Saving the Endangered Fennoscandian *Alopex lagopus*
SEFALO+

LIFE03 NAT/S/000073

FINAL REPORT

WITH COMMENTS ON THE FINANCIAL REPORT

1 June 2003 -1 June 2008

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LIFE Project Number
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FINAL REPORT

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LIFE PROJECT NAME

Saving the Endangered Fennoscandian *Alopex lagopus* SEFALO+

Data Project

Project location	Sweden, Finland and Norway
Project start date:	1 June 2003
Project end date:	1 June 2008
Total Project duration (in months)	60 months
Total budget	€ see financial attachment
EC contribution:	€
(%) of total costs	
(%) of elibible costs	

Data Beneficiary

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2. Executive Summary

A combination of feeding, hunting, protection around dens and information can halt the population decline of the Fennoscandian arctic fox and secure the future of the species. In areas where actions have been implemented by SEFALO+ with a high intensity the population has been doubled between the small rodent peaks and thereby promoting the chances of long term viability of the Fennoscandian arctic fox. It is important to remember that it is the combination of information, protection around dens, red fox culling and feeding that have resulted in the positive population development during the project period. By continuing or extending the actions, each sub population can increase in size and thereby also reduce the vulnerability caused by the small population size. We recommend that the actions are implemented intensively in restricted geographical areas were the population have a good chance to recover.

In Sweden, we recommend more intensive actions in Vindelfjällen (AC) and Arjeplogsfjällen (BD). In these two areas is it logistically possible to perform more actions and there are also enough arctic foxes present today that can respond to the actions. Actions might also be intensified in the Råsto area (BD), since it is an important migration link between Norway, Sweden, Finland and Russia. However, before further actions are implemented in the Råsto area, a careful inventory should be performed to evaluate if there are enough arctic foxes present that can respond to the actions. Remote cameras are provided from SEFALO+ to be used for evaluation of the number of arctic foxes that can stand as a base for a future population development. This can be combined with molecular tracking to identify individuals and study the genetic base in this area. In Helagsfjällen and in Borgafjäll actions should continue in the same extend as today.

In Finland, we recommend that the actions continue in the same extent even though no litters have been found the last 5 years. The closest population in Finmark, Norway, is increasing in size and migration from that area to northern Finland can be expected. Finland is an important area for the whole Fennoscandian population as a geographical dispersal corridor from Russia. Remote cameras are provided to facilitate monitoring in Finland also after the end of SEFALO+.

In Norway there are several parallel projects working on developing measures to conservation of the arctic fox. The SEFALO+ partner, NINA, has a large captive breeding station for arctic foxes that has started to release foxes and restore arctic fox populations where they have gone extinct. This can ,however, also be an important action to increase the gene-pool in existing populations by releasing individuals with other genetic background. The hybrids between wild and farmed arctic foxes identified in the Finse area, Norway, should be removed to avoid that these genes are spread into the Fennoscandian arctic fox population. According to the Convention of Biological Diversity (CDB) and The World Conservation Union (IUCN) animal individuals should be classified as an alien species if they have another genetic and/or geographical origin compared to the native population.

Even if the population will increase as a result of conservation actions, the problem with a low genetic variance within the subpopulations will remain. However, with an increased population size, migration between the populations might again occur; balancing the natural meta-population structure of the Fennoscandian arctic fox population. The large distances between the subpopulations, with several dispersal barriers present such as roads, areas with human development and areas with high density of red foxes can be a major problem. However, we have registred two long distance dispersers. One ear-tagged male, migrated from Vindelfjällen to Borgafjäll and was observed to reproduce there 2007. Another young ear-tagged male, migrated from Helagsfjällen to the captive breeding station, a distance of more than 200 km. This illustrates the migration capacity and the value of ear-tags. Until the population is build up to a self subsistent population we recommend that future conservation projects also should translocate arctic foxes between the subpopulations (Dalén and Angerbjörn 2007), or release foxes from the captive breeding program in Norway. This is highly relevant where local populations already have gone extinct. Both

translocation and individuals released form captive breeding could increase the genetic variance and decrease the Alee effect, and hence increase the long term sustainability of each subpopulation.

3. Introduction

Background

The arctic fox *Alopex lagopus* is threatened by extinction in the European Union and adjacent areas. It is a priority species according to the EC Habitat directive. The main threats are the small population size constrained by low food availability and competition from the larger red fox *Vulpes vulpes.* The arctic fox is a circumpolar, tundra-living canide. In mainland Europe, it breeds above the tree line in the mountain tundra of Fennoscandia (Sweden, Finland, Norway, the Kola Peninsula). The breeding population reached at least 15 000 individuals in peak years in the mid-19th century. However, it suffered a dramatic decline due to over-harvest during the years with high fur prices at the beginning of the 20th century. Many wild foxes were also taken in to the fur farm industry. The population has remained at a low density for more than 70 years despite early protection in (Sweden 1920, Finland 1940, Norway 1930). The non-recovery of the population could probably not be explained by the high hunting pressure before protection alone. During the time span from full protection of the species in Fennoscandia, our landscapes has gone trough large changes which most probable also is in disfavour of the arctic fox, while promotive for the red fox; thereby increasing the competition between the species. Population estimates in 2003 totalled 150 adults, of which approximately 50 were found in Sweden, 50 in Norway, and 10-15 in Finland. From Kola, there were indications of a similar situation, suggesting a population of *ca.* 40 adults. Several factors may have contributed to the non-recovery of the arctic fox:

- *Threat 1 Low population size* The Fennoscandian population of *Alopex lagopus* has become highly fragmented as large areas within its previous range now are empty. Young foxes may therefore have difficulties finding a non-related partner, and their social behaviour might break down and enhance the forces of extinction (allée effects), and hence also increase the risk of inbreeding and genetic degradation. Further, the small population size implies that even small changes in demographic parameters or pure "accidents" (stochastic incidents) can affect the risk of extinction dramatically.
- *Threat 2 Low food availability* Arctic fox breeding is strongly dependent on the availability of the main prey, lemmings and voles (*Lemmus sp., Microtus sp., Clethrionomys sp.*). These small rodents generally have a cyclical pattern of abundance with peaks every 3-4 years, followed by population lows (1-2 years.). Arctic foxes can have up to 19 young in peak years, while few or no cubs are born during lows. The rodent peaks failed to appear during the 1980s and 1990s, causing a further decline in the arctic fox population.
- *Threat 3 Competition* The red fox is a dominant competitor and a predator on arctic fox juveniles. It has increased in numbers above the tree line in the 20th century, taking over dens and excluding the arctic fox from parts of its breeding range. The reasons behind the red fox population expansion and increase is probably a cumulative response to large changes happening at landscape scale (e.g. fragmentation and development, global warming, culling of large carnivores)
- *Threat 4 Diseases* A captive breeding programme in Sweden in the early 1990's failed due to an outbreak of fatal encephalitis. If the disease occurs in the wild population, the effects could be detrimental. Other diseases or parasites could also have serious effects on the population.
- *Threat 5 Disturbance* Disturbance at dens from hunting dogs in early autumn may cause an early juvenile emigration with subsequent higher juvenile mortality.
- *Threat 6 Hybridisation* Hybridisation with escaped farmed arctic foxes, which probably are less well adapted to natural habitats, could decrease the fitness of the wild population. Whether or not hybridisation has occurred is unknown, but farmed foxes have been observed in the wild.

Overall objectives

We have used a dynamic management approach to monitor and allocate conservation actions to support the species in the most efficient way. The monitoring programme have used den surveys, genetic methods, remote cameras and radio telemetry to efficiently investigate presence and breeding success of *Alopex lagopus* in Norway, Sweden and Finland. The supplementary feeding programme and the *Vulpes vulpes* control programme has been used in high quality *Alopex lagopus* territories in Swedish mountain range and northern Finland. The goal is that the actions should increase the reproductive output of local *Alopex lagopus* populations, and thereby substantially increase the long term population viability. To minimise disturbance surrounding areas around breeding dens has been protected from ptarmigan hunting. Further, through information available on a website and information by local tourist operators, we have promoted public co-operation and understanding for the actions needed to support the Fennoscandian *Alopex lagopus* population.

Expected results

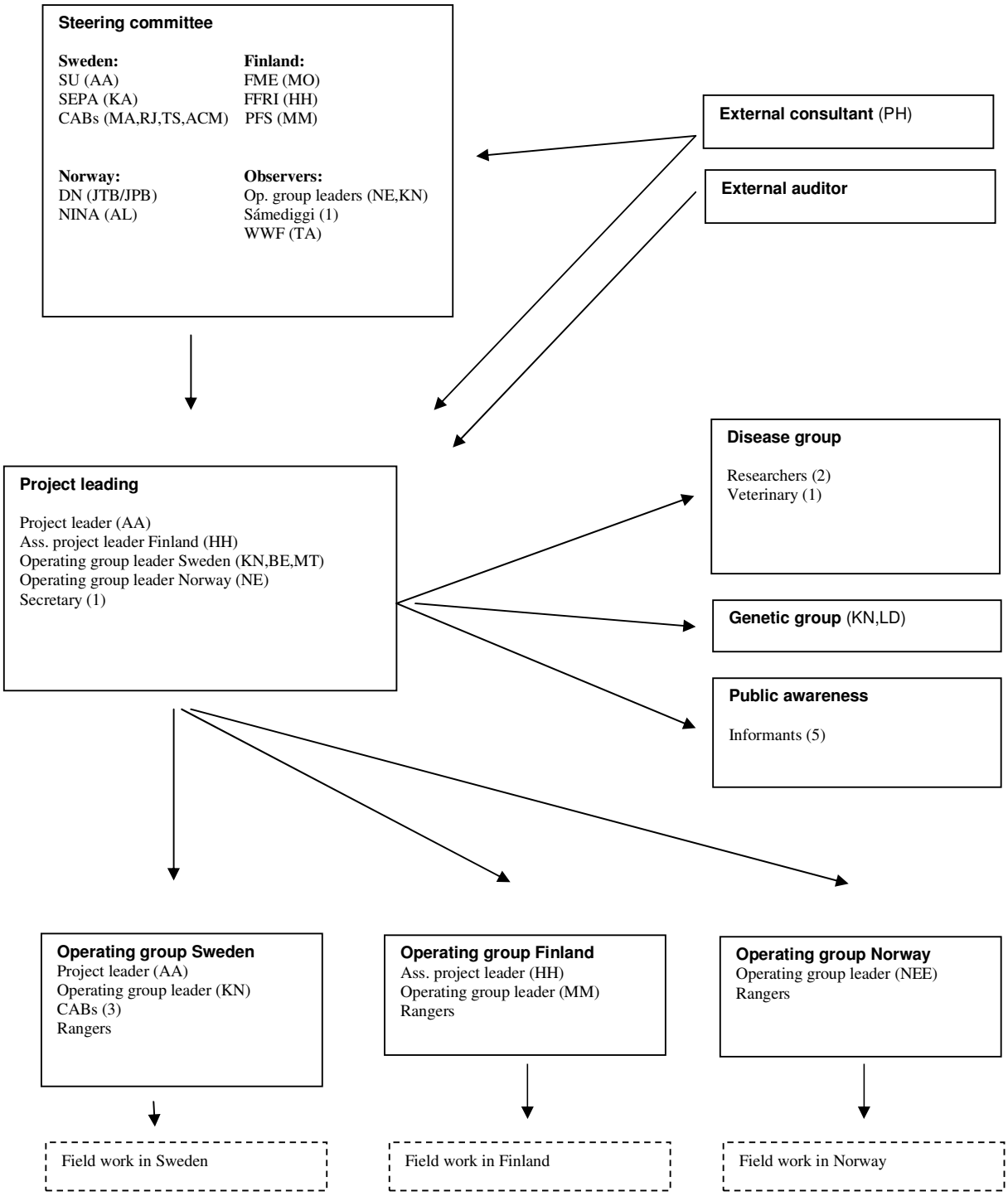
- *Threat 1 Low population size* Knowledge on population size, distribution, inbreeding and Allee effects. Experience from SEFALO indicate that if actions D1-3 and D5 are combined, it is realistic to increase the number of reproducing arctic foxes over 5 years (A2, A3, C1, D1).
- *Threat 2 Low food availability* Increased number of arctic fox litters, litter size and juvenile survival (C1, D1, D2)
- *Threat 3 Competition* Reduced competition from breeding red foxes. Increased number of arctic foxes which establish territories and breed; decreased mortality (C1, D1, D3).
- *Threat 4 Diseases* Identify and screen any new virus to investigate the level of threat. If possible, treat the disease and increase survival (C1, D1, D4)
- *Threat 5 Disturbance* Reduced disturbance from hunting dogs. Understanding of threats and actions from the public (C1, D1, D5, E1-E7).
- *Threat 6 Hybridisation* Identify hybrids in the wild and suggest action (C1, D1).

Participating organisations

Stockholm University SU	Swedish Environmental Protection Agency SEPA	County Administration Board (CAB) of Jämtland	County Administration Board of Västerbotten	County Administration Board of Norrbotten	Finnish Forest Research Institute FFRI
Park and Forestry Service PFS	Norwegian Institute for Nature Research NINA	Swedish University of Agricultural Science SLU	Swedish National Veterinary Institute NVI	Lapplandsafari AB Geunja	Fjällhästen AB
Ramundberget Alpina AB	University of Iceland	Fjällräven AB	WWF Sweden	Dogman	EU Life-Nature

4. Life project framework

We mobilised some of the world's leading experts on different aspects of *Alopex lagopus* biology to increase the viability of the Fennoscandian population. The project has been a co-operation between Stockholm University (SU), the Swedish Environmental Protection Agency (SEPA), the Swedish County Administration Boards (CABs) in Jämtland, Västerbotten and Norrbotten, the Finnish Forest Research Institute Metla (FFRI), the District of Northern Lapland Park and Forestry Service Metsähallitus (PFS) in Finland, Norwegian Institute for Nature Research (NINA), Swedish University of Agricultural Science (SLU), Swedish National Veterinary Institute (NVI), Fjällräven AB, Lapplandsafari AB, Fjällhästen AB and Ramundberget Alpina AB. SU, FFRI and NINA have worked on a administrative level including research and report writing. SEPA is the responsible agency for red listed species in Sweden and have through that the over all responsible for the persistence of the arctic fox population in Sweden. The CABs and PFS has worked on the local scale with local action plans and conducting actions in field. NVI and SLU has been responsible for investigating diseases among the arctic fox population. Fjällräven AB, Lapplandsafari AB, Fjällhästen AB and Ramundberget Alpina AB has all been working with information to wildlife tourist. Fjällräven AB has through their product catalogue informed about the project in not less than 8 languanges.



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5. Progress of activities and results

Summary of deliverables and results

The activities are divided into five parts; A. Preparatory actions, C. Non-recurring management, D. Recurring management, E. Dissemination activities and deliverables F. Overall project operation. Each action, Expected result and results are presented under each section.

Table 1. Actions June 1 2003 – June 1 2008. x indicates planned actions which have been executed according to the approved contract (form 22), ***X*** indicates actions executed in addition to the contract (D1-2) or earlier than planned (A1, E5, F2), **N** indicates a planned action which has not been executed (E2). Due to the late start of the project, we have actions all through the project period toJune 1 2008.

Action	A			C	D					E							F					
Period	1	2	3	1	1	2	3	4	5	1	2	3	4	5	6	7	1	2	3	4	5	6
2003 Jun-Sep	x				***X***	***X***		x	x	x		x			x		x		x	x	x	
Oct-Dec								x		x	x	x	x		x		x	x	x	x	x	
2004 Jan-Mar					x	x	x	x		x		x	x		x		x		x	x	x	
Apr-Jun	***X***	x			x	x	x	x		x	**N**	x			x		x		x	x	x	
Jul-Sep					x	x		x	x	x		x			x		x		x	x	x	
Oct-Dec	x				x	x	x	x		x	x		x	x	x		x	x	x	x	x	
2005 Jan-Mar	x				x	x	x	x		x		x	x		x		x		x	x	x	
Apr-Jun					x	x	x	x		x	x	x		***X***	x		x	***X***	x	x	x	
Jul-Sep					x	x	x	x	x	x		x			x		x		x	x	x	
Oct-Dec					x	x	x	x		x	**N**		x	x	x		x		x	x	x	
2006 Jan-Mar	x				x	x	x	x		x		x	x		x		x		x	x	x	
Apr-Jun	x				x	x	x	x		x	x	x		***X***	x		x		x	x	x	
Jul-Sep	x			x	x	x	x	x	x	x		x			x		x		x	x	x	
Oct-Dec	x				x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	
2007 Jan-Mar	x				x	x	x	x	x	x		x	x	x		x	x		x	x	x	
Apr-Jun	x				x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	
Jul-Sep	x		x		x	x	x	x	x	x		x	x	x		x	x		x	x	x	
Oct-Dec	x				x	x	x	x		x	x		x	x	x		x	x	x	x	x	
2008 Jan-Mar	x				x	x	x	x		x		x	x		x		x		x	x	x	
Apr-May					x	x	x	x		x	x	x		X	x		x	X	x	x	x	

Table 2. Deliverable products June 1 2003 – June 1 2008 (approved contract form 23).

Product	Action	Expected date of delivery	Date of Completion
General management plan	F1	December 2003	March 2004 / July 2005
Norwegian action plan	A2	April 2004	September 2003
European information, biannual	E2	November 2003 / May 2004 / November 2004 / May 2005	November 2003 / Not delivered May 2004 / November 2004 / May 2005
A report on genetic identification of farm-bred *Alopex*	D1	July 2005	September 2004 / June 2005
Local action plans	C1	December 2005	November 2006
A report on the genetic structure of Fennoscandian *Alopex*	D1	December 2006	December 2005
Evaluation report of *Vulpes* control	D3	June 2006	Dec 2007
Evaluation report of feeding programme	D2	June 2006	Dec 2007
Translocation evaluation report	A3	December 2006	Dec 2007

Table 3. Project milestones June 1 2003 – June 1 2008 (approved contract form 24).

Milestone	Action	Expected date of delivery	Date of Completion
Obtain permits necessary for actions D1 and D3	A1	September 2003	April 2004
Playground in Ramundberget	E4	December 2003	December 2003
Renew ethical permit for trapping, tagging, radio collaring and blood sampling	A1	December 2004	April 2003
Alopex lagopus seminars	E5	December 2004	November 2004 / June 2005
Renew ethical permit for trapping, tagging, radio collaring and blood sampling	A1	December 2004	April 2004 / October 2004
PhD dissertation on *Alopex lagopus* genetics	A3, D1	December 2005	December 9, 2005
Local action plans	C1	December 2005	November 2006
Alopex lagopus seminars	E5	December 2005	December 8, 2005/ June 2006

A. Preparatory actions

A1 Permits Monitoring (D1) involves visiting arctic fox dens, ear tagging of juveniles and radio collaring. Blood samples will be taken to screen the population for diseases (D4). Since the arctic fox is protected, permits are needed to visit dens, trap and tag individuals and take blood samples. Permits are also needed for red fox control (D3), and e.g. in Finland local authorities, Sami reindeer herders, grouse hunters and researchers have together elected the person who can carry a gun on snowmobile. In some cases, the project will also need permits to use snowmobiles and helicopters in otherwise restricted areas.

Expected results: Permits will be issued by the respective competent authority
Results: The project has received necessary permits.
Variations/complications/delays: None

A2 Norwegian Action Plan About half of the Fennoscandian arctic fox population is located in Norway. Actions in Norway are therefore vital for the survival of the population. The Norwegian Directorate for Nature Management (NDN) will develop a Norwegian action plan for the conservation of the arctic fox in Norway. The objective is to achieve a more favourable conservation status of the arctic fox.
Expected results: The Norwegian action plan will be a tool for future management in Norway.
Results: The plan was finished in September 2003. Norway is a third country partner in SEFALO+. The Norwegian input according to the approved contract is therefore limited to monitoring in summer (D1; den surveys, trapping and ear tagging of arctic foxes). In the action plan, Norway aims to start conservation actions in addition to the Norwegian involvement in SEFALO+ and several research projects. The plan is available on the Internet at
http://www.dirnat.no/archive/attachments/01/53/Rappo049.pdf .
Variations/complications/delays: The Norwegian Directorate for Nature Management (DN) finance a larger project in support of the Norwegian arctic foxes, adding to the Norwegian involvement in SEFALO+. Complementary actions was described in the interim report 31. Dec. 2005.

Complementary actions in Norway (see Appendix)

A3 Translocation Evaluation Report
The current small population size can lead to inbreeding depression, Allee effects and fragmentation (Threat 1). Translocation of individual arctic foxes, e.g. reciprocal restocking of individuals between subpopulations or introduction of individuals from Russia, could be necessary to eliminate these problems. Monitoring (D1) will provide information on the substructure of the Fennoscandian arctic fox population. Thus, the objective with this action is for Stockholm University and the assistant project leaders to investigate the need for translocation and produce a Translocation Evaluation Report. If translocation is needed, the report will suggest appropriate methods.

Expected results: A studbook on the wild population will be produced to choose appropriate animals for possible translocation. This work will result in a Translocation Evaluation Report, presented in December 2006.

Results: A translocation evaluation report has been produced by SU. The Scandinavian arctic fox is fragmented into four separate subpopulations with low genetic variation and a high proportion of close relatives. As arctic foxes avoid breeding with close relatives, there is a risk that population growth rate decreases as a consequence of lack of unrelated partners. Moreover, the risk of inbreeding is imminent due to the low population size and absence of gene flow between the subpopulations, which may reduce population growth rate further. We thus consider translocation likely to have a positive effect on population viability by increasing the proportion of unrelated individuals within a population and by introducing new genetic material. Although introducing individuals from Russia is likely to have a positive genetic effect, the risk of introducing new diseases and parasites is considerable and is thus not an option. However, reciprocal restocking of individuals between subpopulations is likely to have a positive genetic effect and lowers the risk of negative effects by means of diseases or outbreeding depression. We recommend that reciprocal restocking of individuals between Scandinavian subpopulations should be considered in the future management. This can be accomplished in close cooperation with the captive breeding programme on arctic foxes in Norway, which inhabit all genetic lines in Fennoscandia (except the population in

Helags). Both in Norway and Finland local populations are already extinct and reintroduction is a needed action.

Variations/complications/delays: The translocation evaluation report that was attached to the progress report 2007.

C. Non-recurring management

C1 Implementation Conservation actions will be implemented within CABs in Sweden and PFS in Finland to ensure that they have the organisation and experience needed to continue appropriate actions after this project ends. This is necessary since the present population size is critically low (Threat 1) and the arctic fox will need more time than this project period to recover. The CABs in Sweden differ in landscape and infrastructure e.g. distances between arctic fox habitat, built-up areas and roads. Thus, Local Action Plans will be developed for each county to attain the goals of SEFALO+. The plans will describe local conditions regarding the distribution of arctic fox habitat and clarify how actions can be executed in each area during and after SEFALO+.

Expected results: The CABs will produce Local Action Plans, with assistance from SU by December 2005. FFRI and PFS will produce a similar Action Plan for Finnish Lapland, also by December 2005. Norway will implement actions according to their national Action Plan (A2). In combination with increased numbers of *Alopex lagopus* through conservation actions, we expect to eliminate threats 1 and 2, and actions related to these threats could be ended by the end of the proposed project (D2, A3). With a larger population size, the impact of disease (4) and disturbance (5) will be less important and actions D4 and D5 may also be ended.

