

# Yamal EcoSystems – monitoring terrestrial ecosystems of Yamal peninsula under changing climate and human impact

Aleksandr Sokolov, Dorothee Ehrich,  
Natalia Sokolova, Ivan Fufachev



750 000 sq.km  
520 000 people  
650 000 reindeers



Yamal-Nenets Autonomous District



# Arctic research station

Institute of plant and animal ecology

Ural branch

Russian academy of sciences





Arctic research station,  
Labyntatngi

- situated in forest-tundra zone
  - Taiga zone to the South
  - Tundra zone to the North
- Nearby:
- Polar Ural mountains
  - Lower Ob' delta



Different geographic zones – different species

Rather good logistic

= good start point for different research groups

Image © 2006 NASA  
Image © 2006 TerraMetrics

Google



## Main aims of the Station today:

1. Logistic base for core Institute and other research groups
2. Own staff of researchers (4 PhD at the moment)  
with their own research projects

Ship “Zoolog”  
Crew – 3 people  
Passengers – up to 6  
Autonomous – 3-4 weeks





# 6 wheel-drive “URAL”

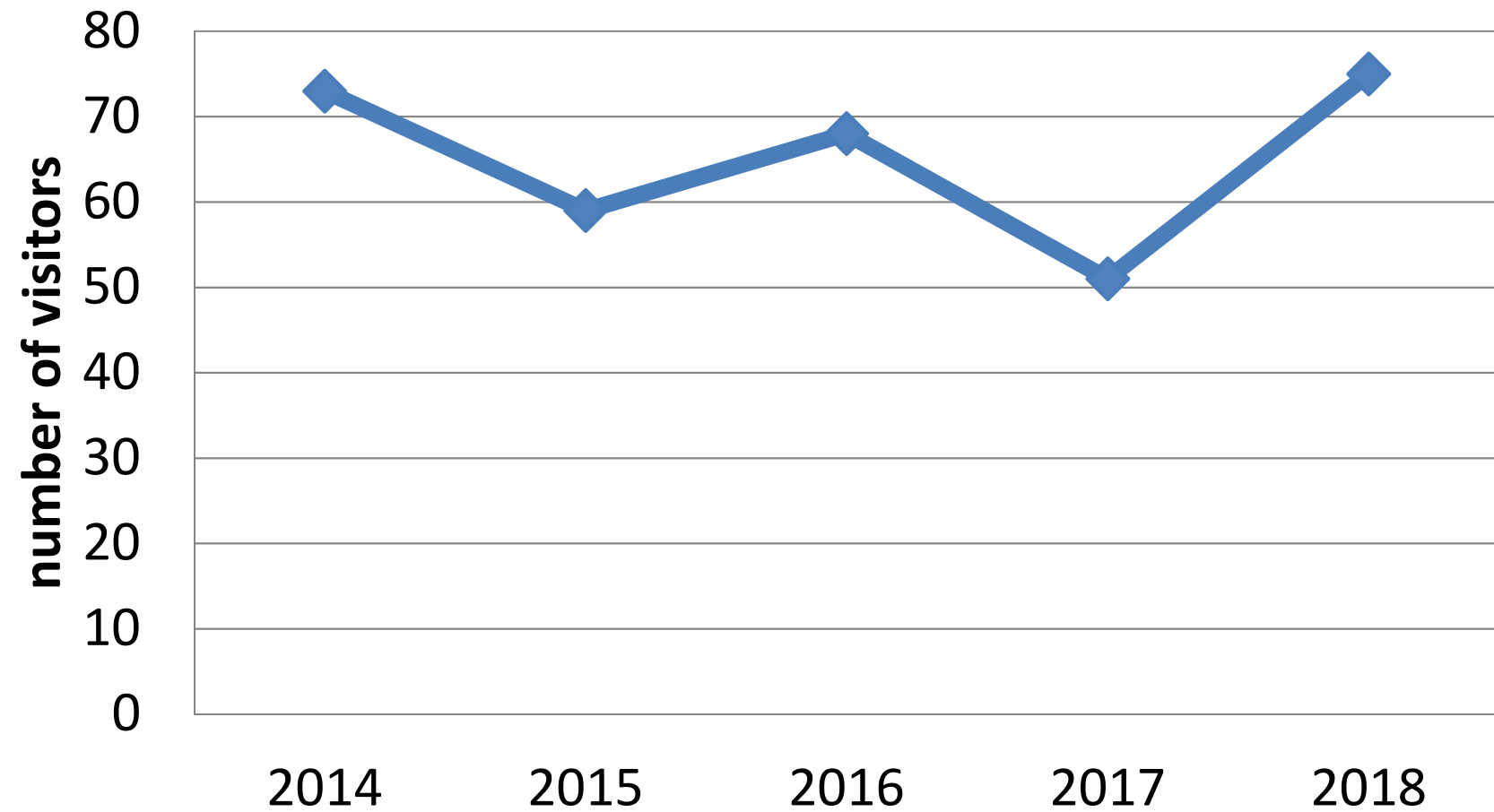


6 wheel-drive “TRECOT” with low-pressure wheels





# Arctic research station researchers visitors



Yamal EcoSystems (**YaES**) –  
study terrestrial tundra ecosystems  
along Yamal Peninsula (Russia)

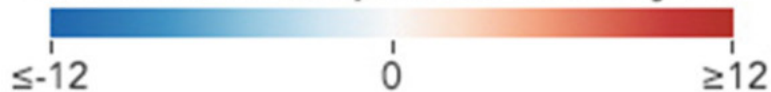




# Drivers of change: climate change

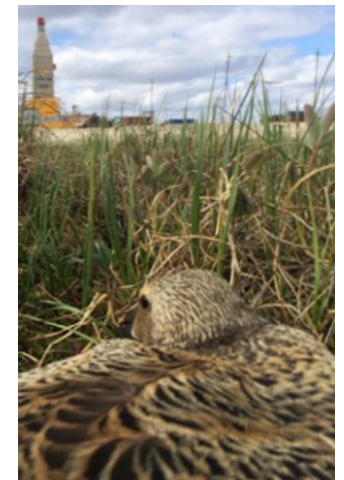
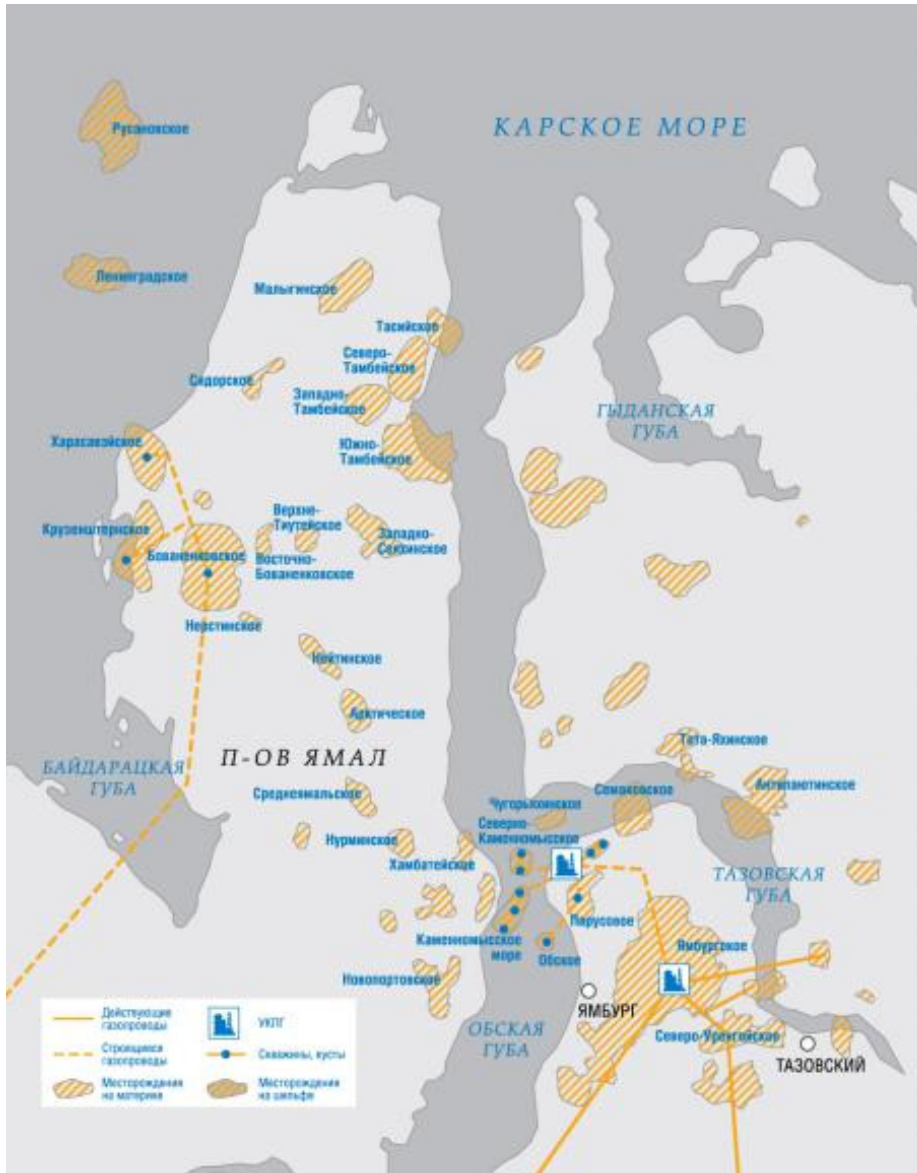
NASA: July 20-27, 2016

Land Surface Temperature Anomaly (°C)



# Drivers of change: fast industrial development

- Rich gas and oil fields – more than 80% of whole Russian gas, more than 15% of whole Russian oil





