

The Arctic Fox – Threatened with Extinction

The arctic fox is threatened with extinction in Scandinavia. A major international project, SEFALO+, has been started in order to ensure the survival of the species. Love Dalén at the Department of Zoology defends his doctoral thesis on 9 December, which discusses the population history of the fox and how its genetic variation has changed with time. His supervisor has been Anders Angerbjörn, project manager for SEFALO+.

Love Dalén describes in the thesis a bottle-neck that the arctic fox seems to have passed through approximately 120,000 years ago, following which its numbers increased explosively in Eurasia, at the start of the most recent ice age. There were approximately 10,000 arctic foxes in Scandinavia during the 19th. century. The fox was hunted intensively during a period around 1900, and this led to the species being protected in Sweden in 1928. Numbers have, however, never recovered to previous levels. There are currently only about 50 reproducing adult arctic foxes in Sweden. The situation is similar in the Norwegian and Finnish parts of the mountain chain, and this means that the arctic fox is under a severe threat, also in EU.

– There are several theories for why the number of arctic foxes did not increase during the 20th. century. One factor may be the reduction of the fox's main food source, lemmings and voles. Another factor may be the increase in the numbers of the red fox, who is a major competitor for food and foxholes. It is also possible that decreasing numbers of large predators has affected the arctic fox negatively, since these predators kill reindeer, which are then a major source of food for arctic foxes during winter.

Researchers also consider disease, parasites and loss of genetic diversity. The arctic fox's genome has changed surprisingly little during the 20th. century, despite massive hunting. Now, however,



Photos: Love Dalén, Bodil Elmhagen

Love Dalén knows the locations of nearly all 500 arctic foxholes in Sweden.

inbreeding and loss of genetic diversity seems to be an increasing problem. Love has studied foxes born in Sweden between 1989 and 2004. The results show that cubs with the greatest genetic variation survived best. In Sweden there are three isolated but genetically quite similar arctic fox populations.

– One idea is to exchange arctic foxes between the populations, or to introduce new foxes from Siberia. There are, however, guidelines that must be followed when transferring animals. It is only permitted if you are certain that they are suffering from inbreeding, which seems to be the case for the Scandinavian arctic fox population. Further, it is not permitted to mix populations that are too different genetically, since this may lead to problems with the local adaptation of the animal. This should not be a problem for our suggested relocation of foxes. It seems that the different populations have been separated for quite a short time, which reduces the risk that they will have had time to adapt genetically to the local environment.

An International Project

The SEFALO project involves 17 authorities, research institutions, organisations and companies in Sweden, Finland

and Norway. These include the county administrations in Norrbotten, Västerbotten and Jämtland, whose personnel have helped researchers and volunteers with surveying the number of arctic foxes in Sweden for several summers. The participants have counted cubs and the number of occupied foxholes; they have weighed, measured and tagged cubs; taken DNA samples; and investigated the availability of lemmings. Some foxes have also been equipped with radio transmitters.

– The numbers of arctic foxes varies a great deal from one year to the next. When it's a "lemming year" the arctic foxes use the abundance of food to raise many cubs. But in other years when there are few lemmings the fox families are much smaller. This year started well with a good supply of lemmings, and the foxes started to reproduce. But then the supply suddenly dried up for some reason. We have tried to supply extra food at the foxholes as much as possible, but many of the 100 or so cubs that were born in the summer have already died, or will die, primarily from hunger.

More information about the SEFALO project is available at go.to/sefalo.

Faculty Actualities

Faculty Research Outreach

Researchers and information personnel from the faculty have organised several popular scientific arrangements during September and October. Thousands of school pupils and adults have been introduced to scientific research in a light-hearted manner.

