators (Zeletzki & Rinnhofer 1966, Austreng & Sømme 1980) have also found a top in the population of *A. nemorum* from the middle of June to the beginning of July. From Fig. 1 it appears that *A. nemorum* has one generation only per year, as was also shown by Austreng & Sømme (1980).

Atractotomus mali **(Meyer-Dür)**

Apple and hawthorn are the chief host-plants of *A. mali* (Southwood & Leston 1959), and it has been recorded from Europe and North America (Lord 1972).

A. mali was the most common bug found in 1976, when it constituted about 21 percent of the bugs. In 1977, however, this percentage was only three.

The first nymphs were collected in the middle of June (Fig. 2), the last in the begin-

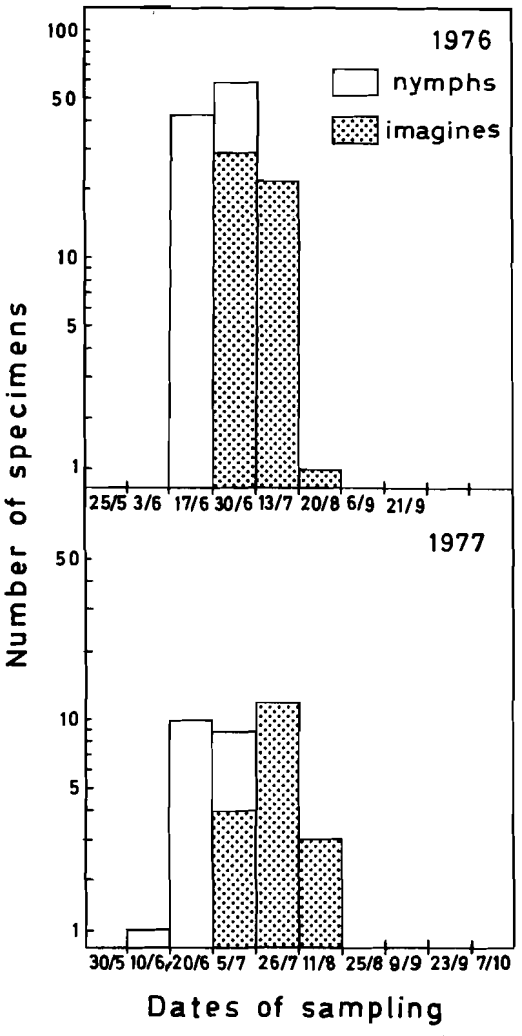

Fig. 2. Catches of *Atractotomus mali* on apple trees, from each date sampling, during the summer of 1976 and 1977 at Sem, Eastern Norway.

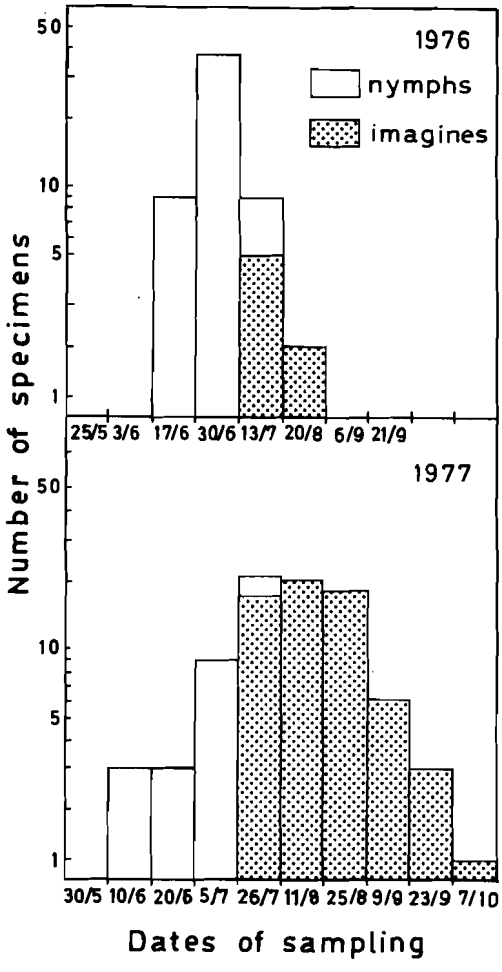

Fig. 3. Catches of *Blepharidopterus angulatus* on apple trees, from each date of sampling, during the summer of 1976 and 1977 at Sem, Eastern Norway.

ning of July. The adults were found on 30 June 1976 and on 5 July 1977. The last adults were collected in the middle of August. Largest populations were found from the middle of June to the middle of July. According to Austreng & Sømme (1980) *A. mali* has one generation each year, which is also clearly shown in Fig. 2.

Blepharidopterus angulatus **(Fallén)**

B. angulatus is common all over Europe, and it has also been reported from North America and North Africa (Lord 1972). It is common in fruit orchards but has also many other host-plants (Collyer 1952).

The first nymphs of *B. angulatus* were found in the middle of June (Fig. 3). This is late compared to many other bugs. The last nymphs were collected about a month later, together with the first adults. The last adults were found on 20 August in 1976, but as late as at the last date of sampling in October 1977. In 1976 there was a marked top in the population on 30 June, while there was no such top in 1977.

B. angulatus overwinters in the egg stage (Collyer 1952) and Fig. 3 shows that it has one generation a year under the present conditions.

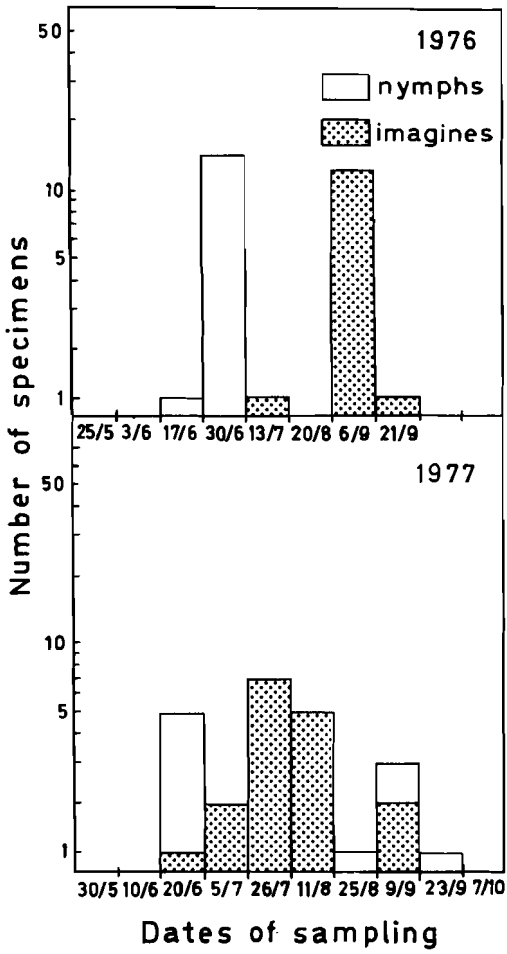

Fig. 4. Catches of *Campylomma verbasci* on apple trees, from each date of sampling, during the summer of 1976 and 1977 at Sem, Eastern Norway.

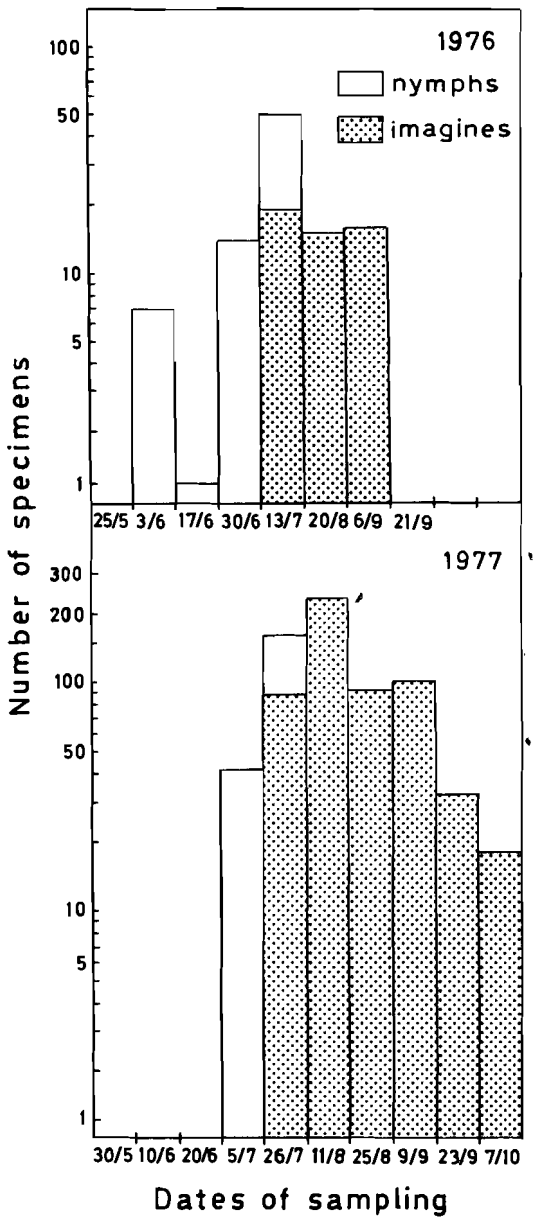

Fig. 5. Catches of *Malacocoris chlorizans* on apple trees, from each date of sampling, during the summer of 1976 and 1977 at Sem, Eastern Norway.