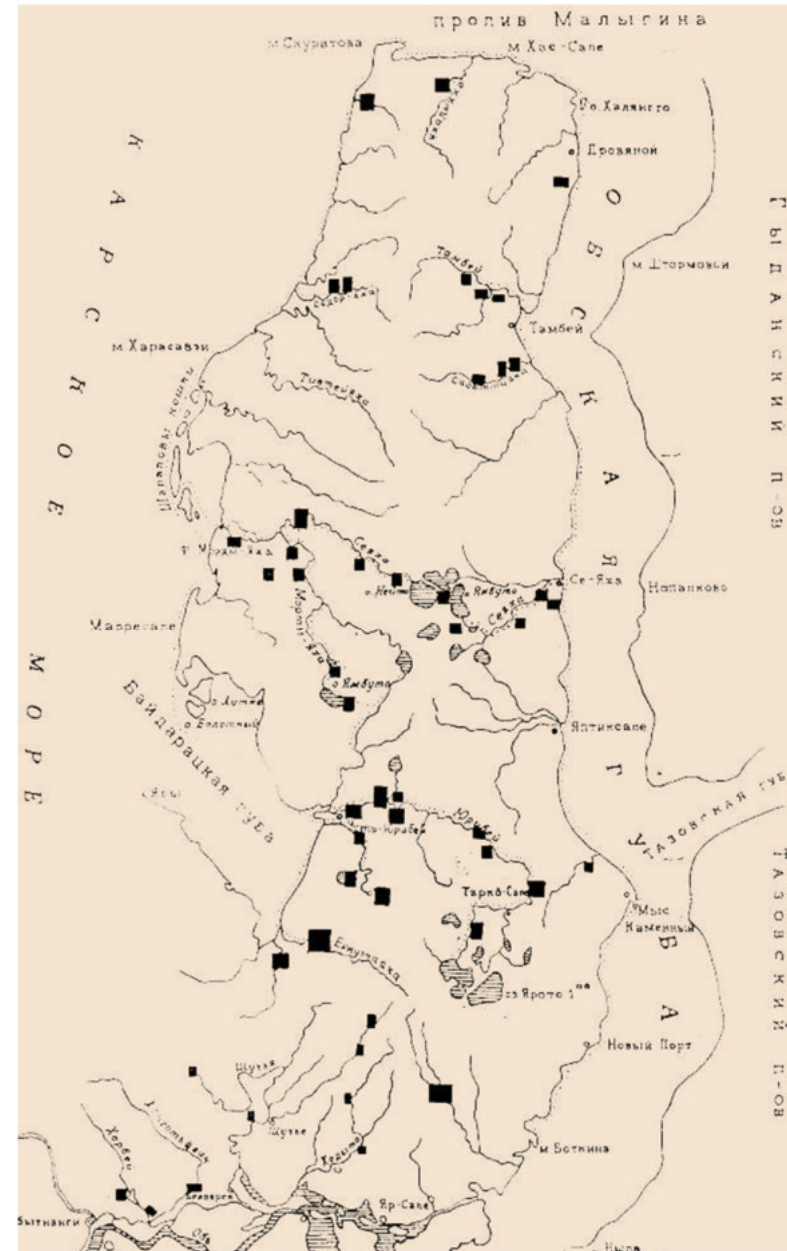
# Drivers of change: reindeer herding



- More than 40 000 indigenous people (growing).  
50 % of them are nomads – reindeer herders.  
600-700 000 of reindeers





## Long-term data (1950th-...)

- Biodiversity and abundance of birds, mammals, fish, plants by the Institute and Station researchers

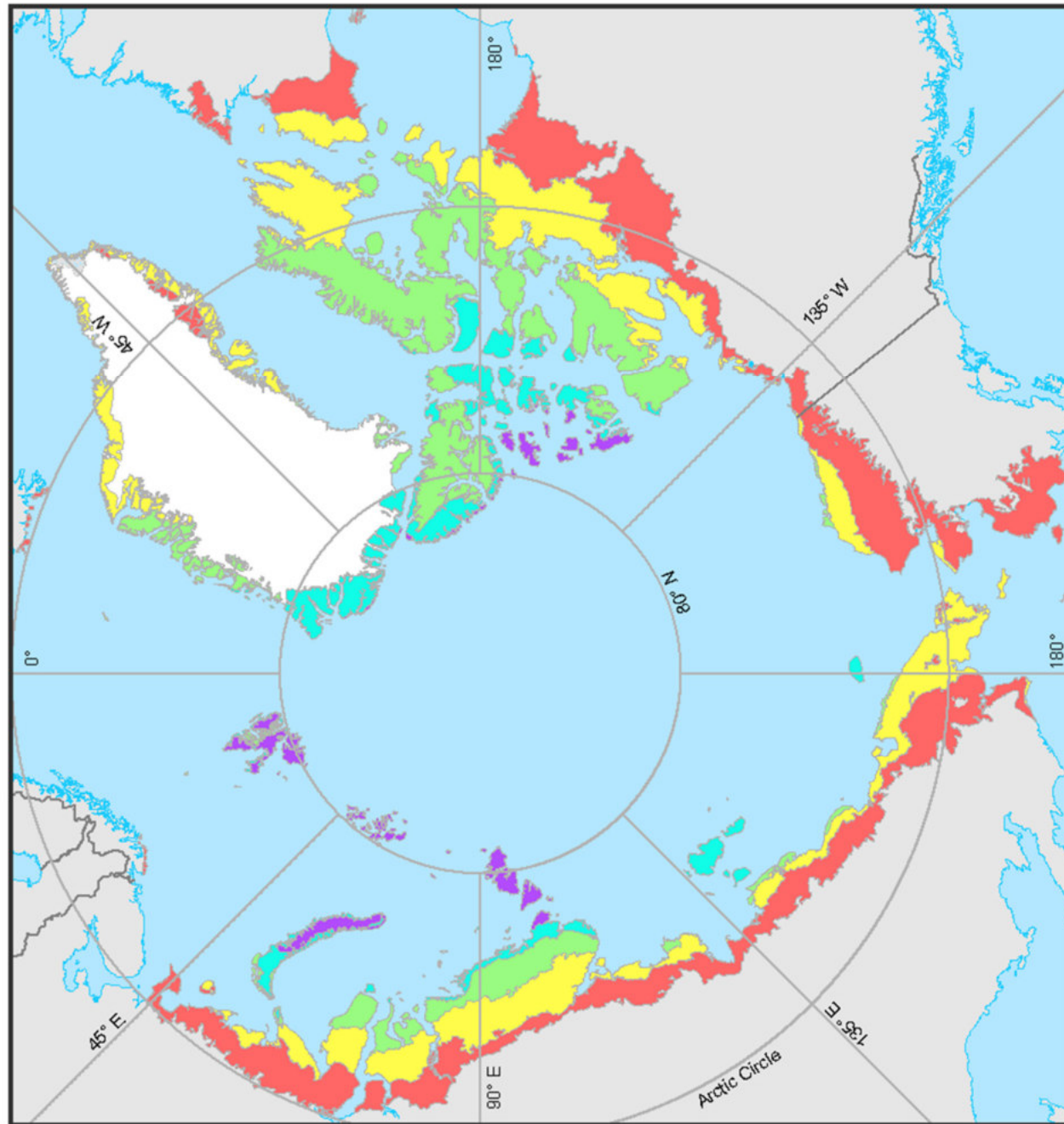


## Uniqueness of Yamal 2: **logistic** (probably the best in Russian Arctic)



-  Railway
-  Helicopters regular flights
-  Airplanes daily flights (Moscow)
-  Building railway





Bioclimatic subzones CAVM team, 2003

## Uniqueness of Yamal 3: **geography**



We aim to **study reaction of terrestrial ecosystems under drivers of change in different subzones**

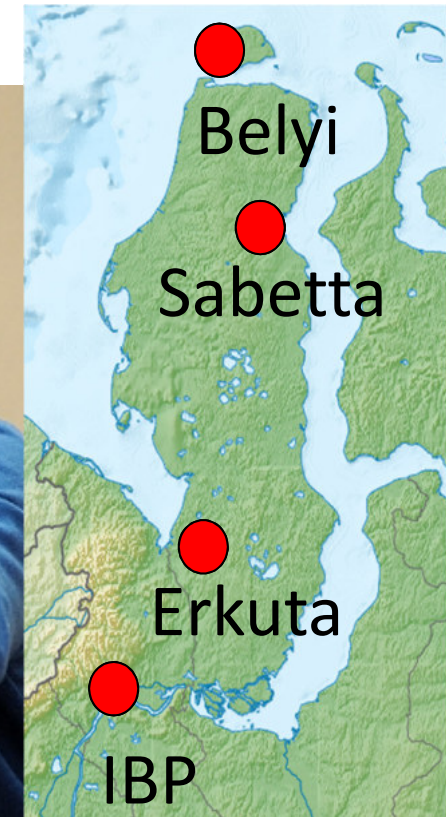


- Uninterrupted latitudinal gradient across different tundra bioclimatic subzones of **similar width and with similar relief**

Bioclimatic subzones CAVM team, 2003



- Governor of Yamal support the idea of creation of latitudinal gradient of research stations - 2014



- Modern longitudinal transect of research stations
- IBP – 1960-th, 2011-ongoing
- Erkuta 1989, 1998 - ongoing
- Sabetta 1980-th, 2014-ongoing
- Belyi– 2015-2017, ?





# WHO we are?

Group of researchers, mostly biologists.

The PI's are:

- **Natalya and Aleksandr Sokolovs'** – ARS, Labytnangi; ARC, Salekhard
- **Dorothee Ehrich** – UiT – Arctic University of Norway
- **Ivan Fufachev** – ARS, Labytnangi
- **Olivier Gilg** – GREA, FPI, Univ. of Burgundy (France)
- **Olga Pokrovskaya** – Marine Research Center of Moscow State University
- **Vasiliy Sokolov** – IPAE, Ekaterinburg
- **Andrew Dixon** – Emirates Falconers' Club, UAE







+ many participants:  
students and  
professors;  
**Nenets** – first of all the  
Laptander family





