First record of *Arrhopalites principalis* Stach, 1945 (Collembola) from Bjørnøya, Svalbard

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Arrhopalites principalis Stach, 1945 (Collembola) has been hitherto reported from Svalbard archipelago on a few occasions. This is the first record of this species from Bjørnøya. One individual was extracted from soil collected on the north Alfredfjellet slope, southern Bjørnøya, close to a little auk colony.

Key words: Bear Island, Collembola, seabirds, springtail.

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Introduction

Bjørnøya (Bear Island, 74°N 19°E) is the southernmost island of the Svalbard archipelago. It is situated midway between the Norwegian mainland and Spitsbergen and comprises an area of 178km^2. During the period 1961–1990 the mean temperature for July and August (the warmest months) was 4.4°C, and that of the coldest month (January) was –8.1°C. Average annual temperature was –2.4°C and the precipitation was 371mm (eKlima 2012). The island's terrestrial ecosystems are strongly influenced by different colonial seabird species, especially on the cliff-dominated southern part and the north-western plateau, and are almost barren inland. Access to the island is more difficult than to Spitsbergen and, as a result, scientific attention has been more limited. Thus, in many ways it remains a *terra incognita*. It has been poorly examined and insufficiently described in the specialist taxonomical and ecological literature, exemplified by the recently published records of two mesostigmatid mite species (*Zercon andrei* Sellnick, 1958 and *Zerconopsis muestairi* (Schweizer, 1949)) that are new to the Svalbard fauna (Gwiazdowicz *et al*. 2009).

Fjellberg (1984) reported 24 Collembola species from Bjørnøya. Totally, there are 68 springtail species recognized in the Svalbard Archipelago (Coulson 2012). *Arrhopalites principalis* Stach, 1945 is a Holarctic species but it has been hitherto reported from very few localities of the Svalbard archipelago. Previous records exist from Ny-Ålesund (Fjellberg 1994), Hornsund (Byzova *et al*. 1995, Uvarov & Byzova 1995), Isfjord, Endalen (Dollery *et al*. 2006), Edgøya (Ávila-Jiménez 2011), and Hoelhalvøya, Aasefjellet (own data). This is the first record of *A. principalis* from Bjørnøya.

Materials and methods

In July 2008, as part of a study of the terrestrial fauna of Bjørnøya and the influence of bird colonies on this fauna, 120 samples of vegetation and soil were collected from a variety of locations around the island. These were extracted using a modified Tullgren apparatus. Core samples were taken from the soil surface layer, and included the vegetation covering the area and soil down to a depth of ca. 5cm. Extracted invertebrates were preserved in 70% ethanol (Barton 1995). Springtails, including *Arrhopalites principalis*, were identified following Fjellberg (1994, 2007).

An individual of *A. principalis* was found in the vicinity of a little auk (*Alle alle* (Linnaeus, 1758)) colony on the north Alfredfjellet slope, at lake Ellasjøen (southern Bjørnøya, 74°22′N 19°01′E). The sampling site was situated at about 50m.a.s.l. and had an inclination of 20%. The vegetation was predominantly moss and *Salix polaris* Wahlenb., with a small admixture (not more than 1% of each species) of *Oxyria digyna* (L.) Hill., *Cerastium arcticum* Lange, *Saxifraga* spp., and *Draba* sp.

Results and discussion

A single specimen of *A. principalis* was recognized in one sample from the vicinity of a little auk colony. Other species present in this sample were: *Isotoma anglicana* Lubbock, 1862 (3 individuals) and *Folsomia quadrioculata* Tullberg, 1871 (2 ind.). Both these species (4 and 41 ind., respectively) as well as *Tetracanthella arctica* Cassagnau, 1959 (1 ind.) and *Sminthurinus concolor* Meinert, 1896 (1 ind.) were recorded from a separate core sample obtained approximately 1 m from that containing *A. principalis*. *Arrhopalites principalis* appears to be a very rare species on Bjørnøya as no further individuals were present in samples obtained along the north Alfredfjellet slope close to this little auk colony (in total N=15 samples), from other locations on this slope but away from the colony (N=15), nor within the north-western part of the island amongst scattered great skua (*Stercorarius skua* Brunnich, 1764) and glaucous gull (*Larus hyperboreus* Gunnerus, 1767) nests (N=90).

Body size of *A. principalis* reaches 1.0mm. Antennal segments 4 have six subsegments and the first subsegment is distinctly longer than last. Its maxillary outer lobe has two sublobal hairs. Head has 6+6 moderately thickened spines, the 4+4 anterior ones strongest. Median pair of dorsal setae on thorax 2 is enlarged, spine-like. Circumanal setae are slender. Subanal appendages are curved and apically split in long filaments (Fjellberg 1994, 2007).

