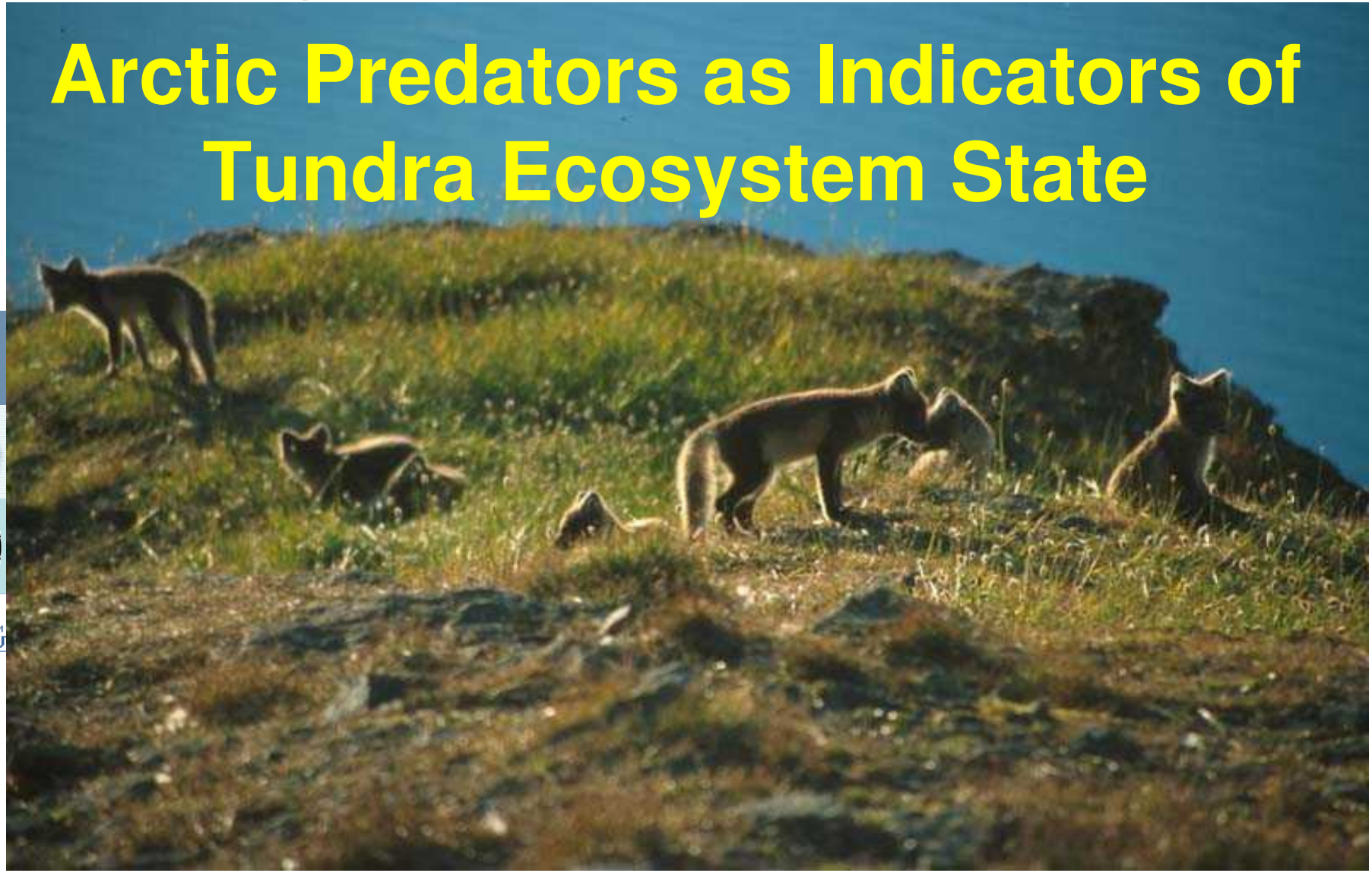
IPY-ARCTIC PREDATORS

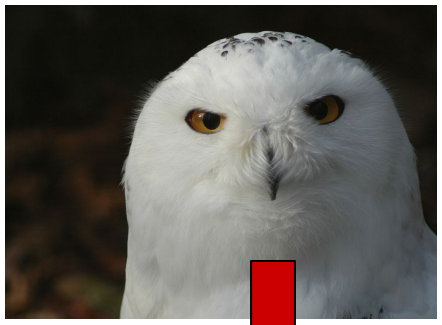
2007 2008 POLARÅRET

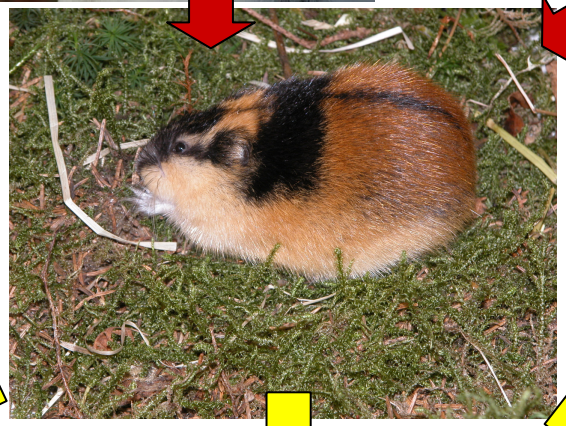