# Erkuta field research station

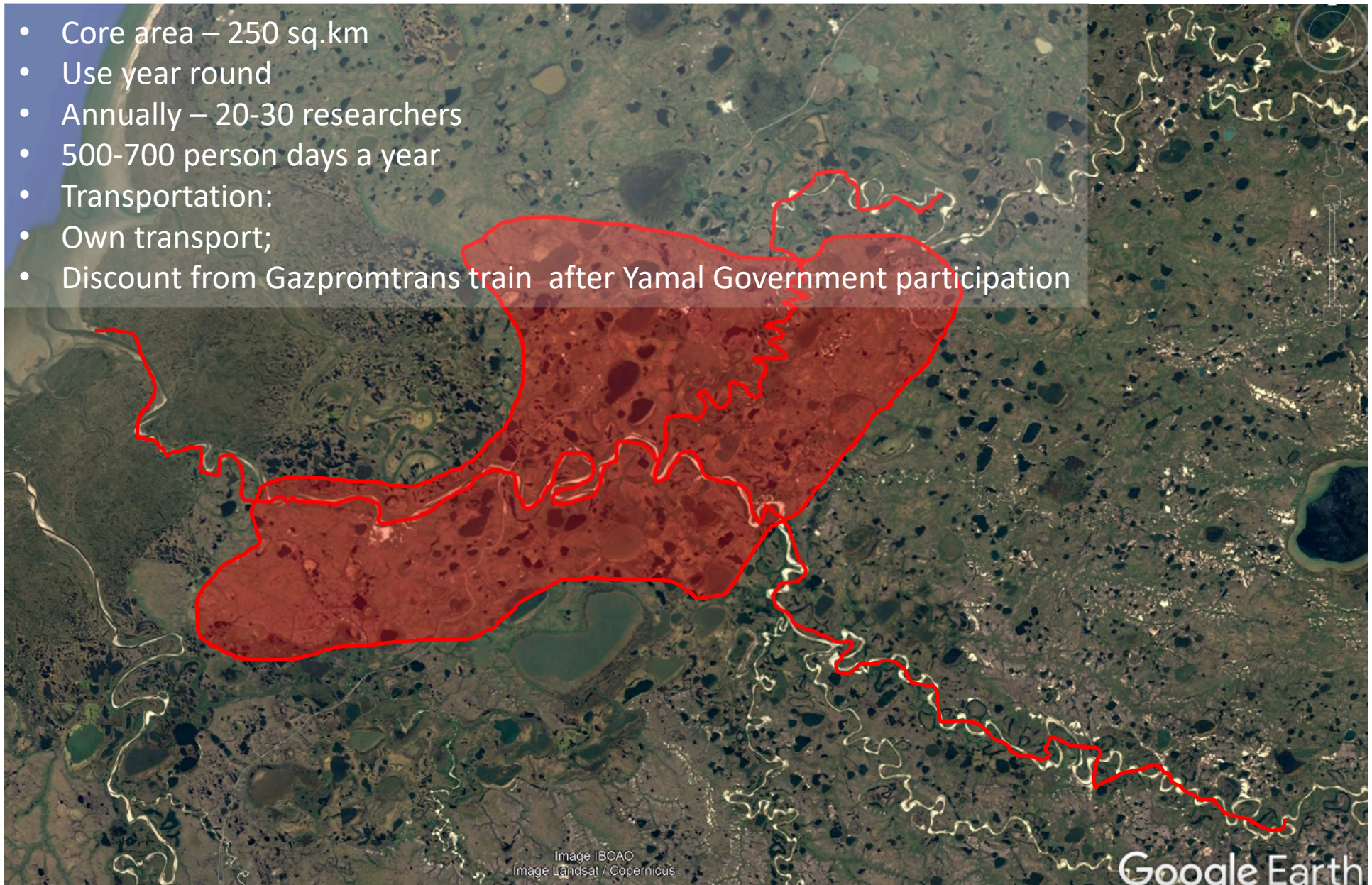
- Start annual expeditions in 1999
- Since 2007 (IPY) – wide international collaboration
- Logistic and funding support from Yamal Government (2014-ongoing)
- 5 permanent containers (3 for living and 2 storage). Solar station power supply
- Start meteostation (HOBO) – March 2017
- Measuring permafrost (CALM protocol) start in 2017
- Close to ZERO emission
- Belonging to Yamal government under scientific supervising of Arctic research station





# Erkuta study area

- Core area – 250 sq.km
- Use year round
- Annually – 20-30 researchers
- 500-700 person days a year
- Transportation:
- Own transport;
- Discount from Gazpromtrans train after Yamal Government participation



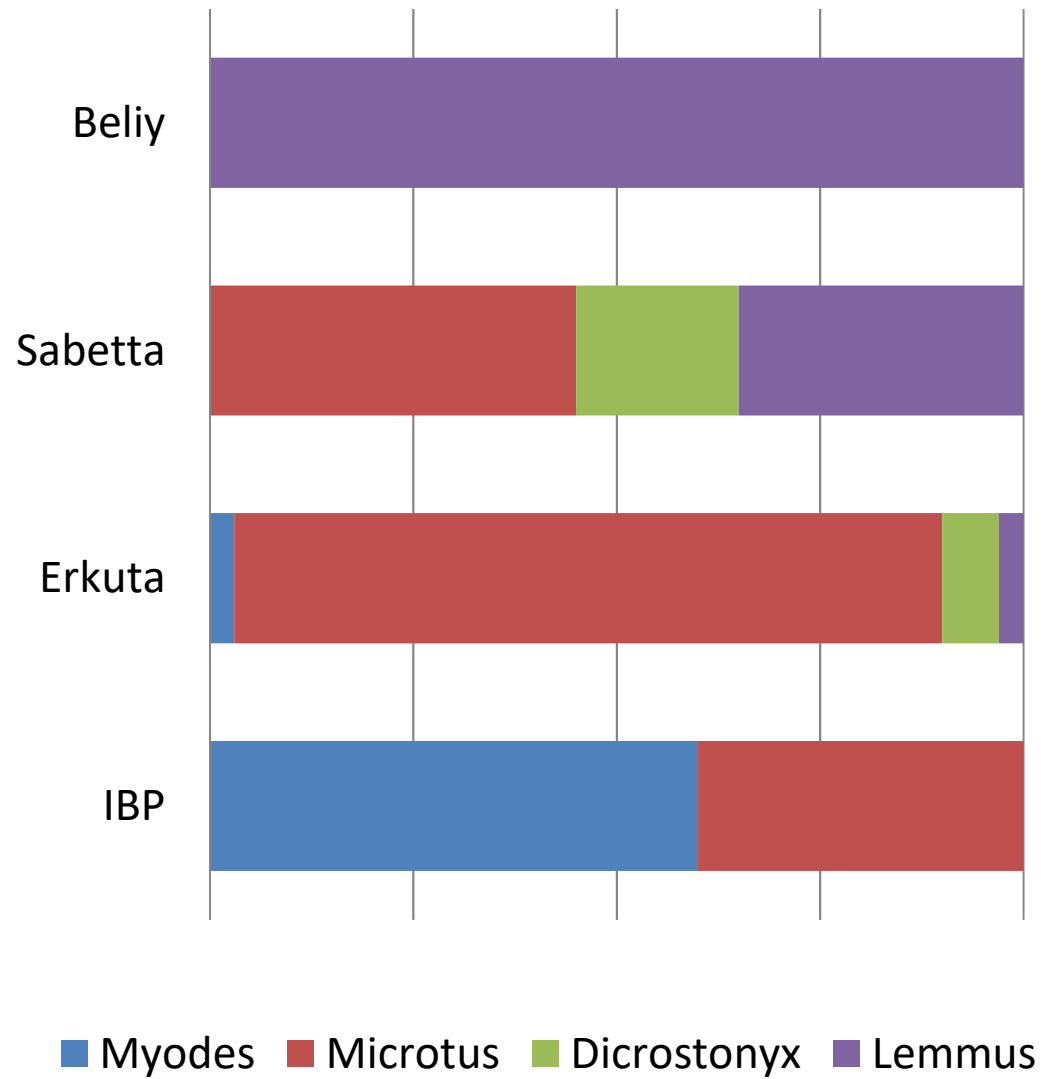


# Sabetta field research station

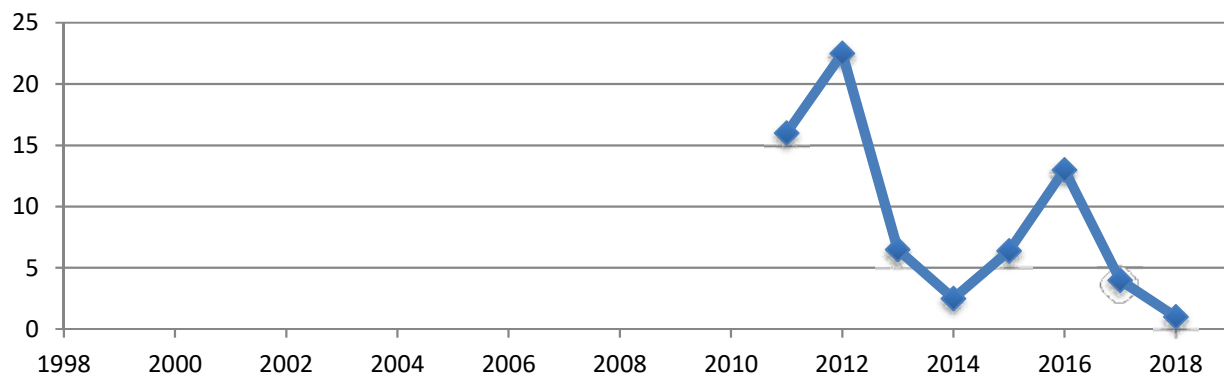
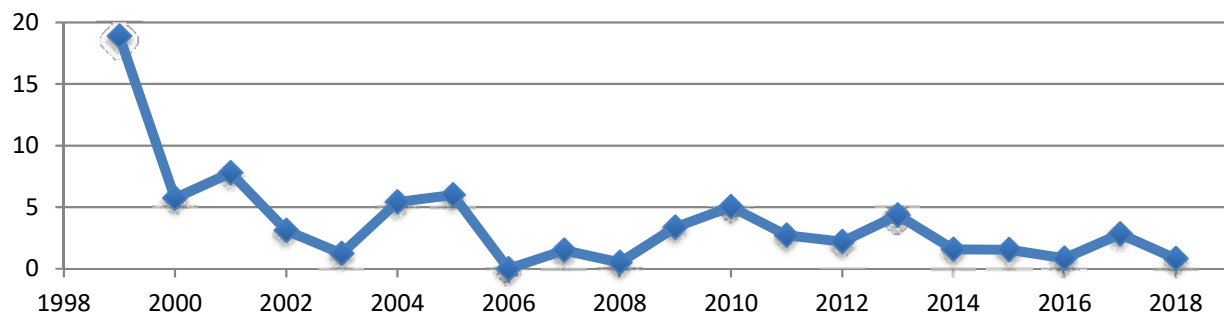
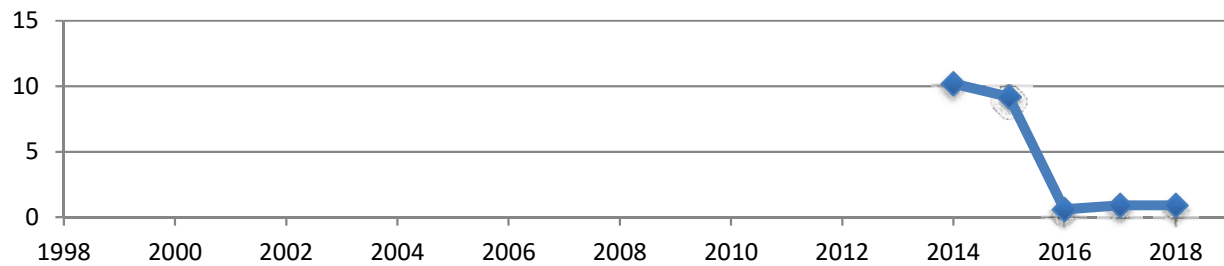
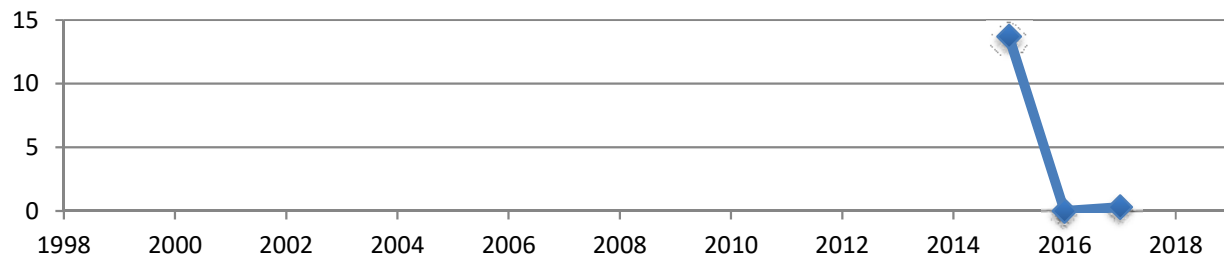
- Start annual expeditions in 2012
- International since 2014
- Logistic and funding support from “Yamal LNG” and Yamal Government (2014-ongoing)
- Permanent container (combine lab and living).
- Solar station power supply since 2018
- Close to ZERO emission
- Belonging to Yamal government under scientific supervising of Arctic research station (Natalia Sokolova)



