High Arctic Invertebrates Biogeography: Invertebrate Biodiversity in Nordaustlandet

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María Luisa Ávila and Rafael Sánchez embarked *MS Horyzont II* last July 9th with the intention of reaching Murchinsonfjord in order to extend the sampling area covered during summer 2007. Ice conditions did not allow us to fulfill our sampling expectations, although other areas were covered in the way back, with high relevance for the PhD project *High Arctic Invertebrate Biogeography*, which includes the study about invertebrate biodiversity in Nordaustlandet. The project is being carried out by PhD student María Luisa Ávila, supervised by Dr. Steve Coulson (UNIS) and Dr. Torstein Solhøy (UiB), and assisted in field during July 2008 by Rafael Sánchez.

Background

The invertebrate fauna of Polar Regions is distinctive and diverse yet often poorly understood. Over 1,200 terrestrial invertebrate species are known from Svalbard, most of them described from Ny-Ålesund, Longyearbyen and Hornsund. Only one recent complete study of invertebrate fauna in Nordaustlandet in the north east of Svalbard has been performed (Fjellberg, 1997), leaving the area still rather poorly known when compared with western Spitsbergen.

In High Arctic regions it is generally considered that few, if any, plants or invertebrates survived the last glacial maxima *in situ*, the *tabula rasa* hypothesis but that the flora and fauna reinvaded from more southerly latitudes during the recent Holocene. Thus, dispersal routes have likely played a crucial role for current species distribution in Svalbard. It is hypothesized that the invertebrate fauna on the cold east coast of Svalbard will be influenced by immigration pathways from the east and north east with the prevailing winds and ocean currents in contrast to the south and south westerly currents and winds that dominate the mild west coast.

This project aim to detail the invertebrate communities on east Svalbard, focusing in collembola species, and complement community descriptions with DNA fingerprinting analyses in order to find population interconnectivity rates within Svalbard and population source(s), combining this data with data from other Arctic areas. The effect of birds as dispersal vectors as well as effect of geographical features as dispersal barriers in the High Arctic is projected throughout intensive sampling in birdcliffs and glacier forelands, and further genetic diversity analyses.

Fieldwork

During August 2007, 131 soil samples were taken in the surroundings of Kinnvika station and in Florabukta birdcliff in Storsteinhalvøya (Fig 1). For July 2008, the expectations were to increase the sampling area including in the study sampling points in Isvika, Gotiahalvøya and places further south surrounding Vestfonna, should transport to the area would have been possible.

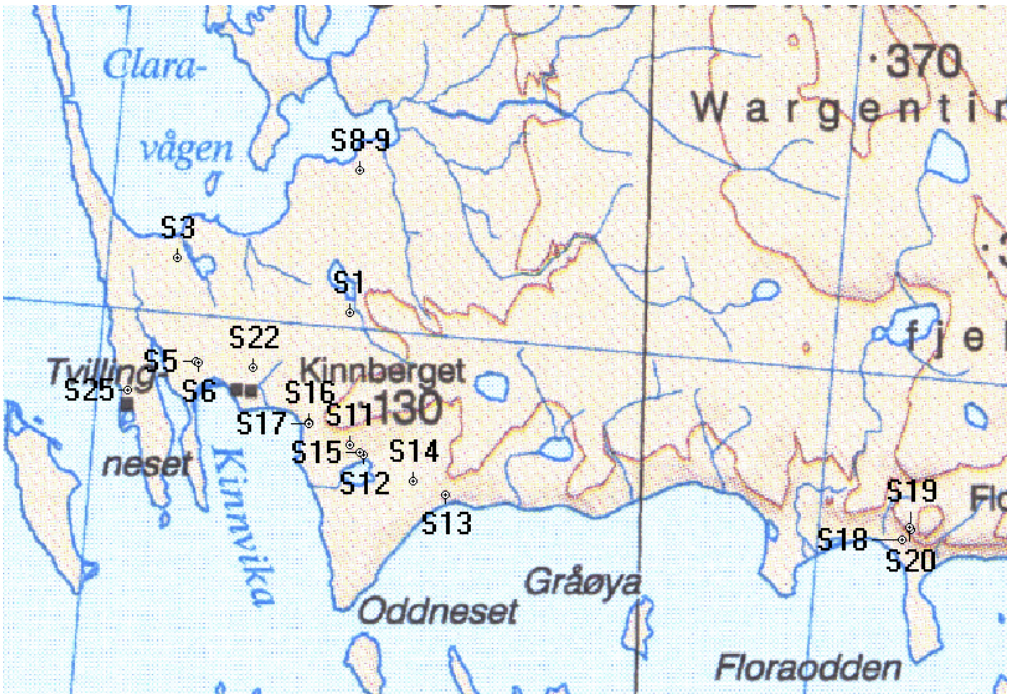

Figure 1: Sampling sites in Storsteinhalvøya during August 2007.

Regardless the impossibility of reaching Nordaustlandet, the travel was not completely unsuccessful, since samples from other areas were included in this study thanks to the possibility of transportation with *MS Horyzont II*. However, many areas were still widely snow covered in July, as it happened in Magdalenefjord (Fig. 2) and therefore soil and invertebrate sampling resulted not being as intense as desired.

