ON THE COLLEMBOLA, ARANEAE AND GAMASIDA FROM THE KINNVIKA REGION OF NORDAUSTLANDET, SVALBARD

BY

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ABSTRACT. The Collembola, Araneae and gamasid mite fauna from the vicinity of Kinnvika on the island of Nordaustlandet in the Svalbard archipelago are described. Few records of the invertebrate fauna from this remote and climatically extreme region exist. Twenty-four species of Collembola were identified, of which three were new records for Nordaustlandet. None were new records for Svalbard. In addition, seven species of Araneae, three of which were new records for Nordaustlandet, and five species of gamasid mite, all new to Nordaustlandet, were collected. All invertebrates collected were already known from locations on the west coast of Spitsbergen. These records supplement the scarce current terrestrial invertebrate data for this region and contribute towards the baseline data for this region proposed to become an Arctic environmental reference area.

Key words: High Arctic, invertebrate, soil microarthropod, Spitsbergen

Introduction

The Svalbard archipelago lies in the European High Arctic centered on 78°N, 12°E. The west coast of the archipelago is comparatively mild for the latitude, the result of a northern branch of the North Atlantic Drift transporting heat from lower latitudes. The eastern regions however are influenced by cold Arctic waters moving south. This results in the eastern regions being climatically more extreme than the relatively mild west coast. Invertebrate research in these Arctic islands has concentrated on the communities of the climatically less extreme west coast and there are only a few publications describing the invertebrate fauna of the eastern regions; for example, de Smet and colleagues have described Rotifera communities from the islands to the east of Spitsbergen – Barentsøya (De Smet 1993), Edgeøya (De Smet et al. 1988), and Hopen (De Smet 1990, De Smet and Van Rompu 1996) – while Fjellberg (1984) presents a list of Collembola from the island of Hopen. The island of Nordaustlandet lies in the north east of the Svalbard archipelago. The Kinnvika station is located on the north coast of Murchisonfjord in the west of the island. This island covers approximately 18 500 km² and hence comprises over 25% of the total land area of the island group, although much is covered by a permanent ice cap. From this region there exist only two descriptions of the invertebrate fauna published some 69 years apart (Summerhayes and Elton 1928 and Fjellberg 1997). This paucity of information stands in stark contrast to the four hundred plus articles concerning the terrestrial invertebrate fauna of the west coast, most notably from the Isfjord and Kongsfjord regions of Spitsbergen (Coulson 2007). This disparity is not due to the unimportance of the east coast, rather it is a result of the inherent difficulty of access to this remote and environmentally harsh region. Indeed, due to a more extreme climate and differing immigration patterns and source populations, it is likely that species of invertebrate occur in the eastern regions of Svalbard that are not observed on the better documented west coast.
There is, therefore, a need to more fully understand the invertebrate biodiversity of Nordaustlandet in order to better comprehend the biodiversity of this unknown region, to fulfill obligations as a signatory to the Convention on Biological Diversity, and also to obtain baseline data to be included in the proposed management plan for the eastern regions of Svalbard and the Arctic environment reference area to be established here (Ministry of Justice and the Police 2009). Moreover, such data will assist in obtaining a clearer picture of invertebrate colonization of the Arctic at the end of the last glacial maximum. Here we provide a list of three groups of the microarthropod fauna, Collembola, Araneae and Gamasina, extracted from soil samples gathered from the vicinity of the Kinnvika as a first step in this process. The Gamasida presented here are the first records of this group from Nordaustlandet.

**Materials and methods**

A variety of habitats, including wet, mesic and rocky dry polar desert, as well as the ornithogenic soils beneath a birdcliff, were sampled within the vicinity of the Kinnvika station on Nordaustlandet between 13 and 21 August 2007 (Fig. 1). Soil cores of 3.5 cm diameter were collected and returned to the University Centre in Svalbard (UNIS) in Longyearbyen where they were extracted into a saturated benzoic acid solution using a MacFadyen high gradient system. Samples were stored in alcohol or dried in glycerol until identification. Collembola, Araneae and gamasid mites are identified to species. Other invertebrate groups remain to be determined.