ARCTIC PREDATORS

Arctic Predators as Indicators of Tundra Ecosystem State



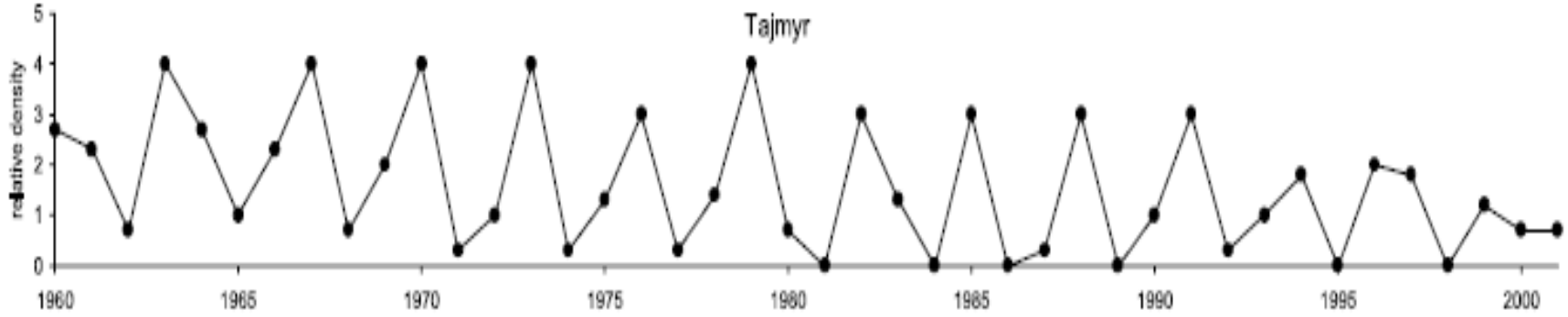
Tundra Ecosystem: interactions predator-prey-vegetation





