

Some Muscidae (Diptera) from Lake Tarraure, Lule Lappmark, Sweden, with notes on collecting in other parts of Scandinavia

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Abstract

A study is presented of a collection of Muscidae (Diptera) made at Lake Tarraure in Lule Lappmark, Sweden, in July and August 1962. 1530 specimens representing 70 species are listed. 29 of these are new to Lule Lappmark. After an introductory section on Lake Tarraure, a brief survey of Dipterological exploration in Lule Lappmark is given, together with brief zoogeographic and ecological comments on the collection made.

In an Appendix, a list of species collected at other localities in Sweden and Norway is given. 76 species are listed, with 32 new provincial records.

Dasyphora zimini Hennig is confirmed as a Swedish species, *Fannia corvina* (Verrall) is re-instated as a Swedish species, and *Hydrotaea similis* Meade is recorded as new to Norway.

Introduction

During July and August 1962, I was a member of an expedition to Swedish Lapland organised by students of Brasenose College, Oxford, and undertook an investigation of the Diptera Brachycera and Cyclorrhapha in the area of Lake Tarraure, near Kvikkjokk in Lule Lappmark. I was particularly interested in the Muscidae, and the present paper is a report on the collection made. The rest of the material has been partially worked up, but it is not intended to report upon it. It is deposited in the Hope Department of Entomology, Oxford, and the British Museum (Natural History), London.

The expedition was centered around Kvikkjokk for five weeks, from 13 July to 18 August, but further smaller collections were made at various localities whilst travelling in Norway and Sweden: these are listed in an Appendix at the end of this report.

The Kvikkjokk area has been a popular one with entomologists, from the time of Linnaeus to the present (vide Ringdahl, 1951: 113—115). Ringdahl (op. cit.) lists material from Lake Virihaure (Brinck and Wingstrand, 1951), Sarek National Park (Poppius, Lundström and Frey, 1916), Kvikkjokk, Njunjes and Snjerak. But Lake Tarraure has not previously been worked despite the interesting variety of biotopes afforded by the formation of a

rapidly-growing delta at the western end of the lake by the River Tarraädno, head-stream of the Lilla Lule älv.

Lake Tarraure is situated 25 km west-north-west or Kvikkjokk (figs. 1—2). The road, from Jokkmokk, 120 km to the east, ends at Kvikkjokk, and to reach the lake the Tarra footpath is then followed. The small settlement of Njunjes is the halfway point and the last telephone station. Beyond this point the path becomes more difficult though it is clearly marked as far as the Tarrekajse Hut. From here it continues towards Norway. There is no evidence of man's presence at Tarraure whatever, apart from the Tarrekajse Hut, a few kâtor and a Lapp migration track. A small plantation of *Larix sibirica* has been attempted, and there are some disused magnesite mines on Mt. Tarrekajse: but otherwise the whole area remains in a completely natural state.

Lake Tarraure stands at an altitude of 504 m above sea-level. The mountains south of the lake consist of hard, largely quartzitic seve schists: here and there amphibolites and rarely serpentines occur. The Tarrekajse massif north of the lake consists of amphibolite, with magnesite and dolomite outcrops to the south-west. The limit of the conifer forest is about 1 km west of Njunjes, and Lake Tarraure falls entirely within the birch zone. The birch forest reaches 900 m above sea-level on the north side of the lake, but hardly exceeds 700 m on the south side (Selander, 1950).

Collecting was limited to the western end of the lake (fig. 3), and was divided into two phases: 18—31 July was spent working in the birch forest, along the lake shore and above the tree-zone; and 3—11 August in the delta. The data given is largely self-explanatory, but in some cases a little amplification is necessary.

The expedition camp was in the birch forest south of the lake, a few metres from the lake shore (fig. 3). This forest was much more difficult to work than that north of the lake. The trees here are thinner and comparatively sporadic, and the forest belongs to the meagre heath type. There are numerous small tracks, but they are ill-defined and frequently vanish amongst the multitude of willow swamps that occur here. The vegetation is not lush, not extending much beyond grasses, juniper shrubs, and *Salices*, but in the gullies of the many streams that flow down from the mountains flowers of many kinds are in abundance. The forest was worked at many different altitudes. The birch forest north of the lake is very different: although only a narrow strip, the forest is here of a luxuriant meadow type. The track is well-defined, there are many open glades, and the ground-vegetation is on the whole dense and lush. The Tarraälvshyddan and the River Korajokk in the west, and the first major constriction of the lake east of the delta mark the furthest limits of the collecting.

The shore of the lake was only investigated on the southern side of the lake, where it is broad enough to warrant collecting. It consists principally of shingle, but there are a few broad sandy stretches bordered with *Salix*.

Collecting above the tree-zone could only be carried out south of the lake, where, owing to frequent high winds, it was concentrated on the numerous gullies down which little rivulets flow. These frequently support various *Salices*. On the north of the lake, the landscape is dominated by Mt. Antiluopta and Mt. Hiltokajse which rise almost sheer above the birch forest to 1850 m. The stream flowing into the lake by the Tarrekajse hut must be followed to

the head of its gully if one wishes to climb either Antiluopta or Hiltokajse and thus get above the tree-zone. We climbed Antiluopta, but not Hiltokajse.

Collecting in the delta was limited to the eastern, youngest parts of the delta, and the three zones investigated have been termed Spit I, Spit II and the Little Delta (fig. 3). Spits I and II could be divided into four biotope groups according to vegetation: (i) the apical sand spits; (ii) grasses and sedges; (iii) willow and sallow scrub; and (iv) birch forest. The vegetation here is confined within extremely fine limits: pure birch forest grows on levels more than 60 cm above water-level, this being particularly well developed along the levee banks of the present main river; 30 cm above water-level, willow and sallow jungle precludes most other growth; grasses and reeds grow at lower levels, and are gradually extending over the sand. Only in very narrow bands between the vegetation types does mixing occur, so sensitive are they to water-level and so closely does the vegetation adjust itself to the conditions. The Little Delta, on the other hand, is rather more complex as the vegetation zones are not so clearly defined. Considerable mixing occurs between the sedges and grasses and the *Salix* scrub so that it is quite impossible to define clearly the exact vegetation zone for the specimen swept. The banks of the small river flowing out through the Little Delta are very largely isolated from all vegetation, from the point where it issues from the birch forest as far as the lake. Odd patches of small scrubby *Salix* and grasses grow on the banks, but there is evidence to show it has frequently altered its course, and the predominant features of the environment are hard baked mud strips and shallow pebbly ditches.

In the Tarraädno, two islands were investigated (fig. 3, *y* and *z*). *Y* is little more than a sand-bank; sometimes it is joined to Spit I, by its south-eastern extremity, at others it is completely submerged. Captures here are included under "Spit I, sand spit". *Z* on the other hand is separated from the north bank of the river by a slender but deep canal, and appears very stable: the western end consists of sand, but grass and sallow scrub have taken a firm hold on the main body of the island, the sallow being especially dense at the eastern extremity. "Island in the Tarraädno" denotes this island.

Most years the whole Delta, except for the highest levels, is inundated for some days by the spring melt-water floods at the end of May or beginning of June, and about two years out of three witness a second flood following the heavy rains in August which is sometimes even higher and nearly always bears more sediment than the first. What effect this has on the insect-life of the delta throughout the year must remain a problem for future investigation. During my visit, the weather was largely favourable, but a series of severe storms in early August caused the level of the lake to rise until all the sand spits and some portions of the sedge areas were under water: the insect-life however seems to remain constant — poor on the sand spits, richer and more varied in the sedge. As the water returned to its former level within two days, this is probably no guide to the effects on the fauna of more prolonged flooding.

Fig. 1. Sweden. Lule Lappmark is stippled. K=Kvikkjokk.

Fig. 2. South Lule Lappmark, to show Lake Tarraure and other localities. 1=Lake Virihaure. 2=Sarek National Park. 3=Lake Tarraure. 4=Njunjes. 5=Kvikkjokk. Mt. Snjerak is further to the south, and is not shown on the map.

Fig. 3. Western end of Lake Tarraure, to show the localities mentioned in the text.