Result: The CABs, has produced Local Action Plans, with assistance from SU by December 2006, and has worked in line with them. FFRI and PFS have together produced a evaluation of the situation for Finnish Lapland, which was attached to the progress report 2007. The conservation in the CABs will also be related to the new Swedish action plan decides by SEPA.

Variations/complications/delays: None

D. Recurring management

D1 Monitoring Monitoring through den surveys will provide information on arctic fox presence and breeding success, food availability for arctic foxes and red fox density. Monitoring is necessary to decide when and where actions D2-D3 and D5 will be performed (Threats 2-3, 5). In addition, radio tracking of arctic foxes, ear tagging of juveniles and genetic analyses of faeces will resolve population size, population substructure, survival, migration rates and routes, and also help identification of potential hybrids with farmed foxes. Radio tracking of individual arctic foxes may also be a tool to follow individual arctic foxes and support them with feeding etc. through their lifetime. By trapping of arctic foxes, we can take blood samples to screen the wild population for diseases (D4, Threat 4). In Finland and Sweden, monitoring will cover both summer and winter, while only summer surveys will be conducted in Norway. Information from monitoring will be used to determine status and viability of the Fennoscandian arctic fox population, which is also the background data in the Translocation Evaluation Plan (Threat 1, A3). Further genetic analyses will be the basis for the report on "The genetic structure of Fennoscandian arctic foxes" (Threat 1) and the report on "Genetic identification of farmed arctic foxes" (Threat 6). Monitoring is the baseline information necessary to evaluate the overall effects of actions under the SEFALO+ project.

Expected results: We expect to generate information necessary for implementation of all other actions (C1, D2-D5) and evaluation of the project (C1).

Results: The monitoring of dens has been performed according to the contract to generate data for implementation and evaluation. Monitoring at den sites show an increase of arctic fox litters between peak years in Helagsfjällen and Borgafjäll (SWE) while the local reproduction seam more stable in Swedish Vindelfjällen (with lower intensity of actions) and in Norwegian Børgefjell (where no actions has been performed since it has worked as a control area) (Figure 1.). In Finland has no litters have been recorded during the whole project period, although a few individuals have been observed. Genetic monitoring has resulted in several scientific publications on the genetic structure of the Fennoscandian population (Dalén *et al.* 2006), distribution of arctic and red foxes during summer and winter (Dalén *et al.* 2004), translocation report (Dalén and Angerbjörn 2007), identification of hybrids between wild and farm breed arctic foxes (Norén *et al*. 2005, Meijer *et al.* 2007) and population size in Helagsfjällen, Sweden (Meijer *et al.* 2007). Further, samples collected during both summer and winter have been used to produce the disease report by SVA/SLU (Berg *et al*.2007). All publications and reports are shortly summarized within this final report.

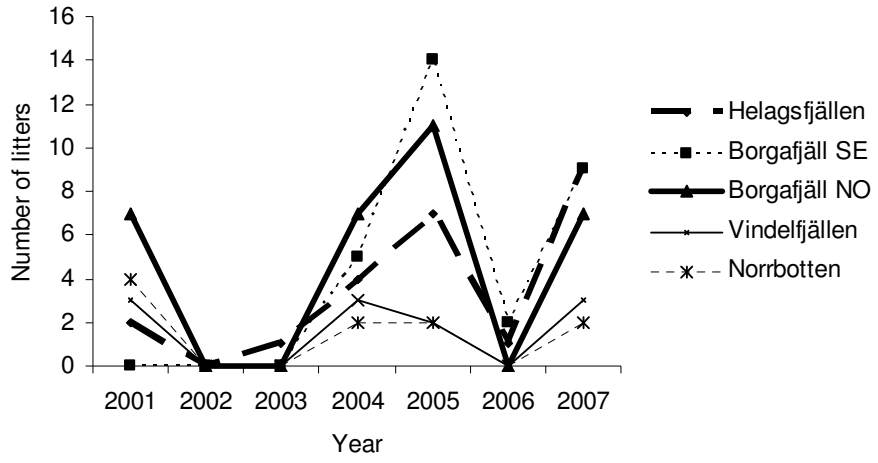


Figure 1. Number of litters in Sweden and Norway separated on area during 2001-2007. Finland is not included in the figure since no litters has been found. (for Norway only Borgfjell NO in included which has been a control area for evaluation of actions in Sweden)

Summer 2003 (Sweden and Finland)

In total, we surveyed 410 of 586 known dens in Sweden and Finland (Table 5). The availability of lemmings, the main prey of arctic foxes, was low in all areas (Table 18). As a result, there was only 1 arctic fox litter (Table 5). The litter was found in Helagsfjällen, Sweden, an area where both feeding (D2) and red fox control (D3) had been maintained since the end of the first SEFALO project in 2002. In total, we found 7 red fox litters in historic arctic fox dens.

Variations/complications/delays: None

Summer 2003 (Norway)

Under the national arctic fox monitoring program and SEFALO+, 209 of the known arctic fox dens were surveyed during summer 2003 (actions completed on assignment from the Norwegian Directorate for Nature Management). 2 arctic fox litters were recorded and 2 red fox litters. The arctic fox litters was located in Finnmark-Varangerhalvøya (1) and Hardangervidda-Finse (1).

A minimum of 6 cubs were recorded. 31 new den sites were found during summer (18 arctic fox dens, 9 red fox dens and 4 dens of uncertain origin). The fox database in Norway now include 605 described fox den sites, of which 431 are arctic fox den sites of origin.
Variations/complications/delays: None

Winter 2003-2004 (Sweden and Finland)
We surveyed 411 of 588 dens in Sweden and Finland. In total, 29 dens were inhabited by arctic foxes and 46 dens by red foxes (Table 6). We estimated that there were 48-67 arctic foxes in the Swedish mountain range. This is an increase since the start of the first phase of the project (SEFALO, winter 1998-1999) when we estimated that there were 36-59 arctic foxes. No den inhabited by arctic foxes was observed in Finland. The two winters should be relatively comparable, as lemming availability was low in both years.
Variations/complications/delays: None

Summer 2004 (Sweden and Finland)
We found an additional 12 dens during the summer. Thus, we surveyed 465 of 600 known dens (Table 8). In Sweden, lemming availability had increased in some areas and was intermediate to high in northern Jämtland and Västerbotten (Borgafjäll, Vindelfjällen). It was lower in southern Jämtland (Helags) and Norrbotten (Table 18). We found 14 arctic fox litters and 15 red fox litters. The arctic fox litters were located in Helags (4), Sösjö-Offerdalsfjällen (1), Borgafjäll (4), Vindelfjällen (3) and in Arjeplog (2) adjacent to Vindelfjällen in southernmost Norrbotten (Fig. 1, Table 4). There were a minimum total of 102 cubs, 60 of which were trapped and ear tagged. In addition, we tagged 3 adult foxes. Later in summer we fitted 6 of the tagged cubs with radio collars. One of the reproductions in Swedish Borgafjäll 2004 failed in July. The lactating female was found dead approximately 70 meters from the den and the cubs, which had not been weaned, probably died inside the den. An autopsie (SVA) indicated that a red fox had killed her. In Finland, lemming availability remained low. There were occasional observations of adult arctic foxes in Finland but no arctic fox litters However, there were 4 red fox litters (Table 8).
Variations/complications/delays: None

Summer 2004 (Norway)
Under the national arctic fox monitoring program and SEFALO+, 266 of the known arctic fox dens were surveyed during summer 2004 (actions completed on assignment from the Norwegian Directorate for Nature Management). Priorities were given to den sites that have been used within the last 15 years. We recorded 14 arctic fox litters and 5 red fox litters. The arctic fox litters was located in Troms-Dividalen (1), Nordland-Saltfjell (4), Nordland-Børgefjell (7) og Blåfjellområdet/ Lierne in Nord Trøndelag (2) (Fig 5., Table 8). There were a minimum of 83 cubs recorded in total. Of these, 1 cub was captured and eartagged. We also captured 2 adults, but we did not have permits to tag adults, hence they were released without being tagged. A total of 67 new den sites were found during summer, 44 arctic fox dens, 22 red fox dens and 1 den of uncertain origin, and the national fox database now include 673 described fox den sites, of which 531 are arctic fox den sites. There were no observations of foxes with eartags or radio collars during the summer.
Variations/complications/delays: None

Winter 2004-2005

We surveyed 393 of 608 dens in Sweden and Finland. In Sweden was a total of 47 dens inhabited by arctic foxes and 20 dens by red foxes (Table 7). In Finland was no arctic foxes observed, 33 dens was inhabited by red foxes.

Variations/complications/delays: No winter inventories were conducted in Norrbotten, Sweden, (Nationalparksblocket) due to logistic problems.

Summer 2005 (Sweden and Finland)

We surveyed 493 of 622 arctic fox dens of which 22 where newly found this year. We found 26 arctic fox litters and 13 red fox litters. The arctic fox litters were located in Helags (7), Sösjö-Offerdalsfjällen (1), Borgafjäll Z (5), Borgafjäll AC (9), Vindelfjällen (2), Arjeplog (1) and in Nationalparksblocket (1) (Fig. 5, Table 9). We trapped and tagged 95 cubs and 2 adult foxes. In Sweden, lemming availability had increased in some areas and showed high abundance in Jämtland and southern Västerbotten (Borgafjäll), intermediate in northern Västerbotten (Vindelfjällen) and parts of Norrbotten, and low abundance in Finland (Table 18). In Finland, lemming availability remained low. No arctic fox litters were found in Finland but there were occasional observations of adult arctic foxes. However, there were 2 red fox litters (Table 9).

Variations/complications/delays: Radio tagging was not performed at all this year. We hade problems to catch the foxes in September, i.e. when they were large enough to be fitted with a radio collar.

Summer 2005 (Norway)

Under the national arctic fox monitoring program, and SEFALO+, 223 of the known arctic fox dens were surveyed during spring and summer 2005 (actions completed on assignment from the Norwegian Directorate for Nature Management, DN). Priorities were given to den sites that have been used within the last 15 years. We recorded 21 arctic fox litters and 2 red fox litters. The arctic fox litters were located in Finnmark-Varangerhalvøya (1) , Finnmark-Ifjordfjellet (1), Troms/Finnmark –Reisa Nord (2), , Troms-Dividalen (1), Nordland-Saltfjellet (4), Nordland-Børgefjell (11) and at Hardangervidda-Finse (1) (Fig 5., Table 10). There was a minimum of 39 cubs recorded in total. Of these, 10 cubs were captured and ear-tagged. A total of 34 new den sites were found during summer; 23 arctic fox dens, 7 red fox dens and 4 dens of uncertain origin. The fox database in Norway now include of which 540 are arctic fox den sites of totally 698 described fox den sites. In September an arctic fox cub ear-tagged in Sweden in the Helags area was observed in Norway, in Tydalen west of Sylane. This fox cub was accidentally killed by a car shortly after.

Variations/complications/delays: None

Winter 2005-2006

We surveyed 404 of 614 dens in Sweden and Finland. In total, 23 dens were inhabited by arctic foxes and 31 dens by red foxes (Table 12). We estimated that there were 76-110 arctic foxes. This is an increase since the start of the first phase of the project, winter 1998-1999 (Life-project SEFALO B4-3200/98/515), when we estimated that there were 36-59 arctic foxes compared to 90-110 the winter 2004-2005. This increase is due to efficient actions and due to an increase in rodent abundance.

Variations/complications/delays: None

Summer 2006 (Sweden and Finland)

We found an additional 22 dens during summer. Thus, we surveyed 475 of 631 known dens. In Sweden and in Finland, lemming availability had decreased in all areas and showed very low abundance (Fig 5.,Table 13). We found only 3 arctic fox litters and 7 red fox litters. The arctic fox litters were located in Helags (1) and Borgafjäll Z (2). We trapped and tagged 3 cubs and 1 adult

foxe. In Finland, lemming availability actually increased during the summer. There were occasional observations of adult arctic foxes but no arctic fox litters.
Variations/complications/delays:None

Summer 2006 (Norway)
Under the national arctic fox monitoring program, and SEFALO+, 239 of the known arctic fox dens were surveyed during spring and summer 2006 (Table 11)(actions completed on assignment from the Norwegian Directorate for Nature Management, DN). We recorded 5 arctic fox litters and 3 red fox litters. The arctic fox litters were located in Finnmark-Varangerhalvøya (3), Finnmark-Ifjordfjellet (1), Finnmark/Troms – Nord Reisa (1) , all located in northern Norway (Fig 1, Table 10). A minimum of 13 cubs recorded None of these cubs were trapped or earmarked this summer, not to conflict with other projects in this northern region. A total of 40 new den sites were found during summer; 16 arctic fox dens, 13 red fox dens and 13 dens of uncertain origin, and the national fox database now include 738 described fox den sites (of which 553 are arctic fox den sites). One ear tagged fox (blue at inside of the right ear) was observed to be one of the parents to a litter in Finnmark, possibly ear tagged in the SEFALO+ project in Indre Troms in Norway in 2005 or in Sweden. 93 scats were collected for genetic analyses.
Variations/complications/delays: None

Winter 2006-2007
We surveyed 347of 614 dens in Sweden and Finland. In total, 38 dens were inhabited by arctic foxes and 19 dens by red foxes (Table 14). Field personnel estimated that there were about 70 arctic foxes. These inventories were highly affected by unusual strong winds and harsh weather during the winter 2006-2007. Due to the severe weather conditions were few observations recorded.
Variations/complications/delays: None

2007 (Sweden and Finland)
We found an additional 3 dens during summer. Thus, we surveyed 411 of 633 known dens (Table 15). In Sweden and in Finland, lemming availability increased in all areas, but showed a large variability of abundance (Table 18). The abundance seems to have increased largely during the autumn 2007. We found 23 arctic fox litters and 10 red fox litters. The arctic fox litters were located in Helags (9), Borgafjäll (8), Vindelfjällen (3) and Arjeplog (2) (Fig 4., Table 15). We trapped and tagged 102 cubs and 2 adult foxes. One female in Borgafjäll were equipped with a satellite radio transmitter. In Finland, lemming availability actually increased during the summer, but no arctic fox litters were found.

Variations/complications/delays: Radio tagging was not performed in the extend that was planned. We hade problems to catch the foxes in September, i.e. when they were large enough to be fitted with a radio collar.

Field work winter and summer 2007 (Norway)
Under the national arctic fox monitoring program, and SEFALO+, 241 of totally 776 know den sites have been surveyed during spring and summer 2007 (actions completed on assignment from the Norwegian Directorate for Nature Management, DN). We recorded 16 arctic fox litters and 17 red fox litters (note that this is not to be interpreted as an increase in red fox numbers compared to the other years, but the expand of the red fox to alpine habitats have received more attention in the Norwegian monitoring program) The arctic fox litters were located in Finnmark-Varangerhalvøya (3), Finnmark-Ifjordfjellet (1), Finnmark/Troms – Nord Reisa (2), Troms-Dividalen (1), Nordland-Saltfjellet (1), Nordland-Børgefjell (8) (Fig 4., Table 16). A minimum of 112 cubs recorded, of these

we trapped 8 cubs, of which 3 were included in the captive breeding program. A total of 33 new den sites were found during summer; 15 arctic fox dens, 11 red fox dens and 9 dens of uncertain origin,. The fox database in Norway now771 described fox den sites (of which 571 are arctic fox den sites). One ear tagged fox was observed in Børgefjell, it was however impossible to identify it to individual. 455 scats were collected for genetic analyses.

Variations/complications/delays Radio tagging and earmarking was not performed to the extent that was planned. We had problems catching the foxes in September, i.e. when they were large enough to be fitted with a radio collar.

Fieldwork has been conducted during five summers and six winters. We completed field work also during the winter 2007/08 although this was not originally planned, as the project had a slow start related to the contract and we had economic and logistic capacity to continue full actions during the winter. In Sweden, most field work during winter time has been conducted by the CABs while the major part of fieldwork during summer time has been performed by SU. In Finland has the field work been conducted by Metsähallitus (PFS). In Norway has there been a cooperation between NINA and SNO (Statens natur oppsyn). The genetic monitoring has been performed by SU and the DNA sample collection has been conducted by all field personnel. Variations/complications/delays are presented under each field period.

Genetic monitoring

Identification of species origin

We have used DNA analysis to identify origin of faeces from red fox, arctic foxes and wolverine, a method developed within SEFALO+ which has been used continuously as a supplement during summer and winter surveys. This has allowed us to determine the current distribution of arctic and red foxes in Scandinavia (Dalén *et al.* 2006, Dalen *et al.* 2004, Meijer *et al*. 2006). The method has facilitated investigation of the impact of red fox competition on arctic fox distribution (Threat 3) (Dalén *et al*. 2004). During SEFALO+ no arctic fox has been identified in 76 analysed faecal samples from Finland.

Identification of escaped farm foxes

Stockholm University and NINA (Norén *et al.* 2006) have developed a method to distinguish wild Fennoscandian arctic foxes from escaped farm-bred arctic foxes using DNA found in e.g. faeces (Threat 6). The method also allows for identification of "hybrids" between farm-bred and wild arctic foxes. Based on this method, we have identified farm-fox genotypes in various locations in Fennoscandia. Using this method we have concluded that hybridisation already has occurred within the wild arctic fox population with a minimum of two and maximum of six identified hybrids. The impact was most severe in Norway where no pure Fennoscandian individuals were identified in the south-western subpopulation (Hardangervidda). In Sweden, six individuals with farmed origin have been identified of which four were identified outside the regular arctic fox distribution range. No farmed or hybrid arctic fox has been detected among wild arctic foxes in Sweden. The geographic distribution of escaped farm foxes corresponds well to the distribution of arctic fox farms.

Genetic population structure and population size

We have completed four genetic studies on the population size, genetic variation, population substructure, effects of inbreeding in Scandinavia (Threat 1). Three of the studies were a part of the PhD-thesis by Love Dalén in 2006. The first study showed that loss of genetic variation was caused by the bottleneck 100 years ago. However, the rate of loss seems to have been slowed by some immigration from Russia. The second study showed that the arctic fox population in Scandinavia is fragmented into four isolated populations where each population size of 10-50 individuals each (Fig. 6). At the moment there seams to be no connection with the arctic foxes on the Kola Peninsula and the Fennoscandian populations. The population at Kola rather belong to the Russian population. In

the third study, we found that individuals with high genetic variability (i.e. low degree of inbreeding) have a higher survival and reproductive success than individuals with low genetic variability (i.e. high degree of inbreeding). These studies are fully presented in the deliverable: *A report on the genetic structure of Fennoscandian arctic foxes* (Dalén *et al. 2006).*The fourth study investigated the population size in the southern subpopulation in Helagsfjällen, Sweden, using molecular tracking. Based on the unique genetic profile of each individual, we genotyped faecal samples collected during the winter of 2006 and concluded that the population consisted of 36-55 individuals. Combining genetic data with observations of previously ear-tagged individuals, we investigated the survival rate during one year (July 2005-July 2006). Juvenile survival on yearly basis was 8% while adults had a survival of 59%. The juvenile survival is very low compared to other small canides were the corresponding estimates for swift fox (0.13-0.69, *op. cit*), kit fox (0.14-0.55, *op. cit*) and red fox (0.25-0.43, *op. cit*) are all higher. The yearly survival rate of adult arctic foxes (0.59) is not lower than rates reported for other small canids, e.g. swift fox (0.45-0.64; *V. velox;* Moehrenschlager *et al.,* 2004), kit fox (0.44-0.58; *V. macrotis*; Moehrenschlager *et al.,* 2004), and red fox (0.33-0.75; Korytin, 2002).The survival is however very much dependent on rodent phase (Tannerfeldt *et al*. 1994), during this winter the abundance of small rodents was very low. The results are fully presented in the deliverable: Estimating population parameters in a threatened arctic fox population using molecular tracking and traditional field methods (Meijer *et al*. 2006).

Variations/complications/delays: None

D2 Feeding Feeding of arctic foxes at inhabited dens is probably necessary since low food availability causes reproduction to fail (Threat 2). The action will increase the number of breeding attempts, litter sizes and juvenile survival. It might also improve adult survival. It is of vital importance that feeding is combined with red fox control (D3) since feeding may otherwise attract red foxes with consequent negative effects on the arctic fox. The project leading group will produce an Evaluation Report on this action by June 2006.
Expected results: Winter feeding raises the number of breeding attempts and litter sizes. It might also improve adult survival. Summer feeding increases juvenile survival.

Results: The aim was to have feeding at all dens inhabited by arctic foxes if it was logistically possible. However, since we have found that feeding attracts red foxes, the feeding action in winter should be combined with red fox control. Both feeding and red fox culling has in Sweden been conducted by respective CAB and in Finland by Metsähallitus (PFS). The feeding effort varied largely between geographical areas. In Sweden, Helagsfjällen there has been more supplemental feeding stations during winter than inhabited dens during the whole project period. In Borgafjäll, there has been supplemental feeding on almost all dens with arctic foxes. An exception was during winter 2005, when fewer dens were supplied with extra food, depending on high natural prey densities. In Vindelfjällen and in Norrbotten the winter feeding has been sporadic (Table 4-5). In Finland winter feeding has been performed in small extent in high quality arctic fox territories. No summer feeding has been conducted since no stationary arctic foxes has been found.

Table 4. Number of inhabited dens with supplemental feeding during winters 2003-2007.

Winter	Helags (Z)		Borgafjäll (Z+AC)		Vindelfjällen (AC)		Norrbotten (BD)	
	N inhabited	N fed	N inhabited	N fed	N inhabited	N fed	N inhabited	N fed
2003	2	5	7	5	1	1	7	0
2004	5	8	11	12	6	0	7	1
2005	8	9	15	7	16	0	7	2
2006	8	20	9	12	2	2	4	0
2007	10	10	10	9	6	0	12	8

Almost all litters in Helagsfjällen, Vindelfjällen and Norrbotten received extra feeding during the project period (except from five litters in Borgafjäll in 2005, , this was mainly due to shortage of field personnel due to unexpected high number of occupied arctic fox dens).

Table 5. Number of arctic fox dens fed during summer in relation and number of litters in respective areas 2003-2007.

Summer	Helags (Z)		Borgafjäll (Z+AC)		Vindelfjällen (AC)		Norrbotten (BD)	
	Litters	Fed dens	Litters	Fed dens	Litters	Fed dens	Litters	Fed dens
2003	1	1	1	1	0	0	0	0
2004	4	4	4	8	3	2	2	6
2005	7	9	14	9	2	0	2	3
2006	1	11	2	8	0	2	0	0
2007	9	9	8	9	3	3	2	11

Variations/complications/delays: Some dens with arctic fox litters were not fed during the summer. This was because of shortage of field personnel and the fact that breeding was discovered too late in the season. Feeding during winter did not take place to full extent in Vindelfjällen, nor in some areas of Norrbotten. This was partly due to the fact that the red fox control was not performed satisfactory in these areas. In Finland, there was some feeding during the winters but no feeding during the summers as the arctic foxes never established at den sites.