# Diversity of small rodents in latitudinal gradient



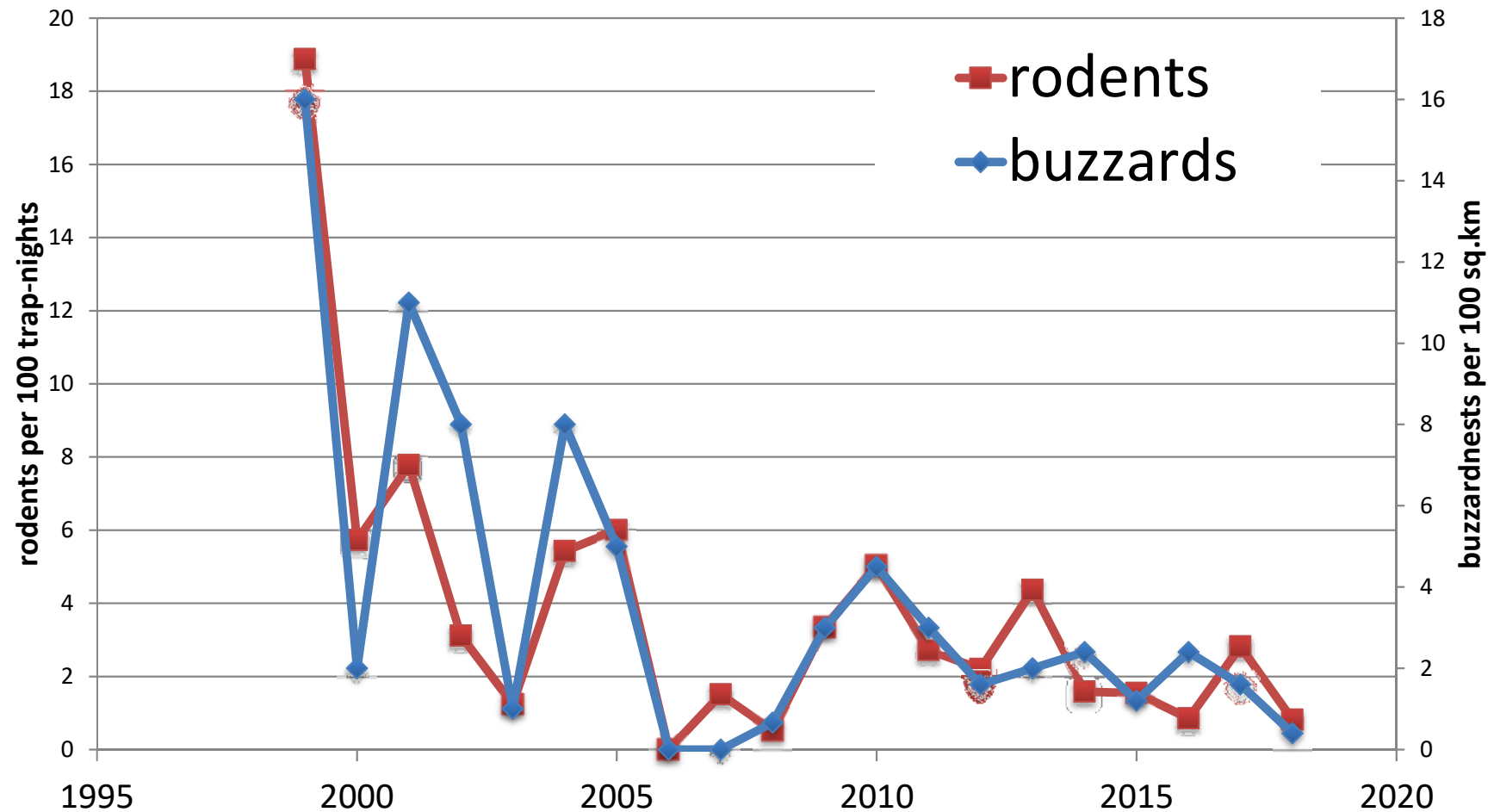




Rodents abundance



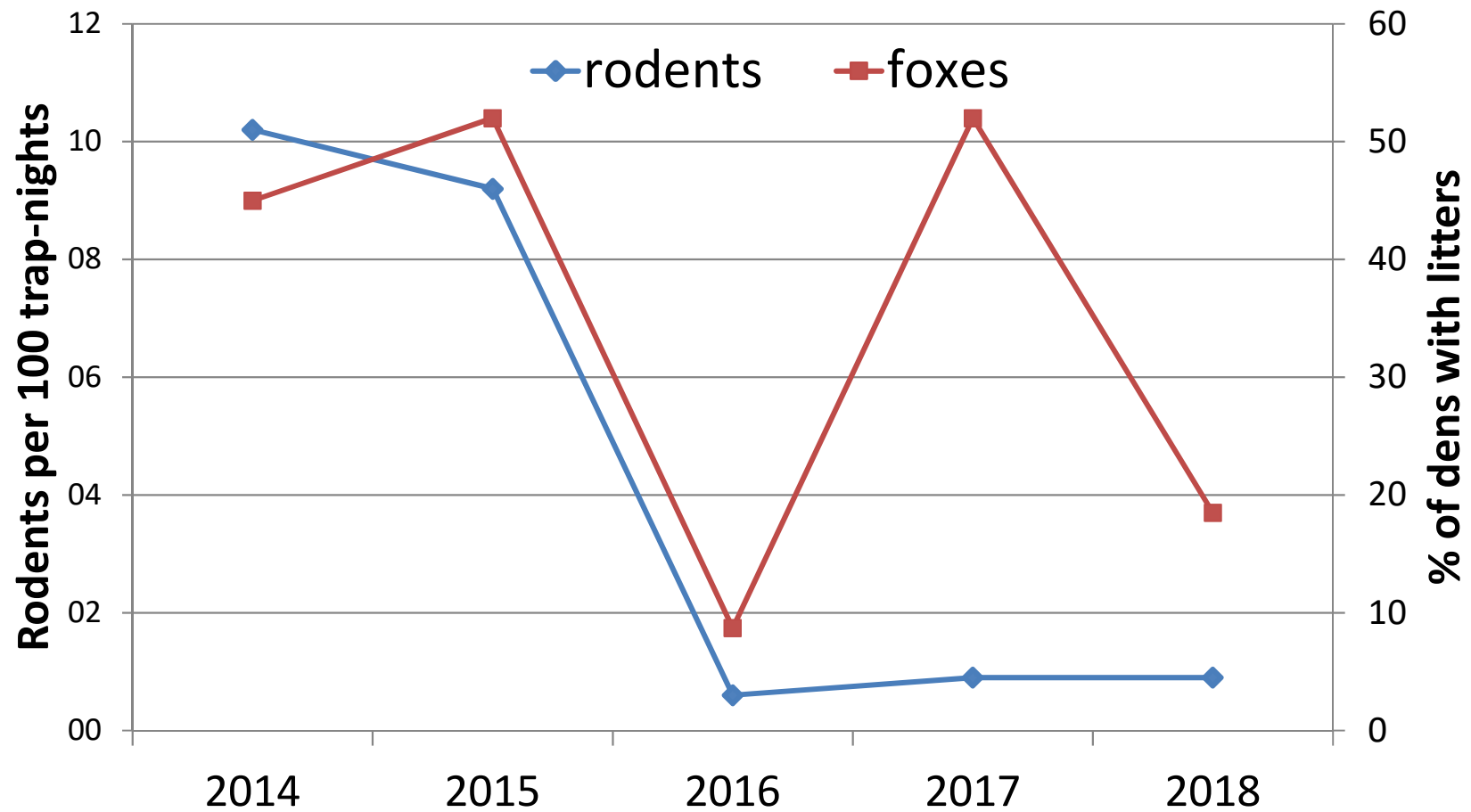
# Erkuta



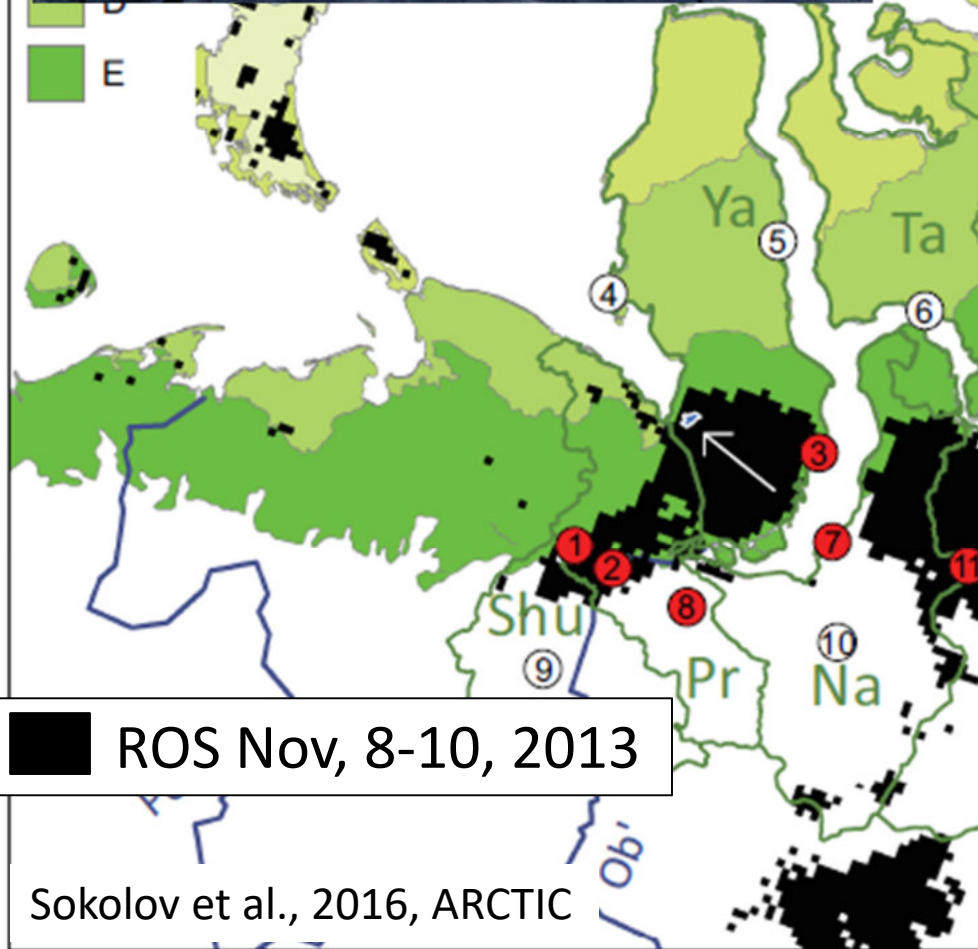




# Sabetta

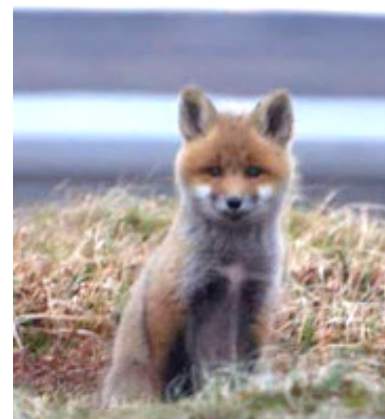


Erkuta, December 2013

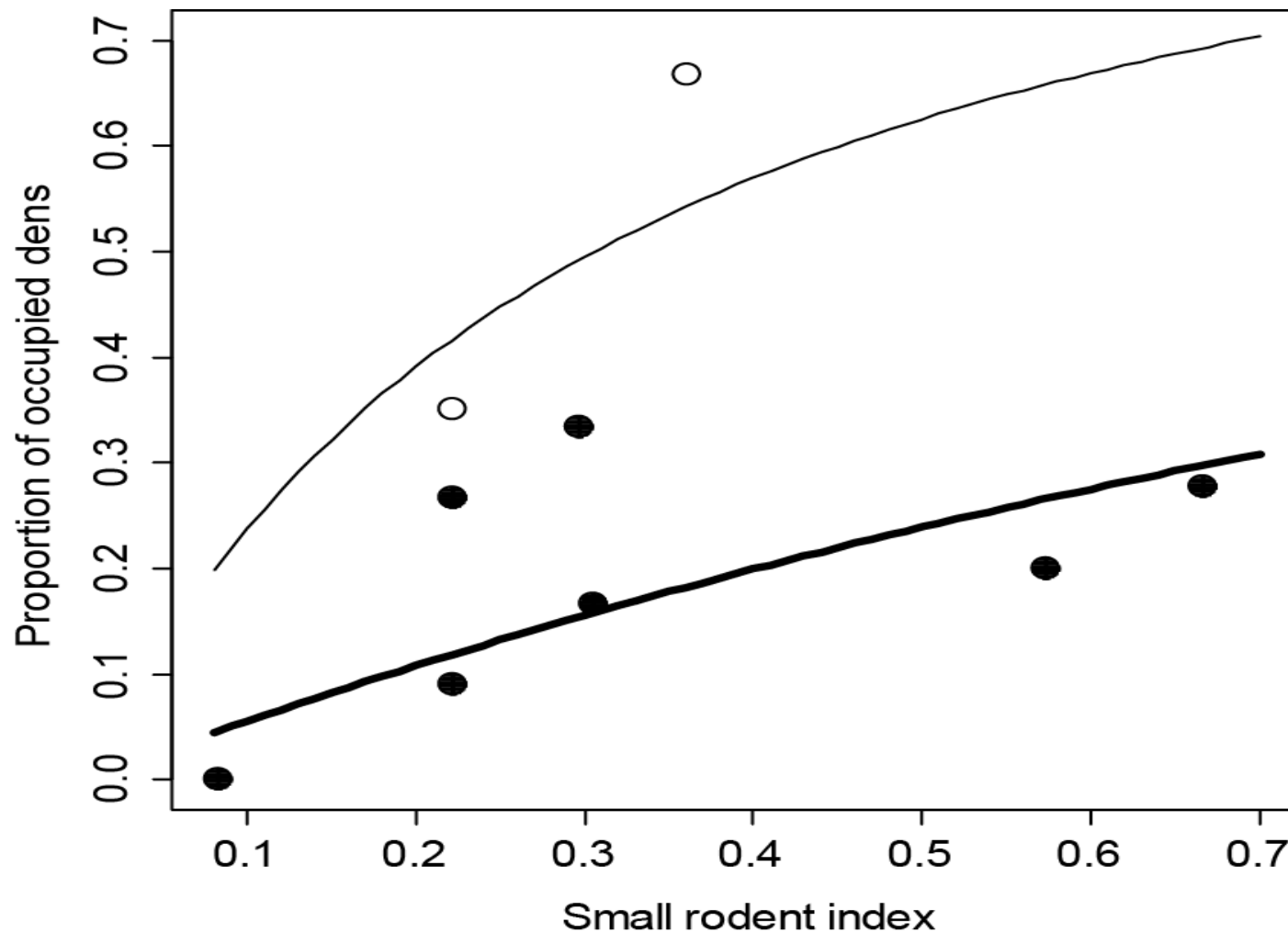


Sokolov et al., 2016, ARCTIC

Officials – 100 000 reindeers die  
Ca. 10% of all herd







Proportion of active arctic fox dens in relation to the small rodent trapping index in June for years with and without high availability of reindeer carcasses. Dots show observed values for the years 2007 to 2015 and lines show the relationships estimated from a generalized linear mixed model (additive effect of small rodents and reindeer on the logit scale).