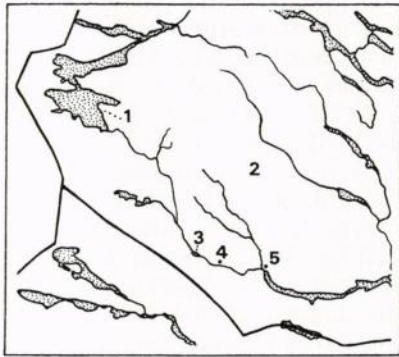


Fig.2

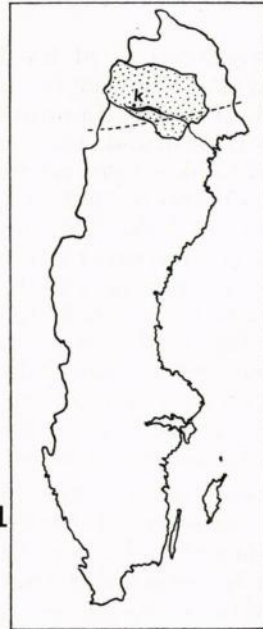


Fig.1

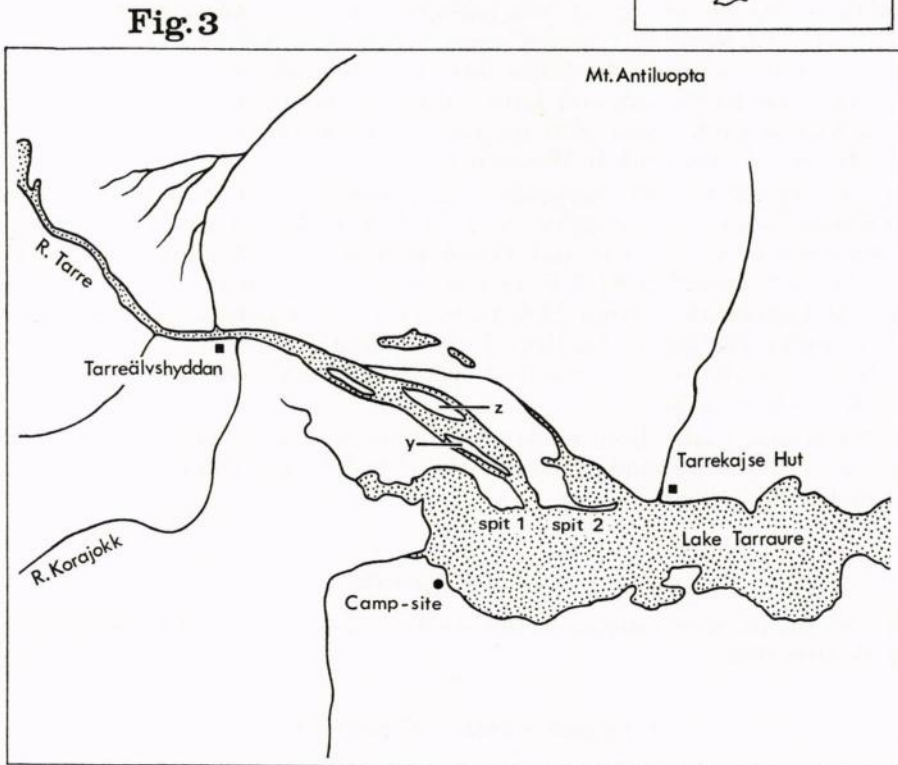


Fig.3

Figs. 1—3.

General results

Investigations of the Diptera of Lule Lappmark, and particularly of the Muscidae, are very far from complete. Earlier expeditions to Sarek National Park (Poppius, Lundström and Frey, 1916) and to Lake Virihaure (Brinck and Wingstrand, 1951) contributed a number of valuable records. 16 species of Muscidae were recorded from Sarek, 11 of which were found by me at Lake Tarraure, and 19 species from Lake Virihaure of which 14 were found by me at Lake Tarraure. Ringdahl (1951), in an invaluable paper on the Diptera Brachycera from the Swedish mountains, lists many species from Lule Lappmark and includes records from the early literature. He lists records from Sarek, Lake Virihaure, Kvikkjokk, Njunjes and Mt. Snjerak (see fig. 2), the only localities where collections have been made. In a later paper (1952), Ringdahl summarises the known distribution of Swedish Calyptrate Diptera, but not all the species listed from Lule Lappmark in 1951 are listed from this province in 1952, and the 1952 list also contains records for the province additional to those given in 1951.

Lake Tarraure was, therefore, virgin territory so far as Dipterous exploration is concerned. I collected some 1530 specimens of Muscidae, representing 70 species or 18% of the Swedish fauna, and of these 29 species were previously unrecorded from Lule Lappmark. Faunistically and zoogeographically these records are of interest, contributing to our knowledge of a little-known area of Swedish Lapland and coming from an area in the province near the upper limit of the birch forests. Lake Tarraure is also a midway point between Kvikkjokk and Lake Virihaure, both centres of recent active entomological exploration, and the results of the present expedition can be usefully linked with work in these areas.

In the Appendix at the conclusion, the material that I collected in Norway and Sweden whilst travelling to and from Kvikkjokk is listed. 334 specimens of 76 species were collected, and 32 new provincial records are listed: 2 from Bohuslän, 3 from Småland, 7 from Uppland, 2 from Ångermanland, 11 from Lycksele Lappmark, 6 from Lule Lappmark and 1 from Norrbotten. *Dasyphora zimini* Hennig is confirmed as a Swedish species, *Fannia corvina* (Verrall) is re-instated as a Swedish species, and *Hydrotaea similis* Meade is recorded as new to Norway.

Identifications have been made with the papers of Ringdahl (1954, 1956), Fonseca (1968) and Hennig (1955—1964). The arrangement of genera follows that of Hennig (1965).

List of species

Species marked with a dagger (†) are new to Lule Lappmark. The year of capture is in all cases 1962.

† *Fannia corvina* (Verrall, 1892)

Records: 1 ♂. — Birch forest, north of lake, 26 July, 1 ♂.

Distribution: England, Austria. In his most recent papers, Ringdahl treats his

species *halterata* as a synonym of *carbonaria* (Meigen, 1826), but Collin (1958: 86) has shown that *carbonaria* and *corvina* are distinct species. *F. corvina* is here reinstated as a Swedish species. Its precise distribution in Sweden must remain a matter for future investigation.

Fannia mollissima (Haliday, 1840)

Records: 1 ♂, 4 ♀. — Birch forest, south of lake, in *Trollius* flowers, 19 July, 1 ♀. Birch forest, north of lake, 25 July, 1 ♀. Above tree-line, 27 July, 1 ♂, 1 ♀. Lake shore, south bank, 19 July, 1 ♀.

Distribution: Sarek National Park; Lake Virihaure; Kvikkjokk (Ringdahl, 1951: 166). — Common throughout Sweden. — Central and north Europe.

† *Fannia ? monilis* (Haliday, 1838)

Records: 1 ♀. — Above tree-line, 20 July, 1 ♀.

Distribution: Frequent from Scania to Lapland. — Throughout Europe.

Fannia serena (Fallén, 1825)

Records: 1 ♂, 4 ♀. — Birch forest, south of lake, 19 July, 1 ♀; 27 July, 1 ♀. Birch forest, north of lake, 25 July, 1 ♂; 26 July, 1 ♀. Delta Spit I, birch forest, 4 August, 1 ♀.

Distribution: Sarek National Park. — Common throughout Sweden. — Throughout Europe, as far east as the Urals. North America.

† *Fannia sociella* (Zetterstedt, 1845)

Records: 1 ♂. — Birch forest, south of the lake, 19 July, 1 ♂.

Distribution: Scania to Lapland, common in the south. — Throughout Europe. North America.

† *Fannia subpellucens* (Zetterstedt, 1845)

Records: 1 ♂, 24 ♀. — Birch forest, south of lake, 24 July, 1 ♀; 27 July, 2 ♀. In *Trollius* flowers, south of lake, 19 July, 5 ♀. Birch forest, north of lake, 25 July, 1 ♂, 10 ♀; 26 July, 6 ♀.

Distribution: Frequent in the Swedish mountains. — Scandinavia, Urals, Kamtchatka, Japan. North America.

† *Fannia tuberculata* (Zetterstedt, 1849)

Records: 1 ♂, 9 ♀. — Birch forest, south of lake, 23 July, 1 ♀; 27 July, 1 ♀. Delta Spit I, Central marsh, 25 July, 1 ♀. Delta Spit I, Salix scrub, 4 August, 1 ♂, 1 ♀; 6 August, 1 ♀. Delta Spit II, sedge, 7 August, 1 ♀. Little Delta, sand spits, 10 August, 1 ♀. Little Delta, Salix scrub, 10 August, 1 ♀. Little Delta, river bank, 10 August, 1 ♀.

Distribution: Frequent throughout Sweden. — North Europe.

Thricops aculeipes (Zetterstedt, 1838)

Records: 116 ♂, 121 ♀. — Birch forest, south of lake, 18 July, 1 ♂; 19 July, 22 ♂, 26 ♀; 20 July, 31 ♂, 10 ♀; 23 July, 7 ♂, 1 ♀; 24 July, 32 ♂, 31 ♀; 27 July, 7 ♂,

14 ♀; 31 July, 1 ♂; 5 August, 1 ♂, 1 ♀. Birch forest, north of lake, 25 July, 4 ♂, 19 ♀; 26 July, 2 ♂, 6 ♀; 29 July, 1 ♀; 31 July, 2 ♂, 5 ♀. Above tree-line, 18 July, 1 ♀; 20 July, 1 ♂, 2 ♀. Delta Spit I, sedge, 4 August, 2 ♂, 1 ♀. Delta Spit I, birch forest, 4 August, 2 ♂; 11 August, 1 ♂, 2 ♀. Delta Spit II, 3 August, 1 ♀ (probably *Salix* scrub).