Campylomma verbasci **(Meyer-Dür)**

C. verbasci has been reported from Europe and Canada (Lord 1971) and it is found on apple, oak, potato and several other plants (Southwood & Leston 1959). In Norway this bug has been reported only from Ås, near Oslo (Austreng & Sømme 1980).

C. verbasci constituted 0.5 percent of the bugs collected at Ås (Austreng & Sømme 1980), while in the present investigation the percentage was 3.4 in 1976 and 2.1 in 1977. In 1976 the first nymph was found on 17 June (Fig. 4), and the last on 30 June. The first adults were collected on 13 July and the last on 21 September. This gives one generation a year, which is the same as found by Austreng & Sømme (1980). In 1977, however, the first nymphs were found on 20 June and from then on only adults till 11 August. Nymphs were again present from 25 August to 23 September, which strongly indicates a

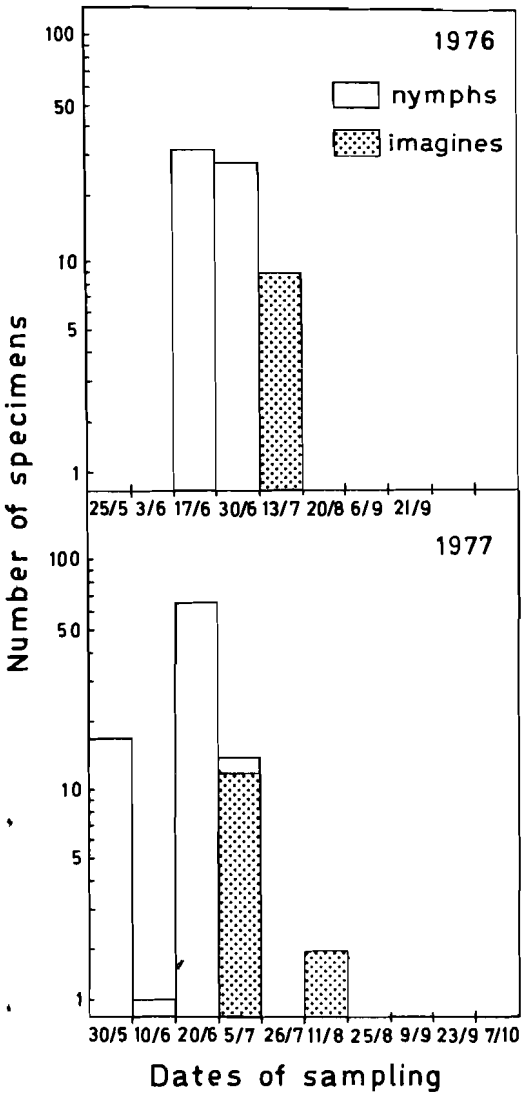

Fig. 6. Catches of *Orthotylus marginalis* on apple trees, from each date of sampling, during the summer of 1976 and 1977 at Sem, Eastern Norway.

second generation this summer. In England two generations each year is the rule (Southwood & Leston 1959). The first generation adults are found in June, and mostly dies by early August. The second generation adults reaches maturity during the same month and may survive until October.

The explanation to the second generation in 1977 may be the dry and sunny summer this year, which had long warm periods in both June, July and August.

Malacocoris chlorizans **(Panzer)**

M. chlorizans is widespread throughout Europe, and is especially common on hazel, but is also found on apple and other trees (Southwood & Leston 1959).

Baeschlin & Taksdal (1979) found *M. chlorizans* to be one of the dominating predatory species of the order Heteroptera while studying the insect fauna in apple orchards at Sem. In 1976 this species made up for nearly 17 percent of all the bugs collected, and in 1977 it was the dominating species with 62 percent.

In 1976 the first nymphs were collected on 3 June (Fig. 5), and the last on 13 July. The adults were found from 13 July to 6 September. In 1977 the nymphs were collected from 5 to 26 July, and the adults from 26 July to 7 October. Both years only one generation was observed, which is in accordance with the results of Austreng & Sømme (1980).

Orthotylus marginalis **(Reuter)**

This bug is found all over Europe (Abraham 1936) and is common and often abundant on apple, sallow, willow and alder (Southwood & Leston 1959).

During 1976 *O. marginalis* was found only during a short period (Fig. 6). Nymphs appeared from 17 to 30 June and adults on 13 July only. In 1977 the species was present over a much longer period. Nymphs were found on the first date of sampling, 30 May, and to 5 July. Adults were found on 5 July and 11 August. This early decline in number of specimens was also found by Austreng & Sømme (1980). The reason is thought to be male mortality shortly after copulation (Abraham 1936) and migration to other plants (Speyer 1934). From Fig. 6 it appears that *O. marginalis* has one generation only per year, and one generation has also previously been reported from Norway (Austreng & Sømme 1980), and from other European countries (Dicker 1968).

Psallus ambiguus **(Fallén)**

This species is common all over Europe (Morris 1965) and it is found on apple, hawthorn, sallow and alder trees (Southwood & Leston 1959).

Fig. 7 shows that *P. ambiguus* nymphs were found on first date of sampling both years. The last nymphs and the first adults were collected on 17 June 1976 and on 30 June 1977. The last adults were collected on 13 July in 1976 and on 26 July in 1977. This was a rapid decline in the population. In England adults of *P. ambiguus* have been reported from the last week of May until August (So-

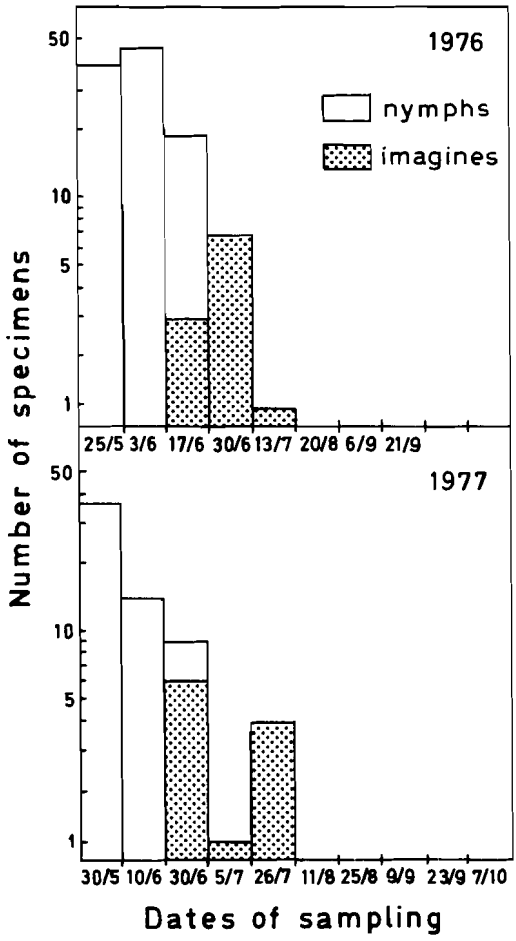

Fig. 7. Catches of *Psallus ambiguus* on apple trees, from each date of sampling, during the summer of 1976 and 1977 at Sem, Eastern Norway.