LEMMING

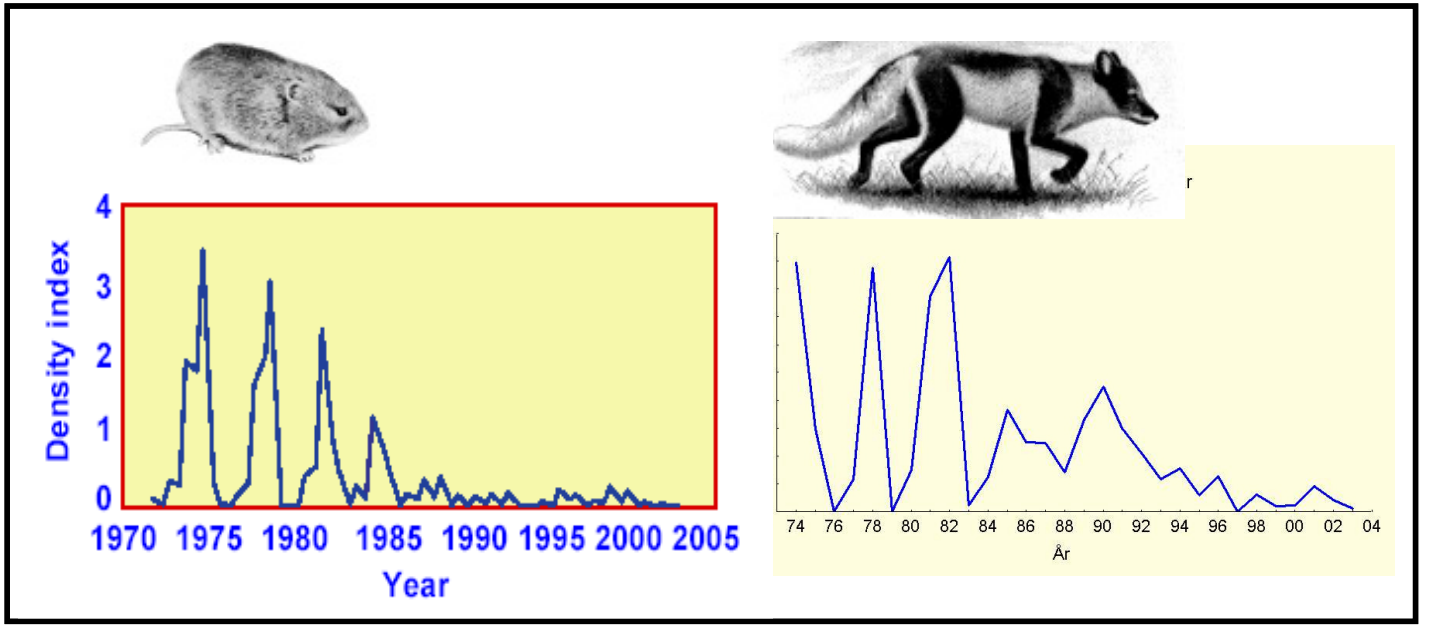
⇨ **Many (but not all) lemming population have multiannual fluctuations**
⇨ **Those are usually periodic (3 to 5-6 years cycles)**
⇨ **They are probably caused by interactions with predators or plants**



Lemmings, Taimyr [Kokorev & Kutsov 2002]

Scientific Questions

- ⇨ Food webs in many parts of the Arctic are influenced by lemming cycles
- ⇨ Climatic changes can modify these cycles, and cycles have become weaker in Fennoscandia in recent years
- ⇨ Changes in lemming dynamics can have large consequences on ecosystem structure and function



Scientific questions

⇨ Specialised tundra predators such as arctic fox and snowy owls are likely to react quickly to change in lemming dynamics, and they are likely to be good sentinels for large structural changes

⇨There is too little quantitative research being done on Arctic ecosystems structure and function

⇨ Indicators need to be adequately tested

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OBJECTIVE

To establish robust monitoring methods for Arctic predators, in particular the Arctic fox, that can be used as indicators of the tundra ecosystem condition

Main possible causes of change:

Climate change

Invasive species (e.g., Red fox)