Distribution: Lake Virihaure; Kvikkjokk (Ringdahl, 1951: 168). — Common in the Swedish Mountains. — Central and north Europe.

Thricops hirsutula (Zetterstedt, 1838)

Records: 11 ♂, 33 ♀. — Birch forest, south of lake, 18 July, 1 ♂; 19 July, 3 ♂; 20 July, 1 ♀; 23 July, 1 ♀; 24 July, 4 ♂, 18 ♀; 27 July, 7 ♀; 5 August, 1 ♀; 6 August, 1 ♂. Birch forest, north of lake, 25 July, 1 ♂, 3 ♀; 26 July, 2 ♀. Little Delta, sand spits, 10 August, 1 ♂.

Distribution: Kvikkjokk (Ringdahl, 1951: 168). — Common throughout Sweden. — Europe, east to Kamtchatka. North America.

Thricops hirtula (Zetterstedt, 1838)

Records: 5 ♂, 6 ♀. — Birch forest, south of lake, in *Trollius* flowers, 18 July, 3 ♀. Birch forest, north of lake, 25 July, 1 ♂. Above tree-line, 18 July, 1 ♂, 1 ♀; 20 July, 3 ♂, 1 ♀. Summit of Mt. Antiluopta, above 1700 m, 8 August, 1 ♀.

Distribution: Sarek National Park; Lake Virihaure. — In the mountains of central and north Sweden. — Northern Europe and Asia. North America. — Not recorded from Lule Lappmark by Ringdahl (1952: 154—155).

Thricops innocua (Zetterstedt, 1838)

Records: 8 ♂, 19 ♀. — Birch forest, south of lake, 19 July, 5 ♀; 20 July, 2 ♀; 24 July, 3 ♀; 27 July, 2 ♂, 2 ♀; 28 July, 1 ♂; 5 August, 1 ♂; 7 August, 2 ♂. Birch forest, north of lake, 25 July, 1 ♂, 4 ♀; 26 July, 1 ♂, 1 ♀; 31 July, 1 ♀. Delta Spit II, *Salix* scrub, 7 August, 1 ♀.

Distribution: Sarek National Park; Kvikkjokk (Ringdahl, 1951: 168). — Common throughout Sweden, especially in the mountains. — Throughout Europe. North America.

Thricops longipes (Zetterstedt, 1845)

Records: 8 ♂, 22 ♀. — Birch forest, south of lake, 20 July, 2 ♂, 1 ♀; 23 July, 1 ♂, 1 ♀; 24 July, 6 ♀; 27 July, 1 ♂, 3 ♀. Birch forest, north of lake, 25 July, 2 ♂, 2 ♀; 26 July, 4 ♀; 31 July, 1 ♀. Above tree-line, 27 July, 2 ♀. Lake shore, south bank, 30 July, 1 ♂, 2 ♀. Delta Spit II, sedge, 7 August, 1 ♂.

Distribution: Lake Virihaure; Kvikkjokk (Ringdahl, 1951: 168). — Common throughout Sweden, especially in the north. — Throughout Europe, and Asia.

Thricops nigritella (Zetterstedt, 1838)

Records: 102 ♂, 171 ♀. — Birch forest, south of lake, 19 July, 9 ♂, 6 ♀; 20 July, 16 ♂, 19 ♀; 23 July, 1 ♂, 2 ♀; 24 July, 23 ♂, 45 ♀; 27 July, 8 ♂, 16 ♀; 30 July, 1 ♂; 3 August, 1 ♂. Birch forest, north of lake, 25 July, 23 ♂, 35 ♀; 26 July, 7 ♂, 19 ♀; 29 July, 4 ♂; 31 July, 6 ♂, 4 ♀. Ex *Trollius* flowers, south of lake, 18 July, 11 ♀.

Above tree-line, 27 July, 1 ♂, 1 ♀. Lake shore, south bank, 19 July, 1 ♀. Island in Tarraädno, 21 July, 1 ♂, 2 ♀. Delta Spit I, Salix scrub, 6 August, 1 ♀. Delta Spit I, birch forest, 4 August, 4 ♀. Delta Spit II, 3 August, 1 ♀ (probably Salix scrub). Little Delta, sand spits, 10 August, 2 ♀. Little Delta, sedge with Salix scrub, 10 August, 1 ♂, 1 ♀. Little Delta, river bank, 10 August, 1 ♀.

Distribution: Lake Virihaure; Kvikkjokk (Ringdahl, 1951: 168). — Common throughout Sweden, especially in the mountains. — Throughout Europe, and Asia.

Thricops rostrata (Meade, 1882)

Records: 21 ♂, 2 ♀. — Above tree-line, 18 July, 1 ♀; 20 July, 19 ♂, 1 ♀; 27 July, 2 ♂.

Distribution: Lake Virihaure. — Frequent in the mountains of central and north Sweden. — Europe, in mountains. Not recorded from Lule Lappmark by Ringdahl (1952: 154—155).

Thricops semicinerea (Wiedemann, 1817)

Records: 5 ♂, 1 ♀. — Birch forest, north of lake, 25 July, 1 ♂, 1 ♀; 26 July, 4 ♂.

Distribution: Lake Virihaure. — Common throughout Sweden. — Throughout Europe. Not recorded from Lule Lappmark by Ringdahl (1952: 154—155).

Thricops separ (Zetterstedt, 1845)

Records: 9 ♂, 19 ♀. — Birch forest, south of lake, 27 July, 1 ♀. Birch forest, north of lake, 25 July, 3 ♂, 10 ♀; 26 July, 4 ♂, 4 ♀; 31 July, 4 ♀. Delta Spit I, birch forest, 11 August, 2 ♂.

Distribution: Kvikkjokk (Ringdahl, 1951: 168). — Uncommon, in the mountains of central and north Sweden. — Europe, in mountains.

Alloestylus lividiventris (Zetterstedt, 1845)

Records: 3 ♂, 2 ♀. — Birch forest, south of lake, 6 August, 1 ♂; 11 August, 1 ♂. Birch forest, north of lake, 31 July, 1 ♂. Delta Spit I, Salix scrub, 6 August, 1 ♀. Delta Spit II, birch forest, 7 August, 1 ♀.

Distribution: Kvikkjokk (Ringdahl, 1951: 169). — Uncommon, in the mountains of central and north Sweden. — Europe, in the mountains. North America.

Alloestylus sundewalli (Zetterstedt, 1845)

Records: 27 ♂, 29 ♀. — Birch forest, south of lake, 18 July, 1 ♂; 19 July, 3 ♂, 2 ♀; 20 July, 1 ♂, 1 ♀; 24 July, 10 ♂, 12 ♀; 27 July, 8 ♂, 10 ♀; 31 July, 1 ♀; 11 August, 1 ♀. Birch forest, north of lake, 31 July, 1 ♂, 1 ♀. Above tree-line, 27 July, 2 ♂. Delta Spit I, birch forest, 4 August, 1 ♀; 11 August, 1 ♂.

Distribution: Sarek National Park; Lake Virihaure; Kvikkjokk (Ringdahl, 1951: 169). — Uncommon, in the mountains of central and north Sweden. — Throughout Europe, in mountains.

Hydrotaea dentipes (Fabricius, 1805)

Records: 1 ♂. — Birch forest, south of lake, 26 July, 1 ♂.

Distribution: Kvikkjokk (Ringdahl, 1951: 167). — Common throughout Sweden. — Throughout Europe and Asia. North America.

† *Hydrotaea irritans* (Fallén, 1823)

Records: 1 ♂. — Above tree-line, 27 July, 1 ♂.

Distribution: Common throughout Sweden. — Throughout Europe.

Lophosceles cinereiventris (Zetterstedt, 1845)

Records: 3 ♂, 2 ♀. — Birch forest, north of lake, 25 July, 1 ♂, 1 ♀. Above tree-line, 27 July, 2 ♂, 1 ♀.

Distribution: Lule Lappmark (Ringdahl, 1952: 154—155), but no localities given. — Uncommon, throughout Sweden. — Central and north Europe, and east Asia.

Lophosceles frenatus (Holmgren, 1872)

Records: 4 ♂. — Above tree-line, 18 July, 3 ♂; 27 July, 1 ♂.

Distribution: Snjerak (Ringdahl, 1951: 169). — In the mountains of north Sweden. — Scandinavia, Alps. North America.

Lophosceles hians (Zetterstedt, 1838)

Records: 3 ♂, 1 ♀. — Birch forest, south of lake, 20 July, 1 ♀; 24 July, 1 ♂; 11 August, 1 ♂. Lake shore, south bank, 30 July, 1 ♂.

Distribution: Kvikkjokk (Ringdahl, 1951: 169). — Common in the mountains of central and north Sweden. — Known only from Scandinavia.