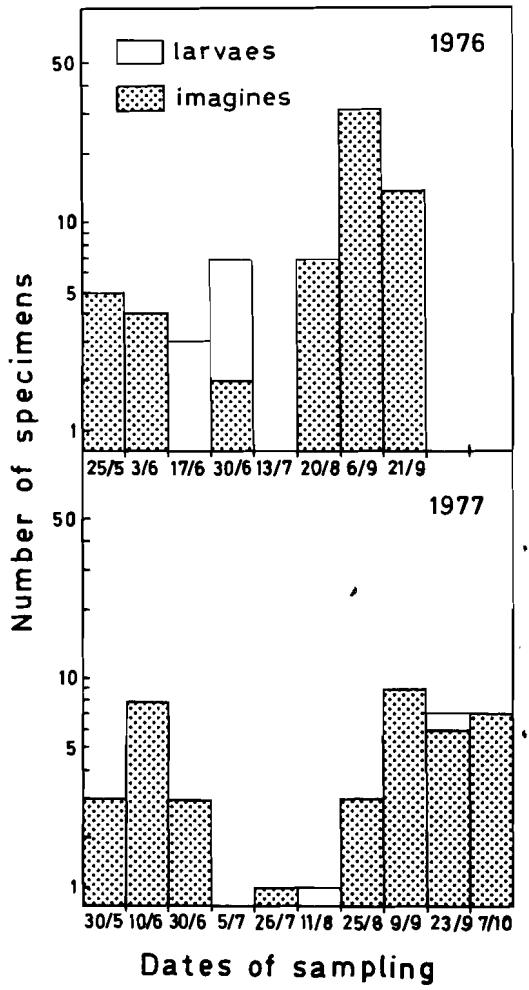

Fig. 8. Catches of *Chrysopa carnea* on apple trees, from each date of sampling, during the summer of 1976 and 1977 at Sem, Eastern Norway.

uthwood & Leston 1959), and Austreng & Sømme (1980) collected the last adults at the end of July in Norway.

One generation a year has been reported by Austreng & Sømme (1980), and the same result was found in the present investigation.

Neuroptera

The two species collected from this order both belonged to the family Chrysopidae. One adult *Chrysopa septempunctata* (L.) was found in 1976 (Table II). All the other specimens belonged to the species *Chrysopa carnea* (Stephens). *C. carnea* was also the dominating species of the order Neuroptera in the material collected from apple trees at Sem by Baeschlin & Taksdal (1979).

Chrysopa carnea **(Stephens)**

C. carnea is found all over Europe and is reported from North — and South America, Africa, the Middle-East and India (Killington 1937). In Norway it is one of the most common *Chrysopa* species (Sundby 1966). The species is common on fruit trees and in the lower vegetation, and is also found on many other trees (Kowalska 1968) *C. carnea* has two generations each year and is overwintering as imago (Honêk 1977).

Adults of *C. carnea* were found on the first date of sampling (Fig. 8). Larvaes were collected on 17 and 30 June 1976 and on 11 August and 23 September 1977.

The larvae found in 1976 were from the first generation, and no second generation larvae was found this year. In 1977 only the second generation larvaes were collected. The larvaes sampled were all in the third stage. Adults were collected to the last date of sampling. These were specimens that would overwinter and start their egg-laying the next spring.

Most specimens were collected in late August and in September. A top in the population at the end of the season has also been found by Honêk (1977) and by Baeschlin & Taksdal (1979).

Coccinellidae

Seven species were collected from the family Coccinellidae (Table II). *Coccinella septempunctata* (L.) was the dominating species both years. In 1976 this species represented 76 percent of all coccinellids collected, and in 1977 45 percent. Clayhills & Markkula (1974) found that *C. septempunctata* constituted 84.1 percent of the coccinellids collected in apple-trees.

Coccinella septempunctata (L.)

C. septempunctata is common in Europe, Asia and North Africa (Asgari 1966). It prefers low vegetation (Iperti 1966), but is also very common on fruit-trees (Clayhills & Markkula 1974). The species overwinters as imago and has one generation per year in Norway and most of its range of distribution (Sundby 1966).

Overwintering imagines of *C. septempunctata* were collected on first date of sampling both seasons (Fig. 9). With one exeption, this species were collected at each date of sampling in 1976. During this year large numbers of *C. septempunctata* were observed in various types of vegetation. Only three larvaes were collected, all on 30 June.

In 1977 there were a great decline in the *C. septempunctata* population compared to 1976. Imagines were collected at three dates of sampling (Fig. 9), and two larvaes were collected on 10 June. The small number of specimens found in 1977 is probably connected to the small aphid population of this year.

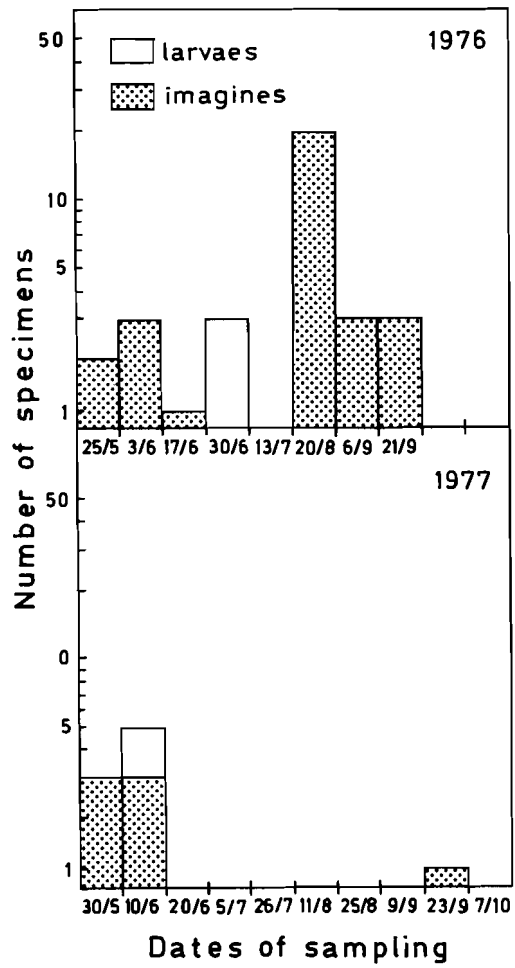

Fig. 9. Catches of *Coccinella septempunctata* on apple trees, from each date of sampling, during the summer of 1976 and 1977 at Sem, Eastern Norway.

CONCLUSIONS

The arthropods were collected from the end of May to the beginning of October. The populations were most numerous from the middle of June to the middle of July. Fewer specimens were collected in 1977 than in 1976, although sampling were carried out for two more dates during the last year.

Eight of the twelve orders of arthropods found had a higher number of specimens in 1977 than in 1976. Of these orders the Heteroptera had the greatest increase with about 82 percent. Of the four orders that had a decline in 1977, the greatest decrease was within the Homoptera, the most numerous group, with more than 39 percent. The reason for this decrease may have been the warm and very dry weather during the summer of 1976. These conditions may have reduced the availability of plant sap for sucking insects. Hot air and low humidity may also have killed eggs and nymphs.

Of the families in Table I the Aphididae had the greatest reduction in specimens collected from 1976 to 1977, with more than 89 percent. The low number of aphids in 1977 may be the explanation to the decline in number of specimens of the groups that mainly feed on aphids, such as the coccinellids and the chrysopids.

The seven most common species of bugs constituted about 91 percent of the total Heteroptera material, compared to about 85 percent in the investigation of Austreng & Sømme (1980). *Atractotomus mali* was the dominating species in 1976 and *Malacocoris chlorizans* in 1977. Baeschlin & Taksdal (1979) also found that *M. chlorizans* was the dominating species in orchards at Sem, while Austreng & Sømme (1980) found *A. mali* to be most common at Ås. While both these localities are situated in Eastern Norway, Sørum (1977) found *Anthocoris nemorum* to be most common in orchards in Sogn, Western Norway. It appears that the fauna of bugs in fruit orchards may vary from year to year, and within different parts of the country.

Of the coccinellids *Coccinella septempunctata* was the dominating species both years. Exept for one specimen of *Chrysopa septempunctata*, Neuroptera were represented by *Chrysopa carnea* only.

More work is needed to obtain a better knowledge of the fluctuations of the fauna and the reasons for these fluctuations. Continuous investigations should be carried out both in orchards from different geografical regions and in different orchards within the same region.

ACKNOWLEDGEMENTS

I am very grateful to Dr. L. Sømme for extensive help during the preparation of the manuscript. I also wish to thank R. Baeschlin, T. Edland and G. Taksdal for practical advices during the investigation, and N. Jonsson for the identification of the Heteroptera species.

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Received 28 Oct. 1980.