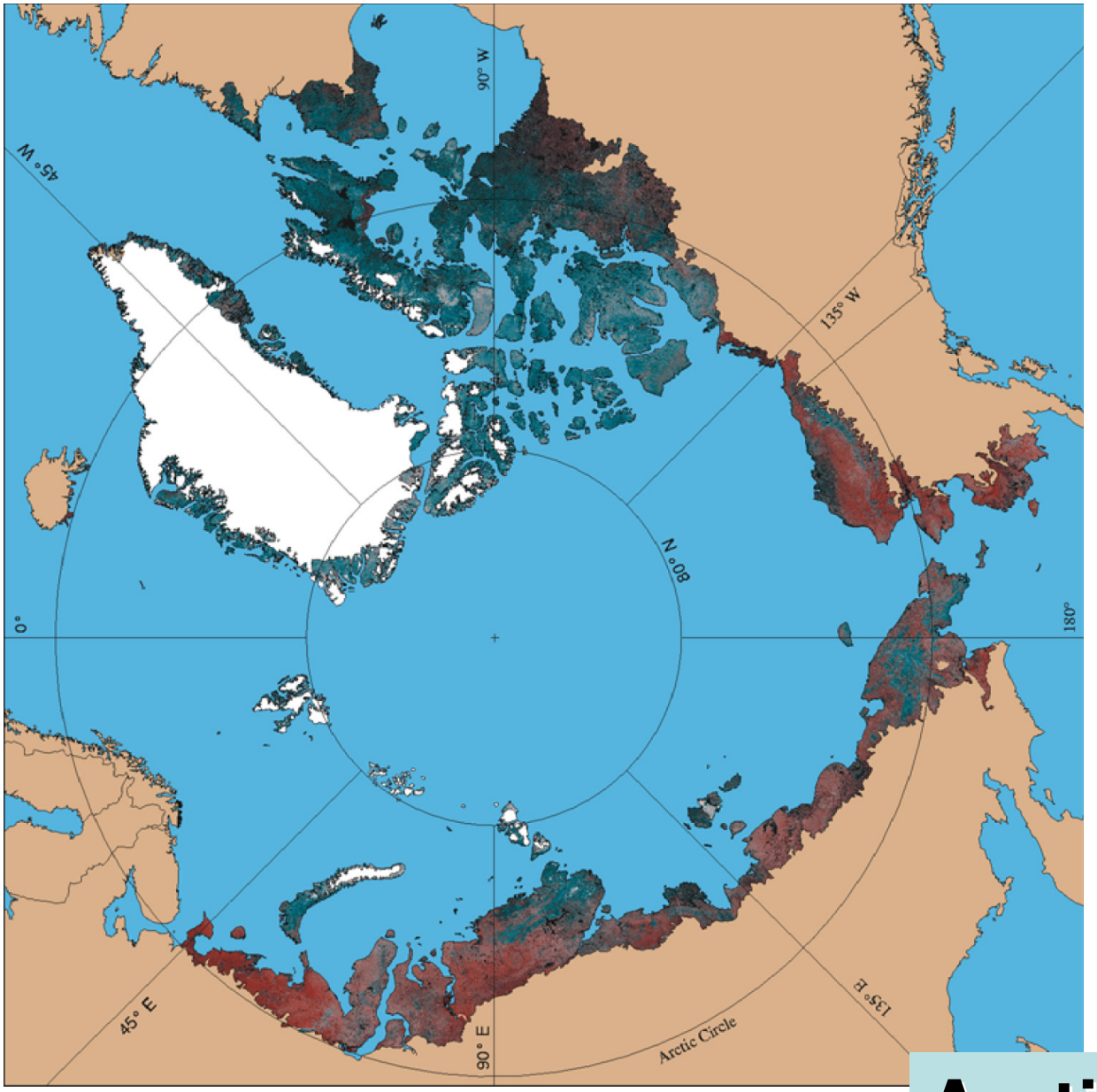
Why is the Arctic fox a good indicator?

The only mammalian predator exclusive to the Arctic tundra, where it is omnipresent and a key predator in several aspects