D3 Red fox control Red foxes will be controlled by culling in areas close to recent or previous arctic fox territories in Sweden and Finland. Culling is necessary as the red fox is a dominant competitor and a predator on arctic fox juveniles. Arctic foxes avoid areas with red foxes and do not establish there (Threat 3). Further, feeding (D2) involves a risk that red foxes are attracted to an area and take over arctic fox dens. All hunting will take the utmost caution, as not to cause any disturbance to other wildlife and only a limited number of carefully selected persons are included. The red fox is a common species in Fennoscandian forests and hunting in some selected mountain tundra habitats will not have any detrimental effects on the population as a whole. We expect culling to leave more dens and territories suitable for establishment of arctic foxes, which implies more litters born. Reduced density of red fox might also result in higher juvenile survival rates due to decreased interference competition including predation and avoidance of red foxes. We have observed that red foxes can kill both juvenile and adult animals, but we do not know to what extent. Avoidance effects of present red foxes might be even more important (Tannerfeldt et al. 2002) The project leading group will produce an Evaluation Report on this action by June 2006.

Expected results: We expect culling to leave more dens and territories suitable for establishment of *Alopex lagopus*, which implies more litters born and higher juvenile survival due to decreased predation and avoidance from *Vulpes vulpes*. In combination with feeding (D2), we expect to increase the number of successful reproductions.

Results: Red fox control has been carried out with different methods and at different intensities, due to differences in logistics and local attitudes as reported earlier. In Jämtland county, Sweden, the CAB field personnel has been responsible for conducting culling of red foxes. Västerbotten county, Sweden, has used their own field personnel in combination with bounties on regular hunting from local people. The red fox culling in Finland has been performed by Metsähallitus (PFS) and licensed local hunters. A total of 914 red foxes were culled here (Table 6). In Helagsfjällen (Z) and in Borgafjäll (AC+Z) the action has worked efficiently with 258 and 133 culled red foxes respectively (Table 6). In addition to this there has also been some hunting by local hunters in southern Västerbotten (AC, Borgafjäll). In Vindelfjällen hunting has not been efficient with only 65 red foxes

shot during the whole project period. In Norrbotten, culling has taken place mainly in the northernareas (Råstojaure and Sitas), with a total of 33 red foxes culled. The CABs in respective county have been responsible for conducting culling. The hunting is evaluated in the feeding and red fox culling report (Angerbjörn *et al.* 2007) that was attached to the progress report 2007.

Table 6. Number of culled red foxes in different areas. For further details se monitoring results in appendix.

Redfox	Helags	Borgafjäll	Vindelfjällen	Norrbotten	Käsivarsi	Pöyrisjärvi	Utsjoki
2003	15	4	0	0	6	25	70
2004	8	18	0	10	5	40	105
2005	86	32	6	17	0	47	73
2006	48	27	3	1	0	29	68
2007	36	14	11	0	0	50	136
2008	65	38	45	7	36	50	190
Total	258	133	65	35	47	241	642

Variations/complications/delays: Hunting from snow mobiles has been most efficient, although controversial. The alternative methods have, however, not reached such levels that any positive effect on arctic foxes could be detected. Be aware that even hunting in nearby forested areas could contribute to reduce the red fox population in alpine areas.

D4 Disease The main scope and responsibility of SLU and NVI has been to identify a causative agent of a fatal necrotizing encephalitis of arctic foxes within a captive programme and monitor its possible spread in nature. The latter includes wild arctic foxes and other animals. The causative agent has for many years been elusive. Several possible agents have before the start of SEFALO+ been tested negative. One important aim has been to characterize the pathological changes of this fatal necrotizing encephalitis that affected the arctic foxes in the captive program in order to be able to postulate an aetiology and to differentiate the disease from other, previously recognized conditions, to summarize a list of the pathological agents known to have caused disease in arctic foxes in Sweden, for both, arctic foxes in captivity and arctic foxes in the wild, to rule out the already known pathogens as cause of the novel necrotizing encephalitis and to conduct a pathological examination and laboratory testing on all arctic foxes that die in Sweden, and/or on biological samples from arctic foxes, to provide knowledge on health-disease status and presence and significance of various pathogens, such as lung parasites. A Disease Evaluation Report will be produced at the end of the project.

Expected results An identification of the causative infectious agent behind the fatal disease, and a Disease Evaluation Report by the end of the project.

Results We have identified a possible causative agent for the encephalitis of the arctic foxes in captivity, we have tested a limited number of wild animals as candidate carriers of this virus, we have ruled out a number of other possible candidate pathogens, we have conducted a thorough pathological examination of diseased animals, we have made an investigation of the infectious agents that artic foxes in wild carry, and finally we have written a Disease Evaluation Report.

Identification of a possible infectious causative agent

The work to identify a possible causative infectious agent behind the fatal encephalitis were done on a broad basis using classical methods (Electron Micrographs, growth in cell-culture and various molecular methods like PCR and selective amplification of unique nucleic acids. The “classical” ones, like growth in various tissue culture systems were unsuccessful and EM, was also inconclusive. Experts at Swedish Infectious disease control (SMI) investigated a number of micrographs. Virus-like particles shown in some of the micrographs, could however not be identified as viruses.

The one method that turned out positive was a "pan-herpes PCR". This showed clear positive results in particular cerebrospinal fluid of diseased animals. The investigation then continued aiming at a more characterization of this herpesvirus, and development of a more specific and sensitive method for screening, a real-time PCR method. The genetic characterization showed that this virus was highly related to bovine herpesvirus type I. The longer sequence analysis of the viral genome made it possible to develop a sensitive real-time PCR method, Tac-man type, for this virus. This method was then used for screening of various arctic foxes and wild animals.

Screening of wild animals

We have screened a number of possible reservoirs of the virus. In addition, a few wild arctic foxes have been tested. This has been possible after our development of a real-time PCR method. We tested initially red foxes (*Vulpes vulpes*), since they partially share the habitat of the arctic foxes. However, all the red foxes tested so far have been negative. We have also tested a few farmed arctic foxes (blue). Also in these, we were unable to show the presence of the virus. Additionally, we tested a small number of wild arctic foxes by real-time PCR. These have also been negative. We have access to another real-time pan herpes method. These two methods have been tested in parallel. These two PCR methods combined show that many (but not all) of the farmed arctic foxes carry this herpesvirus, but no wild animals that we are aware of.

Since not all farmed foxes were positive for herpesvirus, and the "blue ones" were negative, we have throughout the program worked in parallel with other molecular methods, to amplify unique genetic material from infected material, in order to find other possible infectious agents that can be found in arctic foxes. These investigations have sofar not led us further, and still the herpesvirus is the only candidate for being the true cause of the disease. There were a few bacteria present, no viruses, and a lot of unknown genetic material.
This part of the project has throughout the programme been a major task for us. The overall possible outcomes from these studies are:

1) To find another infectious agent in dead farmed animals
2) To have another method for identifying the microbial flora in arctic foxes

Conclusions

All overall data point to that the fatal encephalitis of farmed arctic foxes was caused by a herpesvirus, genetically closely related to bovine herpes virus type I. How the virus infected the arctic foxes is unknown. It appears however, that this virus is not present, or at least wide-spread, in nature.

D5 Protection of areas around dens with cubs Areas around dens with arctic fox cubs will be excluded from ptarmigan hunting in Sweden. Ptarmigans are hunted in basically all alpine areas from August 25 until February or March. Excluding areas from hunting is necessary since hunters use unleashed dogs and especially juvenile foxes may be disturbed and leave the area (Threat 5). Arctic foxes has also been mixed up with other game species as mountain hare and accidentally been shot. We expect an increase in juvenile survival.
Expected results: We expect a resulting increase in juvenile survival.

Actions foreseen in report period: The CABs in Sweden will exclude areas around breeding dens from ptarmigan hunting.
Results: All dens have been protected from hunting except for 6 dens in 2005. The CABs have been responsible for excluding the areas around breeding dens.

Variations/complications/delays: Some arctic fox litters died of starvation before hunting started and protection was therefore not necessary. In Norrbotten and in one small area in Borgafjäll Jämtland, the areas around breeding dens were only excluded from hunting with dogs, since the dogs, not hunting in itself, constitutes the main threat to arctic foxes. The aim with this distinction was to achieve a greater local acceptance for the action.

E. Dissemination activities and deliverables

It is vital that the general public understands why arctic fox conservation is important. Increased awareness of the status and ecology of arctic foxes is necessary to gain local understanding and acceptance for actions such as red fox control (Threat 3, D3) and exclusion of areas from ptarmigan hunting (Threat 5, D5). Each action in this section has defined target groups.

Expected results: Increased awareness of *Alopex* status and ecology is necessary to gain local understanding and acceptance for actions such as *Vulpes* control (Threat 3, D3) and exclusion of areas from ptarmigan hunting (Threat 5, D5). Each action in this section has defined target groups.

Results: The SEFALO+ project has been successful to disseminate the results and knowledge about the arctic fox. Information has been spread to both the scientific society (E5 and publications) and the public. According to the public, children (E4 and E5) has been informed through the playground with an arctic fox theme in Ramunberget and presentations in schools. Wildlife tourists has been successfully informed through the partnership with Fjällhästen and Lapplandsafari, and through the exhibition.

In addition to this has more than 25 lectures been performed addressed to locals and wildlife tourists. The project has also received attention from both radio/TV and press which meet a broad audience. In total the arctic fox and the SEFALO+ has figured in more than 120 articles and media programs, both regional and local.
Variations/complications/delays: None

E1 Website – Global information The SEFALO+ website at http://go.to/sefalo contains information about the SEFALO+ project, arctic fox ecology and conservation issues. The target groups are school children, students and scientists within and outside Europe.
Results: Our website has been updated. There is also a home page about the arctic fox in Norway organised by our colleagues in "Prosjekt Fjellreven", with information about SEFALO+ and our partner NINA. http://www.fjellrev.no/. NINA and the University of Tromsø has also own web pages with information on other actions completed in Norway.

Variations/complications/delays: Due to a major change of personnel that has worked in the project, the home page was not updated during 2005. The website is very popular and especially many young people show their appreciation in the guestbook at the web site. We get frequently questions from school children that are conducting "research" in school about the arctic fox. We will continue updating the webpage after 2008.

E2 European information Information about the project will be presented on two pages in a catalogue for outdoor equipment. This catalogue is distributed twice a year in Swedish, English, German, Finnish, Norwegian and Danish. For the winter edition of 2005 it will also be published in Russian. The edition in 2003 was 100 000 copies, but it is planned to increase to 400 000. The target group is people engaged in outdoor activities.
Progress to date: We have included information about the project in the spring-summer editions of the catalogue, printed in Swedish, English, German, Norwegian, Danish, Finnish and Dutch (see

Appendix: Media and Publications). The 2005 summer edition was the first time also printed in French.
Variations/complications/delays: Due to a misunderstanding about the deadline for submission of material, no information about the project was included in the spring-summer 2004 edition of the catalogue. However, we have published an information text in February 2003 with this partner, which we suggest should compensate for this.

E3 Local information addressed to wildlife tourists In the Nature Reserve of Vindelfjällen, Saami tourist operators certificated as eco-tourist companies, Lapplandsafari AB-Saami Ecolodge and Fjällhästen, will reach individual tourists that travel in arctic fox habitat with appropriate information.
Actions foreseen in report period: SU is responsible for providing information to these local tourist operators. Lapplandsafari AB-Saami Ecolodge and Fjällhästen are responsible for disseminating information to their guests.
Results: Lapplandsafari AB-Saami Ecolodge and Fjällhästen have informed their guests about the project as planned. They have communicated arctic fox biology and SEFALO+ actions during informal contacts with their guests, i.e. about 15 tourist groups/year each. The project leader has visited both partners and updated them on the current status of the project each year. The exhibition in Ammarnäs has been completed.
Variations/complications/delays: None

E4 Local information addressed to children Ramundberget is a holiday resort with skiing and hiking activities in a mountain area in Jämtland, Sweden. Ramundbergets Alpina AB will build a playground with an arctic fox theme (a fox den, fox statues, etc.) in 2003. Personnel will show children how the arctic foxes live and explain what problems they face. Booklets and toys with information on arctic fox conservation issues will be sold on a non-profit basis.
Actions foreseen in report period; Ramundberget will build a playground and distribute information to their guests. SU will provide updated information to Ramundbergets Alpina AB.
Results: A playground which resembles an arctic fox den was built during 2004 and rebuilt in 2007. The playground is used during the winter season and during play, children learn how arctic foxes live in their dens. Personnel at Ramundberget have spread information about arctic foxes during public lectures and informal contacts with tourists (see attached pictures). During skiing contests for children, arctic fox puppets are distributed along with information about arctic foxes. The project leader has visited this partner and updated the personnel on the current status of the project.
Variations/complications/delays: The playground was completed 2004, and documentation for SEFALO+ was included progress report 2006. It was rebuilt during the summer of 2007.

E5 Seminars - Conferences It is important to disseminate results and discuss planned actions within the international scientific community and with NGO's involved in conservation of the arctic fox. Thus, we aim for a continuous process of project evaluation, which will be presented for the public. We will arrange a total of 4 seminars with scientists, NGO's and other people with interest in arctic fox conservation. Prof. Pall Hersteinsson from Iceland University, who is officer in the IUCN Arctic Fox Specialist Group, will attend as external consultant. SU will also attend four international scientific conferences to disseminate project results regarding conservation biology in general.

Results: The first seminar was arranged by "Projekt Fjellreven", a Norwegian NGO information project on arctic foxes, and The Norwegian Directorate for Nature Management (DN), in collaboration with SEFALO+. The seminar was held in Meråker, Norway, on November 15-16, 2004. The Commission agreed to us holding the seminar outside EU. Results from the seminar can

be found on the home page: http://www.fjellrev.no/. The second seminar was held in Helags June 2005, with talks by the Project Leading Group (Anders Angerbjörn, Heikki Henttonen, Bodil Elmhagen), the external consultant (Pall Hersteinsson) and representatives from the Swedish Operating Group (Love Dalén, Peter Hellström). Invited to this seminar were rangers from all CABs, volunteering field workers, and partners in SEFALO+ such as SLU, FFRI, SEPA, NINA. The third seminar was held in December 2005 in Stockholm with talks by internationally distinguished colleagues as Robert K Wayne (UCLA) and Pall Hersteinsson (University of Iceland). Further Anders Angerbjörn, Bodil Elmhagen, Love Dalén and Peter Hellström from the SEFALO+ held seminars, as well as Eva Fuglei and Nina E. Eide. Love Dalén also defended his doctoral thesis on arctic fox genetics in December. Another seminar was held in Helags in June 2006 where volunteerfield workers were invited. The fourth seminar was held at Stockholm university 2006-11-24 with presentations by; Karin Norén, Tomas Meijer and Peter Hellström. The disease group, SVA and SLU, have presented there result on two scientific meetings (Se appendix; presenatations). In addition more than 32 seminars addressed to the public have been performed during the project period conducted both by SU, CAB Jämtland and FFRI (se appendix Presentations).
Variations/complications/delays: None

E6 Press contacts We aim to keep continuous contacts with the press and disseminate project results to newspapers, magazines, radio and television.
Results: The project has been featured in both regional and local newspapers. In total 70 articles in newspapers, 53 television and radio programmes, 12 popular scientific papers. 48 publications from the Beneficiary, Partners and Co-financiers are published.
Variations/complications/delays: None

E7 Layman's report SU will produce a layman's report at the end of the project period 2008. The report will be available in paper and electronic format, in Swedish and English.
Results: The report is included in the final report.

F. Overall project operation

F1 Project leading The leading group will have frequent meetings and discuss co-ordination and how different actions (D1-D6) are implemented within the different countries (F3-F5). The Project leader is responsible for reports and communications with LIFE, for the overall project operation and basic financial administration. The Assistant Project leader is responsible for all actions in Finland while the Operating group leader for Norway is responsible for monitoring in Norway (D1). The Project leading group will present a General Management Plan and detailed plans for the action programme to the Steering Committee by December 2003. Based on the yearly Progress Reports, the Project leading group will present an updated Project Action Plan to the Steering Committee in November each year 2004-2007. The Project leading group will present a Final Report to the Commission by June 2008.

Expected results: The Project leading group will to the Steering Committee present a General Management Plan and detailed plans for the action programme by December 2003. Based on the yearly Progress Reports, the Project leading group will present an updated Project Action Plan to the Steering Committee in November each year 2004-2007. The Project leading group will present a Final Report to the Commission by June 2008.

Results: The first meeting was held on November 20, 2003 in Vantaa Helsinki, Finland. The situation for arctic foxes in each country was reviewed. Planned actions and research in Norway

according to the Norwegian Action Plan (A2) was described. Field methods during actions and a draft of the General Management Plan were discussed. Prioritised areas for actions were determined. The General Management Plan was updated in June 2005 and discussed with the Steering Committee in June 2005. The Plan will be updated continuously when needed. The leading group has also had ongoing discussions about progress, actions and arctic fox biology during the project period. The Project leader organised a meeting in Jämtland, Sweden, June 2005, with three important components: (1) The Steering Committee had its yearly meeting (see F2); (2) a seminar on field methods (see E6); (3) a workshop on ethical considerations in research on mammals and birds, including field methods and excursions to an occupied arctic fox den (see F3).

Variations/complications/delays: The Project leading group has produced and published a Field Hand Book (see Appendix: Media and Publications) in order to make the field work more efficient and more precise (July 2005). The cost for this was accepted by the Commission to be included in the SEFALO+ project. The Hand Book has been very appreciated by rangers and field workers in Sweden, Norway and Finland. An additional meting was held at Tovetorp, Sweden, in May 2008. This meeting was held to gather most people working actively with the arctic fox to plan for the future.

F2 The Steering Committee The Steering Committee shall supervise the project, meet on a yearly basis and approve an updated project action plan, submitted by the Project leading group each year.
Expected results: The Steering Committee shall supervise the project and approve an updated project action plan, submitted by the Project leading group each year.

Results: The meeting for 2004 was held in November, Meråker, Norway. The meeting for 2005 was held at Helags, Sweden, on June 18 - 21. Field methods during actions and a draft of the "Field hand book for arctic foxes" were discussed. In combination with a seminar the steering committee meeting was held in December 2006, Stockholm. The meeting for 2006 was held 24 November in Stockholm, Sweden in combination with a seminar. The last meeting was held in Geunja, Vindelfjälen, Sweden in October 2007.

Variations/complications/delays: Instead of having a yearly meeting in November, the Steering Committee decided to spread them over the year and to have them at different places.

F3 The Operating Group in Sweden The Operating group leader in Sweden is responsible for field actions and practical co-ordination.

Expected results: The Operating group leader in Sweden will be responsible for field actions and practical co-ordination.
Results: Project coordination had worked smoothly. The Operating group leader has had continuous contact with all Partners. We had a large meeting in Meråker in connection with the Nordic arctic fox meeting (Nov 2004). We organised a workshop with rangers from all CABs in Helags, Västerbotten, June 2005. At this workshop, other field workers also took part. Field methods, protocols and reporting were discussed and tested in the field. All field works got information about the regulation of ethical considerations when studying wild mammals in Sweden. They are now certified to conduct field work within SEFALO+. This meeting was repeated June 2006 with mostly summer field workers and some rangers. The operating group meeting, April 2007, was performed in Ammarnäs. A last operating group meeting was held in Vålådalen, March 2008, Jämtland. Many rangers from all CABs were presented at both meetings and we discussed all parts of the field work.
Variations/complications/delays: None

F4 The Operating Group in Finland The Operating group leader in Finland is responsible for field actions and practical co-ordination.
Results: Project coordination has run smoothly. The coordinator and field coordinators have been in continuous contact weekly via phone discussions and emails. Coordinators have met several times and have also done joint field work. There has been regular contact with the fox hunters in the course of hunting season. This, for example, lead to a successful application to the Ministry of Forestry and Agriculture in the middle of season to increase our quota because the red fox numbers were record high, and the first quota war reached early in the season. The information flow from public to coordinators and that way to the whole Finnish Sefalo+ has been efficient.
Variations/complications/delays: None

F5 The Operating Group in Norway The Operating group leader in Norway is responsible for field actions and practical co-ordination.
Results: Project co-ordination have worked smoothly and information between the different agencies involved in arctic fox monitoring is distributed effectively, in great help to trapping and ear-tagging in special. There are priority meetings prior to every breeding season, and there are running contacts between coordinators in the field during the whole summer. Changes and improvements are discussed at the end of every season.
Variations/complications/delays: None

F6 Auditor's report The independent auditor at Stockholm University will make a revision in the last year of the project (2008) in accordance with Article 27 of the Standard Administrative Provisions.
The report will be written during the spring and will be finished until 1 September 2008.

Results:

6. Evaluation and conclusions – project implementation

A. The process
The SEFALO+ project has been a large project with many partners and implementation of actions in an area spread over a distance of 2000 km in mainly remote areas. The collaboration between the partners has been organised at several levels; the steering committee has been responsible at the administrative level while the operating groups have been responsible for the collaboration between field personnel in each country. Working together with several organisations has made it possible to implement conservations action in all areas with arctic foxes. However, all partners are independent organisations with their tradition and formal decision order, which has contributed to the differences in quantity and quality of actions. The project has overall run smoothly and the majority of the planed actions have been implemented.

B. The project management
The project management has worked according to the plan with a project leading group, operating group and steering committee. The project leading group have met several times per year both formally and informally at scientific conferences and other occasions. This has made the project leading smooth with few problems. The operating groups in Norway, Finland and Sweden have met at least yearly, which has improved the quantity and quality of actions through discussions with and between the rangers. The actions have constantly been improved during the project period. The operating group meetings have also facilitated cooperation between rangers in different county boarders, as well as across the country boarders. Even though, as many as 16 partners have been involved, all partners were needed to implement actions.

C. Technical and commercial application

Applying commercial values on a conservation project can be difficult. However, a larger population size, due to conservation actions, in Fennoscandia would tolerate some disturbance from wildlife watching/eco-tourism and would work as a flag-species for a region. During 2007, we were a part in a pilot arrangement regarding the arctic fox. The arrangement was a cooperation between SEFALO+ , EC inter region project NOA and the Swedish ecotourism association. Combining conservation and commercial eco-tourism might render even more positive attitudes towards conserving the arctic fox. Further, this might also be a way to implement future actions.

D. Comparison against the project-objectives

We have used a dynamic management approach to monitor and allocate conservation actions to support the species in the most efficient way. The monitoring programme (D1) has run smoothly with few delays according to the contract, which has resulted in a good summary of the population development and population distribution. The main complication to the plan has been to perform winter inventories in Norrbotten County (BD). Especially in this area, it has been problematic to perform winter inventories due to large distance in remote areas. The summer inventories in Norway has run smoothly through the project. In Finland the monitoring has worked smooth both winter and summer. Tagging juveniles and adults with ear-tags has been performed according to the contract in Jämtland and Västerbotten and to a certain extent in Norway. The ear-tagging has resulted in both a good base for the genetic studies (D1, A3) and for the overall monitoring to be able to follow individuals. A bonus effect of ear-tagging is that field personnel that have worked with tagging are more interested in monitoring and conducting actions afterward. Monitoring by radio telemetry has not been performed in the extent that was planned due to problems with catching foxes during the autum to be equipped with a transmitter. Some of the partners has also shown a restrictive attitude towards putting on transmitters. This has resulted in a lack of knowledge in habitat use and dispersal strategies of juvenile arctic foxes. However, financial resources were moved from the transmitter account to wildlife cameras. The cameras have shown to be an effecient and powerful tool for surveying the arctic fox population and other species in the sub arctic ecosystem. The number of re-sighted tagged individuals has increased enormously during the winter 2007-2008. The cameras will be an important tool also after the end of SEFALO+.