Phaonia alpicola (Zetterstedt, 1845)

Records: 25 ♂, 59 ♀. — Birch forest, south of lake, 18 July, 1 ♂, 3 ♀; 19 July, 3 ♂, 8 ♀; 20 July, 5 ♂, 18 ♀; 21 July, 2 ♂, 1 ♀; 23 July, 1 ♀; 24 July, 4 ♂, 11 ♀; 27 July, 4 ♂, 3 ♀. Birch forest, north of lake, 25 July, 1 ♀; 26 July, 1 ♂; 31 July, 2 ♀. Above tree-line, 18 July, 3 ♂, 4 ♀; 20 July, 2 ♂, 4 ♀. Island in Tarraädno, 21 July, 1 ♀. Delta, Spit I, birch forest, 4 August, 1 ♀. Delta Spit II, 3 August, 1 ♀ (probably *Salix* scrub).

Distribution: Sarek National Park; Lake Virihaure; Kvikkjokk (Ringdahl, 1951: 170). — Common in the mountains of central and north Sweden. — Europe, in the mountains, and Asia.

† *Phaonia atrocyanea* Ringdahl, 1916

Records: 3 ♀. — Birch forest, south of lake, 26 July, 1 ♀; 27 July, 2 ♀.

Distribution: Rare, Jämtland and Torne Lappmark. — Known only from Sweden.

Phaonia errans (Meigen, 1826)

Records: 4 ♀. — Birch forest, south of lake, 24 July, 2 ♀. Birch forest, north of lake, 25 July, 1 ♀; 29 July, 1 ♀.

Distribution: Kvikkjokk (Ringdahl, 1951: 170). — Common throughout Sweden. — Throughout Europe, and Asia. North America.

† *Phaonia grandaeva* (Zetterstedt, 1845)

Records: 1 ♂. — Birch forest, south of lake, 19 July, 1 ♂.

Distribution: This marks a considerable northward extension in the range of this species. — Rare; Scania, Dalarna, Jämtland. — Known only from Scandinavia.

Phaonia hybrida (Schnabl, 1888)

Records: 3 ♂, 4 ♀. — Birch forest, south of lake, 19 July, 1 ♀; 20 July, 1 ♂. Birch forest, north of lake, 25 July, 1 ♀; 26 July, 1 ♂, 2 ♀. Above tree-line, 27 July, 1 ♂.

Distribution: Kvikkjokk (Ringdahl, 1951: 169). — Common in the mountains of central and north Sweden. — Throughout Europe, and Asia. North America.

Phaonia morio (Zetterstedt, 1845)

Records: 13 ♂, 19 ♀. — Birch forest, south of lake, 18 July, 1 ♂; 19 July, 1 ♂, 2 ♀; 20 July, 2 ♂, 2 ♀; 24 July, 1 ♂, 6 ♀; 26 July, 1 ♀; 27 July, 1 ♂, 1 ♀; 3 August, 1 ♀; 4 August, 1 ♀; 11 August, 1 ♀. Birch forest, north of lake, 25 July, 1 ♂; 26 July, 1 ♂, 1 ♀; 31 July, 1 ♀. Above tree-line, 18 July, 1 ♂; 20 July, 1 ♂; 27 July, 2 ♂, 1 ♀. Island in Tarraädno, 21 July, 1 ♂, 1 ♀.

Distribution: Sarek National Park. — Common in the mountains of central and north Sweden. — Central and north Europe, in mountains. Asia. North America.

Phaonia subfuscinervis (Zetterstedt, 1838)

Records: 1 ♂. — Birch forest, south of lake, 20 July, 1 ♂.

Distribution: Sarek National Park; Snjerak (Ringdahl, 1951: 169). — Frequent in the mountains of central and north Sweden. — Scotland, Scandinavia. North America.

Helina binotata (Zetterstedt, 1845)

Records: 4 ♂, 31 ♀. — Birch forest, south of lake, 19 July, 1 ♂, 1 ♀; 20 July, 2 ♀; 21 July, 1 ♀; 23 July, 2 ♀; 24 July, 2 ♂, 6 ♀; 27 July, 2 ♀; 5 August, 1 ♀; 6 August, 1 ♀; 10 August, 2 ♀; 11 August, 1 ♀. Birch forest, north of lake, 25 July, 1 ♀; 31 July, 2 ♀. Above tree-line, 27 July, 1 ♂, 2 ♀. Delta Spit I, sedge, 4 August, 1 ♀. Delta Spit I, Salix scrub, 4 August, 1 ♀. Delta Spit I, birch forest, 4 August, 2 ♀; 11 August, 2 ♀. Little Delta, sand spits, 10 August, 1 ♀.

Distribution: Sarek National Park; Njunjes and Kvikkjokk (Ringdahl, 1951: 165). — Common in the mountains of central and north Sweden. — Known only from Scandinavia.

† *Helina cothurnata* (Rondani, 1866)

Records: 1 ♀. — Birch forest, south of lake, 24 July, 1 ♀.

Distribution: Rare; Uppland, Dalarna, Torne Lappmark. — North and central Europe, Kamtchatka.

Helina denudata (Zetterstedt, 1845)

Records: 1 ♀. — Birch forest, south of lake, 24 July, 1 ♀.

Distribution: Kvikkjokk (Ringdahl, 1951: 165). — Rare, from Scania to Lapland. — North and central Europe, in the mountains.

Helina flavisquama (Zetterstedt, 1849)

Records: 4 ♂, 13 ♀. — Birch forest, south of lake, 19 July, 2 ♀; 23 July, 2 ♂; 24 July, 3 ♀; 27 July, 1 ♂, 1 ♀. Birch forest, north of lake, 25 July, 5 ♀. Island in Tarraädno, 21 July, 1 ♀. Delta Spit II, birch forest, 7 August, 1 ♂. Little Delta, river bank, 10 August, 1 ♀.

Distribution: Kvikkjokk and Njunjes (Ringdahl, 1951: 165). — Common in the mountains of central and north Sweden. — Scandinavia and the Alps, ?Kamtchatka.

Helina fulvisquama (Zetterstedt, 1845)

Records: 7 ♂. — Birch forest, south of lake, 18 July, 2 ♂; 19 July, 3 ♂; 24 July, 2 ♂.

Distribution: Kvikkjokk (Ringdahl, 1951: 164). — Common in the mountains of central and north Sweden. — Scandinavia, Alps; Kamtchatka. North America.

† *Helina laetifica* (Robineau-Desvoidy, 1830)

Records: 1 ♀. — Birch forest, south of lake, 20 July, 1 ♀.

Distribution: Common throughout Sweden. — Holarctic, common.

Helina luteisquama (Zetterstedt, 1845)

Records: 2 ♂. — Birch forest, south of lake, 24 July, 1 ♂; 27 July, 1 ♂.

Distribution: Kvikkjokk (Ringdahl, 1951: 165). — Frequent in the mountains of Jämtland and Lapland. — Scandinavia. North America.

Helina ? maculipennis (Zetterstedt, 1845)

Records: 3 ♀. — Birch forest, south of lake, 24 July, 1 ♀. Birch forest, north of lake, 25 July, 1 ♀; 26 July, 1 ♀.

Distribution: Kvikkjokk (Ringdahl, 1951: 165). — Frequent throughout Sweden. — Central and north Europe; Kamtchatka.

† *Helina subvittata* (Séguy, 1923)

Records: 1 ♂, 1 ♀. — Delta Spit II, 3 August, 1 ♀ (probably *Salix* scrub). Little Delta, sedge with *Salix* scrub, 10 August, 1 ♂.

Distribution: Throughout Sweden, most common in the north. — Central and north Europe, in mountains. Asia. North America.

Helina veterana (Zetterstedt, 1838)

Records: 2 ♂. — Birch forest, south of lake, 24 July, 1 ♂; 27 July, 1 ♂.

Distribution: Kvikkjokk (Ringdahl, 1951: 164). — Rare, Jämtland and Lapland. Not recorded from Lule Lappmark by Ringdahl (1952: 162—163). — Known only from Scandinavia.

Mydaea anicula (Zetterstedt, 1860)

Records: 1 ♂. — Birch forest, south of lake, 27 July, 1 ♂.

Distribution: Kvikkjokk (Ringdahl, 1951: 165). — Frequent throughout Sweden, especially in the north. — North Europe.

Mydaea orichalcea (Zetterstedt, 1849)

Records: 5 ♀. — Birch forest, south of lake, 30 July, 1 ♀; 6 August, 1 ♀; 10 August, 2 ♀; 11 August, 1 ♀.

Distribution: Kvikkjokk (Ringdahl, 1951: 166). — Frequent in the mountains of central and north Sweden. Not recorded from Lule Lappmark by Ringdahl (1952: 160—161). — Scandinavia, Kamtchatka. North America.

† *Spilogona alpica* (Zetterstedt, 1845)

Records: 1 ♀. — Above tree-line, 18 July, 1 ♀.

Distribution: Rare; Jämtland and Torne Lappmark. — Central and north Europe, in the mountains. North America.

† *Spilogona baltica* (Ringdahl, 1918)

Records: 2 ♂. — Island in Tarraädno, 21 July, 2 ♂.

Distribution: A southern species in Sweden, not previously recorded north of Västergötland. — North Europe, North America.