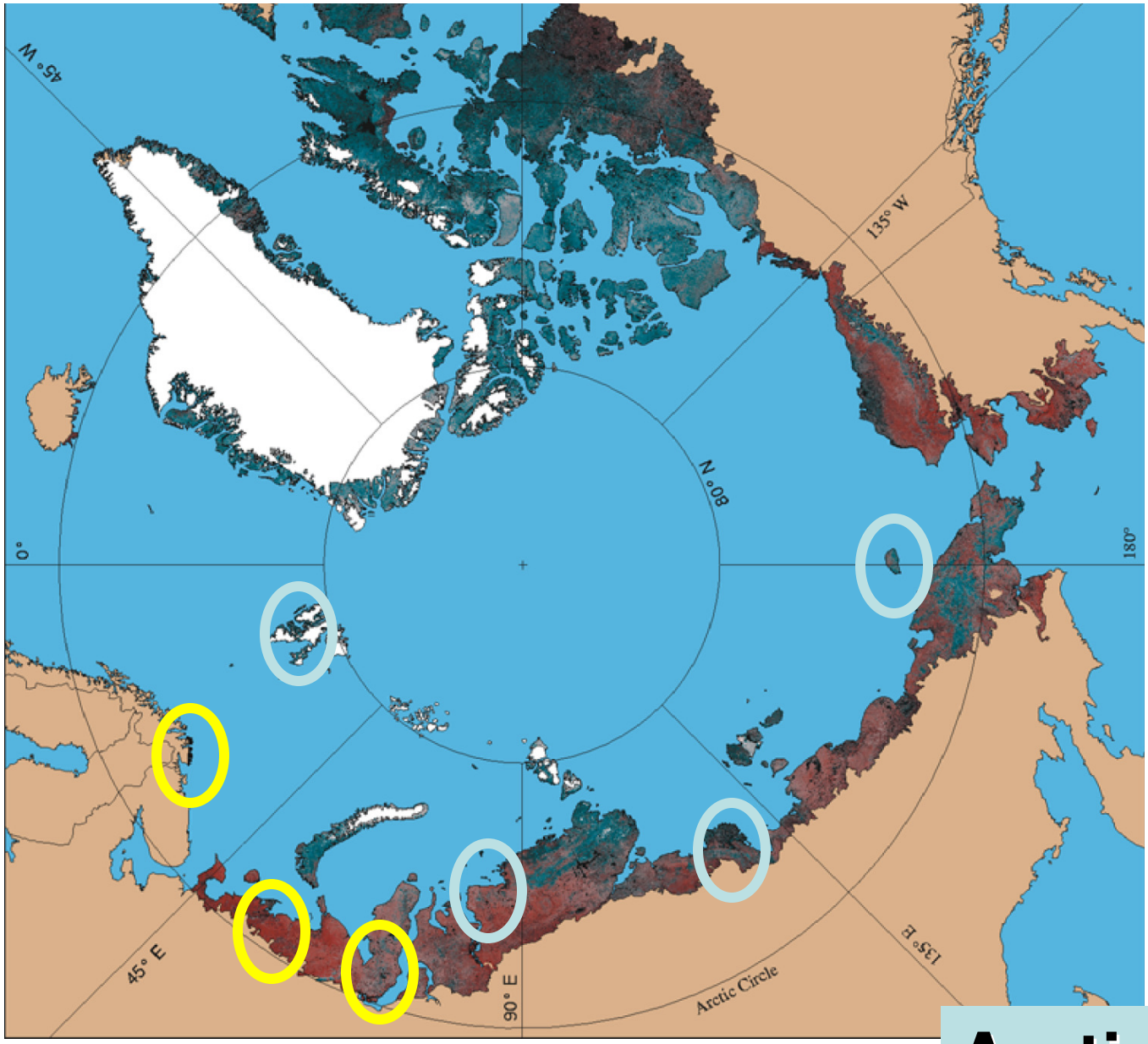
The Arctic fox often depends on lemmings for reproduction (but not always); it can be quite opportunistic (Eva Fuglei):
⇨ geese, waders, voles, carcasses (dead reindeer)
⇨ marine food webs (seals [polar bears], fish…)

⇨ fox diet and its trophic position can be treated as a "blue print" of the food web structure (Nicolas Lecomte)

⇨ the retreat of the arctic fox from the southern margin of the tundra biome, was one of the first reported biotic indicators of global change in northern areas (Anders Angerbjörn)



Arctic tundra Vegetation map



Intensive Sites

Jamal
Nenetskii
Varanger

Arctic tundra Vegetation map

Collaboration between Norway and Russia Funded by the Norwegian Research Council 2007-2010 (field work 2007-08)

Nigel G. Yoccoz, Rolf A. Ims, Univ Tromsø
Harald Steen, Ronny Aanes, Eva Fuglei, Norwegian Polar Institute
Dorothée Ehrich, Nicolas Lecomte, Univ Tromsø

Andrej Glotov, Director of the Nenetski Nature Reserve, Iskateley, Nenetski.

Aleksandr Sokolov, Deputy director of the Ecological Research Station of the Institute of Plant & Animal Ecology, Ural Division Russian Academy of Sciences, Labytnangi.

Vladimir Podznyakov, Deputy director for science, International Biological Station "Lena-Nordenskjöld", Ministry for Nature Protection of Sakha Republic (Yakutia).

Irina Menyushina, Nikita Ovsyannikov, Senior research scientist, Wrangel Island State Nature Reserve.

Bart Ebbinge, Senior researcher at the Alterra Research Center, Netherlands.
Taimyr: Medusa Bay, Russia.