(Ehrich et al., 2017 BMC Ecology)

# Arctic foxes dominate (still) the predator guild in low arctic Yamal, Russia







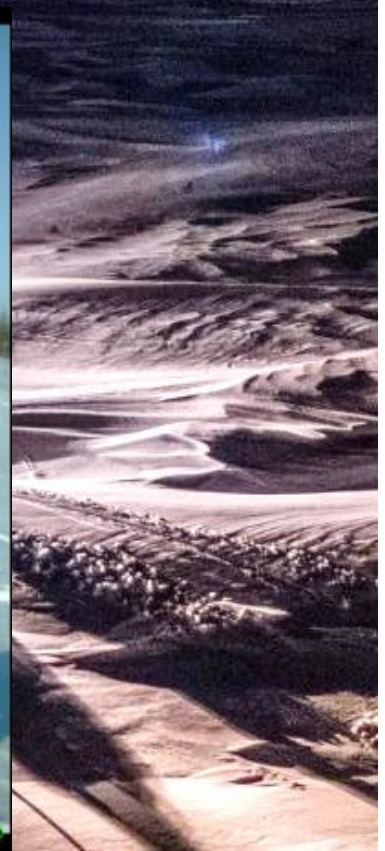
2018-03-11 2:35:00 PM T

0 -21°C



CAM 2

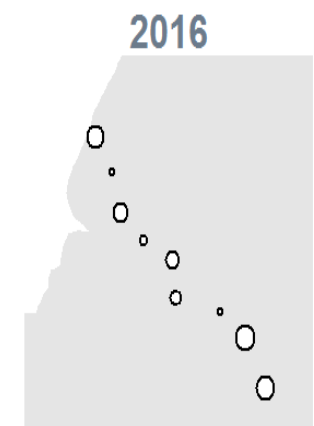
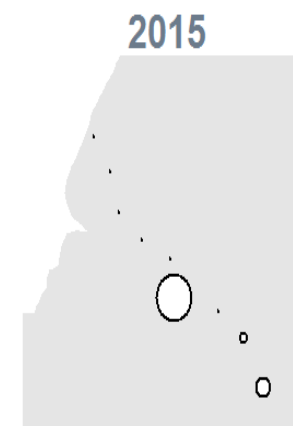
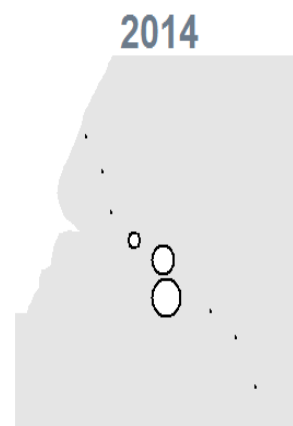
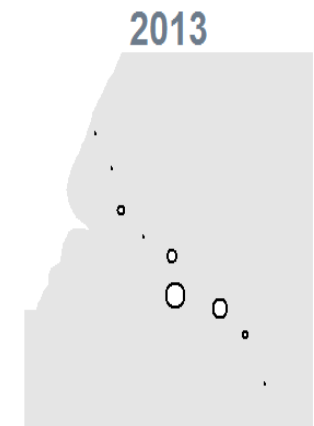
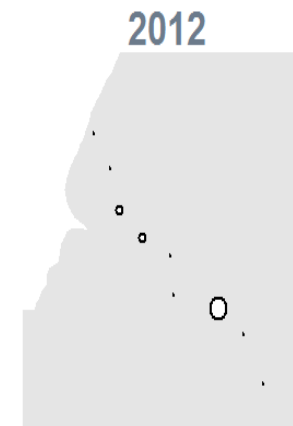
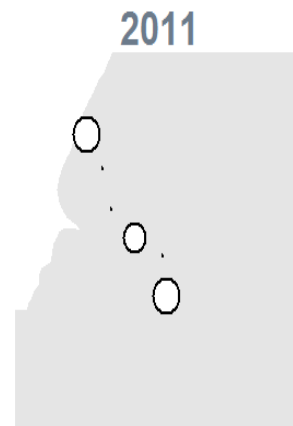
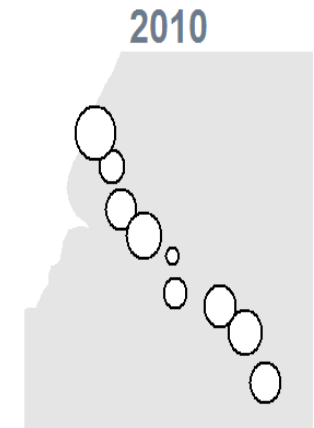
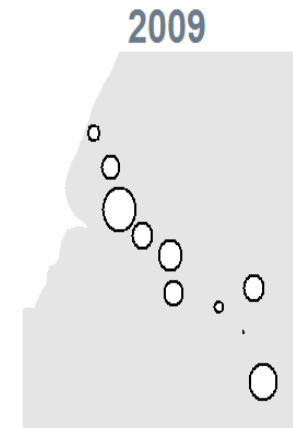
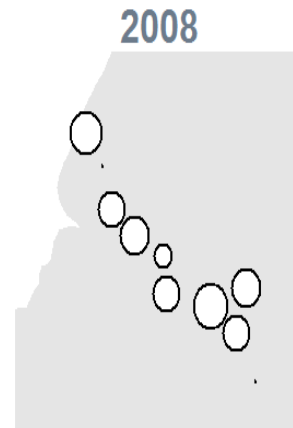
RECONYX



## Proportion of days with the AF

Tendency to decline?