The supplementary feeding programme and the *Vulpes vulpes* control programme has been fully applied in the best *Alopex lagopus* territories in Helagsfjällen and Borgafjäll. In Vindelfjällen and Norrbotten the feeding and red fox culling has been more sporadic. We planned intensive actions in all the three counties in Sweden but we have only managed to implement this in Jämtland an in some parts of Västerbotten. In Vindelfjällen and all of Norrbotten we have conducted inventories but only minor feeding and red fox culling. The three counties have different organisations and have thus implemented actions differently. Although, the project had a strong support from the key officials in Jämtland and Västerbotten counties, this has not been the case in Norrbotten county.

In Finland the culling has been very efficient with a total of 1262 shot red foxes. However, since no arctic foxes have been present, the positive population response seen in Sweden has not yet been seen in Finland. Generally, conservation actions have been given a lower priority in Vindelfjällen and Norrbotten than in Borgafjäll and Helagsfjällen. In the areas were actions have been performed fully according to the contract, the number of litters have more than doubled and thereby increased the population viability. Unfortunately, in the northern populations, Vindelfjällen and Norrbotten, no increase of the number of litter have been recorded. Again, theses results are of high relevance to the total evaluation of the project as this underline that feeding also has to be done with a certain intensity to have positive effect. Summer feeding alone is probably not enough. Supplemental feeding during winter seem to be of great importance for the arctic fox spring abundance. In Norway, the sub-population has been stable through out the project period. However, there are signs of a positive response in the northern areas were red foxes are culled, organised by Tromsö universitet. In Finland the population has been too small, or absent, to respond to the implemented actions.

E. Effectiveness off dissemination activities

The dissemination activities (E1-E6) have been very successful with around 100 articles in newspapers, 53 part of a programme in radio and television and 12 articles in popular scientific magazines. From the project with their partners 50 different publications has been produced. In addition, 34 public lectures have been performed in Sweden and Finland. During the lectures we have inform about how to act when observing arctic foxes to avoid disturbance. The project webpage has been updated continuous during the project, except for 2005. We have during the project promoted this LIFE project and increased the understanding for the actions needed to support the Fennoscandian *Alopex lagopus* population.

F. The future: continuation of the project and remaining threats

Saving an endangered carnivore is a long-term project spanning over several years. This Life-project has supplied tools and techniques for future conservation work by the management authorities; the CABs, Metsähallitus (PFS) and DN. The conservation effort will continue but unfortunately not to the same extent as during the project and it will probably be large differences between the different areas. Hopefully, there will be a future continue of the SEFALO+ project, supporting the CABs, Metsähallitus and NINA with evaluation and suggested actions. Despite actions during the SEFALO + project, most of the threats against the Fennoscandian population remain. The low population size is still a remaining threat, even if the number of litter has increased. Competition and predation by the red fox is still a remaining threat and will so be in the future. We do however hope that extended actions could lead to a balance the competition between the two species, lifting arctic fox densities up to a level were actions are no longer needed.

The threat of hybridisation between wild and farmed arctic foxes does not seem to be a future problem to the wild arctic fox population in Sweden if detected farmed foxes are removed. This is due to a more strict regulation of fur farming in Sweden and awareness of the hybridisation problem. However, since farming of arctic foxes in Norway and Finland are extensive, the threat of hybridisation remains. The hybrids identified in the Finse population in southern Norway should be removed to avoid spreading to other populations. In Finland the red fox culling should continue since the area is an important migration area from the Russian population on Kola to Finland, Sweden and Norway. Future information addressed to hunters and outdoor people will be necessary to minimize the disturbance from dogs.

G. Long-term benefits and sustainability

The long-term benefits from the SEFALO+ project can be divided into two parts: (1) reaching the conservation goals that we set before the project (2) increased ecological understanding why the arctic fox has not increased after more than 70 years of protection. The increased number of arctic foxes constitutes a good start for further population increase. If the population is following the same positive population response as over the last five years, the population will be less vulnerable to the extinction threats. The final and ultimate goal is that that the arctic fox population should become self subsistent.

The most important benefit from the project is the understanding in how the viability of the Fennoscandian arctic fox population can be increased through intensive conservation actions. How these actions should be allocated has been presented in the red fox and feeding report (Angerbjörn et al. 2007) to gain maximum output. This report, in combination with the other deliverables from the project, can and will be used in the future management of the Fennoscandian arctic fox population. However, the project will only have long-term effects if the knowledge are actively used within the management. The arctic fox population is still too small for long-term sustainability without conservation actions. The SEFALO+ project has made and presented the tools for future management.

H. Replicability, demonstration, transferability, cooperation
All endangered species are unique and it is difficult to directly transfer conservation actions and results into other species. However, since we have published much of our findings in scientific journals with peer review system, our experience are thus internationally available to similar conservation projects. Through the publications, parts of the methods and results can be implemented or tested in other conservation projects. The SEFALO+ project has resulted in a strong cooperation between the Fennoscandian countries holding the common responsibility for a common arctic fox population. Good cooperation is also established between international university colleagues, field personnel, governmental organisations, as well as non governmental organisations that all will benefit the future work of conserving the arctic fox and future project development.

I. Innovation
Working with a species as the arctic fox with a wide distribution in a harsh alpine environment demands specified and adapted conservation actions. This LIFE project has it been unique in that way that it has conducted action over a very large area from south to north about 2000 km, and from east to west about 500 km. The actions have also been unique because of the combination of actions feeding, red fox culling, protection from game hunting and disease surveying. This project has stated an example on how to imply a package of actions, aiming both to remove the cause of decline and increase the viability of a small population.

7. Conservational plan and recommendations of SEFALO+

Summary of results
Genetic analyses have revealed that the Fennoscandian arctic fox population is divided into four subpopulations with little or no gene flow between them (Dalén *et al*. 2006) (Fig 2.). Historical records from museum samples show that the genetic variation has declined by 25 % since the beginning of the 20th century most probable a result of declining population size, fragmentation and geographical separation into subpopulations (Nyström *et al.* 2006). The isolation means that each sub population at the moment is a single conservational unit. Actions in one of them will most likely not affect arctic foxes in other areas. Fragmentation of the Fennoscandian arctic fox population has thus increased the vulnerability of the species in Fennoscandia. Small populations are exposed to genetic loss and inbreeding, and they are sensible for stochastic demographic events (Herfindal *et al*.in prep). Each subpopulation has 10-100 individuals, which is far too few for long term viability.

Contamination from escaped farm foxes is an additional genetic threat; e.g. the arctic foxes in southern Norway now constitute of only hybrids between wild and farmed arctic foxes (Norén *et al.* 2005). Farmed arctic foxes have their geographical origin outside Fennoscandia and have been under domestication over several generations. Arctic foxes originating from fur farms are generally much larger, have other variants of fur colour and differences in behaviour compared to wild arctic foxes. The introgression of non native arctic fox genes can lower the viability of the population further and increase the risk of extinction. No farmed arctic foxes or hybrids have however been found among wild arctic foxes in the Swedish population (Meijer *et a*l. 2007).

For long term viability there is a need to both have an increased population size and restore genetic variation. An increase in population size can be achieved by implementing the results from this project. However, increased genetic variation can only be achieved by gene flow between the populations, which can be obtained by natural migration or translocation between the populations. Release of captive breed foxes from the Norwegian captive breeding program could also be an option to re-establish extinct populations or strengthen populations. The ultimate goal is that actions such as

red fox culling, feeding at den sites and re-establishment (through translocation and/or captive breeding) can boost local arctic fox populations up to levels where the arctic fox meta-population ecology is restored, where natural migrations connect local populations to larger and more viable population units. Natural migration between sub populations will be an essential mechanism to achieve viable and self subsistent population of arctic foxes not depending on ever lasting actions. Although it is still a long way to go before we are there. We also believe that the competition with the red fox might balance if the arctic fox population are raised to natural densities.

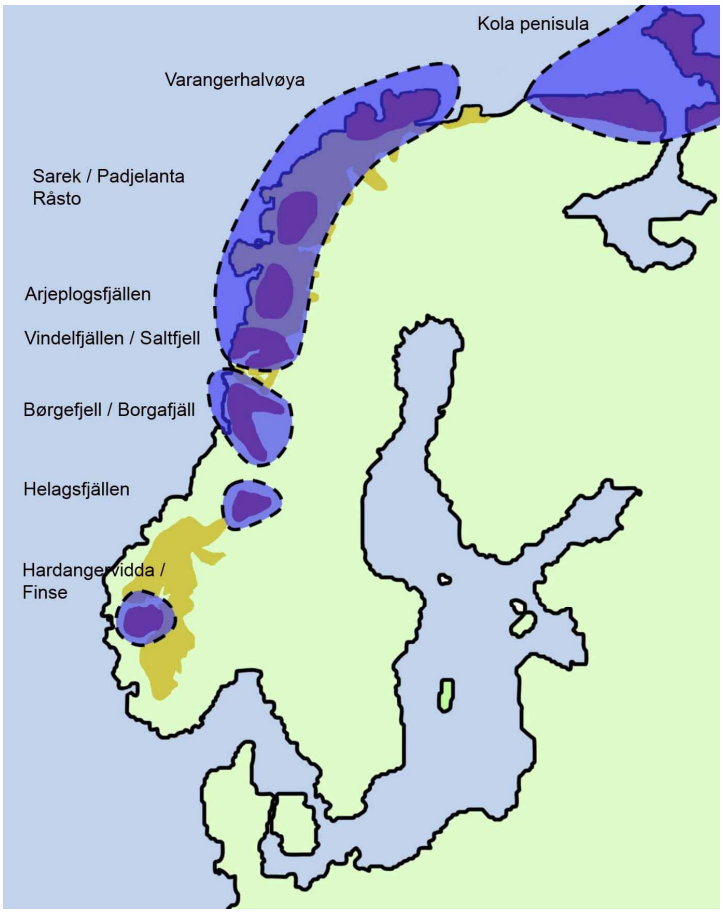


Figure 2. The dark areas indicate present distribution of arctic foxes. The broken lines show the borders between the four genetically distinct subpopulations. Note that the southern population is contaminated from escaped farm foxes and has no true wild foxes left.

The red fox has a negative impact on both the geographical distribution (Elmhagen *et al.* 2002, Dalén *et al*. 2004) and number of arctic fox litters (Angerbjörn et al. 2007). Red fox hunting is of major importance to stop the declining population and facilitate population recovery. In areas where intensive red fox culling has been performed, the number of breeding arctic foxes has more than doubled since 2001 when the culling started (Angerbjörn *et al*. 2007). However, it is important to bear in mind that the intensity of culling is vital. It is only in areas with a certain level of culling where the number of litters has increased. However, the lower level of culling intensity in Vindelfjällen might have contributed to that the population is stable and not further declined. In Padjelanta, where no culling has been conducted, no litters have been recorded during the project period. There are several problems when defining the intensity of culling, this is of course dependent on the number of red foxes present.

In addition to culling, an extensive feeding program has been conducted within the framework of the SEFALO+ project. Since the “natural” small rodent cycle seem to have returned after 20 years of non-appearance with a first peak in 2001, supplementary feeding might therefore seem to be a

redundancy of resources. However, the aim of the feeding programme has been to facilitate and accelerate the population recovery by increasing both juvenile and adult survival. It is important to separate the effects of summer and winter feeding to understand when and where to feed. The supplemental feeding during wintertime increases the numbers of breeding pairs during the spring and thereby increases the number of litters (Angerbjörn et al. 1994, Angerbjörn *et al*. 2007). It is probably the access of food during the mating season (February, March, April) that affects the numbers of litters and litter sizes during the following summer. However, even though arctic foxes are fed, the natural cycle of small rodents is still of major importance. During years with a low abundance of small rodents, still few or no arctic fox litters are born, even if they have access to supplemental food. Feeding during the summer does however seem to increases the juvenile survival as long as they are fed (Tannerfeldt *et al.* 1994). Hence supplemental feeding during both summer and winter increase the survival of both juveniles and adults, which has a positive effect on the population. However, winter feeding should always be conducted in combination with red fox culling since supplemental feeding can attract red foxes and thereby infer a negative effect on the arctic fox.

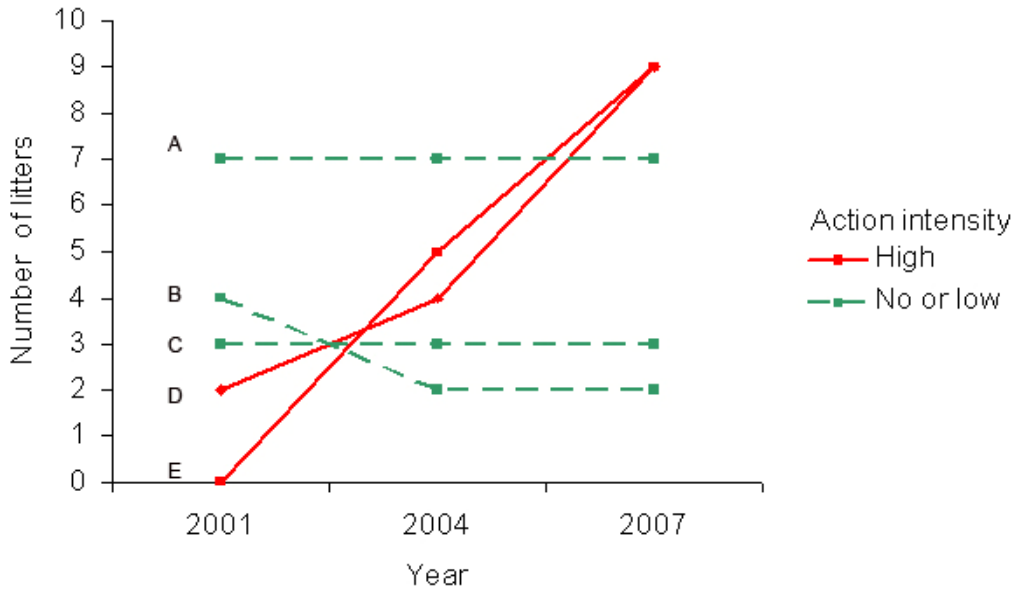


Figure 3. Number of arctic fox litters during years with increasing numbers of rodents. A. Børgefjell*** B. Norbotten** C. Vindelfjällen**. D. Helagsfjällen* D. Borgafjäll*. Area with high intensity of actions *, area with no actions *, area with low intensity of actions **.

In Sweden, the number of litters has more than doubled during the SEFALO projects in Helagsfjällen and Borgafjäll where intensive actions have been performed (Fig 3.). In Helagsfjällen, all inhabited dens have been provided with supplemental feeding stations and 258 red foxes have been culled during the project period. In the more northern subpopulation in Borgafjäll the increase of litters has been similar to the increase in Helagsfjällen. Here actions have been almost as intensive with 140 culled red foxes and the major part of inhabited dens supplied with food (Table 6). In Vindelfjällen and Norrbotten no change in the number of litters has been observed during the project period, probably because of the low intensity on the actions undertaken This demonstrate the importance of high intensity of actions to have effect on the population level. In these areas the amount and continuity of actions has been less intense compared to the more southern areas. In total 58 red foxes has been culled in Vindelfjällen and 38 in Norrbotten. The number of feed dens has constantly been lower than the number of inhabited dens.

In Finland, 1262 red foxes have been culled during SEFALO projects. However, no response in the numbers of arctic fox has been detected. The lemming increase in 2007 lead to record numbers of red foxes in Northern Lapland. Most of the potential habitat of the arctic fox in Finnish Lapland belong to the low alpine zone which is easily inhabited by the red fox. For example, early in 2008 almost 200 red foxes were culled in the Utsjoki region where slightly more than 100 old den sites are known, and many of these could be recent excavation of red foxes. In middle Käsivarsi, en extended detailed survey was carried out in 2007 (both in July and September) outside the earlier known core research area in NW Käsivarsi. The results was very alarming: during last 10-15 years, some 100 new red fox excavations/dens sites were found in the low alpine region, while 10 previously unknown old den sites of arctic foxesd were found. These figures clearly indicate the expansion of red fox to the low alpine.

No arctic fox litters have been found during the project. Yearly some observations of arctic foxes have been done on each of the three study regions in Finnish Lapland. However, they could be nonstationary individuals crossing the borders.

It is obvious that the red fox expansion is single most serious threat to the arctic fox in Finnish Lapland. It was hoped that the lemming peak after a long pause in 2007 had helped Finnish arctic foxes, as lemming peaks have helped arctic foxes in Sweden and Norway though at higher altitudes, but it seems that in Finland rodent peak helped only red foxes.

The Norwegian action undertaken in SEFALO+ has only been monitoring of the number of arctic fox litters during summer. In Norway, the number of litters has been stable in Børgefjell (Fig 6.) with good reproduction in peak years, while other populations have varied more. All other populations in Norway are very small which might explain the great variation. In Børgefjell, no culling or feeding has been conducted according to the contract. In Finnmark the research project “Fjellrev i Finmark” (Arctic foxes in Finmark), which started in 2004, has also carried out red fox control to test effects on ecosystem structure. It is too early to analyse the effects on the local arctic fox population, results are promising. The smallest populations in Norway, e.g, at Saltfjellet and in Dividalen still are decreasing being very vulnerable to stochastic events.

At the start of SEFALO+, there was a concern that the fatal disease that caused large losses of arctic foxes within a captive programme and at zoo’s in the beginning of 2000 would spread to the wild population. Gladly, no wild arctic foxes have been identified to be carriers of the herpes virus why spreading in wild is unlikely. However, it is important that all arctic foxes that are found dead are passed on to the veterinary authorities for examination.

Recommendations / Conclusions

The result shows that a combination of feeding, hunting, protection around dens and information can halt the population decline and even increase the population size where arctic foxes are present and thereby promoting the chances for a long term viability of the Fennoscandian arctic fox. In areas where intensive actions have been performed the population has more than doubled over a four year period (Fig 3.). It is important to remember that it is the combination of actions that have resulted in the positive population development during the project period. However, as all actions are completed together it is also difficult to distinguish which contribute most. Information and protection around dens are difficult to evaluate in a quantitative way, but they are important factors in the cumulative conservation efforts. The information work creates an understanding for the actions and also informs people how to avoid disturbing the arctic foxes.

We strongly recommend that the actions continue and that they are implemented in other arctic fox areas as well. By continuing or extending the actions, each sub population can increase in size and thereby make sub populations more robust and reduce the vulnerability caused by the small population size e.g. stochastic effects, and eventually balance the natural meta-population dynamic of

the arctic fox. We recommend that the actions are implemented intensively in restricted geographical areas were the population have a good chance to recover. In Sweden, we recommend more intensive actions in Vindelfjällen (AC) and Arjeplogsfjällen (BD). In these two areas is it logistically possible to perform more actions and there are also enough arctic foxes present to day which can respond to actions. Actions might also be intensified in the Råsto area (BD), since it is an important migration link between Norway, Sweden, Finland and Russia. However, before further actions are implemented in the Råsto area, a careful inventory need to be performed to evaluate if there are enough arctic foxes that can respond to the actions. Remote cameras are provided from SEFALO+ to be used for evaluation of the number of arctic foxes that can stand as a base for a future population development. This can be combined with molecular tracking to identify individuals and study the genetic base in this area. In Helagsfjällen and in Borgafjäll actions should continue in the same extend as today.

In Finland, we recommend that the actions continue to the same extent even though no litters have been found the last 5 years. We recommend that red fox culling will be continued in Utsjoki, and it should be intensified in Käsivarsi because in Käsivarsi Finland has the highest altitudes which might provide some help against red foxes. The closest population to Utsjoki in Finmark, Norway, is increasing in size and migration from that area to northern Finland can be expected. We have identified some movement corridors for Finnish/Norwegian arctic foxes, and most of the Utsjoki observations are from this area. Finland is an important area for the whole Fennoscandian population as geographical dispersal corridor from Russia. Remote cameras are provided to facilitate monitoring in Finland after the end of SEFALO+.

In Norway there are several parallel projects working on developing measures to conservation of the arctic fox. The SEFALO+ partner, NINA, has a large captive breeding station for arctic foxes that has started to release foxes and restore arctic fox populations where they have gone extinct. This can however also be an important action to increase the gene-pool in existing populations by setting free individuals with other genetic background.

Even if the arctic fox population will increase as a result of conservation actions, the problem with a low genetic variance within the subpopulations will remain. However, with an increased population size, natural migration between the populations might again occur; balancing the natural meta-population structure of the Fennoscandian arctic fox population. During teen years of arctic fox studies, we have only recorded a single fox migrating between the sub populations. The large distances between the subpopulations, with several dispersal barriers present such as roads, areas with human development and areas with high density of red foxes can be a major problem. Until the population is build up to a self subsistent population we recommend that future conservation projects also should translocate arctic foxes between the subpopulations (Dalén and Angerbjörn 2007), or set out foxes from the captive breeding program in Norway. This is highly relevant where local populations already have gone extinct. Both translocation and individuals released form captive breeding will increase the genetic variance and decrease the alee effect, and hence increase the long term sustainability of each subpopulation..

The hybrids between wild and farmed arctic foxes identified in the Finse area, Norway, should be removed to avoid that these genes are spread into the Fennoscandian arctic fox population. According to the Convention of Biological Diversity (CDB) and The World Conservation Unit (IUCN) animal individuals should be classified as an alien species if they have another genetic and/or geographical origin compared to the native population. It is also important that field personnel working with arctic foxes can identify possible escaped farmed foxes for fast removal to avoid hybridisation.

With effecient conservation actions we have increased the viability of the Fennoscandian arctic fox population. In 2001 the availability of lemmings was at a peak, and 25 litters were born. Thereby, the

minimum number of breeding adults was 50. Of course, these 50 individuals were not the only arctic foxes in Fennoscandia, but the only individuals that found an unrelated partner to breed with. In 2007, the lemming was again increasing in numbers and 36 arctic fox litters were born. This means that the minimum breeding population in Fennoscandia constituted 72 adults, which is an increase of 44% compared to 2001. However, it is important to remember that 2007 was not a lemming peak year, which is believed to happen in 2008. The winter inventories for 2007/08 indicates that the number of litters have the potential to increase by at least 50% compared to 2007.

For the future conservation efforts it is important that the cooperation between Norway, Sweden and Finland continues, since the Fennoscandian arctic fox population stretches over all three countries. The arctic fox populations are really connected along the country borders, and a common concern for environmental management. We recommend a future application for a LIFE+ project to be able to secure the existence of arctic foxes in Europe. But we also encourage local and regional initiatives to continue the conservation work. Even though local initiatives might be taken, a larger project with a comprehensive overview in all subpopulations is needed for future management.

In Sweden will the SEPA will continue to financially support conservation actions in line with the new action plan that will be finished during 2008. Swedish WWF will continue to support the research concerning the Fennoscandian arctic fox.

In Norway, the Ministry of Environment has extended their funding to continue arctic fox conservation work, action development and ecological research. The Norwegian Directorate for Nature Management will revise the arctic fox action plan in 2009, based on all the work that has been completed these last five years, both under SEFALO+, under the captive breeding program and under the project “Fjellrev i Finnmark”. NINA as the active partner in SEFALO+ will continue an offensive information policy to the public, building awareness an engagement.

Even though the SEFALO+ project has been a success in both implementing actions and communicating arctic fox, there is a need of further research and communication. To do this the plan to receive funding for a new arctic fox project, to continue development of actions, research/evaluation and information. An important step in a new project would be further developing the cooperation with tourist operators to spread information to tourists.