The red *Apion* species in Norway (Col., Apionidae)

TORSTEIN KVAMME

Kvamme, T. 1980. The red *Apion* species in Norway (Col. Apionidae). *Fauna norv. Ser. B, 28,* 35–38.

The distribution of the red *Apion* species, subgenus *Erythrapion* Schilsky, 1906, is revised. A. *haematodes* Kirby, 1808, and A. *rubiginosum* Grill, 1893, are recorded only in the south of Norway. *A. cruentatum Walton,* 1844, is distributed all over the country. There is no basis for considering *A. sanguineum* (De Geer, 1775) and *A. rubens* Stephens, 1839, as members of the Norwegian fauna.

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When examining specimens from my own and several collections, I found that *A. cruentatum* Walton, 1844, and *A. haematodes* Kirby, 1808, have been confused. This, together with the fact that *A. cruentatum* is not listed as an inhabitant of the Norwegian fauna (Lindroth 1960, Strand 1970, 1977, Silfverberg 1979), made a revision of the subgenus *Erythrapion* Schlisky, 1906, necessary.

SYSTEMATICS AND NOMENCLATURE

A total of five species of the subgenus *Erythrapion* are know from Scandinavia. Including *A. cruentatum* three species are known from Norway. This subgenus is easily distinguished from other Norwegian *Apion* species by the red colour alone. *A. rubiginosum* Grill, 1893 is separated from *A. cruentatum* and *A. haematodes* by the long almost straight rostrum (Fig. 1). Dieckmann (1973) changed the status of *A. cruentatum* from being a subspecies of *A. haematodes* to a valid species. *A. cruentatum* and *A. haematodes* can be separated by the punctures on the side of the head (Fig. 1). Dieckmann (1973, 1977) stressed that this is the only stable character for separation of the two species, and that the other characters such as colour, body size etc. (Hansen 1965) overlapped.

The nomenclature of the species has changed several times. In Tab. 1 the names and their synonyms are presented. Incorporated are the names which the quoted authors have used as valid and also the names they have used as synonyms. The nomenclature in this paper follows Silfverberg (1979).

MATERIAL

The revision of the distribution has been based upon examination of the following collections: Museum of Zoology, University of Oslo; Museum of Zoology, University of Bergen, including Andreas Strand's collection and journals; Norwegian Plant Protection Institute, Ås; and my own collection. The data in the literature are compared with the results of my examination of specimens (Tab. 1). Literature data on *A. cruen-*

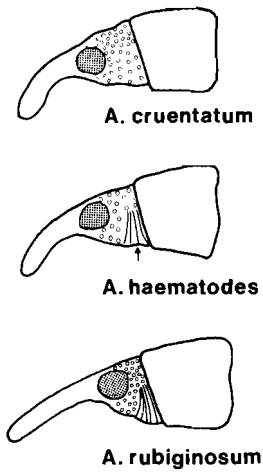


Fig. 1. Head and pronotum of *Apion cruentatum* Walton, *A. haematodes* Kirby, and *A. rubiginosum* Grill. The smooth area on *A. haematodes* is pointed out with an arrow. Punctures on rostrum and pronotum, pubescens, pubescens, antennae and legs are omitted.

Tab. 1. Column A: Species names applied by different authors for the species of the subgenus *Erythrapion* Schilsky, 1906. Column B: Quoted authors whose names are underlined, have used the corresponding species-name in column A as the valid name. When the author's name is placed in a paraenthesis, this indicates that the author uses the corresponding species-name as a synonym. Column C: Corrections and updating of the quoted publicatlons in accordance with the present revision.

A	B	C
Apion haematodes Kirby 1808	Silfverberg 1979	
	(Dieckmann 1977)	
	(Grill 1896)	Based upon Siebke (1875) (below). *A. haematodes* and *A. cruentatum* confused.
frumentarium Paykull 1792, nec Linnaeus 1758	(Silfverberg 1979)	
	Dieckmann 1977	
	Fjellberg 1972	The species is *A.cruentatum*
	Hansen 1965	
	Lindroth 1960	*A.haematodes* and *A. cruentatum* confused
	Strand & Hanssen 1932	Only *A. cruentatum*
	Lysholm 1937	Probably only *A.cruentatum*
	Münster 1928	*A.haematodes* and *A. cruentatum* confused
	Helliesen 1915	*A. haematodes*, probably also *A. cruentatum*
	Grill 1896	Based upon Siebke (1875), (see below).
frumentarium Linnaeus 1758	Sparre-Schneider 1901	Partly based upon Grill (1896), who has based upon Siebke (1875) (see below).
	Siebke 1875	*A.haematodes* and *A. cruentatum* confused
A. cruentatum Walton 1844	Silfverberg 1979	
	Dieckmann 1977	
	Grill 1896	Not listed from Norway
haematodes s.sp. cruentatum Walton 1844	(Dieckmann 1973,1977)	
	Hansen 1965	
	Lindroth 1960	Not listed from Norway
	Strand 1946	Correctly classified as *A. cruentatum*
	Munster 1928,1930	1928: *A. haematodes* and *cruentatum* confused 1930: Probably correctly classified as *A. cruentatum*
	Natvig 1916	Correctly classified as *A. cruentatum*
A. rubiginosum Grill 1893	Silfverberg 1979	
	(Dieckmann 1977)	
	Hansen 1965	
	Lindroth 1960	Norwegian specimens correctly classified
	Munster 1928	Correctly classified
	Grill 1896	Based upon Siebke (1875)
sanguineum (DeGeer 1775)	Dieckmann 1977	
	Helliesen 1910	Correctly determinated
	Siebke 1875	Correctly determinated
sanguineum auct. nec DeGeer 1775	(Silfverberg 1979)	
	(Hansen 1965)	
	(Lindroth 1960)	Correctly determinated
	(Munster 1928)	Correctly determinated
	(Grill 1896)	Based upon Siebke, correctly classified
A. sanguineum (De Geer 1775)	Silfverberg 1979	
	(Dieckmann 1977)	
	Hansen 1965	
	Lindroth 1961	
	Grill 1896	Misidentified, based upon Siebke (1875)
miniatum Germar 1833	(Silfverberg 1979)	
	Dieckmann 1977	
	(Hansen 1965)	
	(Lindroth 1960)	
	Helliesen 1915	Misidentified, should have been *A. cruentatum* or *A. haematodes*
	(Grill 1896)	See comments *A.sanguineum*
A. rubens Stephens 1839	Silfverberg 1979	
	(Dieckmann 1977)	
	Hansen 1965	
	Lindroth 1960	
	Munster 1935	Misidentified, based upon Siebke 1875
	Grill 1896	Based upon Siebke, see below
	Siebke 1875	Misidentification
rubens Walton 1844 nec Stephens 1831	Dieckmann 1977	

(Continues)

tatum is included only when records were made in areas where *A. haematodes* is absent, or not expected to occur, i.e. in North-Norway.

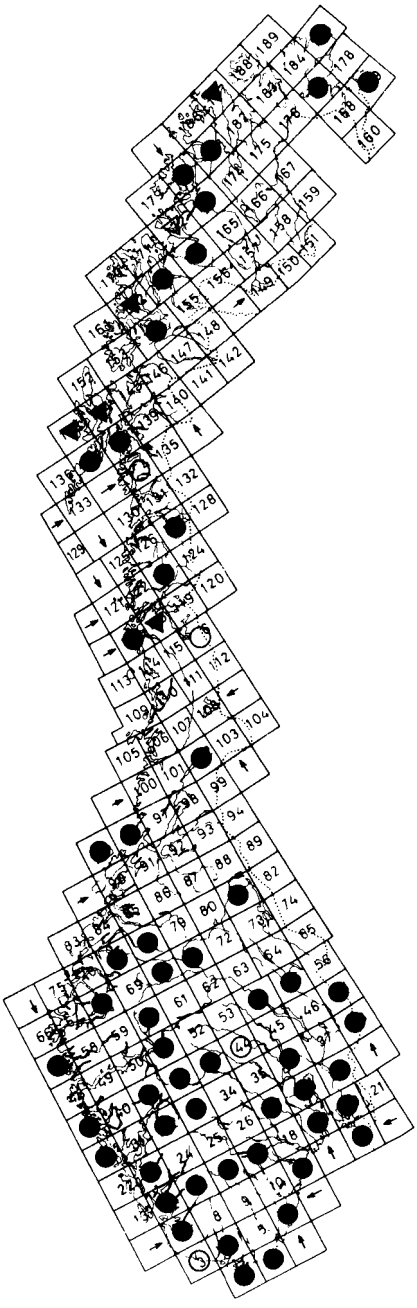
RESULTS AND DISCUSSION

The distribution of the species are depicted on UTM-EIS grid maps (Fig. 2). Tab. 2 presents the distribution in accordance with the faunal divisions proposed by Strand (1943). Even though *A. cruentatum* is not listed from Norway Lindroth 1960, Strand 1970, 1977, Silfverberg 1979, Münster 1928, 1930, Strand 1946, and others have mentioned it as a Norwegian inhabitant. Many of Münster's specimens were correctly determined as *A. cruentatum* by Wagner, and Strand (1946) writes (in translation): «The specimens from North-Norway belong to the subspecies *cruentatum* ...».