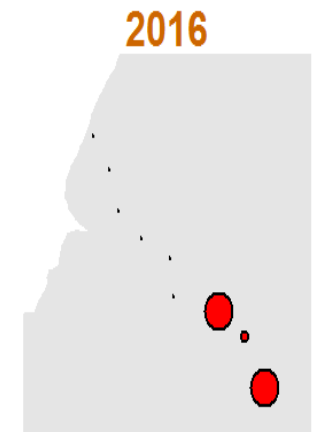
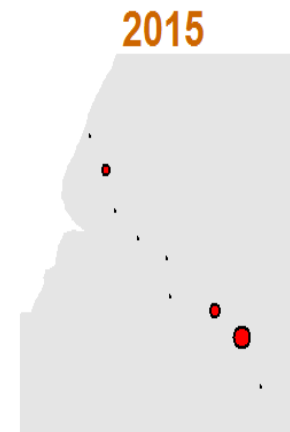
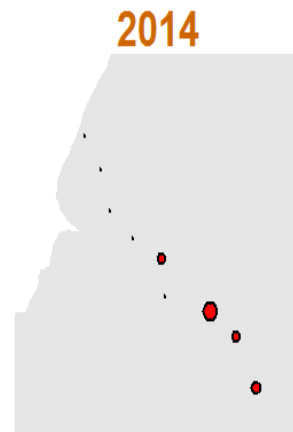
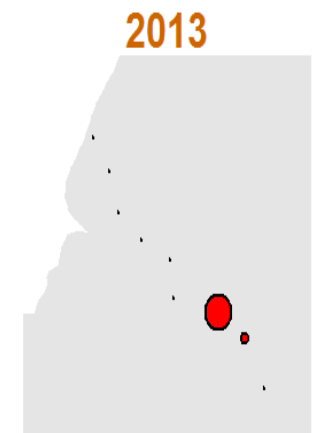
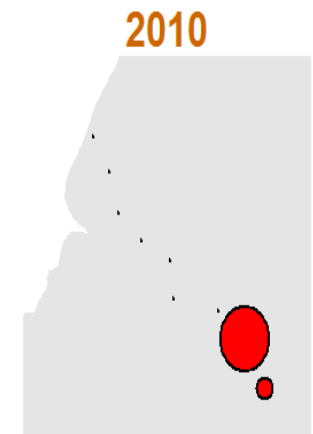
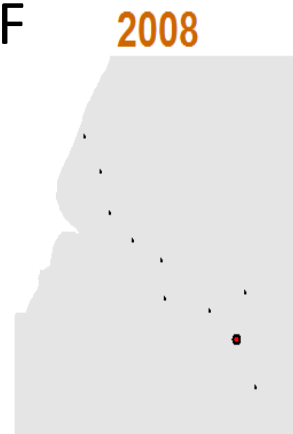
No clear effect of sea or road?





Proportion of days with the RF

Tendency to increase?  
Effect of sea/shrubs?



**12+6 sites  
5 countries  
3 regional  
gradients**

**« Interactions Working Group »**  
(2016-2019+)

**5 protocols:**

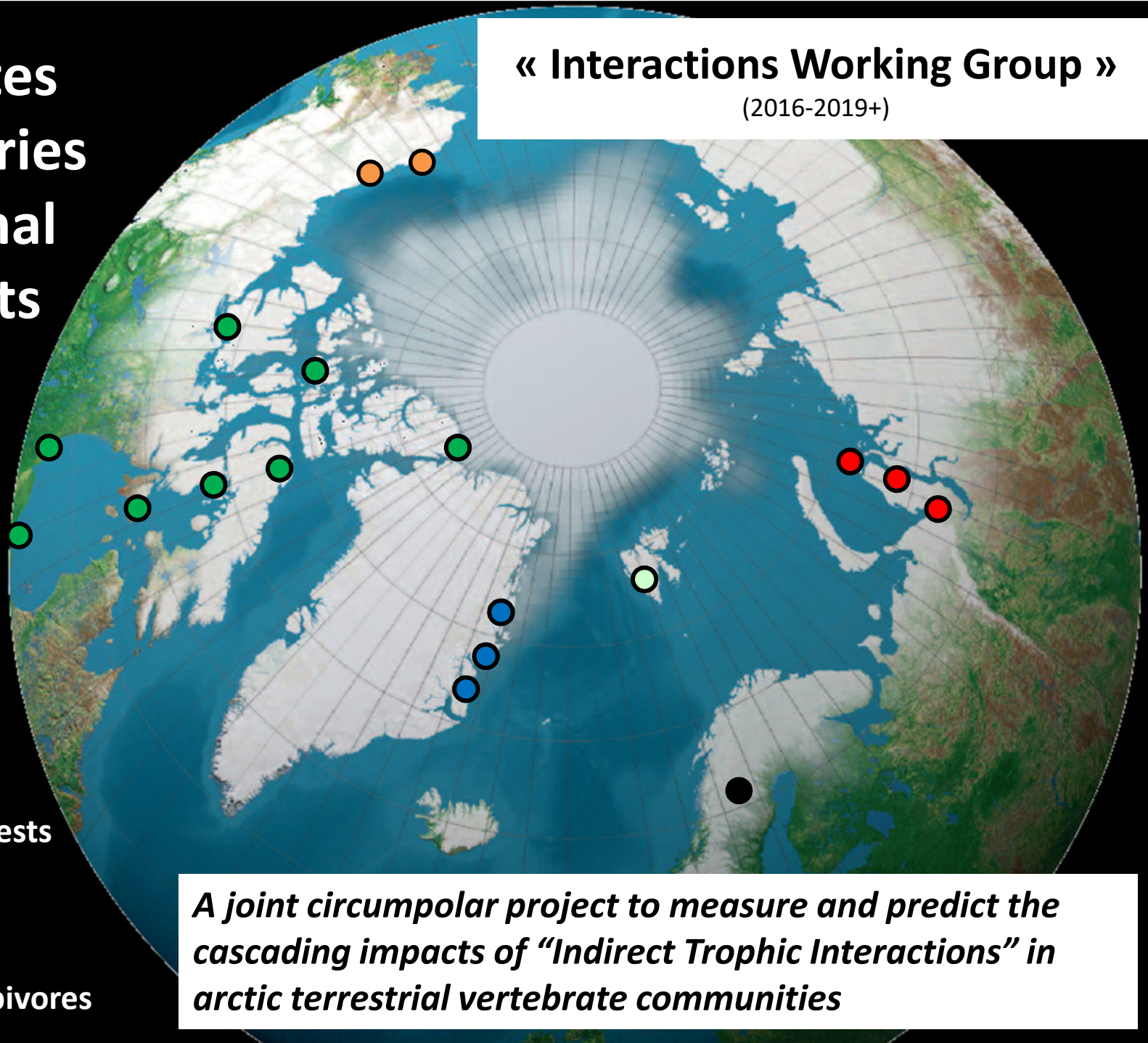
**P1 Artificial nests**

**P2 Real nests**

**P3 Predators**

**P4 Rodents**

**P5 Other herbivores**



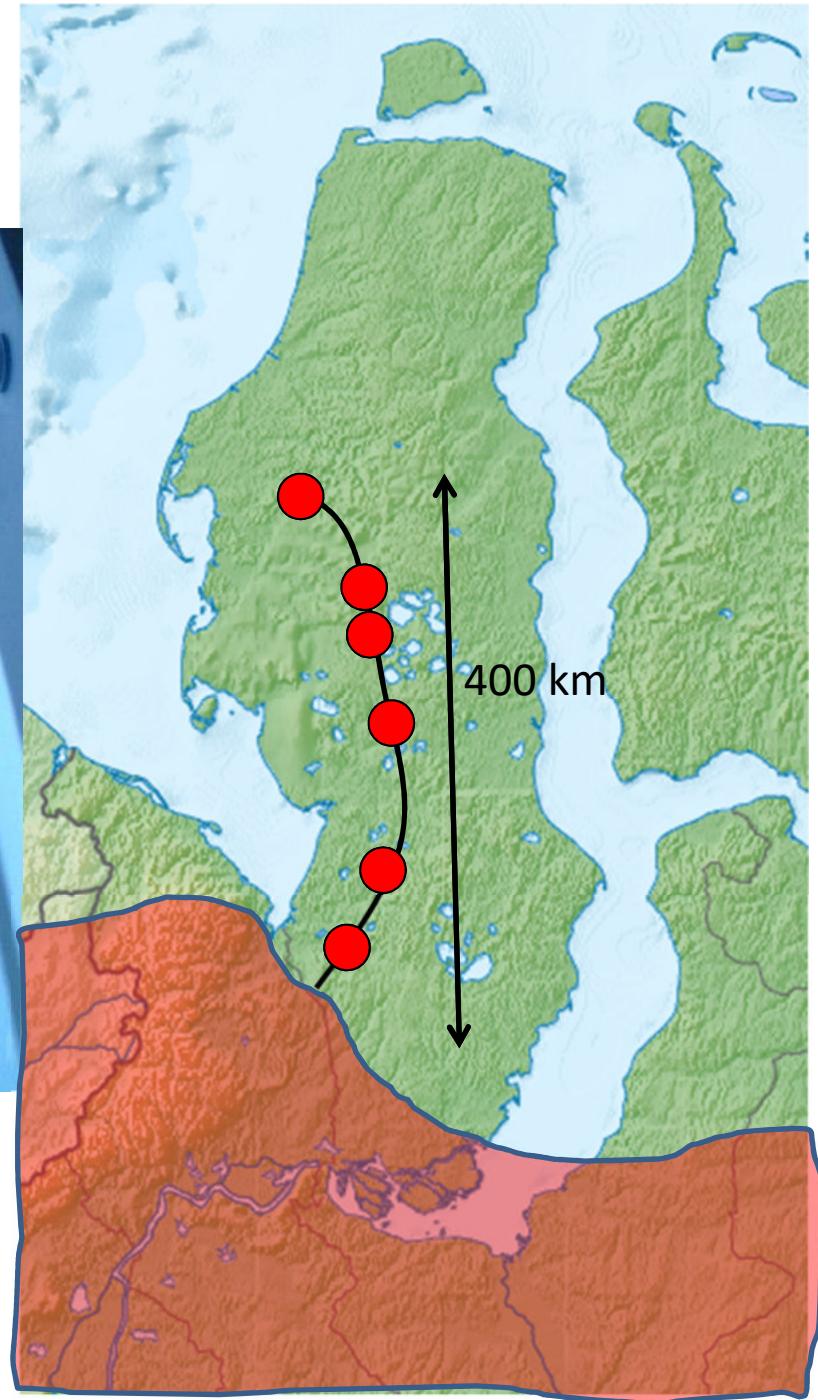
*A joint circumpolar project to measure and predict the cascading impacts of “Indirect Trophic Interactions” in arctic terrestrial vertebrate communities*