Arrhopalites principalis is the only representative of the family Arrhopalitidae recorded from Svalbard. It is widely distributed and common across Fennoscandia and Denmark, where it is present in moss and forest litter, and also in bogs, alpine meadows and *Salix* thickets (Fjellberg 2007). In Spitsbergen the species has been recorded amongst *Dryas octopetala* L. and *Cassiope tetragona* (L.) D. Don on calcareous rocks in Ny-Ålesund (Fjellberg 1994), in *D. octopetala* dominated heath (with the inclusion of *Salix polaris*, *Saxifraga oppositifolia* L., *Polygonum viviparum* L. and *Carex rupestris* All.) in Endalen, Isfjord (Dollery *et al*. 2006), and also in pure associations of fructicose lichens in Hornsund (Uvarov & Byzova 1995). On Bjørnøya, despite widespread sampling across the habitats on the island, it was found only in ornithogenic tundra. This observation may emphasise the importance of seabirds in terrestrial ecosystem enrichment in these polar ecosystems, and their subsequent effect on soil invertebrate communities (cf. Byzova *et al*. 2005, Gwiazdowicz *et al*. 2009, Zmudczyńska *et al*. 2012).

The record of a new springtail species for Bjørnøya confirms that the island's invertebrate fauna is still poorly described, requiring further research effort both in the contexts of taxonomy and ecology. Similar conlusions have recently been drawn relating more generally to Svalbard and the High Arctic (e.g. Ávila-Jiménez *et al*. 2008, Gwiazdowicz *et al*. 2009, 2012, Kaczmarek *et al*. 2012).

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References

Ávila-Jiménez, M.L., Fjellberg, A., & Coulson, S.J. 2008. First record of *Folsomia bisetosella* Fjellberg, 2005 (Hexapoda, Collembola) from High Arctic Islands. *Norwegian Journal of Entomology* 55, 129–130.

Ávila-Jiménez, M.L., Coulson, S.J., Solhøy, T., Gwiazdowicz, D.J, Fjellberg, A., Dózsa-Farkas, K., Ekrem, T., & Monson, F. 2011. The invertebrate fauna of the high Arctic island of Edgeøya, Svalbard; what can it tell us about invertebrate colonisation of Arctic archipelagos? – In: Ávila-Jiménez, M.L. *High Arctic invertebrate biogeography. Patterns and colonization processes since the Last Glacial Maximum*. PhD Thesis. University of Bergen, Bergen, 259 pp.

Barton, T.R. 1995. A modified technique for extracting live ticks from small soil and litter samples. *Experimental and Applied Acarology* 19, 357–360.

Byzova, J.B., Uvarov, A.V. & Petrova, A.D. 1995. Seasonal changes in communities of soil invertebrates in tundra ecosystems of Hornsund, Spitsbergen. *Polar Reseacrh* 16, 245–266.

Coulson, S. 2012. *The terrestrial and freshwater invertebrate fauna of Svalbard: an inventory and bibliography.* 188 pp. Available from: http://www.unis.no/35_STAFF/staff_webpages/biology/steve_coulson/ (Accessed 8 April 2013)

Dollery, R., Hodkinson, I.D., & Jónsdóttir, I.S. 2006. Impact of warming and timing of snow melt on soil microarthropod assemblages associated with *Dryas* -dominated plant communities on Svalbard. *Ecography* 29, 111–119.

eKlima 2012. *Monthly normal values*, Norwegian Meteorological Institute. Available from: http://sharki.oslo.dnmi.no/ (Accessed 18 May 2012).

Fjellberg, A. 1994. The Collembola of the Norwegian Arctic islands. *Meddelelser* 133, Oslo, Norwegian Polar Institute, 57 pp.

Fjellberg, A. 2007. The Collembola of Fennoscandia and Denmark: Part 2: Entomobryomorpha and Symphypleona. *Fauna Entomologica Scandinavica* 42, 264 pp.

Gwiazdowicz, D.J., Coulson, S.J., & Ávila-Jiménez, M.L. 2009. First records of *Zercon andrei* Sellnick, 1958 and *Zerconopsis muestairi* (Schweizer, 1949) (Acari, Mesostigmata) from Bjørnøya. *Norwegian Journal of Entomology* 56, 117–119.

Gwiazdowicz, D.J., Solhøy, T., Coulson, S.J., Lebedeva, N., & Melekhina, E. 2012. First record of *Vulgarogamasus immanis* (Acari, Mesostigmata) in Svalbard. *Polish Polar Research* 33, 35–39.

Kaczmarek, L., Zawierucha, K., Smykla J., & Michalczyk, L. 2012 Tardigrada of the Revdalen (Spitsbergen) with the descriptions of two new species: *Bryodelphax parvuspolaris* (Heterotardigrada) and *Isohypsibius coulsoni* (Eutardigrada). *Polar Biology* 35, 1013–1026.

Uvarov, A.V. & Byzova, J.B. 1995. Species diversity and distribution of Collembola in the vicinity of the Polish Polar Station, Hornsund area, Spitsbergen. *Polish Polar Reseacrh* 16, 233–243.

Zmudczyńska, K., Olejniczak, I., Zwolicki, A., Iliszko, L., Convey, P., & Stempniewicz, L. 2012. Influence of allochtonous nutrients delivered by colonial seabirds on soil collembolan communities on Spitsbergen. *Polar Biology* 35, 1233–1245.

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