Spilogona brunneisquama (Zetterstedt, 1845)

Records: 42 ♂, 44 ♀. — Birch forest, south of lake, 19 July, 2 ♀; 20 July, 1 ♂, 1 ♀; 23 July, 1 ♂; 24 July, 9 ♂, 19 ♀; 25 July, 1 ♂; 27 July, 7 ♂, 1 ♀; 28 July, 3 ♂; 30 July, 2 ♀; 31 July, 1 ♀; 3 August, 1 ♂, 1 ♀; 10 August, 1 ♂, 1 ♀; 11 August, 2 ♂, 1 ♀. Birch forest, north of lake, 25 July, 2 ♀; 26 July, 1 ♂; 31 July, 1 ♂. Above tree-line, 18 July, 3 ♂, 1 ♀; 20 July, 1 ♂; 27 July, 1 ♂, 1 ♀. Lake shore, south bank, 19 July, 1 ♂; 30 July, 1 ♂. Delta Spit I, Central marsh, 25 July, 2 ♀. Delta Spit I, sedge, 4 August, 2 ♂, 1 ♀. Delta Spit I, Salix scrub, 4 August, 2 ♂; 6 August, 1 ♀. Delta Spit I, birch forest, 4 August, 1 ♂. Delta Spit II, Salix scrub, 7 August, 3 ♀. Little Delta, sand spits, 10 August, 2 ♀. Little Delta, sedge with Salix scrub, 10 August, 2 ♂, 1 ♀. Little Delta, river bank, 10 August, 1 ♀.

Distribution: Lake Virihaure. — Common in the mountains of central and north Sweden; Scania. — Central and north Europe, in the mountains. Siberia.

Spilogona contractifrons (Zetterstedt, 1838)

Records: 52 ♂, 108 ♀. — Birch forest, south of lake, 18 July, 1 ♀; 19 July, 6 ♂, 17 ♀; 20 July, 2 ♂, 7 ♀; 23 July, 1 ♂, 3 ♀; 24 July, 7 ♂, 23 ♀; 26 July, 1 ♂;

27 July, 4 ♂, 28 ♀; 31 July, 1 ♂, 1 ♀. Birch forest, north of lake, 25 July, 10 ♂, 7 ♀; 26 July, 6 ♂, 3 ♀; 29 July, 2 ♂; 31 July, 2 ♂, 3 ♀. Above tree-line, 18 July, 1 ♀; 27 July, 3 ♂, 3 ♀. Summit of Mt. Antiluopta, over 1700 m, 8 August, 3 ♀. Delta Spit I, Salix scrub, 4 August, 1 ♀; 6 August, 2 ♀. Delta Spit I, birch forest, 11 August, 1 ♀. Delta Spit II, sedge, 7 August, 1 ♀. Delta Spit II, Salix scrub, 7 August, 1 ♂. Delta Spit II, 3 August, 4 ♂, 1 ♀ (probably Salix scrub). Delta Spit II, birch forest, 7 August, 1 ♂. Little Delta, sand spits, 10 August, 1 ♂. Little Delta, sedge with Salix scrub, 10 August, 2 ♀.

Distribution: Sarek National Park; Lake Virihaure. — Throughout Sweden, most common in the north. Not recorded from Lule Lappmark by Ringdahl (1952: 162—163). — Central and north Europe. North America.

† *Spilogona denigrata* (Meigen, 1826)

Records: 9 ♂, 4 ♀. — Birch forest, south of lake, 19 July, 2 ♂; 20 July, 1 ♂; 23 July, 1 ♂; 24 July, 2 ♂; 5 August, 1 ♂, 1 ♀. Birch forest, north of lake, 25 July, 2 ♂, 3 ♀.

Distribution: Throughout Sweden, from Scania to Torne Lappmark. — Central and north Europe.

† *Spilogona depressiuscula* (Zetterstedt, 1838)

Records: 1 ♂, 4 ♀. — Delta Spit I, sedge, 6 August, 1 ♂. Delta Spit II, Salix scrub, 7 August, 1 ♀. Little Delta, sedge with Salix scrub, 10 August, 3 ♀.

Distribution: Frequent in the Swedish mountains; Småland. — Central and north Europe, in the mountains.

Spilogona dorsata (Zetterstedt, 1845)

Records: 1 ♀. — Delta Spit I, sand spits, 4 August, 1 ♀.

Distribution: Lake Virihaure. — Uncommon, in the mountains of north Sweden. Not recorded from Lule Lappmark by Ringdahl (1952: 164—165). — Scandinavia, Arctic islands. North America.

† *Spilogona malaisei* (Ringdahl, 1920)

Records: 7 ♂, 9 ♀. — Delta Spit I, sedge, 4 August, 2 ♀; 6 August, 1 ♂. Delta Spit I, Salix scrub, 4 August, 1 ♀. Delta Spit II, sedge, 7 August, 2 ♂, 2 ♀. Little Delta, sedge with Salix scrub, 10 August, 4 ♂, 3 ♀. Little Delta, river bank, 10 August, 1 ♀.

Distribution: Rare, in Åsele and Torne Lappmark. — Scandinavia. North America.

† *Spilogona meadei* (Schnabl, 1915)

Records: 1 ♀. — Little Delta, river bank, 10 August, 1 ♀.

Distribution: Common in the mountains of north Sweden. — Central and north Europe, in the mountains.

† *Spilogona micans* (Ringdahl, 1918)

Records: 2 ♂, 6 ♀. — Island in Tarraädno, 21 July, 1 ♂, 1 ♀. Little Delta, sedge with *Salix* scrub, 10 August, 1 ♂, 3 ♀. Little Delta, river bank, 10 August, 2 ♀.

Distribution: Previously known only from Torne Lappmark. — Scandinavia. North America.

Spilogona nigriventris (Zetterstedt, 1845)

Records: 5 ♀. — Island in Tarraädno, 21 July, 3 ♀. Delta Spit I, sedge, 4 August, 1 ♀. Little Delta, river bank, 10 August, 1 ♀.

Distribution: Kvikkjokk (Ringdahl, 1951: 163). — Frequent in the mountains of north Sweden. — Scandinavia. North America.

† *Spilogona nitidicauda* (Schnabl, 1915)

Records: 1 ♂. — Above tree-line, 20 July, 1 ♂.

Distribution: Previously known only from Jämtland and Torne Lappmark. — Sweden, north Asia.

† *Spilogona ? surda* (Zetterstedt, 1845)

Records: 1 ♀. — Little Delta, river bank, 10 August, 1 ♀.

Distribution: Throughout Sweden, from Scania to Torne Lappmark. — Central and north Europe, Kamtchatka. North America.

† *Spilogona tornensis* (Ringdahl, 1926)

Records: 2 ♀. — Delta Spit I, sedge, 4 August, 1 ♀. Little Delta, river bank, 10 August, 1 ♀.

Distribution: Previously known from Jämtland and Torne Lappmark. — Sweden. North America.

Spilogona triangulifera (Zetterstedt, 1838)

Records: 46 ♂, 34 ♀. — Birch forest, south of lake, 25 July, 1 ♀; 30 July, 2 ♀; 5 August, 1 ♀. Above tree-line, 18 July, 4 ♂, 2 ♀. Lake shore, south bank, 19 July, 38 ♂, 9 ♀; 24 July, 2 ♂, 3 ♀; 30 July, 1 ♂, 1 ♀. Island in Tarraädno, 21 July, 2 ♀. Delta Spit I, sand spits, 4 August, 1 ♂, 4 ♀. Delta Spit I, sedge, 4 August, 1 ♀; 6 August, 1 ♀. Delta Spit I, *Salix* scrub, 4 August, 1 ♀; 6 August, 1 ♀. Delta Spit II, sand spits, 7 August, 1 ♀. Delta Spit II, sedge, 7 August, 1 ♀. Delta Spit II, 3 August, 1 ♀ (probably *Salix* scrub). Little Delta, sand spits, 10 August, 1 ♀. Little Delta, river bank, 10 August, 1 ♀.

Distribution: Sarek National Park; Kvikkjokk (Ringdahl, 1951: 163). — Common in the mountains of central and north Sweden. — North Europe. North America.

Spilogona tundrica (Schnabl, 1911)

Records: 20 ♂, 44 ♀. — Lake shore, south bank, 19 July, 1 ♂. Delta Spit I, central marsh, 25 July, 1 ♂, 10 ♀. Delta Spit I, sedge, 4 August, 6 ♂, 3 ♀; 6 August, 3 ♂, 3 ♀.

Delta Spit II, sedge, 7 August, 7 ♂, 28 ♀. Little Delta, sedge with Salix scrub, 10 August, 2 ♂.

Distribution: Lake Virihaure; Kvikkjokk (Ringdahl, 1951: 164). — In the mountains of central and north Sweden. Not recorded from Lule Lappmark by Ringdahl (1952: 164—165). — Scandinavia, Siberia.

† *Spilogona vana* (Zetterstedt, 1845)

Records: 1 ♀. — Little Delta, river bank, 10 August, 1 ♀.

Distribution: Previously known only as far north as Dalarna in Sweden, so this record must be regarded as rather doubtful. — Throughout Europe.