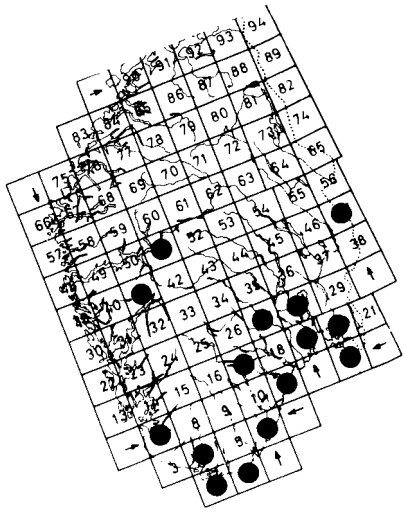
A. sanguineum (De Geer 1775) and *A. rubens* Stephens, 1839, have both been published from Norway (Siebke 1875, Grill 1896, Helliesen 1915) and were believed to be represented in the museum collections. By the examination all of the specimens proved to belong to other species. Consequently there is no evidence for regarding *A. sanguineum* and *A. rubens* as members of the Norwegian fauna.

Dieckmann (1977) mentions that *A. haematodes* and *A. rubiginosum* are monophagous on *Rumex acetocella* L. and that published records of *A. haematodes* from other host plants (Hoffmann 1950 and others) are based upon misidentifications.

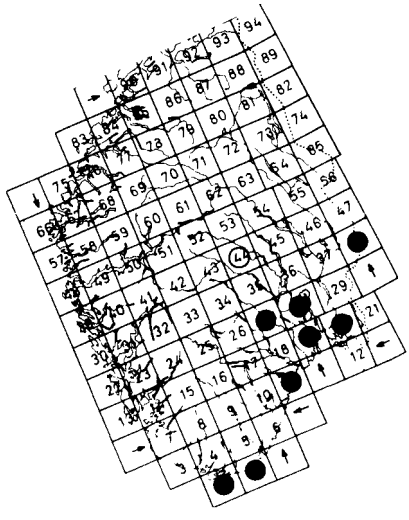
However, Hansen (1965) has recorded *A. haematodes* on *Rumex acetosa* L. *A. cruentatum* is polyphagous and *R. acetosa* L., *R. acetocella* L., *R. conglomeratus* Murr., *R. maritimus* L., *R.*



Apion
cruentatum Walton,1844.



Apion
haematodes Kirby,1808.



Apion
rubiginosum Grill,1893.

Fig. 2. Distribution of the subgenus *Erythrapion* Schilsky, 1906, in Norway, depicted on UTM-EIS grid maps.
Symbols:
— Black circles: Records verified by the author.
— Open circles: The exact locality is unknown, determination verified.
— Black triangels: Data from the literature, not verified.
— Open triangels: Data from the literature, exact locality is unknown.

Faunal division \ Species	*A. haematodes* Kirby 1808	*A. cruentatum* Walton 1844	*A. rubiginosum* Grill 1893
Ø	●	●	●
AK	●	●	●
HEs	●	●	●
HEn		●	
Os		●	
On		●	
BØ	●	●	●
BV		●	
VE	●	●	●
TEy	●	●	●
TEi	●	●	
AAy	●	●	▼
AAi			
VAy	●	●	●
VAi			
Ry	●	●	
Ri		●	
HOy		●	
HOi	●	●	
SFy		●	
SFi	●	●	
MRy			
MRi		●	
STy		●	
STi		●	
NTy		▼	
NTi		●	
Nsy		●	
Nsi		●	
Nnø		●	
Nnv		●	
TRy		●	
TRi		●	
Fv		●	
Fi		●	
Fn		●	
Fø		●	

Tab. 2: Distribution of the subgenus *Erythrapion* Schilsky, 1906, according to Strand's faunal division (1943).

Symbols: ● Records verified by the author

▼ Records quoted from literature, not verified by the author

alpestris Jacq. (= *arifolius* All.) (Dieckmann 1977, Hansen 1965) are known as host plants. Fjellberg (1972) published *A. haematodes* from Finse (EIS: 42), about 1250 m a.s.l., with *Oxria digyna* (L.) Hill. as host plant. All his specimens, which are preserved in Museum of Zoology, Bergen are *A. cruentatum*.

The distribution of *A. haematodes* and *A. rubiginosum* northwards probably are limited by climatical conditions as both *R. acetocella* and *R. acetosa* are distributed all over the country (Hultén 1950).

ACKNOWLEDGEMENTS

I wish to express my gratitude to the late Andreas Strand for valuable information and Stig Lundberg for verifying the determination of my reference specimens.

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Received 28 Apr. 1980.

Five species new to Norway (Col., Attelabidae and Curculionidae).

TORSTEIN KVAMME

Kvamme, T. 1980. Five species new to Norway (Col., Attelabidae and Curculionidae). *Fauna norv. Ser. B, 28,* 39—40.

The following species are recorded as new to the Norwegian fauna: *Caenorhinus longiceps* (Thomson), *Sitona humeralis* Stephens, *Dorytomus melanophthalmus* (Paykull), *Ceutorhynchus asperifoliarum* (Gyllenhal) and *Neosirocalus pulvinatus* (Gyllenhal). All these species, except *D. melanophthalmus,* are known from areas in Sweden adjacent to the Norwegian border. *D. melanophthalmus* was first reported from Skåne, South Sweden in 1977. The Norwegian is the second from the Scandinavian peninsula.

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Examination of my sweep-net material from last summer-season and earlier, resulted in five Coleoptera species new to the Norwegian fauna (Lindroth 1960, Silfverberg 1979). In addition to the locality names, the abbreviations for the faunal divisions proposed by Strand (1943) are used. The numbers in parenthesis refers to the UTM-EIS square numbers (Økland 1977).

THE RECORDS

Attelabidae

Caenorhinus longiceps (Thomsen 1888) HEs: Eidskog, Slettmoen (EIS:38), 19 June 1978. One specimen was caught by sweep-netting on 1 to 3 m tall *Betula* bushes, growing in the outskirt of a bog. *Salix* sp p. are the most common host trees, but also *Betula* sp p. are well-known as hosts (Hansen 1965, Dieckmann 1974). *C. longiceps* is known from a wide range in Sweden, north to Lule Lappmark, and might be found many places in Norway.

Curculionidae

Sitona humerlis Stephens, 1831 Ø: Hvaler, Ørekroken (EIS:12), 25 August 1979. I found one specimen together with *Apion loti* Kirby, 1808 by sweep-netting *Lotus* spp. The vegetation was rather sparse, on an open sandy and sunny sea-meadow. However, it might be accidently occurring on this site. Hansen (1965) assigned *Medicago* spp., among other *M. sativa* L., and Hoffmann (1950) mentioned *Medicago falcata* L., *Ononis repens* L., *Lathyrus aphacca* L., *Trifolium repens* L. and *Pisum sativum* L. as hostplants. *S. humeralis* is known from South-Sweden, with Bohuslän as the closest locality (Lindroth 1960).

Dorytomus melanophthalmus (Paykull, 1792) AK: Ås (EIS:28), 22 September 1976. The specimen was caught on a window. Hansen (1965) assigned *Salix* spp. as hostplant, and in Germany larvae have been found in male flowers of *Salix viminalis* L. and female flowers of *S. alba* L. *D. melanophthalmus* was first published from the Scandinavian Peninsula in Skåne, Sweden (Baranowski 1977), where one specimen was found. The species is known from seventeen provinces in Finland (Lindroth 1960).