9. Appendix

Map, figures and tables

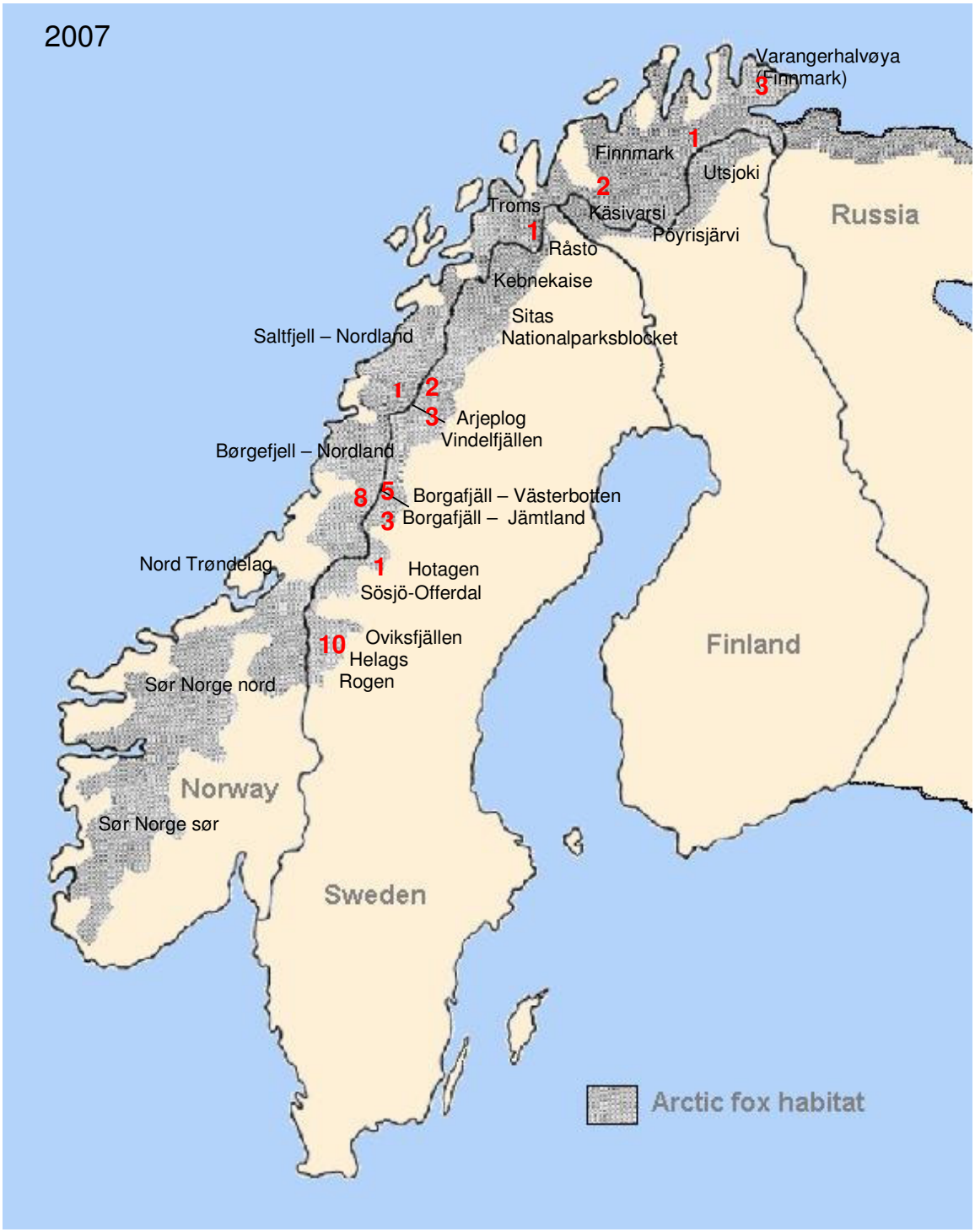


Figure 4. The project area includes area above treeline in Finland, Sweden and Norway. Red numbers show the number of litters 2007 in different areas in Sweden and Norway. *Projektområdet inkluderar områden ovanför trädgränsen i Finland, Sverige och Norge. Röda siffror visar antalet fjällrävskullar i olika svenska och norska fjällområden 2007*

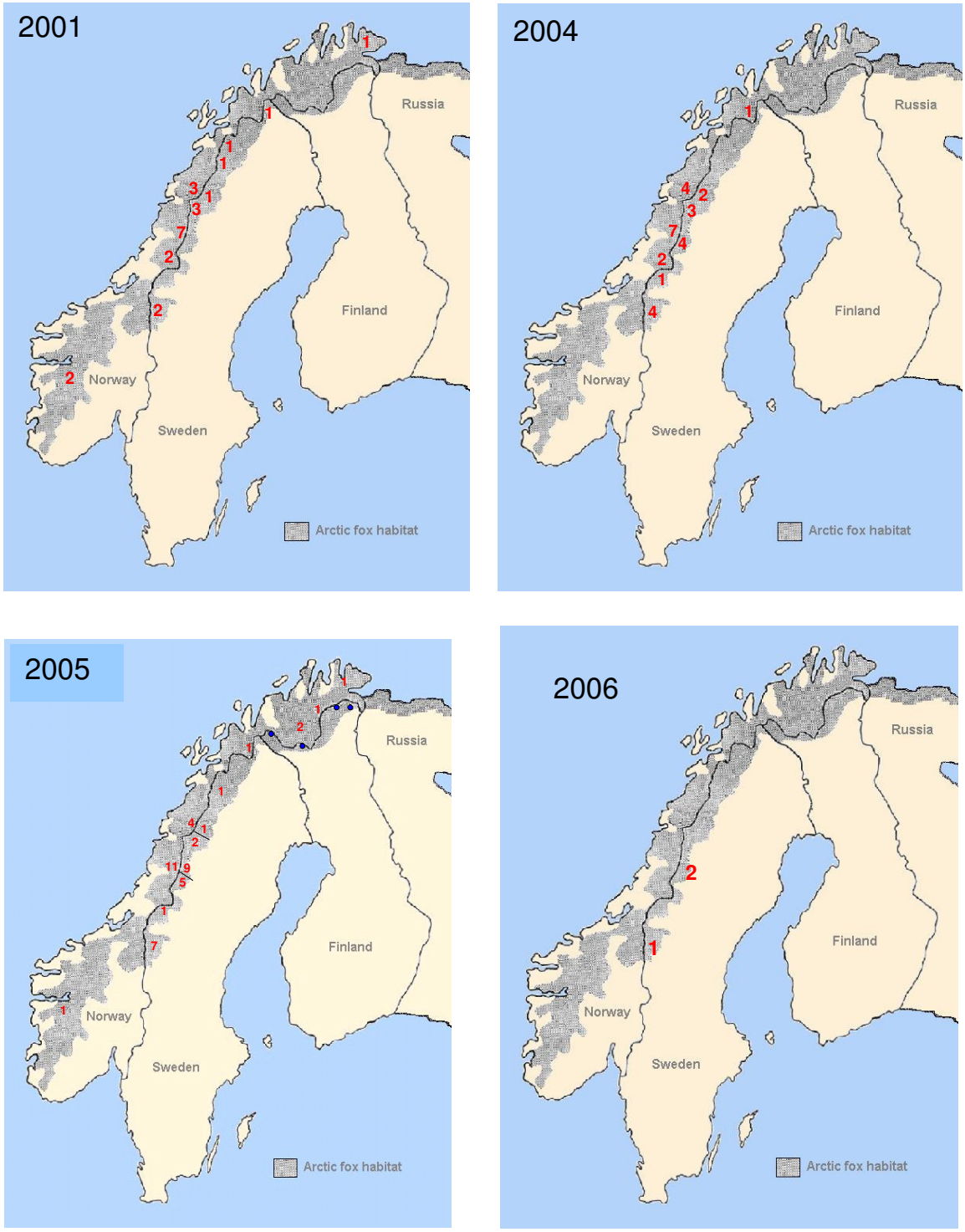


Figure 5. Arctic fox litters in Sweden and Norway in 2001 - 2006.

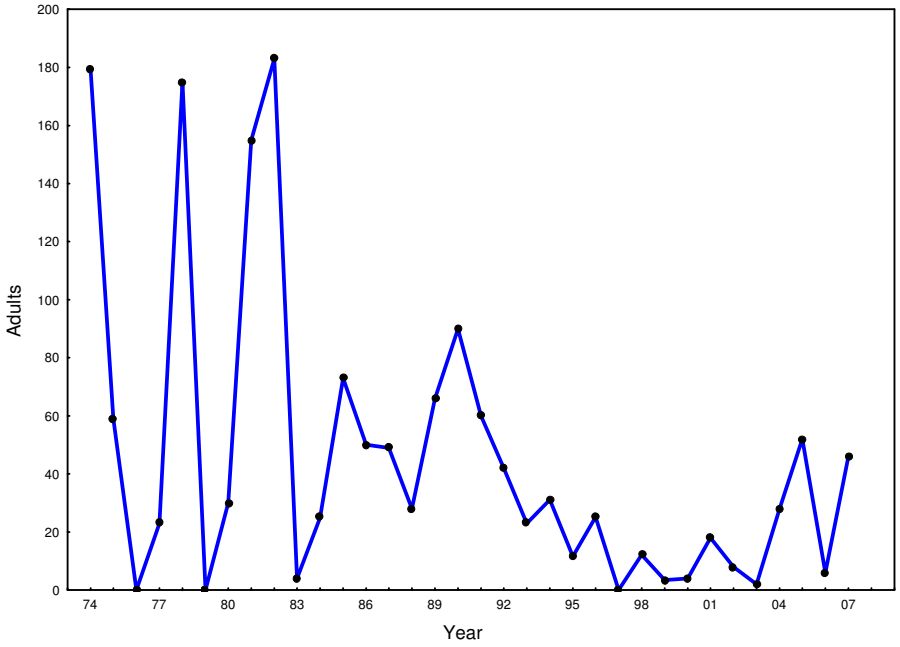
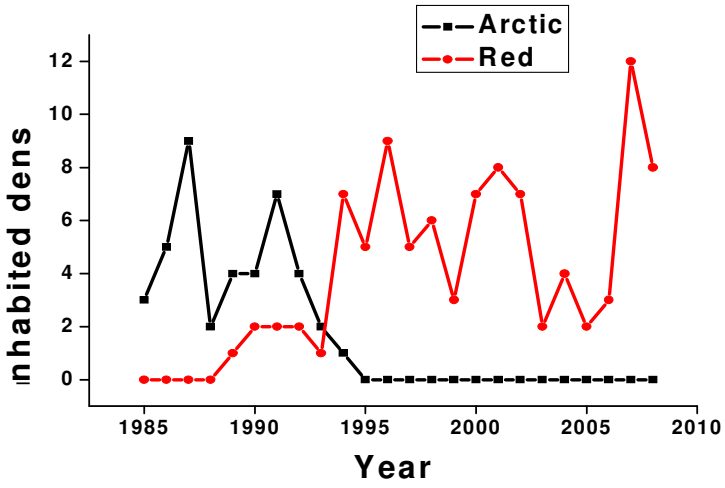


Figure 6. The number of arctic foxes that have reproduced in Sweden in 1974-2005. Antal fjällrävar som reproducerat sig i Sverige 1974-2007.



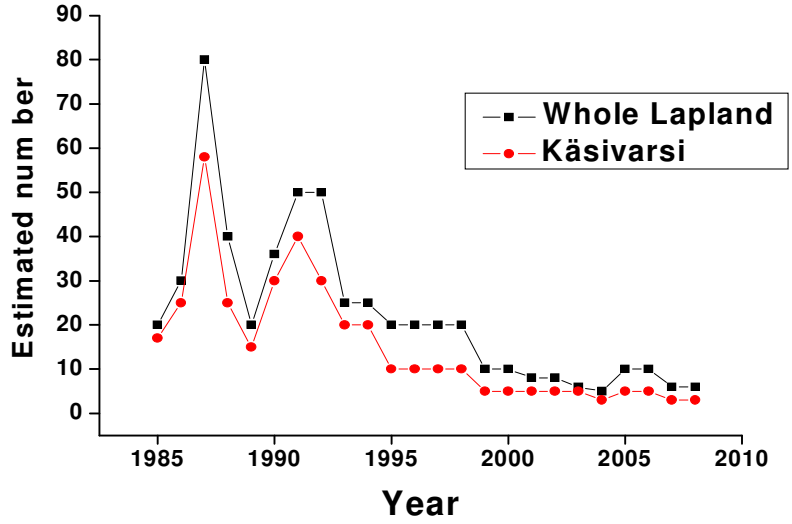


Figure 7 a. Estimated numbers of arctic foxes in Käsivarsi and the whole of Finnish Lapland 1985-2004. Uppskattat antal fjällrävar i Käsivarsi resp. hela finska Lapland 1985-2004**. b**. The number of arctic and red fox litters in Käsivarsi, Finland 1985-2004. Antal fjäll- och rödrävskullar i Käsivarsi, Finland 1985-2004

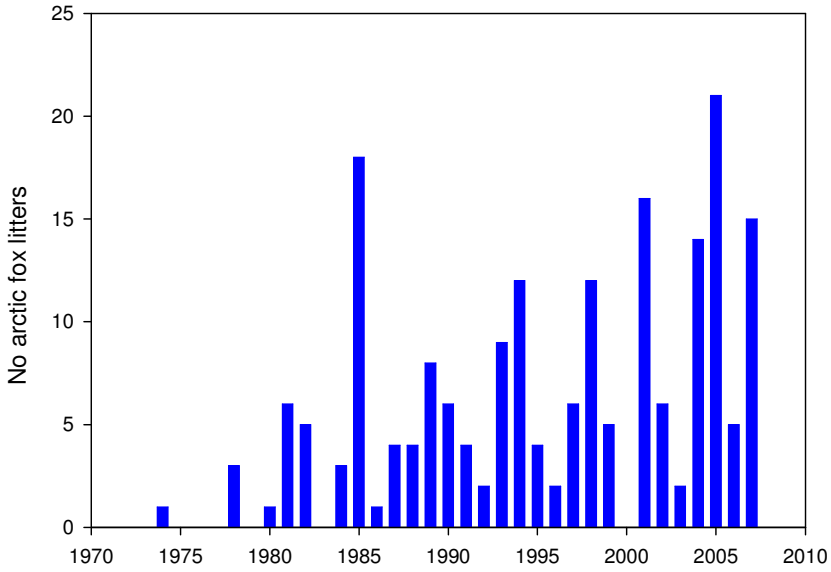


Figure 8 The number of arctic fox litters in Norway in 1988-2007. *Antal fjällrävskullar i Norge 1988-2006.*

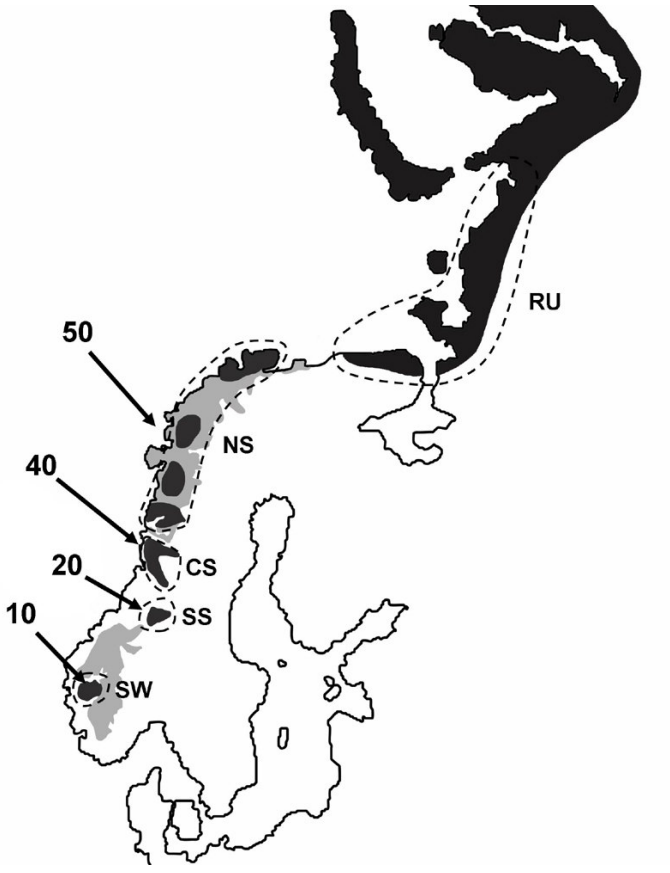


Figure 9. The substructure of arctic foxes in Scandinavia with estimated numbers in each population. RU= Russia, NS= northern Scandinavia, CS= central Scandinavia, SS= southern Scandinavia, SW= southwest Scandinavia. Grey is the area of former arctic fox distribution.

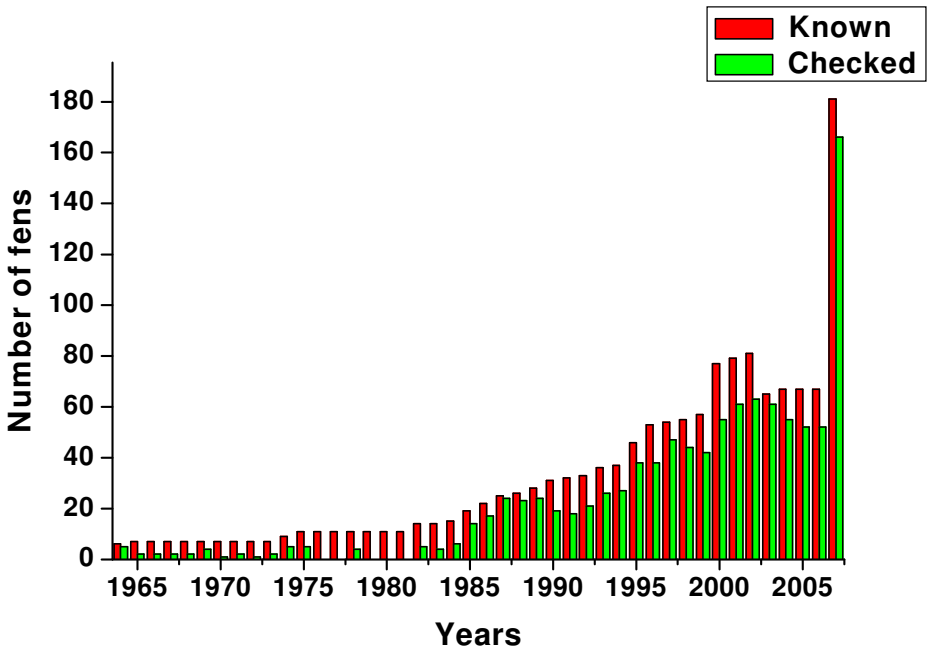


Figure 9. Number of known and checked dens in Käsivarsi, Finland, 1960-2008

Table 4. Results of monitoring in winter 2002-2003 complementary to SEFALO+ in Sweden and Finland (- = no information). *Resultat av inventeringar vintern 2002-2003, utanför SEFALO+ i Sverige och Finland (- = ingen information).*

Country	Area	Known dens	Monitored dens	Dens with arctic foxes	Estimated no of arctic foxes[1]	Fed dens	Dens with red foxes	Culled red foxes	Organisation responsible for field work
SE - Z	Rogen	1	0	-	-	0	-	0	CAB Jämtland
SE - Z	Helags-Lunndörrsfjällen	53	53	2	5-8	5	1	15	CAB Jämtland
SE - Z	Oviksfjällen	4	4	0	0	0	0	0	CAB Jämtland
SE - Z	Sösjö-Offerdalsfjällen	1	1	0	0	0	0	0	CAB Jämtland
SE - Z	Hotagen	5	0	-	-	0	-	0	CAB Jämtland
SE - Z	Borgafjäll – Jämtland	13	13	1	5-6	3	0	4	CAB Jämtland
SE -AC	Borgafjäll – Västerbotten	34	33	6	6-8	2	0	0	CAB Västerbotten
SE -AC	Vindelfjällen, S Storfjället	115	65	1	1	1	1	0	CAB Västerbotten
SE - BD	Arjeplog	35	10	7	7-14	0	0	0	CAB Norrbotten
SE - BD	Nationalparksblocket	43	4	0	0	0	0	0	CAB Norrbotten
SE - BD	Sitas	29	23	0	0	0	0	0	CAB Norrbotten
SE - BD	Kebnekaise	6	2	0	0	0	1	0	CAB Norrbotten
SE - BD	Råsto	55	33	0	0	0	1	0	CAB Norrbotten
FIN	Käsivarsi	65	0	-	-	0	-	21	FFRI
FIN	Pöyrisjärvi	16	14	0	0-1	0	6	22	Metsähallitus
FIN	Utsjoki	106	77	0	5-7	0	28	70	Metsähallitus
	TOTAL	**581**	**332**	**17**	**29-45**	**11**	**38**	**132**	

[1]Estimation of the rangers in each area. *Fältpersonalens uppskattning i respektive områden.*

[s]Red foxes shot from snow mobiles by rangers (Sweden) or selected local people (Finland) with special permissions. *Rödrävar skjutna från skoter av naturbevakare (Sverige) eller av utvalda personer ur lokalbefolkningen (Finland) med specialtillstånd.*

[L]Red foxes shot by local people according to ordinary hunting legislation rules. *Rödrävar skjutna av lokalbefolkning enligt ordinarie jaktlagstiftning.*

Table 5. Results of monitoring in summer 2003 complementary to SEFALO+ in Sweden and Finland (- = no information). *Resultat av inventeringar sommaren 2003, utanför SEFALO+in Sweden and Finland (- = ingen information).*

Country	Area	Known dens	Monitored dens	Dens with arctic fox litter	Adult arctic foxes at dens[1]	Fed dens	Red fox litters	Organisation responsible for field work
SE - Z	Rogen	1	1	0	0	0	0	CAB Jämtland
SE - Z	Helags	57	57	1	2	1	1	CAB Jämtland
SE - Z	Oviksfjällen	5	5	0	0	0	1	CAB Jämtland
SE - Z	Sösjö-Offerdalsfjällen	1	0	0	0	0	0	CAB Jämtland
SE - Z	Hotagen	5	0	0	0	0	0	CAB Jämtland
SE - Z	Borgafjäll – Jämtland	13	13	0	2	1	0	CAB Jämtland
SE -AC	Borgafjäll – Västerbotten	34	17	0	3-6	0	0	CAB Västerbotten, SU
SE -AC	Vindelfjällen, S Storfjället	115	92	0	2-4	0	0	CAB Västerbotten, SU
SE - BD	Arjeplog	35	3	0	0	0	0	CAB Norrbotten
SE - BD	Nationalparksblocket	43	29	0	1	0	1	CAB Norrbotten, SU
SE - BD	Sitas	29	0	-	-	0	-	CAB Norrbotten
SE - BD	Kebnekaise	6	0	-	-	0	-	CAB Norrbotten
SE - BD	Råsto	55	43	0	0	0	0	CAB Norrbotten
FIN	Käsivarsi	65	61	0	5[2]	0	2	FFRI
FIN	Pöyrisjärvi	16	12	0	0-1[2]	0	0	Metsähallitus
FIN	Utsjoki	106	77	0	5-7[2]	0	2	Metsähallitus
	TOTAL	**586**	**410**	**1**	**20-28**	**1**	**7**	

[1]Estimation of the rangers in each area . *Fältpersonalens uppskattning i respektive områden.*

[2]Estimated number of arctic foxes in the area (i.e. non-territorial foxes that have not established at dens). *Uppskattat antal fjällrävar i området (d v s icke-territoriella rävar som inte etablerat sig vid lya).*

