The invertebrate fauna of Edgeøya: Mapping *Terra Incognita*

(RIS ID: 3312, Miljøfond 06/46)

DESCRIPTION AND GOALS

The invertebrate fauna of Svalbard is rich and unique. Yet despite this still poorly understood. Over 1,200 species of invertebrate are recorded from Spitsbergen, including some 500 species of insects, spiders and mites (www.svalbardinsects.net). However, most of the invertebrate records are from western locations close to Longyearbyen, Ny-Ålesund and Hornsund, with extremely few expeditions to other localities such as Kinnvika, Nordaustlandet. In particular there are no published records of the invertebrate fauna of Edgeøya (Fig. 1), leaving an area of more than 5,000 km^2 completely unknown. To put this is context, the lack of information for Edgeøya means that we have no knowledge of the invertebrate fauna from a land area close to 20% of the unglaciated land surface of Svalbard, or put another way, for an area of similar extent to Akershus fylke.

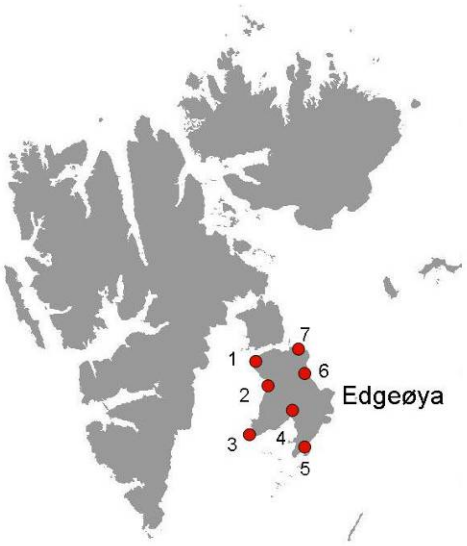

Fig. 1. Location of planned sampling sites on Edgeøya. 1) Kapp Lee, 2) Diskobukta, 3) Russebukta, 4) Dyrheiane, 5) Negerdalen, 6) Blåbukta and 7) Kapp Heuglin.

That there are no descriptions of the invertebrate fauna from Edgeøya is even more significant when you consider that the east coast may have a very different fauna from that on the west coast. In one of the few publications describing the insects of Nordaustlandet, Fjellberg describes 34 species of Collembola , three of which were new records to Svalbard and are species still not observed on the west coast. This difference in communities is likely to be the result of the more extreme climate on the eastern coastline of Svalbard combined with the input of species from Russia. Easterly ocean currents (Fig 2.) sweep driftwood (Fig. 3) from the great Russian rivers onto this coast, it is likely that immigrant invertebrates are brought with these currents.

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Fig. 2. Ocean currents in the Arctic.
Note the easterly currents arriving on the east coast of Svalbard (picture: *Philippe Rekacewicz, UNEP/GRID-Arendal* http://maps.grida.no/ go/graphic/ocean_currents_and_sea_ice_extent)

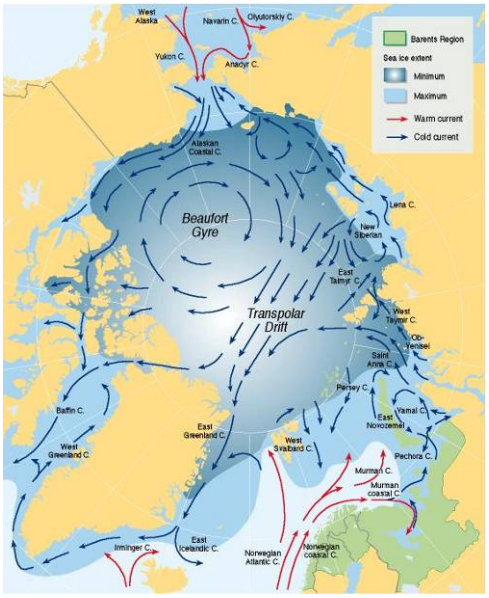

Fig. 3. Driftwood on the beach. Much of such driftwood originates on from the great Russian rivers in Siberia. As early as 1859 Charles Darwin speculated that plant seeds could be transported to isolated islands in the soil attached to roots. Invertebrates may also travel under the bark. On the east coast of Svalbard the screwing action of the sea ice may thrust the drift wood high up the beach enhancing the colonization chances of the travelers. (S.J. Coulson)

In 2009, soil samples were obtained from the west coast of Edgeøya (Arctic Field Grant funding). Although samples were collected at three locations (Kapp Lee, Diskobukta and Russebukta) it was not possible to reach the east coast of the island due to high winds and low cloud. These initial samples are still being analysed but to date have revealed two species of Collembola (springtails, spretthaler) and two species of Enchytraeid worm) not previously known to Svalbard. The mite fauna has yet to be properly assessed. Therefore, despite the paucity of sampling on the east coast there appear to be many invertebrate species on this coast not present on the west coast and there is hence a unique community on this coast. The species of springtails observed are also found in Russia and Siberia and generally not in Greenland or the neoarctic. There is hence a possibility that these animals arrive on the east coast of Svalbard having travelled great distances over the sea but find the shorter distance over land a greater challenge and have not yet managed to reach the west coast. This is currently only a working hypothesis.