## Industrial development resulted Gyr falcon distribution expand



- The biggest and one of the rarest species of falcons worldwide
- Study supported by “Gazpromtrans” after Yamal Government participation





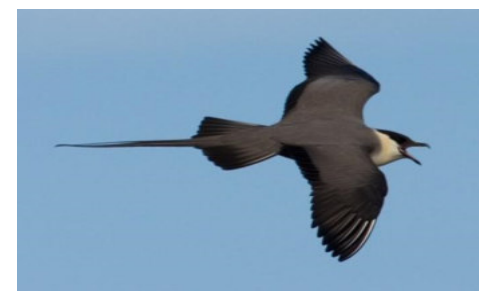


# Migration of birds and mammals

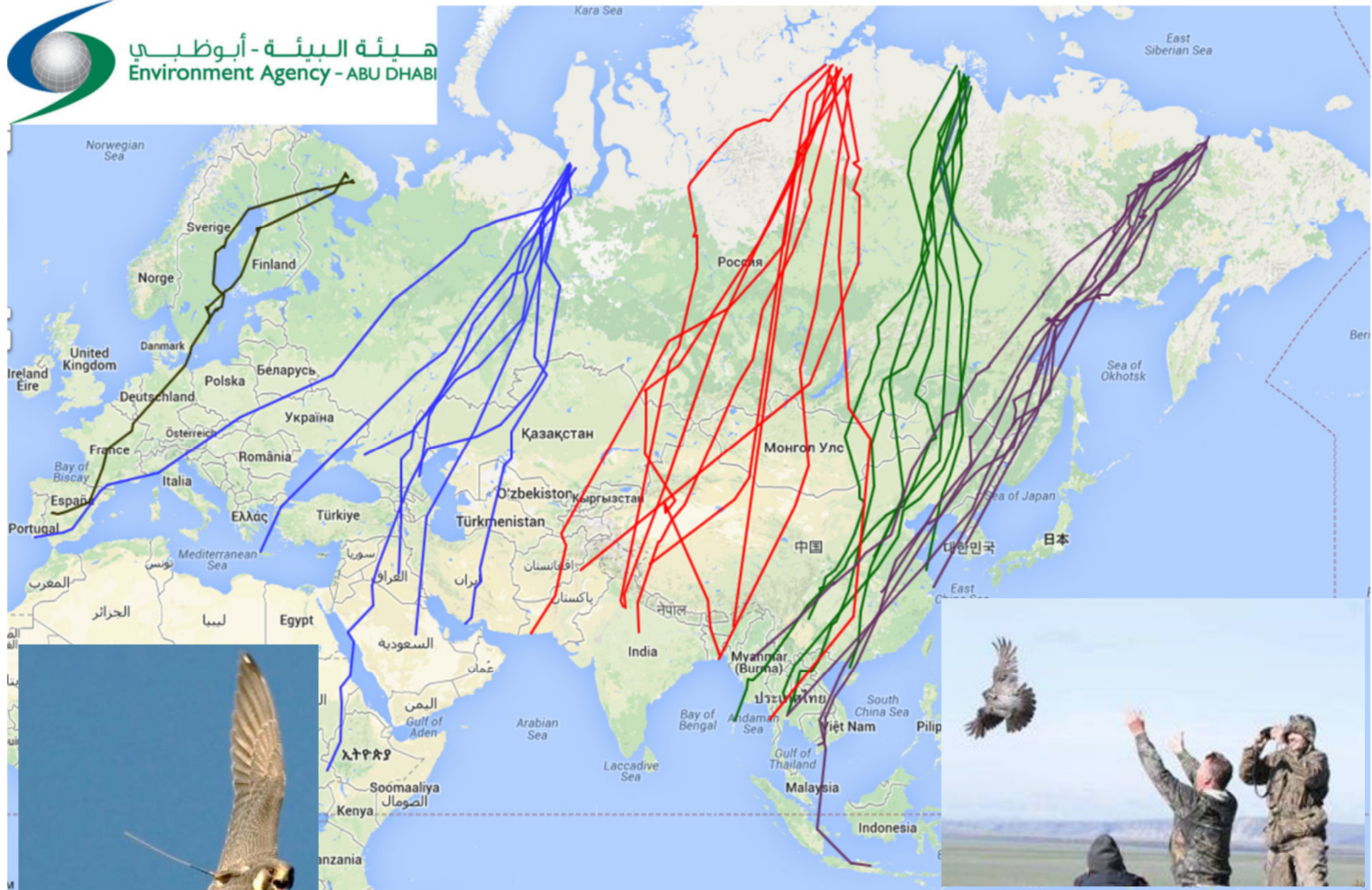
(what unite us with the rest of the planet)





[illegible]





Migration of North Eurasian Peregrines.  
 A.Dixon, A.Sokolov, V.Sokolov,. Partly published)





April 25 – May 5 – Gazprom station







*Red-breasted*



*Lesser white-fronted*

## Erkuta

80% nests of geese -  
around peregrine  
(umbrella effect)