Table 6. Results of monitoring in winter 2003-2004 in Sweden and Finland (- = no information). *Resultat av inventeringar vintern 2003-2004 i Sverige och Finland (- = ingen information)*

Country	Area	Known dens	Monitored dens	Dens with arctic foxes	Estimated no of arctic foxes[1]	Fed dens	Dens with red foxes	Culled red foxes	Organisation responsible for field work
SE	Rogen	2	2	0	0	0	0	0	CAB Jämtland
SE	Helags-Lunndörrsfjällen	58	55	5	12-15	8	2	8[S]	CAB Jämtland
SE	Oviksfjällen	5	5	0	0	0	1	0	CAB Jämtland
SE	Sösjö-Offerdalsfjällen	1	0	0	0	0	0	0	CAB Jämtland
SE	Hotagen	5	0	0	0	0	0	0	CAB Jämtland
SE	Borgafjäll – Jämtland	13	10	3	5	5	2	2[S]	CAB Jämtland
SE	Borgafjäll – Västerbotten	34	34	8	8-11	7	0	16[L]	CAB Västerbotten
SE	Vindelfjällen, S Storfjället	115	87	6	8-9	0	1	0	CAB Västerbotten
SE	Arjeplog	35	3	1	5-8	0	1	0	CAB Norrbotten
SE	Nationalparksblocket	43	28	2	2	0	0	0	CAB Norrbotten
SE	Sitas	29	18	0	1-2	0	0	4[L]	CAB Norrbotten
SE	Kebnekaise	6	1	0	0	0	0	0	CAB Norrbotten
SE	Råsto	55	30	4	2-5	1	1	6[L]	CAB Norrbotten
FIN	Käsivarsi	65	34	0	5	0	1	14[S]	FFRI
FIN	Pöyrisjärvi	16	15	0	1-2	0	7	42[S]	Metsähallitus
FIN	Utsjoki	106	89	0	4-8	2	30	105[S]	Metsähallitus
NO	*No monitoring in winter*	-	-	-	-	-	-	-	
	TOTAL	**588**	**411**	**29**	**48-67**	**23**	**46**	**197**	

[1]Estimation of the rangers in each area. *Fältpersonalens uppskattning i respektive områden.*

[S]Red foxes shot from snow mobiles by rangers (Sweden) or selected local people (Finland) with special permissions. *Rödrävar skjutna från skoter av naturbevakare (Sverige) eller av utvalda personer ur lokalbefolkningen (Finland) med specialtillstånd.*

[L]Red foxes shot by local people according to ordinary hunting legislation rules. *Rödrävar skjutna av lokalbefolkning enligt ordinarie jaktlagstiftning.*

Table 7. Results of monitoring in winter 2004-2005 (- = no information). *Resultat av inventeringar vintern 2004-2005 (- = ingen information)*
[1]Estimation of the rangers in each area. *Fältpersonalens uppskattning i respektive områden.*

Country	Area	Known dens	Monitored dens	Dens with arctic foxes	Estimated no of arctic foxes[1]	Fed dens	Dens with red foxes	Culled red foxes	Organisation responsible for field work
SE	Rogen	3	3	0	0	0	0	0	CAB Jämtland
SE	Helags-Lunndörrsfjällen	64	64	8	21-25	9	1	81[s]+**5**	CAB Jämtland, SU
SE	Oviksfjällen	5	5	0	0	0	2	0	CAB Jämtland
SE	Sösjö-Offerdalsfjällen	4	4	1	3	0	3	0	CAB Jämtland
SE	Hotagen	5	4	0	0	0	3	0	CAB Jämtland
SE	Borgafjäll – Jämtland	13	9	5	14-17	5	0	6	CAB Jämtland
SE	Borgafjäll – Västerbotten	34	34	10	15	2	1	26	CAB Västerbotten
SE	Vindelfjällen, S Storfjället	115	87	16	14	0	9	6	CABVästerbotten
SE	Arjeplog	35	6	2	5 ≥ 8	-	-	-	CAB Norrbotten
SE	Nationalparksblocket	43	-	-	4 ≥ 6	-	-	-	CAB Norrbotten
SE	Sitas	29	-	-	-	-	-	5	CAB Norrbotten
SE	Kebnekaise	6	2	-	-	-	1	-	CAB Norrbotten
SE	Råsto	55	15	5	3 ≥ 6	2	-	12	CAB Norrbotten
FIN	Käsivarsi	67	35	0	4-6	0	3	0	FFRI
FIN	Pöyrisjärvi	16	14	0	1-2	0	5	47	Metsähallitus
FIN	Paistunturi-Kaldoaivi	114	111	0	6-8	2	25	73	Metsähallitus
	TOTAL	**608**	**393**	**47**	**90-110**	**20**	**53**	**279**	

[s]Red foxes shot from snow mobiles by rangers (Sweden) or selected local people (Finland) with special permissions. *Rödrävar skjutna från skoter av naturbevakare (Sverige) eller av utvalda personer ur lokalbefolkningen (Finland) med specialtillstånd.*
[L]Red foxes shot by local people according to ordinary hunting legislation rules. *Rödrävar skjutna av lokalbefolkning enligt ordinarie jaktlagstiftning.*

Table 8. Results of monitoring in summer 2004 (- = no information). *Resultat av inventeringar sommaren 2004 (- = ingen information)*

Country	Area	Known dens	Monitored dens	Dens with arctic fox litter	Adult arctic foxes at dens[1]	Fed dens	Red fox litters	Organisation responsible for field work
SE	Rogen	3	3	0	0	0	0	CAB Jämtland
SE	Helags	58	53	4	8	4	1	CAB Jämtland
SE	Oviksfjällen	5	5	0	0	0	1	CAB Jämtland
SE	Sösjö-Offerdalsfjällen	3	3	1	2	0	0	CAB Jämtland
SE	Hotagen	5	0	0	0	0	0	CAB Jämtland
SE	Borgafjäll – Jämtland	13	10	2	4	5	1	CAB Jämtland
SE	Borgafjäll – Västerbotten	34	34	2	7	3	1	CAB Västerbotten, SU
SE	Vindelfjällen, S Storfjället	115	92	3	6	2	3	CAB Västerbotten, SU
SE	Arjeplog	35	23	2	4-8	5	2	CAB Norrbotten
SE	Nationalparksblocket	43	27	0	1-2	0	4	CAB Norrbotten, SU
SE	Sitas	29	16	0	0	0	0	CAB Norrbotten, SU
SE	Kebnekaise	6	0	-	-	-	-	CAB Norrbotten
SE	Råsto	55	20	0	3-6	1	2	CAB Norrbotten
FIN	Käsivarsi	67	55	0	5[2]	0	4	FFRI
FIN	Pöyrisjärvi	16	14	0	0	0	0	Metsähallitus
FIN	Utsjoki	113	110	0	0	0	0	Metsähallitus
	TOTAL Swe-Fin	**600**	**465**	**14**	**40-48**	**20**	**19**	
NO[3]	Finnmark	105	61	0	0	-	2	SNO –Fjelltjenesten
NO[3]	Troms	39	13	1	1-2	-	0	SNO – Fjelltjenesten
NO[3]	Børgefjell – Nordland	32	27	7	11-17	-	0	SNO – Fjelltjenesten
NO[3]	Saltfjell – Nordland	46	38	4	5-8	-	0	SNO – Fjelltjenesten
NO[3]	Rest of Nordland	6	6	0	0	-	0	SNO – Fjelltjenesten
NO[3]	Nord Trøndelag	15	12	2	2-4	-	0	SNO
NO[3]	Sør Norge nord	125	58	0	0	-	1	SNO
NO[3]	Sør Norge sør	163	51	0	0	-	0	SNO-NINA
	TOTAL Norway	**531**	**266**	**14**	**19-31**	**0**	**3**	

[1]Estimation of the rangers in each area . *Fältpersonalens uppskattning i respektive områden.*

[2]Estimated number of arctic foxes in the area (i.e. non-territorial foxes that have not established at dens). *Uppskattat antal fjällrävar i området (d v s icke-territoriella rävar som inte etalberat sig vid lya).*

[3]These numbers are collected under the Norwegian national arctic fox monitoring program and SEFALO+. *Uppgifter insamlade inom Norges nationella övervaknings-program för fjällräv och SEFALO+*

Table 9. Results of monitoring in summer 2005 (- = no information). *Resultat av inventeringar sommaren 2005 (- = ingen information)*
[1]Estimation of the rangers in each area . *Fältpersonalens uppskattning i respektive områden.*

Country	Area	Known dens	Monitored dens	Dens with arctic fox litter	Adult arctic foxes at dens[1]	Fed dens	Red fox litters	Organisation responsible for field work
SE	Rogen	3	3	0	0	0	0	CAB Jämtland
SE	Helags	65	65	7*	19	9	2	CAB Jämtland, SU
SE	Oviksfjällen	5	5	0	0	0	0	CAB Jämtland
SE	Sösjö-Offerdalsfjällen	4	3	1	1	0	0	CAB Jämtland
SE	Hotagen	7	6	0	0	0	2	CAB Jämtland
SE	Borgafjäll – Jämtland	13	9	5	10	4	0	CAB Jämtland
SE	Borgafjäll – Västerbotten	34	34	9	18	5	0	CAB Västerbotten, SU
SE	Vindelfjällen, S Storfjället	115	92	2	4	0	0	CAB Västerbotten, SU
SE	Arjeplog	40	30	1	2 ≥ 8	0	2	CAB Norrbotten
SE	Nationalparksblocket	47	29	1	4 ≥ 6	1	1	CAB Norrbotten, SU
SE	Sitas	29	13	0	0	0	1	CAB Norrbotten, SU
SE	Kebnekaise	6	2	-	-	-	-	CAB Norrbotten
SE	Råsto	55	22	0	3 ≥ 6	2	3	CAB Norrbotten
FIN	Käsivarsi	67	52	0	0 (4-6[2)]	0	2	FFRI
FIN	Pöyrisjärvi	16	14	0	0 (1-2[2])	0	0	Metsähallitus
FIN	Paistunturi-Kaldoaivi	116	114	0	0 (4-6[2])	0	0	Metsähallitus
	TOTAL	**622**	**493**	**26**	**70-86**	**21**	**13**	

[2]Estimated number of arctic foxes in the area (i.e. non-territorial foxes that have not established at dens)
* Two litters at one den

		Totalt	2005						
Ref.	Område	Kjente hi	Antall kontroller	Kontrollerte hi	Yngling	Voksne fjellrev	Valper	Rødrev yngling	Ansvarlig
A	Varangerhalvøya	27	30	26	1	2	1	0	SNO, Fjelltjenesten
B	Ifjordfjellet	23	27	16	1	2	2	0	SNO, Fjelltjenesten
C	Anarjohka	5	0	0	0	0	0	0	SNO, Fjelltjenesten
D	Porsanger vest	31	0	0	0	0	0	0	SNO, Fjelltjenesten
E	Reisa nord	26	22	13	2	4	7	0	SNO, Fjelltjenesten
F	Reisa sør	17	4	2	0	0	0	0	SNO, Fjelltjenesten
G	Indre Troms	22	29	10	1	2	5	0	SNO, Fjelltjenesten
H	Sitas	3	3	3	0	0	0	0	SNO, Fjelltjenesten
I	Saltfjellet	47	48	35	4	3-8	9*a	1	SNO, Fjelltjenesten
J	Artfjellet	3	3	3	0	0	0	0	SNO, Fjelltjenesten
K	Børgefjell	33	50	26	11	9-22	15*b	0	SNO, Fjelltjenesten
L	Hestkjølen	7	9	6	0	0	0	0	SNO
M	Blåfjellet	8	8	4	0	0	0	0	SNO
N	Skjækerfjellet	1	0	0	0	0	0	0	SNO
P	Kjølifjellet/Sylane	27	19	13	0	0	0	0	SNO
Q	Forollhogna	26	22	22	0	0	0	0	SNO
R	Knutshø	19	4	4	0	0	0	0	SNO
S	Trollheimen	4	0	0	0	0	0	0	SNO
T	Snøhetta	36	15	14	0	0	0	0	SNO
U	Ottadalen nord	7	4	4	0	0	0	0	SNO
V	Rondane	3	0	0	0	0	0	0	SNO
W	Valdres	1	0	0	0	0	0	0	SNO
X	Finse	25	9	9	1	0-2	0	0	NINA
Y	Hardangervidda	139	14	13	0	0	0	1	SNO
	TOTAL	**540**	**320**	**223**	**21**	**22-42**	**39**	**2**	

Table 10. Results of monitoring in summer 2005 in Norway. *Oversikt over områder og fylke med opplysninger om antall kjente fjellrevhi, antall kontroller utført, antall kontrollerte hi, registrerte ynglinger av fjellrev (**dokumenterte og antatte ynglinger**), observerte voksne fjellrever, observerte valper, registrerte rødrevynglinger og enhet ansvarlig for registreringene innenfor det enkelte området. **Ref** angir henvisning til kart (figur 3). **Voksne fjellrev** angir antall forskjellige individer observert under registreringene (minimums tallet) og antall ved beregning av minimum 2 individer ved hver registrert yngling (maksimums tall). # angir funn av ekskrementer som bekrefter tilstedeværelse av fjellrev i området. **Valper** angir det antallet valper som er observert på det meste på hiene i området.*

Tabell 11. Results of monitoring in summer 2006 in Norway. *Oversikt over områder og fylke med opplysninger om antall hi i databasen, antall fjellrevhi, antall kontroller utført, antall kontrollerte hi, registrerte ynglinger av fjellrev (**dokumenterte og antatte ynglinger**), observerte voksne fjellrever, observerte valper, registrerte rødrevynglinger og enhet ansvarlig for registreringene innenfor det enkelte området. **Voksne fjellrev** angir antall forskjellige individer observert under registreringene (minimums tallet) og antall ved beregning av minimum 2 individer ved hver registrert yngling (maksimums tall). # angir funn av ekskrementer som bekrefter tilstedeværelse av fjellrev i området. **Valper** angir det antallet valper som er observert på det meste på hiene i området. Results from Eide et al 2006.*

Country	County	Ref.	Area	Known dens	Arctic fox dens	Controls	Monitored dens	Arctic fox litters	Adult AF	Juvenile AF	Red fox litters	Organisation responsible for field work
NO	Finnmark	A	Varangerhalvøya	31	30	30 #	27	3	6	8	2	SNO, Fjelltjenesten
NO	Finnmark	B	Ifjordfjellet	24	23	20	12	1	2	3	0	SNO, Fjelltjenesten
NO	Finnmark	C	Anarjohka	5	5	2	2	0	0	0	0	SNO, Fjelltjenesten
NO	Finnmark	D	Porsanger vest	34	32	6	5	0	0	0	0	SNO, Fjelltjenesten
NO	Finnmark-Troms	E	Reisa nord	27	27	22 #	16	1	2	2	0	SNO, Fjelltjenesten
NO	Troms	F	Reisa sør	17	17	10	6	0	2	0	0	SNO, Fjelltjenesten
NO	Troms	G	Indre Troms	23	23	18 #	8	0	3	0	0	SNO, Fjelltjenesten
NO	Nordland	H	Sitas	3	3	1	1	0	0	0	0	SNO, Fjelltjenesten
NO	Nordland	I	Saltfjellet	51	48	58 #	38	0	2	0	0	SNO, Fjelltjenesten
NO	Nordland	J	Artfjellet	3	3	3	3	0	0	0	0	SNO, Fjelltjenesten
NO	Nordland	K	Børgefjell	34	34	31	24	0	3	0	0	SNO, Fjelltjenesten
NO	Nord-Trøndelag	L	Hestkjølen	16	7	11	5	0	0	0	0	SNO
NO	Nord-Trøndelag	M	Blåfjellet	24	10	12	6	0	0	0	0	SNO
NO	Nord-Trøndelag	N	Skjækerfjellet	7	3	2	2	0	0	0	0	SNO
NO	Sør-Norge Nord	P	Kjølifjellet/Sylane	47	27	47	31	0	0	0	0	SNO
NO	Sør-Norge Nord	Q	Forollhogna	27	26	0	0	0	0	0	0	SNO
NO	Sør-Norge Nord	R	Knutshø	32	21	14	13	0	0	0	1	SNO
NO	Sør-Norge Nord	S	Trollheimen	4	4	0	0	0	0	0	0	SNO
NO	Sør-Norge Nord	T	Snøhetta	58	36	14	13	0	0	0	0	SNO
NO	Sør-Norge Nord	U	Ottadalen nord	12	6	0	0	0	0	0	0	SNO
NO	Sør-Norge Nord	V	Rondane	3	3	0	0	0	0	0	0	SNO
NO	Sør-Norge Nord	W	Valdres	1	1	0	0	0	0	0	0	SNO
NO	Sør-Norge Sør	X	Finse	29	25	8	8	0	0	0	0	NINA
NO	Sør-Norge Sør	Y	Hardangervidda	220	139	17	17	0	0	0	0	SNO
NO	Sør-Norge	-	Diverse områder *	6	2	2	2	0	0	0	0	SNO

TOTAL	**738**	**553**	**328**	**239**	**5**	**20**	**13**	**3**	

* Hi i Sør-Norge utenfor de spesifiserte fjellområder, samlet i "diverse områder"

Table 12. Results of monitoring in winter 2005-2006 (- = no information). *Resultat av inventeringar vintern 2005-2006 (- = ingen information)*
[1]Estimation of the rangers in each area. *Fältpersonalens uppskattning i respektive områden.*

Country	Area	Known dens	Monitored dens	Dens with arctic foxes	Estimated no of arctic foxes[1]	Fed dens	Dens with red foxes	Culled red foxes	Organisation responsible for field work
SE	Rogen	3	2	0	0	0	0	0	CAB Jämtland
SE	Helags-Lunndörrsfjällen	66	65	8	40	20	0	48	CAB Jämtland, SU
SE	Oviksfjällen	5	5	0	0	0	0	0	CAB Jämtland
SE	Sösjö-Offerdalsfjällen	4	4	0	1	0	0	0	CAB Jämtland
SE	Hotagen	7	0	0	0	0	0	0	CAB Jämtland
SE	Borgafjäll - Jämtland	11	11	6	10-17	5	0	6	CAB Jämtland
SE	Borgafjäll - Västerbotten	34	30	3	10-17	7	1	21	CAB Västerbotten
SE	Vindelfjällen, S Storfjället	115	80	2	4-6	2	3	3	CABVästerbotten
SE	Arjeplog	40	3	3	2 ≥ 5	0	-	0	CAB Norrbotten
SE	Nationalparks-blocket	47	4	0	2 ≥ 5	0	-	1	CAB Norrbotten
SE	Sitas	23	4	0	1 ≥ 2	0	-	0	CAB Norrbotten
SE	Kebnekaise	6	0	-	-	-	-	0	CAB Norrbotten
SE	Råsto	55	28	1	2 ≥ 5	-	1	0	CAB Norrbotten
FIN	Käsivarsi	67	37	0	4-6	0	3	0	FFRI
FIN	Pöyrisjärvi	16	16	0	0-2	0	4	29	Metsähallitus
FIN	Utsjoki	115	115	0	0-4	2	19	68	Metsähallitus
	TOTAL	**614**	**404**	**23**	**76-110**	**36**	**31**	**176**	

[S]Red foxes shot from snow mobiles by rangers (Sweden) or selected local people (Finland) with special permissions. *Rödrävar skjutna från skoter av naturbevakare (Sverige) eller av utvalda personer ur lokalbefolkningen (Finland) med specialtillstånd.*
[L]Red foxes shot by local people according to ordinary hunting legislation rules. *Rödrävar skjutna av lokalbefolkning enligt ordinarie jaktlagstiftning.*

Table 13. Results of monitoring in summer 2006 (- = no information). *Resultat av inventeringar sommaren 2006 (- = ingen information)*

Country	Area	Known dens	Monitored dens	Dens with arctic fox litter	Adult arctic foxes at dens[1]	Fed dens	Red fox litters	Organisation responsible for field work
SE	Rogen	3	2	0	0	0	0	SU
SE	Helags-Lunndörrsfjällen	66	58	1	8-10	11	0	SU
SE	Oviksfjällen	5	4	0	0	0	0	SU
SE	Sösjö-Offerdalsfjällen	4	3	0	0	0	0	SU
SE	Hotagen	7	4	0	0	0	0	SU
SE	Borgafjäll - Jämtland	11	11	2	8	5	0	CAB Jämtland
SE	Borgafjäll - Västerbotten	34	32	0	4	3	1	CAB Västerbotten, SU
SE	Vindelfjällen, S Storfjället	115	92	0	2 ≥ 5	2	0	CAB Västerbotten, SU
SE	Arjeplog	45	29	0	2 ≥ 5	0	-	CAB Norrbotten
SE	Nationalparksblocket	48	38	0	2 ≥ 5	0	1	CAB Norrbotten, SU
SE	Sitas	29	20	0	1 ≥ 2	0	-	CAB Norrbotten, SU
SE	Kebnekaise	7	1	-	-	0	-	CAB Norrbotten
SE	Råsto	55	6	0	2 ≥ 5	0	1	CAB Norrbotten
FIN	Käsivarsi	67	52	0	0	0	3	FFRI
FIN	Pöyrisjärvi	16	15	0	0	0	0	Metsähallitus
FIN	Utsjoki	117	116	0	0	0	4	Metsähallitus
	TOTAL Swe-Fin	**631**	**489**	**3**	**17-34**	**21**	**7**	

[1]Estimation of the rangers in each area . *Fältpersonalens uppskattning i respektive områden.*

[2]Estimated number of arctic foxes in the area (i.e. non-territorial foxes that have not established at dens). *Uppskattat antal fjällrävar i området (d v s icke-territoriella rävar som inte etalberat sig vid lya).*

[3]These numbers are collected under the Norwegian national arctic fox monitoring program and SEFALO+. *Uppgifter insamlade inom Norges nationella övervaknings-program för fjällräv och SEFALO+*

Table 14. Results of monitoring in winter 2006-2007 (- = no information). *Resultat av inventeringar vintern* 2006-2007 *(- = ingen information)*
[1]Estimation of the rangers in each area. *Fältpersonalens uppskattning i respektive områden.*

Country	Area	Known dens	Monitored dens	Dens with arctic foxes	Estimated no of arctic foxes[1]	Fed dens	Dens with red foxes	Culled red foxes	Organisation responsible for field work
SE	Rogen	3	3	0	0	0	0	0	CAB Jämtland
SE	Helags-Lunndörrsfjällen	68	61	10	20	10	0	36	CAB Jämtland, SU
SE	Oviksfjällen	5	3	0	0	0	0	0	CAB Jämtland
SE	Sösjö-Offerdalsfjällen	4	3	0	0	0	0	0	CAB Jämtland
SE	Hotagen	7	0	0	0	0	0	0	CAB Jämtland
SE	Borgafjäll - Jämtland	11	11	5	15	4	0	0	CAB Jämtland
SE	Borgafjäll - Västerbotten	34	21	5	4-6	5	2	14	CAB Västerbotten
SE	Vindelfjällen, S Storfjället	115	61	5-6	-	0	1	11	CABVästerbotten
SE	Arjeplog	45	16	9	5-10	8	0	0	CAB Norrbotten
SE	Nationalparks-blocket	48	3	1	2-5	0	0	0	CAB Norrbotten
SE	Sitas	29	13	0	1-2	0	0	0	CAB Norrbotten
SE	Kebnekaise	7	0	0	0	0	0	0	CAB Norrbotten
SE	Råsto	49	20	2	2-5	0	0	0	CAB Norrbotten
FIN	Käsivarsi	67			2-3	0	5	0	FFRI
FIN	Pöyrisjärvi	16	16	0	0-2	0	2	50	Metsähallitus
FIN	Utsjoki	117	116	0	0-4	1	14	136	Metsähallitus
	TOTAL	**614**	**347**	**38**	**69**	**28**	**19**	**247**	