Figure 2: Magdalenefjord on July 11th. Snow covered almost all the area, making it difficult soil and invertebrate sampling. Photo: María Luisa Ávila.

Preliminary Results

In the samples taken during August 2007 in Storsteinhalvøya (Fig. 1) were described 24 species of collembola, including 3 species never described before in the area (Table 1). Florabukta birdcliff showed to be a diversity hotspot, as expected. Other places showed to have surprising high species diversity even at low densities (Fig. 3), as sites 16 and 17, in the western slope of Kinnberget, facing Kinnvika bay, an area patchily covered by plant species as *Saxifraga oppositifolia* and *Bistorta vivipara*.

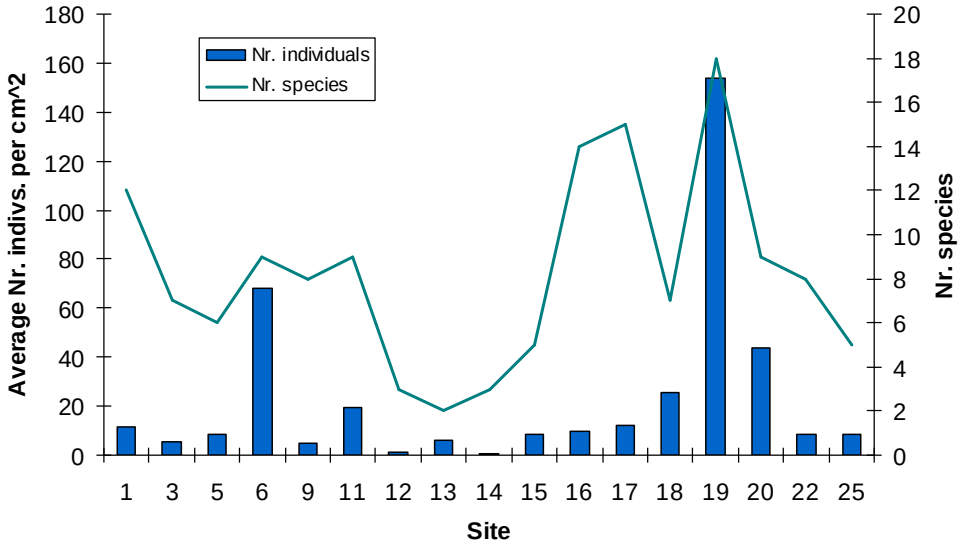

Figure 3: Collembola diversity in different sampling sites in Nordaustlandet vs. density.

The presence of *B. vivipara* in site 17 suggests the area to be warmer than expected. Therefore a *Tinytag* temperature logger was set in the area, and is expected to be picked up by any of the next expeditions to the area. Two other temperature loggers were set in representative habitat areas close to Kinnvika station, data which is hoped to be included in this study.

Table 1. Nordaustlandet collembola species checklist. In columns is showed which species were described in different recent publications about Nordaustlandet fauna.

Family	Species	Fjellberg 1994	Fjellberg 1997	Ávila & Coulson. Non-published data
Hypogastruridae	*H. viatica*	X	X	X
	H. tullbergi	X	X	X
	H. concolor		X	X
	H. sensilis			X
	C. longispina	X	X	X
	B. nivalis		X	
	X. humicola		X	X
	W. scandinavica		X	X
	W. similis		X	X
	W. anophthalma			X
Neanuridae	*F. quinquespinosa*		X	X
	M. pygmaea		X	X
	A. polaris	X	X	X
	A. maritima		X	
Onychiuridae	*O. groenlandica*	X	X	X
	O. ursi		X	X
	M. arctica		X	X
	P. duplopunctata		X	
	T. simplex		X	
	M. macrochaeta		X	
Isotomidae	*P. inoculatus*	X	X	
	A. besselsi		X	
	A. polaris		X	X
	F. sexoculata	X		X
	F. quadrioculata	X	X	X
	F. binoculata	X	X	X
	F. taymirica			X
	F. bisetosa	X	X	X
	F. coeruleogrisea	X	X	X
	A. bidenticulata	X	X	X
	V. arcticus		X	
	I. anglicana	X	X	
	I. neglecta		X	
	I. tsernovi		X	
Entomobryidae	*L. lignorum*	X	X	
Neelidae	*M. minimus*		X	
Sminthurididae	*S. malmgreni*	X	X	
Katiannidae	*S. concolor*		X	X

Outreach

Results from data obtained during 2007 are expected to be presented in the VIII Conference Nature of the Shelf and Archipelagos of the European Arctic in Murmansk, November 2008.

Collaboration with Kinnvika fellow researchers has also arisen during the cruise in *MS Horyzont II*: Molecular studies in bacterial gut content of collembola will be performed in collaboration with Dr. David Pearce from British Antarctic Survey.

The possibility of coming back to Kinnvika for the summer season 2009 is hoped so the biodiversity studies can be extended to further areas in Nordaustlandet.

Figure 4: Rafa Sánchez and Malu Ávila enjoying the snow in Magdalenefjord…the worst sampling situation can be the funniest one! Photo: Lasse.