Ceutorhynchus asperifoliarum (Gyllenhal, 1813) Ø: Hvaler, Ørekroken (EIS:12), 25 August 1979. One single specimen was sweep-netted on the border of a cabbage field. The vegetation mainly consisted of *Capsella burza-pastoris* (L), *Thlaspi alpestre* L., *Myozotis arvensis* (L.) Hill. and several grass species. According to Dieckmann (1972) *C. asperifoliarum* is oligophagous on all species of the family Borginaceae, while Hansen (1965) mention *Echium vulgare* L. and *Anchusa officinalis* L. as important hostplants in Denmark. Västergötland is the closest province in Sweden from which the species is known (Lindroth 1960).

Neosirocalus pulvinatus (Gyllenhal 1837) Ø: Hvaler, Ørekroken (EIS:12), 25 August 1976. More than 20 specimens were found on *Sisymbrium* sp. at the same sea-shore meadow as *Sitona humeralis*. The host plants were situated about 20 m from the sea-line, on sandy ground with sparse vegetation. *C. pulvinatus* is known to breed in *Sysymbrium sophia* L., *S. officinalis* L. and *S. irio* L. (Dieckmann 1972). Bohuslän is the closest Swedish locality (Lindroth 1960).

ACKNOWLEDGEMENT

I wish to thank Stig Lundberg for verifying my identification.

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Received 28 Apr. 1980.

Faunistical notes on Mymaridae (Hymenoptera)

PER SVEUM AND JOHN O. SOLEM

Sveum, P. & Solem, J.O. 1981. Faunistical notes on Mymaridae (Hymenoptera). *Fauna norv. Ser. B. 28,* 41—43.

A list of the Norwegian records of Mymaridae is presented. The list comprises 32 species, of which 13 species are reported for the first time from Norway.

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The knowledge of the Mymaridae in Norway is scarce. Smaller contributions have been given by Heqvist (1958), Løken (1966) i.e. leg. et det. O. Bakkendorf 1934, Mathot (1969) and Hellén (1964). The paper by Hellén (1974) is devoted to Mymaridae in Finland, and Norwegian records are listed only in connection with Finnish records, and without further information.

In the present paper we intend to give a complete list of previous records, as far as known to us, and to add new records. The taxonomy of the family, on a world basis, is poorly cleared up. Some taxa in the material investigated were, in our opinion, not consistent enough to fit any given species descriptions. These taxa will be dealth with in separate papers. However, as shown by us previously (Sveum and Solem 1979), intraspecific variability in quantitative characters, the dominating character type within mymarid taxonomy, is considerable. Thus, the unplaced taxa may perhaps fall within existing species when more information about quantitative characters have been obtained. There is also a need for a thorough revision of especially larger genera in the family.

The new records are based on material collected by Alf Bakke (AB), Dag Dolmen (DD), Anders Olsen (AO), John O. Solem (JOS), and Per Sveum (PS). Methods of collecting: AB: unknown; DD: yellow pan trap; AO: brown pan traps and suction traps; JOS: emergence traps in mountain brooks; PS: sweeping. The genera are ranked according to Debauche (1948), and within genera the species are ranked in alphabetic order. The geographical division follows Strand (1943) with names and limits updated. The material collected by DD, AO, JOS, and PS is mounted in Canada Balsam, and is kept at the Zoological Department, Royal Norwegian Society of Sciences and Letters, the Museum, Trondheim, and the specimens collected by AB are mounted in dry condition and kept at the Zoological Museum, Oslo.

Species marked with * are new for Norway.

**Alaptus antennatus* Kryger, 1950
STi: Oppdal, Kongsvoll 6 Aug. 1978, 1 ♀, AO. The description given by Hincks (1959) fits our specimen nearly completely. However, the antennal segments seem to be slightly broader than figured by him. Length of our specimens: 0.40 mm, smallest specimen by Hincks: 0.43 mm. Only a few specimens from England (in the Waterhouse collection) seem to be known previously.

**Alaptus fusculus* Haliday in Walker, 1846
STi: Oppdal, Kongsvoll 6 Aug. 1978, 1 ♀, 1 ♂, AO; Trondheim, Heimdal 31 July 1978, 1 ♀, 1 ♂, AO.
The specimens are clearly within the descriptions given by Debauche (1948), Hellén (1974), Hincks (1959), and Kryger (1950). Number of cilia in distal row; females: 14—18; males: 20. Lenght of specimens: females: 0.51 mm; males: 0.51—0.59 mm.

Alaptus globularis Sveum and Solem, 1980
STi: Oppdal, Kongsvoll 6 Aug. 1978. AO (Type material) (Sveum and Solem 1980).

**Camptoptera papaveris* Förster, 1856
STi: Oppdal, Kongsvoll 2 Aug. 1978, 1 ♂, AO. The single male fits Hellén's description (Hellén 1974) very well, except in size. Our specimen: 0.46 mm; Hellén's specimens: about 0.35 mm. As pointed out by him, however, males are poorly known, and the description may thus be uncertain.

Camptoptera strobilicola Heqvist, 1958.
HEs: Romedal, Gammelseterberget 17 May 1978, AB (Type material) (Heqvist 1958).

Gonatocerus alecto (Debauche, 1948)
SFi: Sognefjord, Vassbygda (Mathot 1969).

**Gonatocerus crassipes* (Debauche, 1948)
STi: Trondheim, Estenstaddammen 1 Oct. 1978, 1 ♀, PS.

Slightly longer than type material (Debauche 1948), but otherwise Debauche's description fits well.

Gonatocerus litoralis Haliday, 1833
STi: Oppdal, Kongsvoll 1—30 Aug. 1978. 21 ♀ ♀, AO and JOS; Klæbu, Målsjøen 2 July 1978, 1 ♀, AO; AK: Maridalen 17 Aug. 1978, 1 ♀, PS; SFi: Sognefjord, Vassbygda (Hellén 1974), Frettheim (Mathot 1969).
This species is easily distinguished by the excellent drawings by Debauche (1948), when particular emphasis is laid on structure of marginal vein and location and number of sensory ridges on the antennae. The antennal proportions, which are much used as diagnostic characters, seem to be quite unstable.

Gonatocerus sulphuripes Förster, 1847
AK: Tömte 14 June 1953, 1 ♀, AB; AAy: Tromøy 18 July, 1 ♂, AB; VE: Tjøme, Mostranda 19 Aug. 1978, 1 ♀, 1 ♂, PS; SFi: Sognefjord, Vassbygda (Hellén 1974). The specimen from Tömte has a slightly protruding ovipositor, while in the female from Tjøme the ovipositor only nearly reaches the tip of the abdomen. This is in accordance with Hellén (1974) who stated that it may be more or less protruding. However, structure of marginal vein and antennal features seem to be reliable characters (see drawings by Debasuche 1948).

**Gonatocerus thyrides* (Debauche, 1948)
STi: Oppdal, Kongsvoll 16—23 Aug. 1978, 2 ♀ ♀, JOS, Aug. 1978, 1 ♀, PS. Three quite invariable females.

Ooctonus dovrensis Solem and Sveum, 1980 b. sp.
STi: Oppdal, Kongsvoll Aug. 1978 (Type material) (Solem and Sveum), 1980 b); Trondheim, Vold Aug. 1978, 1 ♀, AO.

Ooctonus heterotomus Förster, 1847
VE: Tjøme, Vasser 19 Aug. 1978, 1 c, PS; SFi: Aurland, Flåm, Frettheim (Mathot 1969).
Our specimen has only slight traces of yellow around the abdominal base.

Ooctonus insignis Haliday, 1833
SFi: Sognefjord, Vassbygda (Hellén 1974).

Ooctonus vulgatus Haliday, 1833
SFi: Aurland Flåm, (Løken 1966). Sognefjord, Vassbygda (Mathot 1969).

**Anagrus incarnatus* Haliday, 1833
STi: Oppdal, Kongsvoll 2 Aug. 1978, 2 ♀ ♀, AO, Aug. 1978, 3 ♀ ♀, 2 ♂ ♂, PS. The identification is based on the prevailing apprehension, that the genus includes only one, very variable species, i.e. *A. incarnatus* (Bakkendorf 1934, Kryger 1950, Hellén 1974). Our specimens are indeed variable.

Anaphes autumnalis Förster, 1847
SFi: Aurland, Flåm (Løken 1966).

Anaphes cultripennis Debauche, 1948
STi: Oppdal, Kongsvoll (Sveum and Solem 1980 a)

Anaphes pratensis Förster, 1847
SFi: Sognefjord, Vassbygda (Hellén 1974).