A.Buyevich



I.Dyatchenko



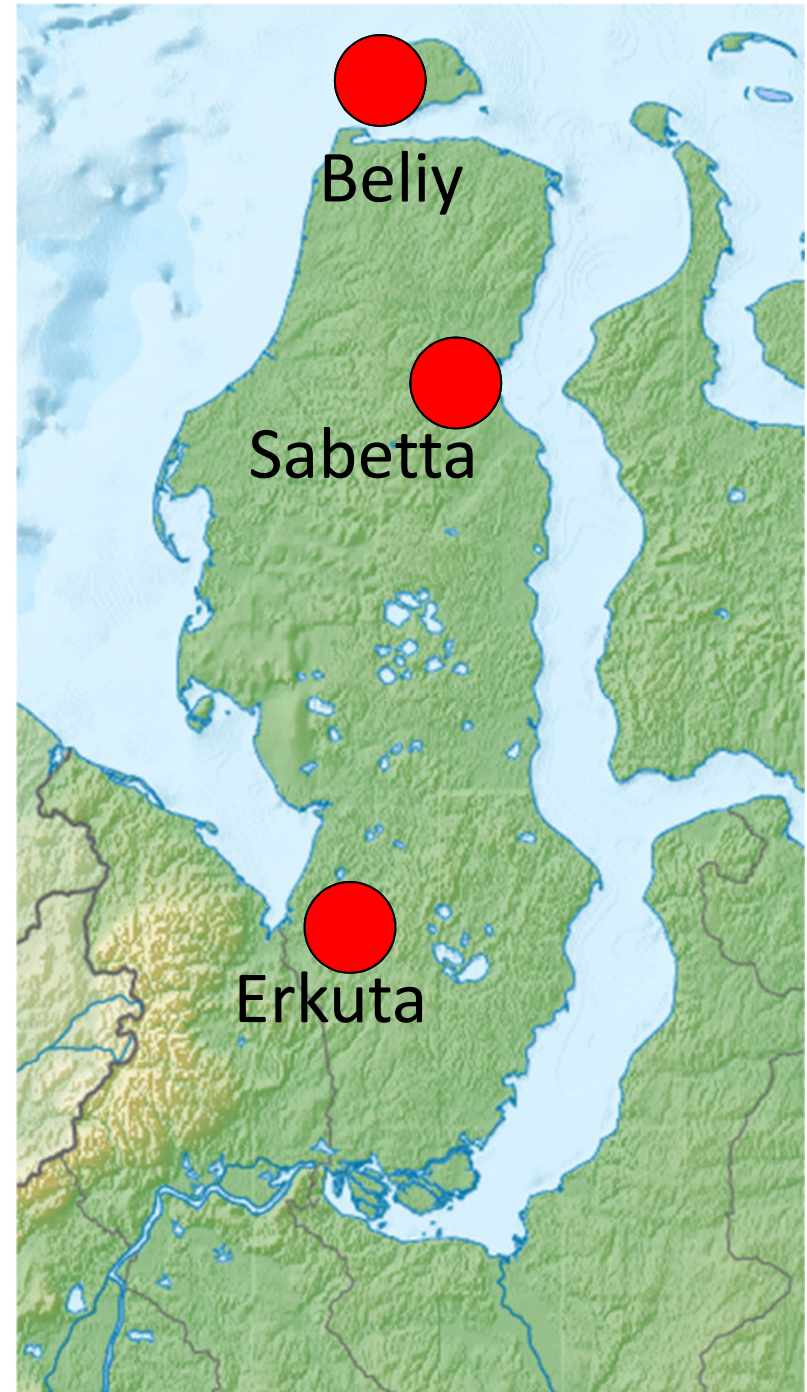
A.Sokolov



World record (Belyi 2015):  
89 Snowy Owls counted from 1 point

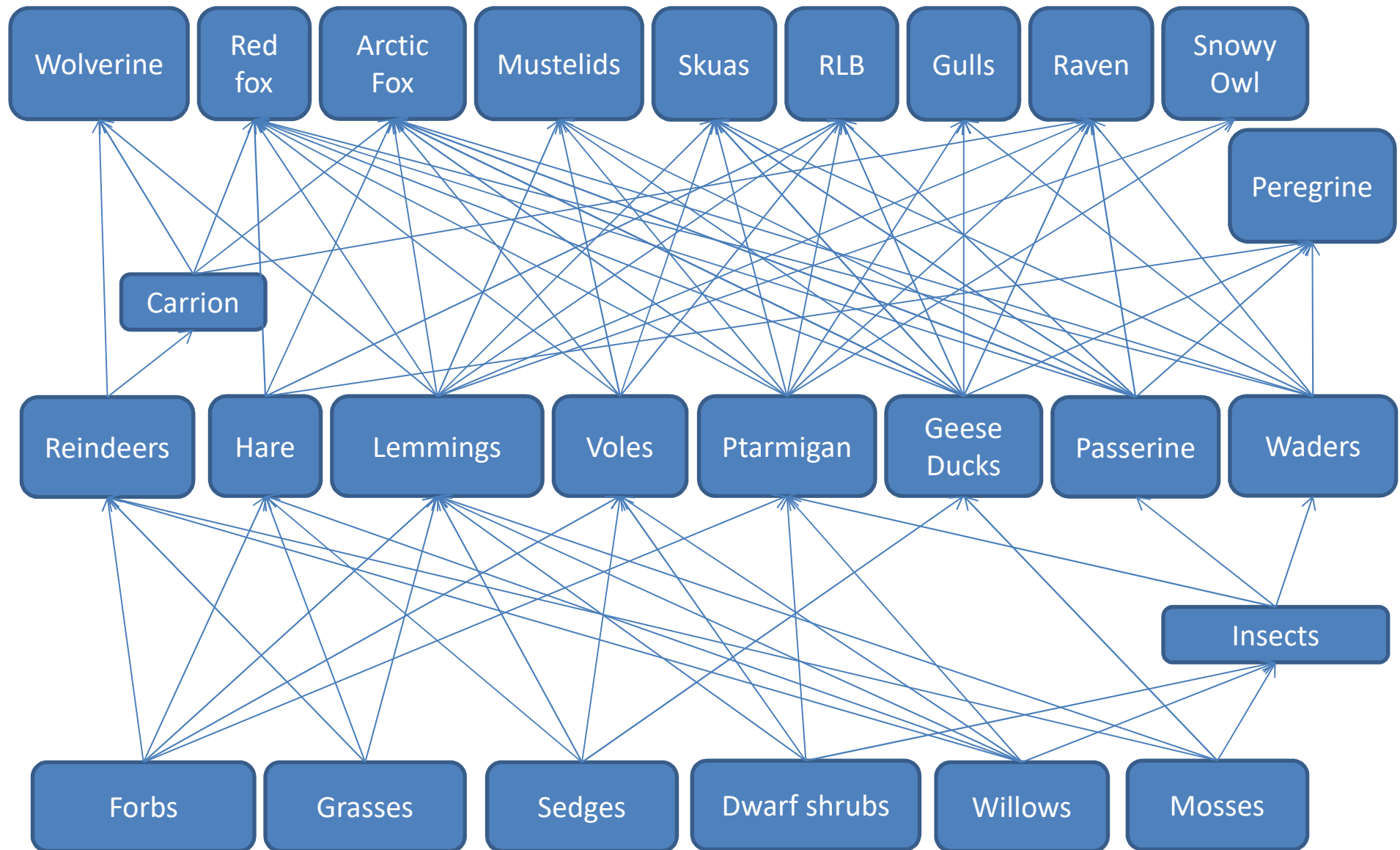


- Schematic food-webs in different monitoring sites



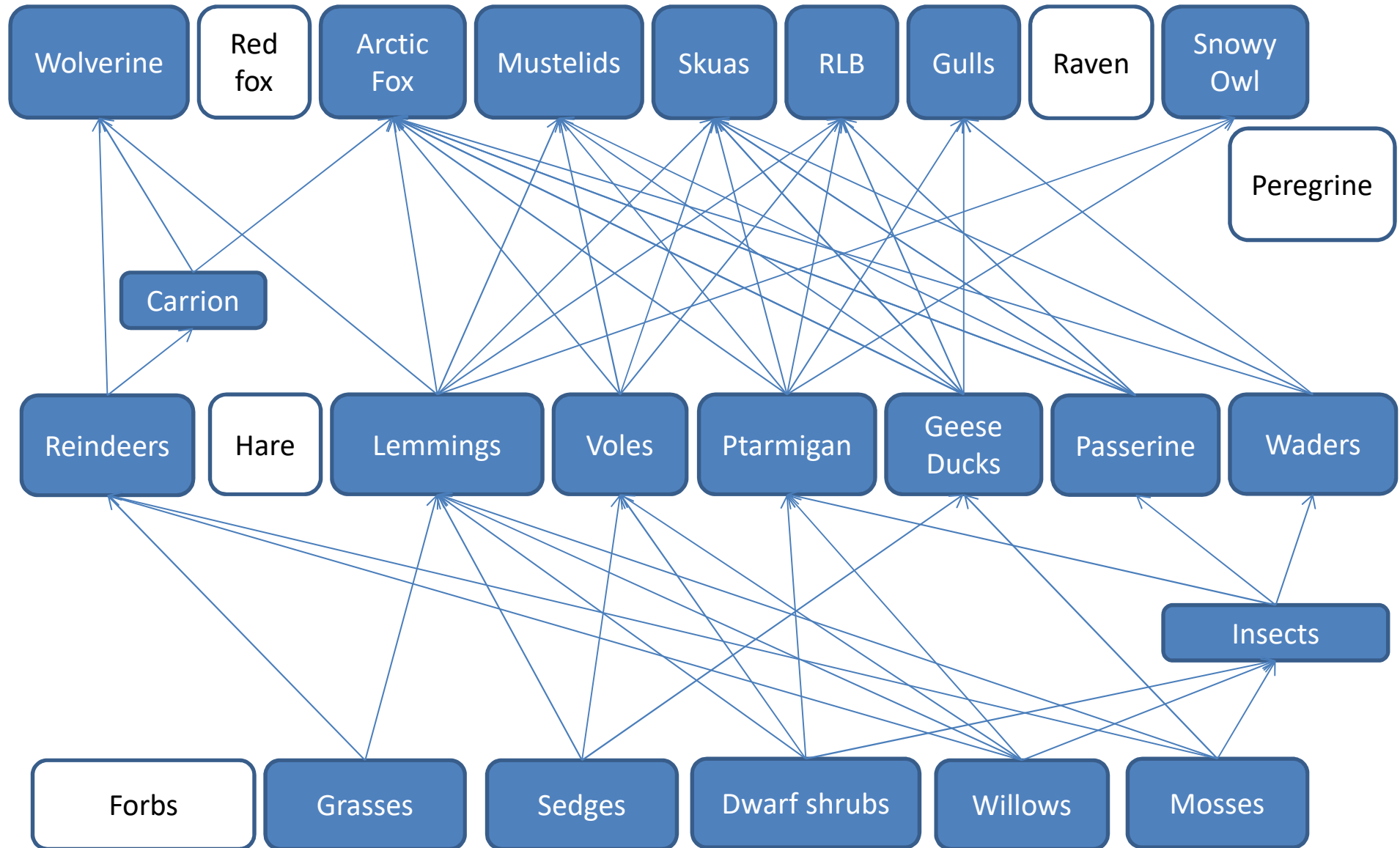


# Erkuta



# Sabetta

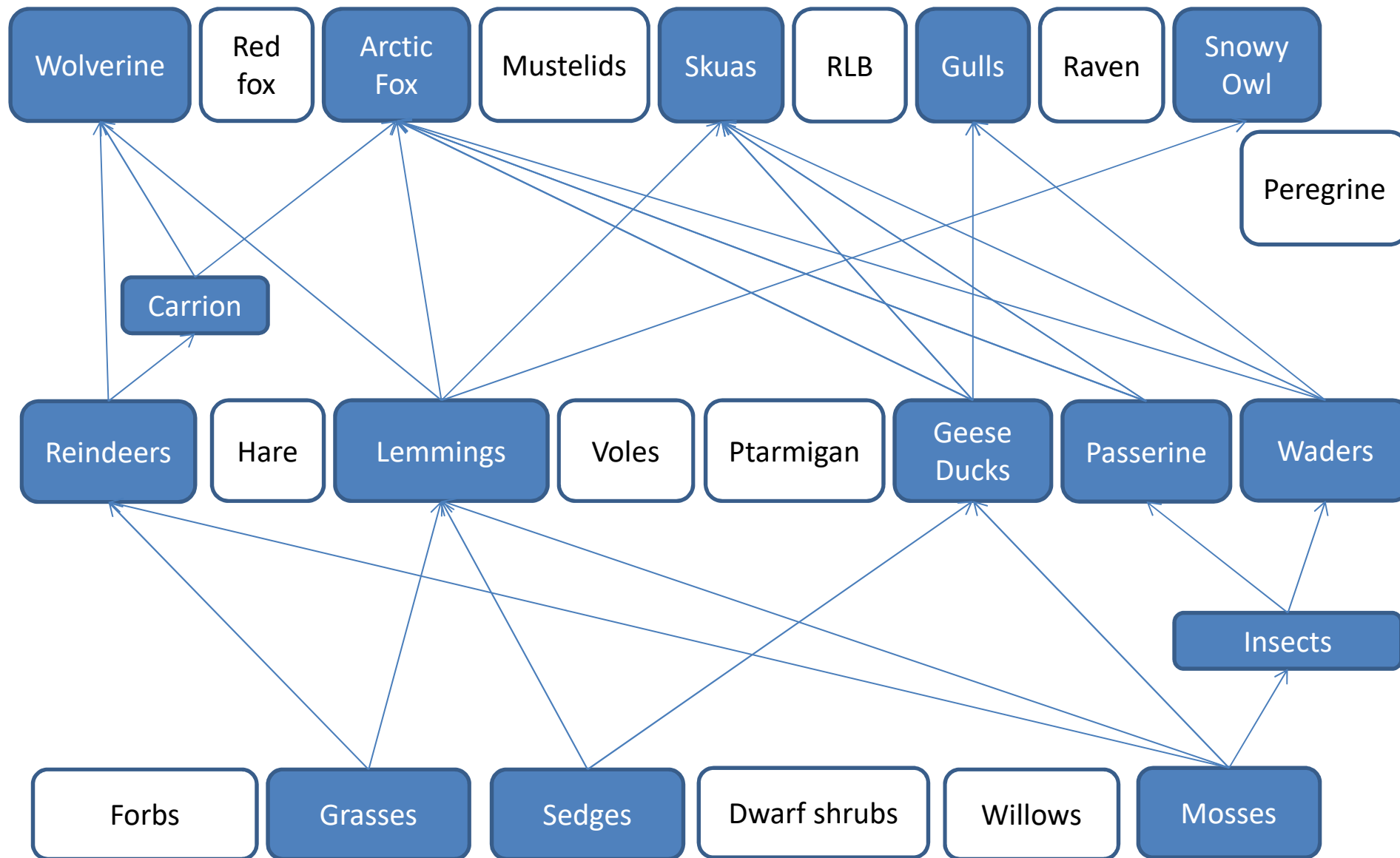
???





# Beliy

???



# Word-cloud – titles of papers





# Thank you!

- Funding came from Department of Science and Innovations and Department of International relations of Yamal Government, Russian Fund for Basic Research grants, Program of Ural Branch of RAS, RFBR projects Yamal, Arctic, Russian-France collaboration, University of Tromso, FRAM Center, COAT initiative (Norway), “Interactions” project, Norwegian-Russian Snowy Owl project, University of Giessen and many other sources
- Yamal Governor Dmitry Kobylkin for support an idea to run a transect of the research stations
- NGO “Russian Center of Development of the Arctic”, Interregional Expedition Center “Arctic”, “Gazpromtrans” Ltd., and “Yamal-LNG” Ltd. organize transportation and logistic