There is thus a large gap in our knowledge and understanding of the ecology of Svalbard. The stated aim of the Ministry of the Environment is to ensure that Svalbard is “one of the best managed wilderness area in the world”. To this end, a range of national parks and reserves have been established and are constantly under review with new parks and reserves being founded periodically. In addition, new regulations are being continuously considered and brought into effect to protect the fragile Arctic environment, for example

the recent ban on cruise ships burning heavy bunker oils from waters around the north east of Svalbard.

However, management plans should be based in the most complete knowledge available and hence the lack of comprehensive information concerning the ecology of Edgeøya is a significant omission. Through the article 7 of the International Convention in Biodiversity, which Norway ratified in 1992, signatory countries are committed to map and monitor biodiversity. Outlining the invertebrate fauna of eastern Svalbard through description of Edgeøya communities will enhance our knowledge of the uniqueness of Svalbard fauna compared to other regions, as an important management foundation. Furthermore, invertebrate fauna can be further used as reliable bioindicator of environmental changes. The aims of the project are hence to:

1) describe the invertebrate fauna of Edgeøya and set this in context with the flora and climatic conditions.
2) gather information on the invertebrate fauna and ecological system as a whole for informed management decisions.
3) develop the SPIDER database (http://svalbardinsects.net/)

FIELD REPORT 2010

Field work.

This was completed largely as planned and is considered to have been a great success. Three of the four sampling localities were visited which, given the frequently inclement weather conditions on the east coast of Edgeøya, has to be considered very successful.

The field team consisted of Dr. Pernille Bronken Eidesen, PhD students Eike Müller and Henrik Nygård as field assistants and myself (Fig. 4). We were initially booked to fly on July 8th but, due to continual low cloud on the east coast of Edgeøya we were obliged to wait until 15 July when the cloud was considered broken enough to be worth an attempt. We took off at 10:30 and flew direct to Kapp Heuglin (Fig. 5)

Fig 4 Left to right:- Henrik Nygård, Pernille Bronken Eidesen and Eike Müller. (S.J. Coulson)

Time on the ground was limited so samples were obtained from in the immediate vicinity of the

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helicopter (Fig. 6). The 10*10cm soil samples were collected and placed in zip-lock plastic bags. After sampling Kapp Heuglin we continued on to Blåbukta and so to Negerdalen. The latter being made more difficult by the increasing low cloud. The final site, Dyrheiane was cancelled to thick fog.

Fig. 5 Panorama of landing site at Kapp Heuglin. (S.J. Coulson)

Fig. 6. Henrik Nygård cuts out a 10*10cm soil sample. Kapp Heuglin, Edgeøya. (S.J. Coulson)

Laboratory work – work in progress

Soil samples were returned to UNIS and are currently in storage at +5ºC. In early September the soil will be extracted in a Tullgren Funnel system (Figs. 7 & 8). Here the soil sample is placed in a funnel over a collecting pot containing a preservative solution. The soil is gently heated from above for up to five days using light bulbs and until the whole sample is thoroughly dry. As the sample dries the soil animals move down and away from the drying front eventually to fall out of the soil and into the collecting pot. Once in the preservative they can be identified to species and analysed.

Expected completion date for the analysis of the specimens is summer 2011 with reports submitted soon afterward.

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Fig. 7. The Tullgren Funnels at UNIS. being operated by UNIS and University of Bergen Ph.D. student María Luisa Ávila Jiménez. (S.J. Coulson)

Fig. 8. New Tullgren Funnels currently on order and which are due to arrive at UNIS soon. (©Burkard Scientific Ltd)

Once the samples have been processed the animals will be sorted to group (springtails, moss mites etc) and either identified at UNIS or sent to specialist taxonomists (see Table 1 for collaborators in this project). The data will then be summarized in a variety of methods (see Output for more details).

Table 1. Principle participants in the project (excluding UNIS staff)

Torstein Solhøy	UiB
Darius Gwiazdowizc	Poznan, Poland
Frank Monson	Liverpool, UK
Arne Fjellberg	Arne Fjellberg Entomological Research
Klara Dorsa-Farkas	Budapest, Hungary
Torbjørn Ekrem	NTNU
Elisabeth Strue	NTNU
Chester Sands	British Antarctic Survey, Cambridge

Output

The data will provide:-

1) A report to Sysselmannen for conservation purpose to support the decision making process, fulfilling the goals of the Svalbard Environmental Protection Act and as part of signatory's obligations of the Convention in Biodiversity.

2) Scientific manuscripts will be published detailing the invertebrate of Edgeøya to a wider audience. This will form a valuable section in the Ph.D. these of María Luisa Ávila Jiménez.
3) Results will be made available for general public on the SPIDER webpage (Svalbard Pictographic Invertebrate Database and Educational Resources, http://svalbardinsects.net/ ; project supported by the Environmental Fund, project number 08/04) and on the personal webpage of S.J.Coulson:- http://www.unis.no/35_STAFF/staff_webpages/biology/steve_coulson/Coulson_personal_page.htm
4) Material will be deposited in the reference collection at UNIS.
5) Material will be submitted to the international DNA barcoding research PolarBOL project http://www.barcodeoflife.org/barcoding-projects/?page=1&perpage=all
6) Specimens for DNA sequencing will be analysed as part of a holarctic dispersal project to determine dispersal routes of the invertebrate fauna following retreat of the ice.