Anaphes tarsalis Mathot, 1969
SFi: Sognefjord, Vassbygda, (Type material) (Mathot 1969).

**Erythmelus goochi* Enock, 1909
STi: Oppdal, Kongsvoll 6 Aug. 1978, 1 ♀, AO. Our specimen fits the description given by Kryger (1950) well, with funicular segments increasing in size from the basal end of funiculus, and not as described by Hellén (1974), with funicular segments 3—4 nearly square.

Polynema atratum Haliday, 1933 sensu Hincks 1950 nec sensu Bakkendorf 1934
STi: Trondheim, Estenstaddammen 10 Oct. 1978, 7 ♀ ♀, PS; AK: Oslo, Maridalen 17 Aug. 1978, 1 ♂, 1 ♀, PS; SFi: Sognefjord, Aurland (Hellén 1974).
The description by Hincks (1950) fits our specimens well. Hellén (1974) in his description of Finnish specimens points out that antennal segment 4 is shorter than 2 + 3, while 4 equals 2 + 3 in our specimens, and as a result Hellén's key did not work out on our specimens.

Polynema elegans Förster, 18
SFi: Aurland, Flåm (Mathot 1969).

Polynama euchariforme Haliday,1833 sensu Hincks 1950 nec sensu Soyka 1956
STi: Oppdal, Kongsvoll 2 Aug. 1978, 2 ♀, 1 ♂, AO: Dovre, Vågåmo (Hellén 1974).
Without transverse ridges on scapus.

**Polynema funipenne* Haliday in Walker, 1846
AK: Oslo, Lommedalen 21 Aug. 1978, 3 ♀ ♀, PS, Oslo Malmøya 18 Aug. 1978, 1 ♂, PS; MRi: Rindal, Dalsegga May 1972, 1 ♂, DD.
Judged from the description by Hincks (1950), all specimens are typical.

**Polynema fuscipes* Haliday, 1833 sensu Hincks 1950
STi: Oppdal, Kongsvoll 16—23 Aug. 1978, 2 ♀ ♀, 1 ♂, JOS.
The numerous synonyms suggested by Hincks (1950) for the original species give knowledge of intraspecific variability that makes it very likely that our specimens should be assigned to this species.

Polynema ovulorum Haliday, 1833 sensu Debauche 1948
SFi: Sognefjord, Vassbygda (Mathot 1969).

Polynema reticulatus Hincks, 1950
SFi: Aurland, Flåm (Løken 1966).

**Polynema spectabilis* (Soyka, 1956 (*Maidliella spectabili* Soyka, 1956, *Polynema* Haliday sensu Annecke and Doutt, 1961)
STi: Oppdal, Kongvoll 16 Aug. 1978, 1 ♀, JOS, Trondheim, Steinan 4 Aug. 1978, 1 ♀, PS.
The identification may be doubtful, however, it fits Soyka's description in most respects.

**Polynema simile* Förster, 1847
AK: Oslo, Ila 21 Aug. 1978, 1 ♂, PS.

**Polynema valkenburgensis* Soyka, 1931
AA: Tromøy 18 July 1953, 1 ♀, AB.

Mymar pulchellum Curtis, 1832
SFi: Aurland, Vassbygda (Løken 1966).

**Mymar regale* Enock, 1911
STi: Klæbu, Målsjøen 31 July 1978, 1 ♀, AO.

ACKNOWLEDGEMENTS

We wish to thank Dag Dolmen and Anders Olsen, both Trondheim, who contributed material, and Curator Albert Lillehammer for permission to study the Mymaridae at the Zoological Museum, Oslo, collected by Alf Bakke.

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Received 14 July 1980.

Mites (Acarina) From Nests of Norwegian Birds of Prey

JAMES R. PHILIPS

Philips, J.R. Mites (Acarina) from nests of Norwegian birds of prey. *Fauna norv. Ser. B 28*, 44—47.

Nest material collected from two goshawk (*Accipiter gentilis* (L.)) nests and four Tengmalm's owl (*Aegolius funereus* (L.)) nests in Nannestad, Norway yielded 1866 mites of 31 species. Included were 14 species not previously known from Norway or birds' nests, as well as three species new to science. The fauna is compared with that known from Finnish and American raptor nests.

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INTRODUCTION

Nests of birds of prey (Falconiformes and Strigiformes) represent temporary habitats which are colonized by a wide variety of invertebrates. Philips & Dindal (1977) reviewed the occurrence of invertebrates in these nests, and the fauna can be classified into several main groups: parasites, predators, animal saprovores and humus fauna. Raptor nests may contain arthropods of importance as domestic pests, stored products pests, or parasites, but on the whole, raptor nest fauna is not very well known. Hicks (1959, 1962, 1971) provided a checklist of birds' nest insects and the works of Strand (1943, 1967, 1969) and Hågvar (1969, 1975) have greatly contributed to our knowledge of the coleopteran fauna of these nests in Norway. However, Philips & Dindal (1979) found that mites may represent up to 100% of the arthropod fauna of nests of birds of prey. Raptor nests are also a rich source of undescribed mite species (Fain & Philips 1977a, 1977b, 1978, 1979, Philips & Norton 1978).

The objective of this research has been to investigate the mite community in nests of Norwegian birds of prey. There have been no previous reports of mites from nests of Norway raptors, but Nordberg (1936) recorded 40 species from nests of Finnish raptors.

METHODS

Dr. S. Hågvar collected material from six nests. Nest no. 1 (goshawk, *Accipiter gentilis* (L.)) was collected in autumn 1976 from a Scotch pine (*Pinus sylvestris* L.), Rederbergbekken, Nannestad. This very old nest was situated 10 m high in the tree and had probably been used in 1975. A second goshawk nest was collected 19 May 1977 in Gudhildrun, Nannestad. The nest was originally located 12 m high in a spruce, but it had fallen down on snow. The goshawks had probably last used it in 1975. Nests 3—6 consisted of samples from nest-boxes used by Tengmalm's owls (*Aegolius funereus* (L.)) and were collected about 1 August 1977 in Nannestad. Nest 3 was used the same year, while the others were used the previous year. The nest material was placed in bags upon collection, and the mites were later extracted from a portion of the sample by means of a drying funnel.

RESULTS

The nest samples yielded 1866 specimens representing 31 species (Table 1). Astigmatic mites were the most numerous group in the owl nests but were not found in the hawk nests. In contrast, mesostigmatic mites were most abundant in the goshawk nests and included the greatest number of species in both types of nests. No species occurred in both hawk and owl nests, and none were common to both goshawk nests. Four species occurred in more than one owl nest, and the two species of *Myianoetus* were numerically dominant in all four owl nests.

DISCUSSION

These data probably present only a partial analysis of the acarine community in these nests. It is highly likely that some mite species were not collected in the small samples of nest material analyzed. I have found that acarine population in individual nests of American raptors may include nearly 23,000 individuals of 45 species (Philips & Dindal 1979).

Table I. Mites from nests of *Accipiter gentilis* (L.) and *Aegolius funereus* (L.) in Norway.

Species	Bird	*A. gentilis*			*A. funereus*		
	Nest	1	2	3	4	5	6
Mesostigmata							1
Family Ascidae							
Arctoseius cetratus (Sellnick)		1					
Proctolaelaps sp. nr. *epureae* (Hirst)				40			
Proctolaelaps sp. nr. pini (Hirst)		4					
Family Digamasellidae							1
Dendrolaelaps cornutulus group				12			
Family Laelapidae							
Androlaelaps casalis (Berlese)				1	1		18
Family Parasitidae						1	
Gamasodes bispinosus (Halbert)				15			
Parasitus sp.		8					
Family Rhodacaridae				4			
Gamasellus alpinus Schweizer			44				
Family Trachytidae			2				
Family Zerconidae			1				
Zercon curiosus Trägårdh		5					
Prostigmata							
Family Eupodidae							
Protereunetes sp.			1				
Family Penthaleidae							
Halotydeus sp.			1				
Family Rhagidiidae							
Rhagidia sp.		8					
Family Tydeidae							
Paratriophytydeus sp.							1
Astigmata							
Family Anoetidae							
Myianoetus n. sp.				1114	141	7	18
Myianoetus sp.				219	54	33	91
Family Glycyphagidae							
Dermacarus norvegicus Fain, Philips & Wilson				1			
Glycyphagus hypudaei O.L., (Koch)				1			
Family Listrophoridae							
Listrophorus phenacomys Fain & Hyland						1	
Listrophorus sp.				1			
Family Saproglyphidae							
Procalvolia n. sp.							1
Oribatei							
Family Damaeidae							
Damaeus sp.		1					
Family Brachychthoniidae							
Brachychthonius zelawaiensis Sellnick					1		
Liochthonius sp.			2				
Family Oppiidae							
Oppia ornata (Oudemans)							1
Oppiella nova (Oudemans)			5				

Three new species of astigmatic mites were found in the owl nest; the new *Dermacarus* has been recently described (Fain, Philips & Wilson 1979). The genera *Procalvolia* and *Myianoetus* have not previously been recorded from Norway. The discovery of *Arctoseius cetratus, Gamasodes bispinosus,* and *Gamasellus alpinus* also appear to be new records from Norway.