† *Spilogona varsaviensis* (Schnabl, 1911)

Records: 4 ♂. — Lake shore, south bank, 20 July, 3 ♂. Island in Tarraädno, 21 July, 1 ♂.

Distribution: Previously known only from Torneträsk in Sweden. — North Europe.

† *Limnophora nigripes* (Robineau-Desvoidy, 1830)

Records: 1 ♂. — Lake shore, south bank, 19 July, 1 ♂.

Distribution: Throughout Sweden, most common in the north. — Europe, east Asia. North America.

† *Limnophora ? orbitalis* Stein, 1907

Records: 5 ♀. — Birch forest, north of lake, 26 July, 1 ♀. Lake shore, south bank, 18 July, 1 ♀. — Island in Tarraädno, 21 July, 1 ♀. Delta Spit I, sedge, 6 August, 1 ♀. Little Delta, sand spits, 10 August, 1 ♀.

Distribution: Previously known only from Jämtland and Torne Lappmark. — Europe, in the mountains. Central Asia.

† *Lispe tentaculata* (Degeer, 1776)

Records: 1 ♀. — Lake shore, south bank, 19 July, 1 ♀.

Distribution: Common throughout Sweden. — Throughout Europe and Asia. North and South America.

Schoenomyza litorella (Fallén, 1823)

Records: 6 ♂, 10 ♀. — Delta Spit I, sedge, 4 August, 4 ♂, 4 ♀. Delta Spit I, Salix scrub, 4 August, 1 ♀. Delta Spit II, sedge, 7 August, 2 ♂, 2 ♀. Delta Spit II, Salix scrub, 7 August, 1 ♀. Little Delta, river bank, 10 August, 2 ♀.

Distribution: Lake Virihaure. — Common throughout Sweden. Not recorded from Lule Lappmark by Ringdahl (1952: 168—169). — Throughout Europe and Asia. North and East Africa. North America.

† *Coenosia bilineella* (Zetterstedt, 1838)

Records: 1 ♂, 2 ♀. — Island in Tarraädno, 21 July, 1 ♂, 2 ♀.

Distribution: Common from Scania to Torne Lappmark. — Throughout Europe and Asia.

Coenosia fulvicornis (Zetterstedt, 1845)

Records: 21 ♀. — Lake shore, south bank, 19 July, 1 ♀. Island in Tarraädno, 21 July, 3 ♀. Delta Spit I, central marsh, 25 July, 2 ♀. Delta Spit I, sedge, 4 August, 6 ♀. Delta Spit I, Salix scrub, 4 August, 5 ♀; 6 August, 2 ♀. Little Delta, sedge with Salix scrub, 10 August, 1 ♀. Little Delta, river bank, 10 August, 1 ♀.

Distribution: Recorded from Lule Lappmark by Ringdahl (1952: 166—167), but without localities. — In the mountains of Jämtland, Lule Lappmark and Torne Lappmark. — Scandinavia. Asia.

Coenosia means Meigen, 1826

Records: 4 ♂, 4 ♀. — Birch forest, south of lake, 27 July, 2 ♂, 1 ♀. Birch forest, north of lake, 25 July, 1 ♂; 31 July, 1 ♀. Delta Spit I, sedge, 4 August, 1 ♂, 1 ♀. Little Delta, sedge with Salix scrub, 10 August, 1 ♀.

Distribution: Kvikkjokk (Ringdahl, 1951: 161). — Common throughout Sweden. — Central and north Europe, especially in the mountains.

† *Coenosia mollicula* (Fallén, 1825)

Records: 1 ♀. — Birch forest, north of lake, 26 July, 1 ♀.

Distribution: Not previously known north of Ångermanland and Jämtland, common in the south. — Throughout Europe and Asia. North America.

† *Coenosia perpusilla* Meigen, 1826

Records: 1 ♂. — Little Delta, sedge with Salix scrub, 10 August, 1 ♂. — Doubtfully determined, 4 ♀: Island in Tarraädno, 21 August, 1 ♀. Delta Spit I, sedge, 4 August, 1 ♀. Delta Spit I, birch forest, 4 August, 1 ♀. Little Delta, river bank, 10 August, 1 ♀.

Distribution: Common from Scania to Torne Lappmark. — Central and north Europe.

Coenosia pulicaria (Zetterstedt, 1845)

Records: 4 ♂, 6 ♀. — Birch forest, south of lake, 24 July, 1 ♀. Island in Tarraädno, 21 July, 2 ♂, 1 ♀. Delta Spit I, sedge, 4 August, 1 ♂, 1 ♀. Delta Spit II, sedge, 7 August, 1 ♀. Little Delta, sedge with Salix scrub, 10 August, 1 ♂, 2 ♀.

Distribution: Kvikkjokk (Ringdahl, 1951: 161). — Frequent, from Scania to Torne Lappmark. Not recorded from Lule Lappmark by Ringdahl (1952: 168—169). — Central and north Europe, Asia. North America.

Ecological discussion

The remarks in this section must be limited since no objective sampling of Muscidae was attempted. All collecting was done with a hand-net, mainly

by sweeping but also with some individual collecting. No traps or baits were used. Any ecological analysis must therefore reflect to a certain extent the bias in collecting. A further consideration is the situation of the expedition camp-site, in the birch forest on the south side of the lake, the result of which was that far more extensive and systematic collecting was possible here. One would expect a much greater diversification of the fauna north of the lake, on the south-facing bluffs, correlated with the richer flora of such situations (Selander, 1950). But in fact 40 species were found in the birch forest south of the lake, compared with only 28 species north of the lake.

The area studied could be divided into four broad ecological zones: (a) above the tree-zone, including arctic heath, rocky stream beds and the associated dwarf sallows; (b) the birch forest, including the willow swamps amongst them; (c) the marshes and sedge fens, with the willow and sallow jungles; (d) beaches and sand spits.

In general terms, most of the species above the tree-line and in the birch forests are Fanniinae, Hydrotaeinae, Phaoniinae and Mydaeinae, and those in the marshes and on the beaches are Limnophorinae and Coenosiinae. *Thricops*, *Phaonia* and *Helina* are the dominant genera of the birch forest, *Spilogona* and *Coenosia* the dominant genera of the marshes. Certain species have a very broad ecological tolerance and are found in all four biotopes:

| | |
|----------------------------|---------------------------------|
| <i>Thricops longipes</i> | <i>Spilogona brunneisquama</i> |
| <i>Thricops nigritella</i> | <i>Spilogona contractifrons</i> |
| <i>Helina binotata</i> | <i>Spilogona triangulifera</i> |

Some are also found in three biotopes:

| | |
|---------------------------|-----------------------------|
| <i>Fannia mollissima</i> | <i>Phaonia alpicola</i> |
| <i>Fannia tuberculata</i> | <i>Phaonia morio</i> |
| <i>Thricops aculeipes</i> | <i>Limnophora orbitalis</i> |

But the vast majority of species are found in only two biotopes (15 species) or in just one (43 species).

Species found in the different biotopes are as follows. Those marked with an asterisk were found only in the biotope under which they are listed.

A. Above tree-zone

| | |
|-----------------------------------|---------------------------------|
| 20 species (28.6%). | * <i>Lophosceles frenatus</i> |
| <i>Fannia mollissima</i> | <i>Phaonia alpicola</i> |
| * <i>Fannia monilis</i> | <i>Phaonia hybrida</i> |
| <i>Thricops aculeipes</i> | <i>Phaonia morio</i> |
| <i>Thricops hirtula</i> | <i>Helina binotata</i> |
| <i>Thricops longipes</i> | * <i>Spilogona alpica</i> |
| <i>Thricops nigritella</i> | <i>Spilogona brunneisquama</i> |
| * <i>Thricops rostrata</i> | <i>Spilogona contractifrons</i> |
| <i>Alloeostylus sundewalli</i> | * <i>Spilogona nitidicauda</i> |
| * <i>Hydrotaea irritans</i> | <i>Spilogona triangulifera</i> |
| <i>Lophosceles cinereiventris</i> | |

Of these 20 species, 6 were found only above the tree-zone, 4 were common to two biotopes, 4 were common to three, and 6 common to all four.

20 species were found above the tree-zone south of the lake, and 2 on the summit of Mt. Antiluopta.

B. Birch forest

46 species (65.7 %).

**Fannia corvina*
Fannia mollissima
 **Fannia serena*
 **Fannia sociella*
 **Fannia subpellucens*
Fannia tuberculata
Thricops aculeipes
Thricops hirsutula
Thricops hirtula
Thricops innocua
Thricops longipes
Thricops nigritella
 **Thricops semicinerea*
 **Thricops separ*
Alloeostylus lividiventris
Alloeostylus sundewalli
 **Hydrotaea dentipes*
Lophosceles cinereiventris
Lophosceles hians
Phaonia alpicola
 **Phaonia atrocyanea*
 **Phaonia errans*
 **Phaonia grandaeva*

Phaonia hybrida
Phaonia morio
 **Phaonia subfuscineris*
Helina binotata
 **Helina cothurnata*
 **Helina denudata*
Helina flavisquama
 **Helina fulvisquama*
 **Helina luteisquama*
 **Helina laetifica*
 **Helina maculipennis*
 **Helina veterana*
 **Mydaea anicula*
 **Mydaea orichalcea*
Spilogona brunneisquama
Spilogona contractifrons
 **Spilogona denigrata*
Spilogona triangulifera
Coenosia means
 **Coenosia mollicula*
Coenosia perpusilla
Coenosia pulicaria
Limnophora orbitalis

Of these 46 species, 22 were found only in the birch forest, 12 were common to two biotopes, 6 were common to three, and 6 common to all four.