![Fig. 1. Map of the sampling locations around Kinnvika station; 1 = Bolinderodden and raised beach region northeast to Drikkevatnet, 2 = Kinnberget, 3 = Florabukta bird cliffs.](image-url)
Results and discussion

A total of 24 species of Collembola were identified in the samples (Table 1). Fjellberg (1997) identified 34 species of Collembola from northern Nordaustlandet including three not previously observed in the Norwegian Arctic islands. In this study we found four species not observed by Fjellberg (1997). Combined with the earlier records of Summerhayes and Elton (1928) the number of species of Collembola known from Nordaustlandet stands at 40 (Table 1). The Collembola diversity of Nordaustlandet is set against the approximately 61 species known from Svalbard as a whole (Coulson 2007, Ávila-Jiménez et al. 2008). As such, the diversity is rather great despite the extreme high Arctic polar desert environment. All the species observed in the present study have been recorded from the west coast of Spitsbergen and the community was comprised of species with a wide distribution both in Svalbard and throughout the Arctic. Nonetheless, the presence of three species of Collembola on Nordaustlandet identified by Fjellberg (1997) not observed on the west coast, despite the extensive literature from the Isfjord and Kongsfjord regions (Coulson and Refseth 2004, Coulson 2007) suggests that the east coast of the Svalbard archipelago may indeed have a soil microarthropod community which differs in detail from that of the better known west coast. Recent work on the island of Edgeøya also supports this contention. Sampling on this island lying in the east of Svalbard, revealed two species of Collembola previously not recorded from Svalbard (manuscript in prep.).

The gamasid mite fauna was species poor with only five species being found in the samples (Table 1) representing 21.7% of the Svalbard fauna (Gwiazdowicz and Gulvik 2008, Gwiazdowicz and Coulson 2010, Gwiazdowicz et al. in press). All were new records to Nordaustlandet. As with the Collembola, these species also consisted of species with a wide Arctic distribution and there was no evidence of a specialized community to the extreme environmental conditions of Nordaustlandet. Arctoseius multidentatus and A. tschernovi have been reported from many northern regions including Franz Josef Land, Novaya Zemlya, Severnaya Zemlya, Wrangle Islands, northern Russia and also northern Canada and Alaska (Evans 1955, Lindquist 1961, Makarova 2000). Some of these species, including Antennoseius oudemansi and Zercon solenites, have been reported only in Greenland and Svalbard where they are found in both polar deserts and the arctic tundra subzone occurring in areas with occasional polar willow, (Salix polaris), Cassiope heaths, under stones and in moss and lichen. However, Z. forsslundi also occurs at more southerly latitudes in Latvia and Lithuania (Petrova 1977).

Of the 19 species of spiders recorded from Svalbard (Coulson 2007) some seven species of Linyphiidae were observed from the Kinnvika region. With the nine species previously identified by Summerhayes and Elton (1928), some 12 species are now known from Nordaustlandet (Table 1). As with the gamasid mites however, these species have also been observed before at other locations on the west coast and are generally widely distributed throughout the Arctic.

Summary

Overall, the Collembola, Araneae and gamasid mite fauna of the Kinnvika region of Svalbard appears to be largely comprised of species known from other locations in Svalbard. Lack of sampling effort in this region precludes conclusions concerning the absence of species from this region. However, the occurrence of three species of Collembola from the north coast of Nordaustlandet not recorded from the comparatively well studied west coast indicates that, while parallels exist with the west coast community, invertebrate species are found in the eastern regions which do not occur in the west. Such differences may be due to, or a combination off, climate and immigration history.

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Table 1. The recorded soil microarthropod fauna of Nordaustlandet, Svalbard (dashes indicate taxa not considered by Fjellberg 1997 and Summerhayes and Elton 1928).