[S]Red foxes shot from snow mobiles by rangers (Sweden) or selected local people (Finland) with special permissions. *Rödrävar skjutna från skoter av naturbevakare (Sverige) eller av utvalda personer ur lokalbefolkningen (Finland) med specialtillstånd.*
[L]Red foxes shot by local people according to ordinary hunting legislation rules. *Rödrävar skjutna av lokalbefolkning enligt ordinarie jaktlagstiftning.*

Table 115. Results of monitoring in summer 2007 (- = no information). *Resultat av inventeringar sommaren 2007 (- = ingen information)*

Country	Area	Known dens	Monitored dens	Dens with arctic fox litter	Adult arctic foxes at dens[1]	Fed dens	Red fox litters	Organisation responsible for field work
SE	Rogen	3	2	0	0	0	0	SU
SE	Helags-Lunndörrsfjällen	68	60	10*	20	9	0	SU
SE	Oviksfjällen	5	5	0	0	0	0	SU
SE	Sösjö-Offerdalsfjällen	4	4	1	2	0	0	SU
SE	Hotagen	7	3	0	0	0	0	SU
SE	Borgafjäll - Jämtland	11	11	3	6	4	0	CAB Jämtland
SE	Borgafjäll - Västerbotten	34	13	5	11	5	0	CAB Västerbotten, SU
SE	Vindelfjällen, S Storfjället	115	96	3	6	3	0	CAB Västerbotten, SU
SE	Arjeplog	46	20	2	10	11	0	CAB Norrbotten
SE	Nationalparksblocket	48	31	0	2-5	0	4	CAB Norrbotten, SU
SE	Sitas	29	10	0	1-2	0	0	CAB Norrbotten, SU
SE	Kebnekaise	7	0	0	0	0	-	CAB Norrbotten
SE	Råsto	49	16	0	2-5	0	1	CAB Norrbotten
FIN	Käsivarsi	67	-	-	-	0	12	FFRI
FIN	Pöyrisjärvi	16	16	0	0	0	0	Metsähallitus
FIN	Utsjoki	124	124	0	0	0	5	Metsähallitus
	TOTAL Swe-Fin	**633**	**411**	**24***	**67**	**32**	**10**	

[1]Estimation of the rangers in each area. *Fältpersonalens uppskattning i respektive områden.*

[2]Estimated number of arctic foxes in the area (i.e. non-territorial foxes that have not established at dens). *Uppskattat antal fjällrävar i området (d v s icke-territoriella rävar som inte etalberat sig vid lya).*

[3]These numbers are collected under the Norwegian national arctic fox monitoring program and SEFALO+. *Uppgifter insamlade inom Norges nationella övervaknings-program för fjällräv och SEFALO+ * two litters at one den.*

Tabell 16. Results of monitoring in Norway 2007. *Oversikt over områder og fylke med opplysninger om antall hi i databasen, antall fjellrevhi, antall kontroller utført, antall kontrollerte hi, registrerte ynglinger av fjellrev (**dokumenterte og antatte ynglinger**), observerte voksne fjellrever, observerte valper, registrerte rødrevynglinger og enhet ansvarlig for registreringene innenfor det enkelte området. **Voksne fjellrev** angir antall forskjellige individer observert under registreringene (minimums tallet) og antall ved beregning av minimum 2 individer ved hver registrert yngling (maksimums tall). # angir funn av ekskrementer som bekrefter tilstedeværelse av fjellrev i området. **Valper** angir det antallet valper som er observert på det meste på hiene i området. Results from Eide et al 2007.*

* Hi i Sør-Norge utenfor de spesifiserte fjellområder, samlet i "diverse områder"

			Totalt		2007							
Fylke	**Ref.**	**Fjellområde**	**Kjente hi**	**Fjellrev hi**	**Ant. kont. vinter**	**Ant. kont. sommer**	**Antall hi kontrollert**	**Fjellrev yngling**	**Voksne fjellrev**	**Valper fjellrev**	**Rødrev yngling**	**Fjellrev vinter**
Finnmark	A	Varangerhalvøya	32	30	11	30	29	3	6	13	0	4
Finnmark	B	Ifjordfjellet	28	26	11	18	18	1	1	9	0	0
Finnmark	C	Anarjohka	5	5	1	1	2	0	0	0	0	0
Finnmark	D	Porsanger vest	35	33	0	3	3	0	0	0	2 (1)	0
Finnmark-Troms	E	Reisa nord	28	27	7	23	18	2	3	19	1 (1)	1
Troms	F	Reisa sør	17	17	6	11	11	0	0	0	2 (2)	0
Troms	G	Indre Troms	23	23	9	14	13	1	2	5	0	1
Nordland	H	Sitas	3	3	1	1	2	0	0	0	0	0
Nordland	I	Saltfjellet	52	49	44	49	50	1	4	9	3 (2)	2
Nordland	J	Artfjellet	3	3	0	0	0	0	0	0	0	0
Nordland	K	Børgefjell	38	35	27	55	30	8 (1)	14	57	3 (3)	5
Nord-Trøndelag	L	Hestkjølen	16	7	7	6	6	0	0	0	0	0
Nord-Trøndelag	M	Blåfjellet	27	10	5	10	6	0	0	0	0	1
Nord-Trøndelag	N	Skjækerfjellet	7	3	0	0	0	0	0	0	0	0
Sør-Norge Nord	P	Kjølifjellet/Sylane	50	29	18	17	23	0	0	0	1 (1)	0
Sør-Norge Nord	Q	Forollhogna	27	26	0	0	0	0	0	0	0	0
Sør-Norge Nord	R	Knutshø	38	24	2	13	12	0	0	0	1	0
Sør-Norge Nord	S	Trollheimen	4	4	0	0	0	0	0	0	0	0
Sør-Norge Nord	T	Snøhetta	59	36	5	27	23	0	0	0	2 (1)	0
Sør-Norge Nord	U	Ottadalen nord	12	6	0	0	0	0	0	0	0	0
Sør-Norge Nord	V	Rondane	3	3	0	0	0	0	0	0	0	0
Sør-Norge Nord	W	Valdres	1	1	0	0	0	0	0	0	0	0
Sør-Norge Sør	X	Finse	27	25	5	16	16	0	0	0	0	1
Sør-Norge Sør	Y	Hardangervidda	229	144	0	89	92	0	0	0	2	0
Sør-Norge	-	Diverse områder *	7	2	0	1	1	0	0	0	0	0
		TOTAL	771	571	159	384	**355**	**16**	**29-32**	**112**	**17**	**15**

* Hi i Sør-Norge utenfor de spesifiserte fjellområder, samlet i "diverse områder"

Table 17. Results of monitoring in winter 2007-2008 (- = no information). *Resultat av inventeringar vintern* 2006-2007 *(- = ingen information)*
[1]Estimation of the rangers in each area. *Fältpersonalens uppskattning i respektive områden.*

Country	Area	Known dens	Monitored dens	Dens with arctic foxes	Estimated no of arctic foxes[1]	Fed dens	Dens with red foxes	Culled red foxes	Organisation responsible for field work
SE	Rogen	3	2	0	0	0	0	0	CAB Jämtland
SE	Helags-Lunndörrsfjällen	68	68	24	60	22	0	66	CAB Jämtland, SU
SE	Oviksfjällen	5							CAB Jämtland
SE	Sösjö-Offerdalsfjällen	4							CAB Jämtland
SE	Hotagen	7							CAB Jämtland
SE	Borgafjäll - Jämtland	11	11	10	25-30	10	0	0	CAB Jämtland
SE	Borgafjäll - Västerbotten	34	32	11	20	10	0	38	CAB Västerbotten
SE	Vindelfjällen, S Storfjället	115	66	5	12	4	1	45	CAB Västerbotten
SE	Arjeplog	45	19	7	9-20	8	7	0	CAB Norrbotten
SE	Nationalparks-blocket	48	7	1	2-5	0	1	0	CAB Norrbotten
SE	Sitas	29	0	-	-	-	-	-	CAB Norrbotten
SE	Kebnekaise	7	1	-	-	-	1	0	CAB Norrbotten
SE	Råsto	49	16	1	1-5	2	5	7	CAB Norrbotten
FIN	Käsivarsi	67			2-3	0	8	36	FFRI
FIN	Pöyrisjärvi	16	16	0	0-2	0	2	61	Metsähallitus
FIN	Utsjoki	117	124	0	2-6	0	50	190	Metsähallitus
	TOTAL	**614**							

[S]Red foxes shot from snow mobiles by rangers (Sweden) or selected local people (Finland) with special permissions. *Rödrävar skjutna från skoter av naturbevakare (Sverige) eller av utvalda personer ur lokalbefolkningen (Finland) med specialtillstånd.*
[L]Red foxes shot by local people according to ordinary hunting legislation rules. *Rödrävar skjutna av lokalbefolkning enligt ordinarie jaktlagstiftning.*

Table 18. Lemming and vole availability in different areas (no. caught/100 trapnights during snap trapping). Lemming is the main prey of arctic foxes in most areas, while different vole species are an alternative prey. *Lämmel- och sorktillgång i olika områden (antal fångade/100 fällnätter vid fällfångst). Lämmel är fjällrävens viktigaste bytesdjur i de flesta områdena, medan sork är ett alternativt bytesdjur.*
[1]Selective trapping method renders more captures than systematic trapping. *Selektiv fångstmetod ger generellt fler fångster än systematisk fångst.*

Country	Area	Trapping method	Lemming *Lemmus lemmus*	Vole *Microtus & Clethrionomys*	TOTAL
2003					
SE	Helags	Systematic	0.14	0.56	0.70
SE	Vindelfjällen	Systematic	0.14	0.69	0.83
SE	Nationalparksblocket	Systematic	0	0	0
SE	Sitas	Systematic	0	0	0
2004					
SE	Helags	Systematic	0	1.67	1.67
SE	Borgafjäll	Systematic	4.03	3.19	7.22
SE	Vindelfjällen	Systematic	0.50	0.92	1.42
SE	Arjeplog	Systematic	0	0.42	0.42
SE	Nationalparksblocket	Systematic	0.10	3.02	3.12
SE	Sitas	Systematic	0	3.54	3.54
SE	Pältsa –Råstojaure	Selective			*6.00*[1]
FIN	Käsivarsi	Selective			*2.00*[1]
2005					
SE	Helags	Systematic	0	3.19	3.21
SE	Borgafjäll	Systematic	0	0.07	0.07
SE	Vindelfjällen	Systematic	0	0	0
SE	Nationalparksblocket	Systematic	0.42	0.21	0.63
SE	Sitas	Systematic	0.52	1.98	2.50
SE	Pältsa –Råstojaure	Selective			*2.00*[1]
FIN	Käsivarsi	Selective			*2.00*[1]
2006					
SE	Helags	Systematic	0	0,17	0,17
SE	Borgafjäll	Systematic	0	0	0
SE	Vindelfjällen	Systematic	0,33	0	0,33
SE	Arjeplog	Systematic	-	-	-
SE	Nationalparksblocket	Systematic	0	0,05	0,05
SE	Sitas	Systematic	0,31	0,10	0,41
SE	Pältsa –Råstojaure	Selective			
FIN	Käsivarsi	Selective			
2007					
SE	Helags	Systematic	1,88	27,90	29,79
SE	Borgafjäll	Systematic	0,12	0,12	0,24
SE	Vindelfjällen	Systematic	0,56	0,1	0,65
SE	Arjeplog	Systematic	-	-	-
SE	Nationalparksblocket	Systematic	1,39	4,07	4,51
SE	Sitas	Systematic	0	0	0
SE	Pältsa –Råstojaure	Selective	-	-	-
FIN	Käsivarsi	Selective	-	-	-

Complementary actions in Norway

National monitoring program In 2003, the environmental authorities in Norway decided to start a national arctic fox monitoring program which covers larger areas than SEFALO+. The Norwegian Directorate for Nature Management (DN) has given the assignment to the Norwegian Nature Inspectorate (SNO) coordinating the practical work in the field and to the Norwegian Institute for Nature Research (NINA) which gives priorities and quality check of all the incoming field data. NINA is responsible for operating the national fox database and present an annual report from the program. The monitoring actions in SEFALO+ (D1) supplements the national monitoring actions by putting extra monitoring effort in the boarder areas between Norway, Sweden and Finland, as well as earmarking.

Genetic analyses Faeces samples are collected at den sites during the monitoring. Genetic analyses are performed to distinguish between faeces originating from arctic fox, red fox, farmed foxes or wolverine (as in Sweden). Mitochondrial haplotyping and microsatellite analyses are performed on the arctic fox samples both to get information on genetic substructures and to be able to detect foxes either with farm origin or potential hybrids between wild and farmed foxes. The microsatellite analyses are performed to get a more substantial information on the genetic sub structuring of the Fennoscandian arctic fox population. The genetic studies are done in cooperation with Stockholm University. As for Norway this action is not included in SEFALO+. These data are reported in the annual monitoring report.

Captive breeding The Norwegian Institute of Nature Research (NINA), are running a captive breeding program for arctic foxes on assignment from the Norwegian Directorate for Nature Management (DN), not included in SEFALO+. The project received official approval in spring 2000. In summer 2001 a total of 6 pups were caught, followed by 3 more in 2002, 4 in 2004, 5 in 2005, 0 in 2006 and 3 in 2007.These captive foxes represent 6 of the extant arctic fox areas (Hardangervidda, Blåfjell/Lierne, Børgefjell, Saltfjellet, Indre Troms and Finnmark). All animals were housed in a conventional farm situation at Dal forsøksgård (Dal experimental animal station) belonging to the NorwegianVeterinary University until early 2004. In spring 2004 there was the first breeding success, 5 cubs were born after moving an arctic fox couple into a natural enclosure setting at Landedrag zoo. “The captive breeding station for arctic fox” was build summer 2005 in Oppdal commune. The station is situated at 1280 m.a.s.l. in a natural alpine habitat. It consists of 8 fenced enclosures, each enclosures being 50x50m. In the enclosures there are build boulders of stones as natural hides and they each have two artificial den sites. Since the establishment of the station, 1 litter (6 cubs) where born in 2006 and 4 litters (20 cubs) in 2007. The first attempt of release in wild was in 2006, when 2 cubs were released in Nordland. In 2007, 15 cubs were released on Dovrefjell. There are now totally 9 breeding pairs within the captive breeding program.

Red fox control In spring 2004, the Norwegian Directorate for Nature Management (DN) initiated the designing of a “red fox control research project” in Norway at the request from the Norwegian Ministry of Environment. This is not included in SEFALO+. The University of Tromsø, implemented a “red fox control program” spring 2005 as part of a large scale ecosystem research project “Ecosystem Finnmarksvidda” in the northern county on Norway, Finnmark. Red fox control has been completed on the north-eastern half-island Varangerhalvøya, while three other areas were set up as control areas. The Norwegian Nature Inspectorate (SNO) and Fjelltjenesten Finnmark being responsible for the red fox culling in the field. Winter 2005 totally 197 red foxes were culled, in 2006 158 and in 2007 150. Under

this action part of the goal is to test if the control of red fox leads to an increase in the arctic fox population. The group leading this research program is in close contact with SEFALO+ regarding the same control actions undertaken in SEFALO+, and evaluation of this control program will be coordinated between the different research groups.

Public information Norges Naturvernforbund (NNV), Norges Jeger og Fisker Forbund (NJFF), Verdens villmarks fond Norge (WWF) and Den norske turistforening (DNT), 4 non governmental organizations in Norway are together running "Prosjekt Fjellrev" a public information project (www.fjellrev.no). This information project was funded by the Norwegian Directorate for Nature Management (DN). Together with SEFALO+ and DN they arranged the Nordic arctic fox seminar in Meråker, Norway 15-16th November 2004. This seminar was partly financed by Nordisk Ministerråd. "Prosjekt fjellrev" also represent a joint political pressure highlighting the importance conserving the arctic fox on the Fennoscandian peninsula.

Media and publications

Radio and Television

2003-06-16 NRK Radio. Brende vurdere rødrev-jakt [Feature: *Brende is looking at red fox hunting*]
2003-07-14 NRK Radio. Sårbar sjarmør i pels [Feature: *Vulnerable charmer in fur.* Interview Matti Mela, Lars Liljemark]
2003-08-06 Sveriges Television Kanal 2. Aktuellt. Feature: SEFALO+ starts
2003-08-06 Sveriges Radio Ekot. Rejäl satsning för att rädda fjällräven. [*Large effort to save the arctic fox.* Interview Anders Angerbjörn]
2003-08-06 Sveriges Radio Västerbotten. Nytt projekt för att rädda fjällräven. [New project to save the arctic fox. Interview Anders Angerbjörn]
2003-08-21 NRK Radio. Ingen fjellrev-yngling [Feature: *No arctic fox breeding*]
2003-09-06 NRK Radio. Fem millioner til fjellreven [Feature: *5 million to the arctic fox*]
2003-10-21 NRK Radio. Fjellreven har mange fiender. [Feature: *The arctic fox has many challenges.* Interview Nina Eide]
2004-01-25 Radio 1, Finland. Lecture by Asko Kaikusalo
2004-04-02 NRK Radio. Fjellreven skal reddes på Varangerhalvøya [Feature: *The arctic fox will be saved at Varangerhalvøya*]
2004-05-15 Efter Tre, Sveriges Radio P4. Interview Anders Angerbjörn
2004-06-01 Lappland Radio, Finland. Interview Asko Kaikusalo
2004-07-26 Dagens eko, Sveriges Radio P1. Feature after interview with M. Tannerfeldt
2004-07-29 NRK Radio. Sensasjon i fjellet [Feature: *Sensation on the mountain tundra*]
2004-08-12 MTV 3, Utsjoki. Feature: On old arctic fox dens
2004-08-13 NRK Radio. Fjellrev i framgang [Feature: *The arctic fox population increases this year*]
2004-08-14 NRK Radio. Skal skyte rødrev for å berge fjellrev [Feature: *Will shoot red foxes to save the arctic fox*]
2004-08-30 Same TV, Inari. Feature: Conclusions on the arctic fox in Finland this year
2004-09-04 Naturmorgon, Sveriges Radio P1. Interview Anders Angerbjörn

2004-09-10 NRK Radio. Ta hensyn til fjellreven. [Feature: *Be aware of the arctic fox, take care*]
2004-09-13 Sveriges Radio Norrbotten. Två nya fjällrävskullar i länet. [*Two new arctic fox litters in the county.* Feature after interview with Mark Kissinger and Love Dalén]
2004-09- 15 Mitt i Naturen, Sveriges Television Kanal 1. Feature on SEFALO+ results this year
2004-09-15 Sveriges Radio Jämtland. Sex nya kullar fjällrävar i länet [*Six new arctic fox litters in the county.* Interview Ruben Johansson]
2004-10-03 Sveriges Television Kanal 1. Rapport. Interview with Anders Angerbjörn and field work with Lars Liljemark
2004-10-05 Radio Norrbotten. Interview about the arctic fox.
2004-10-07 Radio Norrbotten. Interview about the arctic fox.
2004-10-07 NRK Radio. Fem millioner til fjellreven [Feature: *5 million to the arctic fox*]
2004-10-08 Radio Norrbotten. Feature about the arctic fox in the news.

2005-02-00 Same Radio, Finland. Interview about arctic foxes and red fox culling.
2005-03-16 Sveriges Television Kanal 1. Myror i Brallan. Feature about the arctic fox.
2005-03-28 YLE Finland. Utelivet. Feature about the arctic fox and interview with Bodil Elmhagen.
2005-04-05 Sveriges Television Kunskapskanalen. Mera Natur. Feature about animal conservation projects including an interview with Bodil Elmhagen about SEFALO+.
2005-04-09 Sveriges Radio P1. Naturmorgon. Feature about the arctic fox and SEFALO + including interviews with Bodil Elmhagen and Christer Edsholm (ranger, Jämtland).
2005-04-24 Finnish Radio Broadcasting Company. Lapland Regional Radio. Interview with A. Kaikusalo about arctic foxes.
2005-05-25 Finnish Radio Broadcasting Company. Inari Regional Radio. Interview with A. Kaikusalo about arctic foxes.
2005-07-28 Sveriges Radio P1. Ekot. Feature about the arctic fox in the news, interview with Christer Edsholm.
2005-08-16 Same Radio, Finland. Interview about arctic foxes.
2005-08-23 Sveriges Radio P4. Radio Norrbotten. Interview about the arctic fox.
2005-09-07 Sveriges Television Kanal 1. Rapport. Feature about the arctic fox in the news, interview with Anders Angerbjörn.
2005-09-08 Sveriges Television Kanal 2. Nordnytt. Feature about the arctic fox in the news.
2005-10-26 Sveriges Television Kanal 1. Mitt i naturen. Interview with Lars Liljemark and Håkan Berglund.
2005-10-29 Sveriges Radio P1. Naturmorgon. Feature about the arctic fox.
2006-11-06 SR Jämtland ”Fler fjällrävar i Helags än tidigare känt” [More arctic foxes in Helags, than previous known]
2006-01-10 Sveriges Radio P4. Radio Jämtland. Fjällräven mer sårbar. [*The arctic fox more vulnerable*]. Interview with Love Dalén.
2006-01-27 Sveriges Television. Mittnytt. Feature about genetic variation in the arctic fox in the news.
2006-05-00 Same TV, Finland. Interview about arctic foxes.
2006-06-00 Lapin Radio, Finland. Same Radio, Finland. Interview about arctic foxes.
2007-01-25 Radio lidingö ”Klimathot och fjällräv” [climate change and arctic foxes]

2007-03-22 SR P1 vetenskapsradion ”Rävrymlingar från farmer hotar vild fjällräv” [Escapers from fur farms threathen the wild arctic fox population]
2007-07-17 SR P1 Vetenskapsradion ”Lyckad säsong för fjällräven” [Successful season for arctic foxes]
2007-07-31 SR P1 Vetenskaps radion ”Gott år för fjällräven, intervju med Lars Back”[Good year for the arctic foxes, intervju with ranger Lars Back]
2007-01-22 Intervjun Same TV om fjällrävssituationen och fjällrävsprojekt [sami radio about the arctic fox project]
2007-12-12 SR web ” Fjällrävar får svälta när EU-stöd upphör” [Arctic foxes may starve to death when EC project end] Interview with Anders Angerbjörn
2007-12-21 Radio Inari, Finland: Intervjun om fjällrävssituationen, kadaverkamera, lämmlar osv [intervju about arctic foxes, lemmings and the situation today]
2008-03-03 Sveriges Television. Mittnytt. Interview with Anders Angerbjörn.
2008-03-26 Lapin radio. About red fox culling.
2008-03-31 Saame TV. About red fox culling.
2008-04-16 Saame TV. About den inventories and red fox culling.
2008-05-10 Sveriges Television. Mittnytt. Interview with Tomas Meijer
2008-05-26 SR P5Lämmelår bra för fjällräv Interview with Anders Angerbjörn [Lemming year is good for the arctic fox]

Newspapers

2003-12-10 Lapin Kansa. Naalitutkimukselle jatkoaikaa [*Arctic fox research continues*]
2004-01-22 Nationen. Kun to Ynglinger i fjor [*Only to sucessful breedings last year*]
2004-03-19 Arbeidets Rett. Kan Brende redde fjellreven? [*Can Brende save the arctic fox?*]
2004-07-24 Trønder Avisa. Fjellrevyngling i Lierne [*Arctic fox breeds in Lierene*]
2004-08-16 Kristianstadsbladet. Fjällräven på väg tillbaka. [*The arctic fox on its way back*]
2004-09-02 Norrländska Socialdemokraten. En rödingnatt i fjällrävens rike. [*A night of char fishing in the realm of the arctic fox*]
2004-09-02 Norrländska Socialdemokraten. Kissingers valp är guld värd. [*Kissinger’s cub is worth its weight in gold*]
2004-08-30 Svensk Jakt 9. Hopp för fjällrävarna. [*Hope for arctic foxes*]
2004-09-xx Våra Rovdjur nr. 3. Sommaren 2004 – en ljusning för fjällräven? [*The summer of 2004 – an improvement for the arctic fox?*]
2004-09-13 Sörmlands Nyheter. Efterlängtade valpar ger hopp för fjällräven. [*Longed-for cubs renders hope for the arctic fox*]
2004-09-14 forskning.no. Vis hensyn til fjellreven. [*Be aware of the arctic fox, take care*]
2004-09-14 Svenska Dagbladet. Lämlarna räddar fjällrävarna. [*Lemmings save arctic foxes*]
2004-09-14 Norrbottenskuriren. Luddig fjällkrabat på väg tillbaka. [*Fluffy fellow on its way back*]
2004-09-14 Piteå-Tidningen. Efterlängtade valpar ger hopp för fjällräven i Norrbotten [*Longed-for cubs renders hope for the arctic fox in Norrbotten*]
2004-09-14 Norrländska Socialdemokraten. Efterlängtade valpar ger hopp för fjällräven. [*Longed-for cubs renders hope for the arctic fox*]
2004-09-14 Norra Västerbotten. Fjällräven på återtåg. [*The arctic fox returns*]
2004-09-24 Rana Blad. Liten rev kan velte stort gruveprosjekt. [*Small fox may overthrow large mining project*]
2004-11-15 Adresseavisen. Forskeren er revens fiende [*The researcher is the enemy of the fox*].