40 species were found south of the lake, 28 north of the lake, 10 on Delta Spit I and 3 on Delta Spit II.

C. Marsh

32 species (45.7 %).

Fannia tuberculata
Thricops aculeipes
Thricops innocua
Thricops longipes
Thricops nigritella
Alloeostylus lividiventris
Phaonia alpicola
Phaonia morio
Helina binotata
Helina flavisquama
 **Helina subvittata*
 **Spilogona baltica*
Spilogona brunneisquama
Spilogona contractifrons
 **Spilogona depressiuscula*
 **Spilogona malaisei*

**Spilogona meadei*
 **Spilogona micans*
 **Spilogona nigriiventris*
 **Spilogona surda*
 **Spilogona tornensis*
Spilogona triangulifera
Spilogona tundrica
 **Spilogona vana*
Spilogona varsaviensis
Limnophora orbitalis
 **Schoenomyza litorella*
 **Coenosia bilineella*
Coenosia fulvicornis
Coenosia means
Coenosia perpusilla
Coenosia pulicaria

Of these 32 species, 12 were found only in the marshes, 9 were common to two biotopes, 5 were common to three, and 6 common to all four.

15 species were found in Salix scrub (10 on Delta Spit I and 10 on Delta Spit II), 15 in the Little Delta, river bank, 13 in the Little Delta, sedge and Salix scrub, 14 on the Island in the Tarraädno, and 18 in the sedge fens (15 on Delta Spit I, 4 in the central marsh, and 8 on Delta Spit II).

D. Beaches

17 species (24.3 %).

*Fannia mollissima**Fannia tuberculata**Thricops hirsutula**Thricops longipes**Thricops nigritella**Lophosceles hians**Helina binotata**Spilogona brunneisquama**Spilogona contractifrons***Spilogona dorsata**Spilogona triangulifera**Spilogona tundrica**Spilogona varsaviensis***Limnophora nigripes**Limnophora orbitalis***Lispe tentaculata**Coenosia fulvicornis*

Of these 17 species, 3 were found only on the beaches and sandspits, 5 were common to two biotopes, 3 were common to three, and 6 common to all four.

12 species were found on the south shore of the lake, and 9 on the sandspits of the delta (2 on Delta Spit I, 1 on Delta Spit II, and 8 in the Little Delta).

Appendix

The following is a list of Muscidae collected at various localities in Sweden and Norway whilst travelling to and from Kvikkjokk. Species marked with a dagger (†) are new provincial records. In all cases the year of capture is 1962.

Fannia armata (Meigen, 1826)

SMÅLAND: near Gränna, 7 July, 2 ♂.

UPPLAND: near Tierp, 9 July, 1 ♂.

Fannia canicularis (Linnaeus, 1761)

SMÅLAND: near Gränna, 7 July, 6 ♂.

†UPPLAND: near Tierp, 9 July, 2 ♂.

Fannia corvina (Verrall, 1892)

†UPPLAND: near Tierp, 9 July, 1 ♂.

Fannia hamata (Macquart, 1835)

SMÅLAND: near Gränna, 7 July, 1 ♀.

Fannia manicata (Meigen, 1826)

NORWAY, Nord-Trøndelag: Trondjem, near Trondheim, 23 August, 9 ♂.

Fannia monilis (Haliday, 1838)

†UPPLAND: near Tierp, 9 July, 2 ♂.

Fannia postica (Stein, 1895)

†SMÅLAND: near Gränna, 7 July, 4 ♂.

Fannia ringdahlana Collin, 1939

SMÅLAND: near Gränna, 7 July, 1 ♂.

Fannia serena (Fallén, 1825)

SMÅLAND: near Gränna, 7 July, 3 ♂.

UPPLAND: near Tierp, 9 July, 4 ♂,

1 ♀. LYCKSELE LAPPMARK: Vilan,

near Lycksele, 21 August, 2 ♀. LULE

LAPPMARK: Kvikkjokk, 14 July, 2

♂. NORWAY, Nord-Trøndelag: Trond-

jem, near Trondheim, 23 August, 2 ♀.

Fannia similis (Stein, 1895)

UPPLAND: near Tierp, 9 July, 3 ♀.

Fannia sociella (Zetterstedt, 1845)

†UPPLAND: near Tierp, 9 July, 3 ♂.

Polietes albolineatus (Fallén, 1823)

SMÅLAND: near Gränna, 7 July, 1 ♂.

Polietes lardarius (Fabricius, 1781)

NORWAY, Nord-Trøndelag: Trond-

jem, near Trondheim, 23 August, 1 ♀.

Polietes steinii (Ringdahl, 1913)

†UPPLAND: near Tierp, 9 July, 1 ♀.

Dasyphora zimini Hennig, 1964

†SMÅLAND: near Gränna, 7 July, 1 ♀.

Musca domestica Linnaeus, 1758

†LYCKSELE LAPPMARK: Vilan, near

Lycksele, 21 August, 1 ♂.

Thricops aculeipes (Zetterstedt, 1838)

NORWAY, Nordland: Hattfjellidal, 22

August, 1 ♀.

Thricops hirsutula (Zetterstedt, 1838)

SMÅLAND: near Gränna, 7 July, 24 ♂.

†UPPLAND: near Tierp, 9 July, 15 ♂,

7 ♀. †LYCKSELE LAPPMARK: Vilan,

near Lycksele, 21 August, 21 ♀; Joe-

sjö, near Tärnaby, 22 August, 1 ♀.

NORRBOTTEN: Harads, near Boden,

13 July, 4 ♂; Edefors, near Boden, 19

- August, 3 ♀. LULE LAPPMARK: Kvikkjokk, 14 July, 2 ♂.
- Thricops innocua* (Zetterstedt, 1838)
 †UPPLAND: near Tierp, 9 July, 1 ♂.
 NORRBOTTEN: Harads, near Boden, 13 July, 1 ♂. NORWAY, Nord-Trøndelag: Trondjem, near Trondheim, 23 August, 2 ♀.
- Thricops longipes* (Zetterstedt, 1845)
 †LYCKSELE LAPPMARK: Joesjö, near Tärnaby, 22 August, 1 ♂, 1 ♀.
 LULE LAPPMARK: Kvikkjokk, 14 July, 1 ♂.
- Thricops nigrifrons* (Robineau-Desvoidy, 1830) (= *variabilis* Fallén, 1823, nec Gmelin, 1790)
 VÄSTERGÖTLAND: Borås, 7 July, 1 ♂. SMÅLAND: near Gränna, 7 July, 6 ♂, 2 ♀.
- Thricops nigrifrons* (Zetterstedt, 1838)
 LYCKSELE LAPPMARK: Joesjö, near Tärnaby, 22 August, 1 ♀. LULE LAPPMARK: Kvikkjokk, 14 July, 2 ♂.
 NORWAY, Nordland: Hattfjelldal, 22 August, 2 ♀. NORWAY, Nord-Trøndelag: Trondjem, near Trondheim, 23 August, 2 ♀.
- Thricops semicinerea* (Wiedemann, 1817)
 SMÅLAND: near Gränna, 7 July, 6 ♂, 3 ♀. UPPLAND: near Tierp, 9 July, 4 ♂, 7 ♀. †LYCKSELE LAPPMARK: Vilan, near Lycksele, 21 August, 1 ♂, 3 ♀. NORRBOTTEN: Edefors, near Boden, 19 August, 1 ♂. NORWAY, Nordland: Hattfjelldal, 22 August, 3 ♂. 1 ♀. NORWAY, Nord-Trøndelag: Trondjem, near Trondheim, 23 August, 1 ♀.
- Thricops separ* (Zetterstedt, 1845)
 NORWAY, Nordland: Hattfjelldal, 22 August, 1 ♀.
- Alloestylus diaphanus* (Wiedemann, 1817)
 †LYCKSELE LAPPMARK: Vilan, near Lycksele, 21 August, 1 ♀.
- Alloestylus sundewalli* (Zetterstedt, 1845)
 NORWAY, Nordland: Hattfjelldal, 22 August, 3 ♀.
- Pogonomyia tetra* (Meigen, 1826)
 †LULE LAPPMARK: Kvikkjokk, 14 July, 2 ♂.
- Hydrotaea albipuncta* (Zetterstedt, 1845)
 †SMÅLAND: near Gränna, 7 July, 1 ♀.
- Hydrotaea bimaculata* (Meigen, 1826) (= *ciliata* Fabricius, 1794, nec Müller, 1776) †LULE LAPPMARK: Kvikkjokk, 14 July, 1 ♂.
- Hydrotaea irritans* (Fallén, 1823)
 BOHUSLÄN: Ljungskila, 27 August, 1 ♀. VÄSTERGÖTLAND: near Göteborg, 7 July, 1 ♀. SMÅLAND: near Gränna, 7 July, 1 ♀. UPPLAND: Vaxholm, 9 July, 1 ♂; near Tierp, 9 July, 2 ♂, 2 ♀.
- Hydrotaea militaris* (Meigen, 1826)
 †BOHUSLÄN: Ljungskila, 27 August, 2 ♀. SMÅLAND: near Gränna, 7 July, 1 ♀.
- Hydrotaea pandellei* Stein, 1899
 SMÅLAND: near Gränna, 7 July, 1 ♂.
- Hydrotaea pellucens* Portschinsky, 1880
 UPPLAND: near Tierp, 9 July, 1 ♀.
- Hydrotaea similis* Meade, 1887
 NORWAY, Nord-Trøndelag: near Steinkjer, 22 August, 1 ♂. New to Norway.
- Azelia cilipes* (Haliday, 1838)
 LYCKSELE LAPPMARK: Vilan, near Lycksele, 21 August, 1 ♂.
- Azelia macquarti* (Staeger, 1843)
 UPPLAND: near Tierp, 9 July, 1 ♂.
- Azelia triquetra* (Wiedemann, 1817)
 UPPLAND: near Tierp, 9 July, 1 ♂.
- Azelia zetterstedti* Rondani, 1866
 UPPLAND: near Tierp, 9 July, 1 ♂.
- Lophosceles hians* (Zetterstedt, 1838)
 NORWAY, Nordland: Hattfjelldal, 22 August, 1 ♀.
- Phaonia alpicola* (Zetterstedt, 1845)
 LULE LAPPMARK: Kvikkjokk, 14 July, 1 ♀.
- Phaonia basalis* (Zetterstedt, 1838)
 SMÅLAND: near Gränna, 7 July, 1 ♀.
- Phaonia hybrida* (Schnabl, 1882)
 LULE LAPPMARK: Kvikkjokk, 14 July, 1 ♀.