IPY-ARCTIC PREDATORS

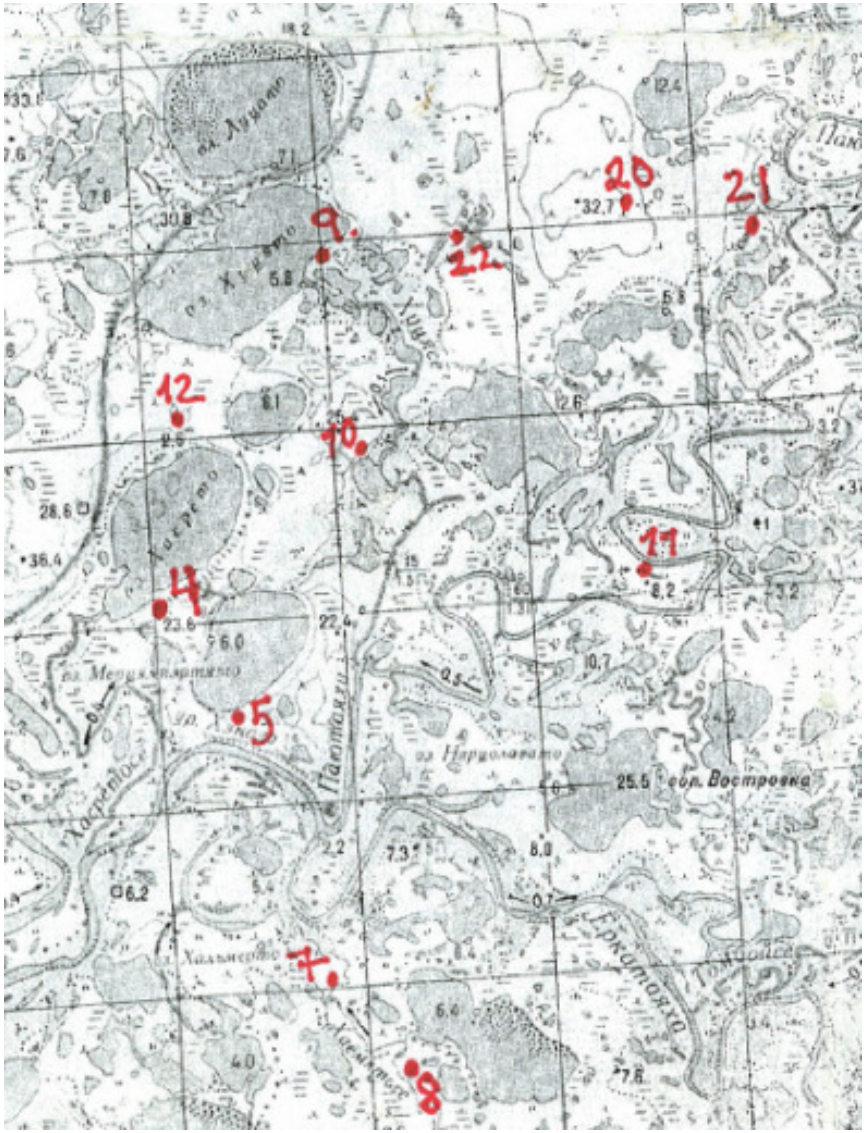
Students

Ivan Pokrovsky
Ph.D. Moscow State University
Predator community - prey interactions

Anna Kosorukova
Ph.D. Moscow State University
Arctic fox demography and dynamics

Lilia Doronina
Master, MSU
Herbivores feces (hare, grouse, reindeer, voles)