2004-11-16 Adresseavisen. Fjellrev helt på randen [*Arctic foxes completely on the brink*].
2004-11-17 Adresseavisen. Geneksperter avslører uekte "fjellrever" [*Experts in genetics reveals false arctic foxes]*.
2004-11-17 Adresseavisen. Vil ha jaktforbud i fjellrevområder [*Wants to forbid hunting from arctic fox areas]*.
2004-11-24 Trønder Avisa. Ni fjellrevkull i Nord- Trøndelag [*Nine arctic fox cubs in the County of Nord Trøndelag*].
2004-11-24 Arbeidets Rett. Stor interesse for fjellrevprosjekt i Holtålen [*Large interest in arctic fox project in Holtålen*].
2005-01-19 Inarilainen. Nordisk Fjällräv Life fortsätter. [*The Scandinavian arctic fox project continues*].
2005-01-22 Östersundsposten. Från 4 000 fjällrävar till ett 50-tal. [*From 4 000 arctic foxes to approximately 50*].
2005-01-22 Östersundsposten. Det är dags för hemkörning av mat till fjällrävarnas lyor. [*Time for delivering food to arctic fox dens*].
2005-02-03 Tornionlaakso. Nordisk Fjällräv Life fortsätter. [*The Scandinavian arctic fox project continues*].
2005-05-08 Satakunnan Kansa: Nordens fjällräv hotad. [Nordic arctic fox endangered]
2005-07-08 Kaleva. Observera fjällräv och jaktfalk. Nordisk Fjällräv Life fortsätter. [*Observations of arctic fox and gyrfalcons*].
2005-08-24 Norrrbottenskuriren. Fjällrävsvalpar svälter ihjäl. [*Arctic fox cubs starve to death*].
2005-08-24 Piteå-Tidningen. Glädjande ökning av antalet fjällrävar. [*Eagerly awaited increase in arctic foxes numbers*].
2005-08-24 Norrländska Socialdemokraten. Fjällräven är illa ute. [*The arctic fox is in trouble*].
2005-08-24 Norra Västerbotten. Fjällräven ska räddas. [*The arctic fox shall be saved*].
2005-09-16 LT, Östersund. Fjällrävarna får inte vara ifred. [*The arctic foxes are not left alone*].
2005-09-16 LT, Östersund. Stödutfodring räddar hotad art. [*Supplementary feeding saves threatened species*].
2005-12-09 Västerbottenskuriren. Ljusglimt för fjällrävarna. [*A glimmer of hope for the arctic fox*].
2006-01-09 Västerbottenskuriren. Forskare: Ryska fjällrävar kan flyttas till Sverige. [*Researchers suggest translocation of Russian arctic foxes into Scandinavia*].
2006-01-09 Norra Västerbotten. Flyttning radar fjällrävar? [*Translocations may save the arctic fox*].
2006-01-10 Dagens Nyheter. Inavel och lämmelbrist hotar fjällräven. [*Inbreeding and lack of lemmings threaten the arctic fox*].
2006-01-10 Västerbottens Folkblad. Fjällräven hotad – stödåtgärder behövs. [*The arctic fox is threatened – actions needed*].
2006-01-10. Västerbottenskuriren. Fjällrävsflytt forskarförslag. [*Researchers suggest translocation of arctic foxes*].
2006-01-11 Östersundsposten. Fjällräven kan räddas av ryska rävar. [*Russian foxes can save the arctic fox*].
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2006-01-27 Dagens Nyheter. Allvarligt läge för fjällräven. [*The arctic fox in trouble*].

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2006-02-17 Västerbottenskuriren. Få fjällrävsungar överlevde. [*Few arctic fox cubs survived*].
2006-03-09 Östersundsposten. Norskt projekt hotar utrota fjällrävar. [*Norwegian project threatens arctic fox to extinction*].
2006-03-10 Västerbottenskuriren. Stoppad rödrövsjakt förödande för fjällräv. [*Cancelled red fox culling devastating for the arctic fox*].
2006-03-10 Västerbottenskuriren. Accepterar inte svensk förbudszon. [*No acceptance for a red fox hunting prohibition in Sweden*].
2006-09-16 Dagens Nyheter. Lämmelbrist slog hårt mot fjällräven. [*Lack of lemmings had a negative impact on the arctic fox*].
2006-11-09 Aftonbladet ”Nu dör fjällräven” [The Arctic fox is dying]
2006-12-15 Östersundsposten ”Kapsyljakt gav pengar till fjällrävar”[Hunt for caps gave money for conservation of arctic foxes]
2006-12-17 Aftenposten ”Tragsik å skyte Finse-revene” [Tragic to kill the Finse-foxes]
2006-12-18 Aftenposten ”Uekte fjellrever vil bli skutt” [False arctic foxes will be shot]
2007-04-20 Östersundsposten “På Sylarna vägrar man svälta räv” [In Sylarna, they refuse to starve foxes]
2007-04-20 Östersundsposten ”Snart chartras resor till fjällrävens rike” [Soon, there will be travels to the land of arctic foxes]
2007-04-20 Östersundsposten ”Så skall fjällräven överleva”[the way the arctic fox will survive]
2007-05-01 Bo på Lantgård ”Fjällräven” [The arctic fox]
2007-07-19 Länstidningen ”Sorkår lyckokast för projekt fjällräv” [Rodent year, good for the arctic fox project]
2007-07-26 Östersundsposten ” Deras jobb är att rädda fjällräven – I deras händer dog en hona” [Their work is to save the arctic foxes, in their hands died a female]
2007-07-27 Östersundsposten ”Viktigt jobb att rädda rävar”[important work to save the arctic fox]
2007-07-27 Östersundsposten ”Rutinerna vid märkning av fjällrävar skall ses över”[the routines will be contrelled]
2007-07-30 Dagens Nyheter ”Sorkfälla tog renens liv” [snap trap killed reindeer]
2007-08-02 Västerbotten kuriren ”Fördubbling av antalet fjällrävar” [the number of foxes are doubled]
2007-08-02 Östersundsposten ”Fjällräven dog av blödning i levern”[the arctic fox died of liver rupture]
2007-08-02 SVT “Fördubbling av antalet fjällrävar” [the population has doubled]
2007-08-12 Dagens Nyheter ”Mickelinas värld. Fjällräven har fått en egen värld” [Mickelina world, the arctic fox gets it´s own arena]
2007-08-13 Västerbottens kuriren ”Glädje när ovanligt många fjällrävsvalpar föds”[manu arctic fox litters are born]
2007-08-14 Västerbottens kuriren ”Aktioner räddade hotade fjällräven” [Actions saves the arctic fox]
2007-08-14 Dagens Nyheter ”Stora valpkullar ger hopp för fjällrävarna” [large litters give hope for the survival of the population]
2007-08-27 Västerbottens kuriren”Familjelycka i rävlyan hos ett av våra mest hotade rovdjur”
2007-09-01 Utemagasinet nr 7 2007 ”Fjällräven ökar”[the arctic fox population increase]
2007-10-12 Västerbottens kuriren ”Forskar på hästrygg i fjällrävsland” [Researchers on horse back in the land of the arctic fox]

2007-11-26 Puistoväki magasin 4-2007 ”Naali Life päättymässä – Lajin tulevaisuus naapurimaiden varassa” [The Life project end- the arctic fox is now dependent of neighbouring contries]

2007-12-12 SR web ” Fjällrävar får svälta när EU-stöd upphör” [Arctic foxes may starve to death when EC project end]

2008-01-05 Norrländska socialdemokraten. ”Länsstyrelsen vill kameraövervaka fjällräven” [The county board want´t to use remote cameras].

2008-01-28 Uutiset ”Naalien pesimisestä Lapissa on vielä toivoa” [There is still hope for the arctic fox in Finish lapland]

2008-02-07 Västerbottens kuriren . ”Jakttursim kan bli fjällrävens räddning” [Hunting tourism can be the rescue for the arctic fox].

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2008-03-04 ATL- Lantbrukets affärstidning. Nytt lämmelår kan rädda fjällräven [New lemming year can save the acrtci fox]

2008-03-05 Västerviks tidningen ”Lämmelår räddar fjällräven” [New lemming year can save the acrtci fox]

2008-03-27 Östersundsposten. Fjällrävarna blir allt fler i Stekenjokkområdet [The number of arctic foxes are increasing in the Stekenjokk area]

2008-04-07 Västerbottens kuriren Lämmelår lyft för fjällräven [Lemming peak, good for the arctic foxes]

2008-05-26 Jaktjornalen. Lämmelår gynnar fjällräv [Lemming year is good for the arctic fox]

2008-05-26 SR web Lämmelår bra för fjällräv [Lemming year is good for the arctic fox]

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Meetings and other activities

Presentations

2003-10-03 Möte Operating Group Sweden. *Storuman, Sweden.* (BE, LD, naturbevakare Z, AC, BD län)
2003-11-20 Styrgruppsmöte, FFRI/Metla. *Vantaa Helsingfors, Finland.*
2003-12-09 Informationsmöte för allmänhet och rödrävsjägare i Enontekiö (MM)
2003-12-10 Informationsmöte för allmänhet och rödrävsjägare i Utsjoki (MM)
2003-12-17/18 Rovdjurs- och naturbevakarträff, Länsstyrelsen i Jämtland. Östersund, Sweden (MT, naturbevakare Z län)
2004-03-25 Public lecture on the arctic fox, Kilpisjärvi (AK)
2004-06-13 Public lecture on the arctic fox, Kilpisjärvi (AK)

2004-02-07 ”The arctic fox – the most threatened mammal in Sweden” Public presentation about the arctic fox and SEFALO+ during the 399th yearly winter market in Jokkmokk at Ájtte, Swedish fjell- and sami museum. *Jokkmokk, Norrbotten, Sweden.* (BE)
2004-09-09 Presentations of the project at the Sixth European Conference on Wildlife Disease
2004-09-12 Aociation (EWDA) in Uppsala 9-12th of September 2004 (www.sva.se/ewda/). Two oral abstracts were presented:
- Pathology of necrotizing encephalitis in Swedish arctic foxes (*Alopex lagopus*) by Erik Ågren, Dolores Gavier-Widén, Kristina Nilsson, Torsten Mörner and Anna-Lena Berg Detection of herpesvirus by PCR in Arctic foxes (*Alopex lagopus*) with encephalitis in Sweden by Frederik Widén and Mikael Berg

2005-02-01/02 Presentation about the arctic fox status in Finland by Matti Mela during the meeting between Metsähallitus and Laplands Miljöcentrum. Ivalo, Finland.
2005-03-02/04 Widén F, Berg M, Gavier-Widén D, Berggren L, Berg AL. Poster presentation on Encephalitis in arctic fox, ESVV II Veterinary Herpesvirus Symposium, Gent, Belgium.
2005-07-13 Lecture about arctic foxes. Asko Kaikusalo, Kilpisjärvi.
2005-07-23/28 Widén F, Berg M, Gavier-Widén D, Berggren L, Berg AL. Poster presentation on Encephalitis in arctic fox, IUMS/ICV XIIIth International Congress of Virology, San Fransisco.
2005-08-29/31 Presentation about the arctic fox status in Finland by Matti Mela during a meeting between Svanhovd Miljösenter(Norge), Metsähallitus and Pasvik Zapovetnik(Ryssland).
2005-09-05 Lecture about arctic foxes. Asko Kaikusalo, Kilpisjärvi.
2005-09-07 Lecture about arctic foxes. Asko Kaikusalo, Kilpisjärvi.
2005-09-11 Lecture about arctic foxes. Asko Kaikusalo, Kilpisjärvi
2006-11-14 Tiltak og resultat i Sverige 2005/06 ved Professor Anders Angerbjörn, Skandinaviskt fjellrevsseminar Tevetunet fjellstue, Meråker [actions and results, Scandinavian arctic fox seminar]

2006-03-24	Presentation regarding the status of the arctic fox in Finland by Matti Mela. Meeting between Metsähallitus and Laplands Miljöcentrum. Sodankylä, Finland.'
2006-04-17	Winter ecology of the arctic fox; a journey in to the wild! Presentation by Tomas Meijer at Sylarna mountain station.
2006-05-31	Presentation by Anders Angerbjörn: Effects of red fox presence on the arctic fox population. At the Institute of Biology, University of Tromsø.
2006-05-31	Presentation by Peter Hellström: Effects of red fox presence in the sub-arctic vertebrate community. At the Institute of Biology, University of Tromsø.
2006-07-23	Sub-arctic predator ecology; The arctic fox as a indicator for cyclicity. Presentation by Tomas Meijer at Sylarna mountain station.
2006-09-07/09	The use of museum specimens in conservation biology- the Scandinavian arctic fox. Poster by Veronica Nyström, Anders Angerbjörn and Love Dalén at Second International Symposium on Biomolecular Archaelogy. Stockholm University, Sweden
2006-11-24	Master thesis presentation; Molecular tracking in a small and isolated arctic fox population, Tomas Meijer
2006-12-13	Fjällräven – Vårt mest hotade rovdjur av Karin Norén och Peter Hellström Ramundbereget fjällanläggning. [The arctic fox – Our most endangered carnivore]
2006-12-14	Fjällräven – Vårt mest hotade rovdjur av Karin Norén och Peter Hellström, Funäsdalens skola. [The arctic fox – Our most endangered carnivore]
2007-09-05	Fauna i förändring: fjällräv (SEFALO+), rödräv. Svensk djurparkskonferans.Järvsö. Elmhagen B. [Fauna in change: arctic foxes and red foxes]
2007-04-15	Conservation of the arctic fox, Presentation at Sylarna mountain station, by Tomas Meijer
2007-04-18	Sub arctic predator ecology : Presentation at Sylarna mountain station, by Tomas Meijer
2007-04-20	The future for the arctic fox; conservation and ecology, Presentation at Sylarna mountain station, by Tomas Meijer
2007-08-17	”Ved et gammelt fjellrevhi nærme havet – nå okkupert av rødrev”, Anders Angerbjörn. Varanger, Norway.
2007-08-17	”Fjällrävarna i Helags området” [Arctic foxes in Helagsfjällen, situation], Lars Liljemark,Varanger, Norway.
2007-06-04	”Svensk fjällräv – läget just nu” [Arctic foxes in Sweden, situation], Tomas Meijer ,Vauldalen Hotell, Norway.
2007-06-04	”Fjällräv i Helagsområdet”[Arctic foxes in Helagsfjällen, situation], Lars Liljemark, Vauldalen Hotell, Norway.
2007-06-04	”Verdens første fjellrevs-arrangement”, informasjon og erfaringer ved guide Tomas Meijer/SEFALO, og Maria Kjellstrøm/Svenska Ekoturismeforeningen”,[Ecotourism and arctic foxes], Tomas Meijer, Vauldalen Hotell, Norway.
2007-09-30	Fjällräven- en lokal resurs? Åre Höstmarknad Tomas Meijer [The arctic fox, a local resource]
2007-09-31	Fjällräven- en lokal resurs? Åre Höstmarknad Tomas Meijer [The arctic fox, a local resource]
2008-03-16	The arctic fox – Status and conservation. Helagsfjällstation Tomas Meijer

2008-03-17 The arctic fox – Status and conservation. Sylarna Tomas Meijer
2008-03-18 The arctic fox – Status and conservation. Storulvån Tomas Meijer
2008-04-15 The arctic fox in Jämtland. ENCORE Conference Östersund Tomas Meijer.

Meetings

2003-10-03 Meeting Operating Group Sweden. *Storuman, Sweden.* (BE, LD, rangers Z, AC, BD län)
2003-11-20 Steering Committee Meeting at FFRI/Metla. *Vantaa Helsingfors, Finland.*
2003-12-09 Information meeting for red fox hunters and the public. *Enontekiö, Finland.* (MM)
2003-12-10 Information meeting for red fox hunters and the public.*Utsjoki, Finland.* (MM)
2003-12-17/18 Meeting for rangers in Jämtland. CAB of Jämtland. *Östersund, Sweden* (MT, rangers in Jämtland)
2004-04-25 Arctic fox meeting. CAB of Norrbotten. *Jokkmokk, Sweden.* (rangers BD län)
2004-11-15/17 Nordic Arctic Fox Meeting. Meråker, Norway. Organised by Projekt Fjellreven, The Norwegian Directorate for Nature Management (DN) and SEFALO+ in Meråker, Norway, November 2004. Presentations among others by Anders Angerbjörn, Magnus Tannerfeldt, Bodil Elmhagen, Love Dalén, Heikki Henttonen, Pall Hersteinsson, Nina Eide, Arild Landa, Jorund Braa (see attached program and http://www.fjellrev.no/).
2004-11-16 Meeting for operating groups in Sweden, Finland and Norway. Meråker, Norway (see above). Presentations of methodology and discussions of especially red fox culling with presentations by Lars Liljemark, Lars Rehnfeldt and Love Dalén.
2004-11-16 Steering Committee Meeting. Meråker, Norway (see above).
2004-11-29 Organization of the annual arctic fox meeting for local people by Matti Mela. Enontekiö, Finland.
2004-11-30 Organization of the annual arctic fox meeting for local people by Matti Mela. Utsjoki, Finland.
2004-11-29 Meeting for public and red fox hunters, Enontekiö, Lapland. Presentation: Arctic fox in Finland by Heikki Henttonen.
2004-11-30 Meeting for public and red fox hunters, Utsjoki, Lapland. Presentation: Arctic fox in Finland by Heikki Henttonen.
2005-06-17/19 Workshop for field workers. Helags Fjällstation, Sweden. Seminars about field methods and ethical aspects with presentations by Anders Angerbjörn, Bodil Elmhagen, Peter Hellström, Heikki Henttonen, Pall Hersteinsson.
2005-06-20 Steering Committee Meeting. Helags Fjällstation, Sweden.
2005-06-20 Operative Group Meeting. Helags Fjällstation, Sweden. Personnel from Stockholm University and field rangers from Z, AC and BD
2005-11-02/03 A national meeting on endangered species, Finnish Environmental Centre, Helsinki, Finland: presentation by Matti Mela and Heikki Henttonen about the arctic fox in Finland
2005-12-08 Conservation of the arctic fox. Workshop at Stockholm University. Presentations of arctic fox ecology and conservation by Anders Angerbjörn, Nina Eide, Eva Fuglei, Bodil Elmhagen, Peter Helllström, Love Dalén, Pall Hersteinsson.
2005-12-12 Arctic fox meeting in Enontekiö, Finland.

2005-12-13	Arctic fox meeting in Utsjoki, Finland
2006-11-24	Workshop at Stockholm university. Presentations by; Karin Norén – Farmed arctic foxes, a threat to wild ones? Tomas Meijer – Molecular tracking of arctic foxes Peter Hellström – Ecological effects of red fox removals
2006-11-24	Steering Committee meeting for the SEFALO+ project, Stockholm University.
2006-12-11	Det årliga fjällrävsmötet för lokala människor och samarbetsgrupper i Enontekiö [yerly congress for field workers in Enontekiö, Finland]
2006-12-12	Det årliga fjällrävsmötet för lokala människor och samarbetsgrupper i Utsjoki [yearly congress for field workers in Utsjoki, Finland]
2006-03-07	Meeting with rangers at the county board of Västerbotten. Anders Angerbjörn
2006-03-08	Meeting with rangers at the county board of Västerbotten. Anders Angerbjörn
2006-03-09	Meeting with rangers at the county board of Jämtland. Anders Angerbjörn
2006-03-13	Meeting with rangers at the county board of Jämtland. Anders Angerbjörn
2006-03-15	Meeting with rangers at the county board of Jämtland. Anders Angerbjörn
2006-06-15	Meeting with Mats Almlöf (Sylarna mountain station), Maria Kjellström (Natures best), Anders Angerbjörn, Karin Norén and Peter Hellström.
2006-06-16/18	Workshop for field workers. Helags Fjällstation, Sweden. Seminars about field methods and ethical aspects by Anders Angerbjörn, Karin Norén, Peter Hellström.
2006-09-08	Meeting with the Astrale representative, Camilla Strandberg-Panelius. Stockholm University. Anders Angerbjörn, Karin Norén, Peter Hellström.
2007-04-15	Meeting with rangers at the county board of Jämtland,Västerbotten and Norbotten. Ammarnäs, Västerbotten
2007-06-17	Workshop for field workers. Helags Fjällstation, Sweden. Seminars about field methods and ethical aspect by Anders Angerbjörn, Karin Norén and Peter Hellström.
2007-06-30	Meeting with Maria Kjellström (Natures best) and Tomas Meijer, Järpen, Sweden
2007-08-17	Njllaseminaret på Varangerhalvøya 17-19 august 2007"
2007-10-12	Steering Committee meeting for the SEFALO+ project, Ammarnäs, Sweden.
2008-05-(06-07)	IPY (international polar year) meeting in Ånn, Jämtland, Sweden. Anders Angerbjörn, Karin Norén and Tomas Meijer.
2008-05-13	Meeting with the Astrale representative, Camilla Strandberg-Panelius. Stockholm University. Anders Angerbjörn, Karin Norén, Tomas Meijer
2008-05(14-15)	Final meeting with steering committee and operating group at Tovetorp research station, Sweden.
2008-05-28	Meeting with SEPA at Stockholm university.

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