- Phaonia lugubris* (Meigen, 1826)
LULE LAPPMARK: Kvikkjokk, 14 July, 1 ♀.
- Phaonia perdita* (Meigen, 1830)
†LULE LAPPMARK: Kvikkjokk, 14 July, 1 ♂.
- Phaonia populi* (Meigen, 1826) (= *scutellaris* Fallén, 1825, nec Fabricius, 1805)
†BOHUSLÄN: Ljungskila, 27 August, 1 ♀.
- Helina anceps* (Zetterstedt, 1838)
UPPLAND: near Tierp, 9 July, 2 ♂.
- Helina atripes* (Meade, 1889)
UPPLAND: near Tierp, 9 July, 1 ♀.
- Helina binotata* (Zetterstedt, 1845)
NORWAY, Nordland: Hattfjelldal, 22 August, 1 ♀. NORWAY, Nord-Trøndelag: Trondjem, near Trondheim, 23 August, 1 ♀; identification queried.
- Helina ciliatocosta* (Zetterstedt, 1845)
BOHUSLÄN: Ljungskila, 27 August, 4 ♀. NORWAY: near Oslo, 26 August, 1 ♀.
- Helina denudata* (Zetterstedt, 1845)
NORWAY, Nord-Trøndelag: Trondjem, near Trondheim, 23 August, 1 ♀.
- Helina depuncta* (Fallén, 1825)
UPPLAND: Vaxholm, 9 July, 4 ♂, 1 ♀.
- Helina duplicata* (Meigen, 1826)
†ÅNGERMANLAND: near Docksta, 11 July, 1 ♀. LULE LAPPMARK: Kvikkjokk, 14 July, 1 ♂, 3 ♀.
- Helina flavisquama* (Zetterstedt, 1849)
LULE LAPPMARK: Kvikkjokk, 14 July, 2 ♂.
- Helina fratercula* (Zetterstedt, 1845)
†LYCKSELE LAPPMARK: Vilan, near Lycksele, 21 August, 3 ♀. NORWAY, Nord-Trøndelag: Trondjem, near Trondheim, 23 August, 1 ♀. NORWAY: near Oslo, 26 August, 1 ♀.
- Helina impuncta* (Fallén, 1825)
BOHUSLÄN: Ljungskila, 27 August, 9 ♂. NORWAY, Nord-Trøndelag: Trondjem, near Trondheim, 23 August, 1 ♀.
- Helina laetifica* (Robineau-Desvoidy, 1830) (= *lucorum* Fallén, 1823, nec Linnaeus, 1758)
NORWAY: near Oslo, 26 August, 1 ♂.
- Helina quadrum* (Fabricius, 1805)
UPPLAND: near Tierp, 9 July, 1 ♀; identification doubtful.
†ÅNGERMANLAND: near Docksta, 11 July, 1 ♂, 1 ♀.
- Helina subvittata* (Séguy, 1923) (= *rothi* Ringdahl, 1939)
NORRBOTTEN: Edefors, near Boden, 19 August, 1 ♀. LULE LAPPMARK: Kvikkjokk, 14 July, 1 ♀.
- Hebecnema affinis* Malloch, 1921 (= *vespertina* Fallén, of Ringdahl not Fallén)
SMÅLAND: near Gränna, 7 July, 2 ♂.
†LYCKSELE LAPPMARK: near Vilan, 21 August, 1 ♂.
- Hebecnema umbratica* (Meigen, 1826)
BOHUSLÄN: Ljungskila, 27 August, 1 ♀. NORWAY, Nordland: Hattfjelldal, 22 August, 2 ♀.
- Hebecnema vespertina* (Fallén, 1823) (= *halterata* Ringdahl, 1945)
†LYCKSELE LAPPMARK: Vilan, near Lycksele, 21 August, 1 ♂.
- Mydaea scutellaris* Robineau-Desvoidy, 1830 (= *pagana* Fabricius, 1794, nec Harris, 1776)
UPPLAND: near Tierp, 9 July, 1 ♀.
- Mydaea setifemur* Ringdahl, 1924
SMÅLAND: near Gränna, 7 July, 1 ♂.
- Mydaea urbana* (Meigen, 1826)
SMÅLAND: near Gränna, 7 July, 1 ♀.
UPPLAND: near Tierp, 9 July, 1 ♀.
NORWAY: near Oslo, 26 August, 1 ♀.
- Spilogona carbonella* (Zetterstedt, 1845)
†LULE LAPPMARK: Kvikkjokk, 14 July, 1 ♂.
- Spilogona contractifrons* (Zetterstedt, 1838)
BOHUSLÄN: Ljungskila, 27 August, 1 ♀. LYCKSELE LAPPMARK: Vilan, near Lycksele, 21 August, 1 ♂, 3 ♀.
LULE LAPPMARK: Kvikkjokk, 14 July, 1 ♂, 1 ♀. NORWAY, Nord-Trøndelag: Trondjem, near Trondheim, 23 August, 10 ♂.
- Spilogona denigrata* (Meigen, 1826)
†LYCKSELE LAPPMARK: Vilan, near Lycksele, 21 August, 1 ♂. NORWAY, Nordland: Hattfjelldal, 22 August, 1 ♂.

- Spilogona depressula* (Zetterstedt, 1845)
SMÅLAND: near Gränna, 7 July, 1 ♀.
- Spilogona litorea* (Fallén, 1823)
†LULE LAPPMARK: Kvikkjokk, 14 July, 1 ♂.
- Spilogona vana* (Zetterstedt, 1845)
†LYCKSELE LAPPMARK: Vilan, near Lycksele, 21 August, 3 ♀.
- Limnophora uniseta* Stein, 1916
†LULE LAPPMARK: Kvikkjokk, 14 July, 1 ♂.
- Macrorchis meditata* (Fallén, 1825)
SMÅLAND: near Gränna, 7 July, 2 ♀.
- Coenosia intermedia* (Fallén, 1825)
BOHUSLÄN: Ljungskila, 27 August, 4 ♀. NORWAY, Nord-Trøndelag: Trondjem, near Trondheim, 23 August, 5 ♀.
- Coenosia means* (Meigen, 1826)
LYCKSELE LAPPMARK: Vilan, near Lycksele, 21 August, 2 ♂.
- Coenosia mollicula* (Fallén, 1825)
BOHUSLÄN: Ljungskila, 27 August, 1 ♀. †LYCKSELE LAPPMARK: Vilan, near Lycksele, 21 August 2 ♂. 7 ♀. †NORRBOTTEN: Edefors, near Boden, 19 August, 1 ♀. NORWAY, Nord-Trøndelag: Trondjem, near Trondheim, 23 August, 3 ♀. NORWAY: near Oslo, 26 August, 1 ♀.
- Coenosia pumila* (Fallén 1825)
LYCKSELE LAPPMARK: Vilan, near Lycksele, 21 August, 1 ♂, 4 ♀.

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