Gunnhild Skostad
Master, Univ of Tromsø.
Vegetation



Arctic fox

Number of active nests
Number of young
feces, feathers


Rough-legged Buzzard
Nests, young, pellets, feathers

Herbivores faeces

Vegetation: estimate of biomass

Tunnels – mustelids and small mammals

Trapping small mammals

Automatic cameras

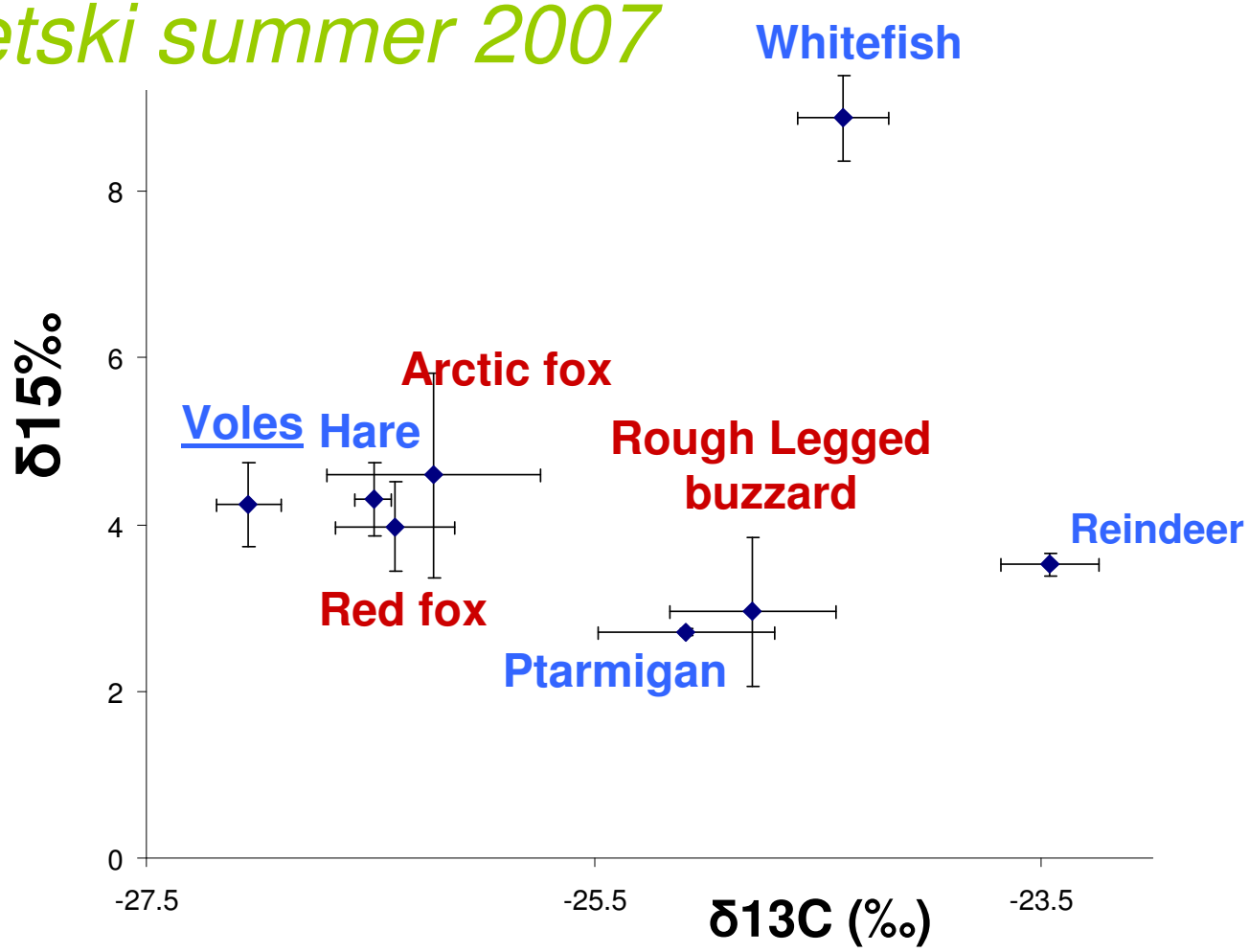
Finnmark, Spitsbergen, Nenetskii, Jamal

Stable Isotopes, on **a large scale (circumpolar)**

Analyses of bones, liver, muscles, feathers, eggs, blood

⇨ Detailed studies of diet
How important are lemmings during the reproductive period and the winter ?
How different is the diet of different predator species in a given year ?

Nenetski summer 2007



Carbon and nitrogen isotopic signatures of the terrestrial trophic system in Nenetski, 2007 (mean ± SE). The δ13C et δ15N for predators tissues are corrected for fractionation.

Communication, education and perspectives

- Scientific publications
- Popular presentations
- Web site with field work description, pictures, results etc. (se http://www.arctic-predators.uit.no)
- Knowledge that can be used to manage Arctic fox populations
- Education: building the link between Russia and Norway
  - 2 Russian PhD students, 50% in Russia and 50% in Norway
  - 1 Russian and 1 Norwegian master students

- <u>Long-term collaboration between our two countries</u>

2007 2008
POLARARET