| Class        | Family                      | Species                               | This study | Fjellberg, 1997 | Summerhayes and Elton, 1928 |
|--------------|-----------------------------|---------------------------------------|------------|-----------------|-----------------------------|
| Collembola   | Hypogastruridae             | Hypogastrura tullbergi (Schäffer, 1900) | X          | X               | X                           |
|              |                             | Hypogastrura concolor (Carpenter, 1900) | X          | X               |                             |
|              |                             | Hypogastrura sensilis (Folsom, 1919)  | X          |                 |                             |
|              |                             | Hypogastrura viatica (Tullberg, 1872) | X          | X               | X                           |
|              |                             | Ceratophysella longispina (Tullberg, 1876) | X          | X               |                             |
|              |                             | Boneogastura rutilis (Martyanova, 1973) | X          |                 |                             |
|              |                             | Xenyllus humicola (Fabricius, 1780)    | X          | X               | X                           |
|              |                             | Willemia anophthalma Börner, 1901      | X          |                 |                             |
|              |                             | Willemia scandinavica Stach, 1949      | X          |                 |                             |
|              |                             | Willemia similis Mills, 1934           | X          | X               | X                           |
| Neanuridae   |                             | Friesia quinquespinosis Wahlgren, 1900 | X          |                 |                             |
|              |                             | Micranura pygmaea Börner, 1901         | X          |                 |                             |
|              |                             | Anurida polaris (Hammer, 1954)         | X          |                 |                             |
|              |                             | Anurida maritima (Guérin, 1836)        | X          |                 |                             |
| Onychiuridae |                             | Oligaphorura groenlandica (Tullberg, 1876) | X          | X               | X                           |
|              |                             | Oligaphorura ursi (Fjellberg, 1984)    | X          |                 |                             |
|              |                             | Megaphorura arctica (Tullberg, 1876)   | X          |                 |                             |
|              |                             | Thalassaphorura duplopunctata (Strenzke, 1954) | X          |                 |                             |
|              |                             | Chaetaphorura simplex (Gisin, 1958)    | X          |                 |                             |
|              |                             | Mesaphorura macrochaeta Rusek, 1974    | X          |                 |                             |
| Isotomidae   |                             | Pseudanurophorus alitica Bagnall, 1949 | X          |                 |                             |
|              |                             | (= inoculatus Bödvarsson, 1957)        | X          |                 |                             |
|              |                             | Folsomia bisetosa Gisin, 1953          | X          | X               |                             |
|              |                             | Folsomia coeruleogrisea (Hammer, 1938) | X          |                 |                             |
|              |                             | Folsomia quadrioculata (Tullberg, 1871) | X          | X               | X                           |
|              |                             | Folsomia sexoculata (Tullberg, 1871)   | X          |                 |                             |
|              |                             | Folsomia taymirica Martyanova, 1973    | X          |                 |                             |
|              |                             | Folsomia binoculata (Wahlgren, 1899)   | X          |                 |                             |
|              |                             | Archisotoma besselii (Packard, 1877)   | X          |                 |                             |
|              |                             | Archisotoma polaris Fjellberg and Poinso, 1975 | X          |                 |                             |
|              |                             | Agrenia bidenticulata (Tullberg, 1876) | X          |                 |                             |
|              |                             | Vertagopus arcticus Martyanova, 1969   | X          |                 |                             |
|              |                             | Isotoma anglicana Lubbock, 1862        | X          |                 |                             |
|              |                             | Desoria olivacea (Tullgren, 1871)      | X          |                 |                             |
|              |                             | Desoria tshernovii (Martyanova, 1974)  | X          |                 |                             |
|              |                             | Desoria neglecta (Schäffer, 1900)      | X          |                 |                             |
| Odentellidae |                             | Xenyllodes armatus Axelson, 1903       | X          |                 |                             |
| Entomobryidae|                             | Lepidocyrtus lignorum (Fabricius, 1793) | X          |                 |                             |
| Neelidae     |                             | Megalothorax minimus Willem, 1900      | X          |                 |                             |
| Sminthuridida|                             | Sminthurides malmsgreni (Tullberg, 1876) | X          |                 |                             |
| Katiannidae  |                             | Sminthurinus concolor (Meinert, 1896)  | X          | X               | X                           |
| Acari        | Mesostigmata                | Antennoseius oudemansi Thor, 1930      | X          |                 |                             |
|              |                             | Arctoseius multitentatus Evans, 1955   | X          | –               |                             |
|              |                             | Arctoseius tshernovii Makarova, 2000   | X          | –               |                             |
|              |                             | Zercon forsslundi Sellnick, 1958       | X          | –               |                             |
|              |                             | Zercon solenites Haarlow, 1942         | X          | –               |                             |
| Araneae      | Linyphiidae                 | Collinia holmgreni (Thorell, 1871)     | X          |                 |                             |
|              |                             | Collinia spetsbergensis (Thorell, 1871) | X          |                 |                             |
|              |                             | Erigone arctica palaearctica Brandegaard, 1934 | X          | –               | X                           |
|              |                             | Erigone psychrophila (Thorell, 1871)   | X          | –               | X                           |
|              |                             | Erigone tirolensis L. Koch, 1872       | –          | –               | X                           |
|              |                             | Halorates holmgreni (Thorell, 1871)    | –          | –               | X                           |
|              |                             | Halorates spetsbergensis (Thorell, 1871) | –          | –               | X                           |
|              |                             | Hilaira glaciialis (Thorell, 1871)     | X          | –               | X                           |
|              |                             | Leptyphanes sobrius (Thorell, 1871)    | X          | –               | X                           |
|              |                             | Meioneta nigripes (Simon, 1884)        | X          | –               | X                           |
|              |                             | Mughiphanes sobrius (Thorell, 1871)    | X          | –               | X                           |
| Gnaphosida   |                             | Micaria constricta Emerton, 1894       | –          | –               | X                           |
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