"Geologins dag" is an initiative throughout the country to strengthen the role of geology in society. The Section for Earth and Environmental Sciences at Stockholm University arranged many activities in and around Geovetenskapens hus. Around 2,500 visitors – students from secondary and upper secondary schools, and the general public – could take part in everything from trying to do the earth jigsaw, examining crystals and minerals, and stone carving, to getting to grips with real Antarctic ice and constructing their own water-filled landscape. They could also listen to seminars and visit an exhibition on climate.

"Fysik i Kungsan". It's 100 years since Einstein published his discoveries, and "The World Year of Physics" celebrates this anniversary. Physicists and astronomers at AlbaNova arranged a major happening in Kungsträdgården on 11 September. Six marquees showed an exhibition on Einstein's discoveries and their significance for physics research today. Visitors could also listen to lectures about the theory of relativity and examine sunspots out in space.

"Utbrott på Lava" 23 September. The EU Commission designated this day as a special day for researchers, and there was a real eruption outside Lava, a meeting place for youth at Kulturhuset in Stockholm. The science festival "Utbrott" was organised by Vetenskap & Allmänhet together with 19 other organisations, including Stockholm University. We were responsible for the bang itself! A 1-metre-high volcano had been built on the pavement by geologists from the faculty, and this erupted at regular intervals throughout the day. The faculty was also represented at several stands: a Volcano Café, forensic science,

climate and minerals, space exploration, and maths with codes and number games.

"Den levande frågelådan" was held on 5 October, for the fifth year in succession. One thousand school pupils from the sixth grade met 10 researchers in science. The researchers were faced with such ingenious and probing questions as "What use are the animals who are at the top of the food chain?", "What temperature does air freeze at?", and "How do ships float?".

"Forskardagarna". The faculty arranged, with the help of researchers, study visits for around 650 pupils from upper secondary schools during "Forskardagarna". The aim was to show research in action, and give an introduction to the University. The exhibitions had various themes. One theme was "CSI", (genetics and biochemistry) where the visitors found out about the techniques used in forensic science. The meteorologists and earth scientists explained climate research, simulating hurricanes and organising laboratory visits. The physicists used scenes from well-known films to discuss physics, an event sponsored by the Swedish Research Council, while at Vetenskapens Hus physicists, mathematicians and astronomers presented the mathematical theories behind computer tomography, and demonstrated PET cameras, radio telescopes and electron microscopes.



Photo: Ylva Hermansson

The faculty's volcano erupts on the pavement outside Kulturhuset in Stockholm. More images can be found at www.natvet.su.se/informationsbilder.

Meteorology Prize, New Professors and a New Section, An Internet Discussion Forum

The following short notice should have been included in the previous number: The WMO Research Award for Young Scientists awarded by the UN World Meteorological Organization, was awarded this year to Nedjeljka Zagar. Nedjeljka defended her thesis at the Department of Meteorology at Stockholm University in 2004, and is now working at Ljubljana University in Slovenia. Nedjeljka Zagar was awarded the prize for one of her thesis's articles. Swedish research in meteorology was recognised at the prize ceremony on 29 September, and the significance it has had for meteorologists in the world, particularly in the fields of numerical forecasting and climate research. Dr Zagar was also awarded the Arrhenius Stipendium in 2004.

New professors at the faculty. Erik Sonnhammer was appointed Professor of Bioinformatics on 1 July, and Georgia Destouni became Professor of Hydrology, Hydrogeology and Water Resources on 1 October. Birgitta Norling will be Professor of Biochemistry, and Margareta Sundberg Professor of Inorganic Chemistry, from 1 November.

The new Section for Earth and Environmental Sciences has now been officially opened. The section includes the Department of Geology and Geochemistry, the Department of Physical Geography and Quaternary Geology, and the Department of Applied Environmental Science.

An Internet discussion forum has been opened for students and research students in the Faculty of Science. This is a place where students can exchange ideas and experiences, give information about courses and events, or discuss such matters as high or low quality teaching, syllabuses, and the working environment. The address is <http://s8.invisionfree.com/studentforum/>

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