Genera not previously recorded from raptor nests include the predators *Gamasodes, Parasitus, Gamasellus, Zercon* and *Rhagidia;* the parasite *Listrophorus;* the herbivore *Halotydeus;* the saprovores *Procalvolia, Protereunetes* and *Liochthonius;* and the unspecialized feeder *Paratriophytydeus.*

The mite fauna in Norwegian raptor nests ap-

pears to be quite different from that in Finnish raptor nests. Only one genus, *Dameus*, was found in this study and by Nordberg (1936). His data represent the only previous findings of mites in the nests of goshawks and Tengmalm's owls. None of the nine species he reported were found in this study. He collected three species of obligate avian ectoparasites and six species of humus fungivores, whereas I found one facultative avian ectoparasite, nine humus fungivores, five animal saprovores, two obligate mammal ectoparasites, one herbivore and 13 predators.

The mite communities in these Norwegian nests are similar to those in raptor nests in North America. Anoetid mites were numerically dominant in a screech owl (*Otus asio* Gmelin) treehole nest in central New York examined one month after nesting was over (unpublished) data). This nest also contained two new species of *Myianoetus*. One of those species, which I also found in the nest of a zone-tailed hawk (*Buteo albonotatus* Kaup) in Texas, is very similar to the *Myianoetus* sp. of the Tengmalm's owl nests. Anoetid mites prefer very moist rotting substrates and mainly feed on microorganisms (Krantz, 1978).

Species in the Norwegian nests which I have also found in raptor nests in the U.S.A. include: *Arctoseius cetratus* (red-tailed hawk (*Buteo jamaicensis*(Gmelin)),nest, Massachusetts); *Androlaelaps casalis* (same red-tailed hawk nest, also screech owl nest, New York); *Brachychthonius zelawaiensis* (same red-tailed hawk nest); *Glycyphagus hypudaei* (American kestrel (*Falco sparverius* L.) nest, New York; saw-whet owl (*Aegolius acadicus* Gmelin) nest, Connecticut); and *Oppiella nova* (same American kestrel nest).

Listrophorids are fur mites, and *L. phenacomys* is known only from the microtine rodent genus *Phenacomys* in Canada (Fain & Hyland 1974). Only one female listrophorid was found in nest 5, and positive identification of the species was not possible. Future sampling may confirm the tentative identification of the species made by Dr. A. Fain, Antwerp. This listrophorid was found in a nest used by the owls a year previously. Such a mammal parasite may have been brought to the nest box on prey captured by a roosting owl, or perhaps the rodent host used the unoccupied box as a resting place. The nymph of *Listrophorus* sp, and the two glycyphagid species, from the nest used in 1977, probably reached the nest on prey. Both glycyphagid species were represented only by the hypopus stage, non-feeding nymphs which possess claspers, grasp mammal hair, and are transported by mammals to favourable breeding sites such as nest burrows. *Glycyphagus hypudaei* is a nearly cosmopolitan species known from many genera of rodents, including *Lemmus lemmus* (L.) and *Myopus schisticolor* (Lilljeborg) in Norway (Fain 1969). The host and adults of *Dermacarus norvegicus* are unknown.

Myianoetus and *Procalvolia* are genera which possess entomophilic hypopi. *Myianoetus* species are phoretic on dipterans, while *Procalvolia* has been found on ptiliid beetles. *Androlaelaps casalis* is a bird and mammal ectoparasite common in birds' nests, but it may prey on astigmatic mites (McKinley 1963, Wilson & Bull 1977). The only previous records of this species in Norway are two specimens collected by Edler & Mehl (1972) on *Clethrionomys glareolus* (Schreber) and *Apodemus sylvaticus* (L.). Although obligate avian ectoparasites were not found in these abandoned raptor nests, future samples may be expected to yield new host records, additional new species of mites, and further records of acarines new to Norway.

ACKNOWLEDGEMENTS

I would like to express my deepest appreciation to Dr. Sigmund Hågvar of the Norwegian Forest Research Institute for collecting the nest material, extracting the mites and sending them to me for analysis. Several acarologists assisted me with the taxonomic identifications: Dr. A. Fain (Glycyphagidae, Listrophoridae), Dr. R. Norton (Oribatei), and Dr. E. Lindquist (Ascidae, Digamasellidae). Dr. R. Norton also helped me to ascertain the current taxonomic classification of many of the species collected by Nordberg, and he kindly reviewed the manuscript.

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Received 17 Aug. 1980.

Short communications

ATHERIX IBIS (Fabr. 1798), 1803 (DIPT., ATHERICIDAE) NEW TO NORWAY

LITA GREVE

Atherix ibis (Fabr.) is reported for the first time from Norway. One female was found in Neiden, eastern Finmark county.

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While working through the collections of *Rhagionidae* (Diptera) in Tromsø Museum, one female *Atherix ibis* was discovered from eastern Finmark: Sør-Varanger county, Neiden, 5 July 1901. The specimen was correctly labelled *A. ibis*, the determinator, however, is unknown.

The Fennoscandian distribution of *A. ibis* shows one record from Sweden. Andersson (1962) published the first record from Torne Lappmark. Two females were found, and up to this date, June 1980, no additional material has been reported (Andersson, pers.comm.). *A. ibis* is also known from Denmark (Lyneborg 1960).

A. ibis is included in the list of Finnish Diptera by Hackman (1980). There are several specimens present in the Museum of Helsingfors/Helsinki, most of them from northern Finland. Hackman, W. (pers comm.) has observed *A. ibis* on the Finnish side of the river Tana which follows the borderline between Finland and Norway for a considerable distance. His observation indicates the presence of *A. ibis* in inner Finmark province as well as in the eastern parts.

A. ibis has previously not been reported from Norway, and this species is not present in the collections of the museums in Oslo, Bergen, Rana or Trondheim.

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Received 23 July 1980.

PLATYCHEIRUS GROENLANDICUS CURRAN AND *PL. FJELLBERGI* NIELSEN (DIPT., SYRPHIDAE) IN THE SOVIET UNION

TORE R. NIELSEN

Platycheirus groenlandicus Curran 1927 and *Pl. fjellbergi* Nielsen 1974 are reported from the Soviet Union. *Pl. groenlandicus* has uptill now only been known from the Nearctic Region.

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Examination of some older syrphid specimens collected in the Soviet Union, and kept in the collections of the Zoological Museum, Helsinki, has shown the occurrence of *Platycheirus groenlandicus* Curran and *Pl. fjellbergi* Nielsen in Northern Siberia. The material is as follows: *Pl. groenlandicus:* Dudinka, leg. Wuorentaus (2 ♂ ♂) and *Pl. fjellbergi:* Kanin, leg. B. Poppius (1 ♂); Dudinka, leg. Wuorentaus (1 ♂).

Pl. fjellbergi was described on material from alpine and arctic/subarctic areas in Norway and Sweden (Nielsen 1974), while *Pl. groenlandicus* has so far been known only from the Nearctic Region (Greenland and arctic parts of North America).

Pl. groenlandicus is a small species (size about that of *Melanostoma mellinum* (L.)), with three pairs of greyish spots on the abdomen and rather broad front metatarsi in the male (Fig. 1). A comparison with some related northern species is given in a previous paper (Nielsen 1972).

ACKNOWLEDGEMENTS

I am indebted to Professor Dr. Walter Hackman, Helsinki for loan of the material concerned.

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Received 21 July 1980.

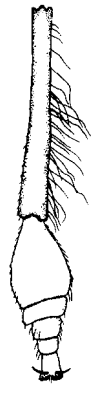

Fig. 1. Front leg of male *Platycheirus groenlandicus*.

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

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Content

Fauna norv. Ser. B, Vol. 28, No. 1.

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