COLLAPSING LEMMING CYCLES IN GREENLAND

DEMOGRAPHIC CONSEQUENCES FOR LEMMING PREDATORS AND ITS LINKAGES TO SNOW

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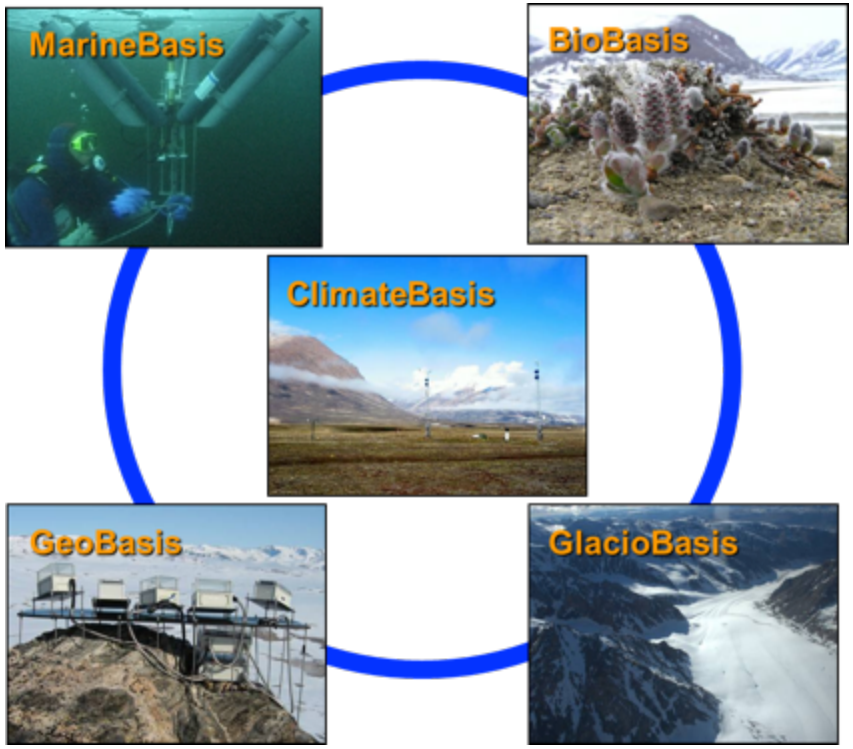
ZACKENBERG



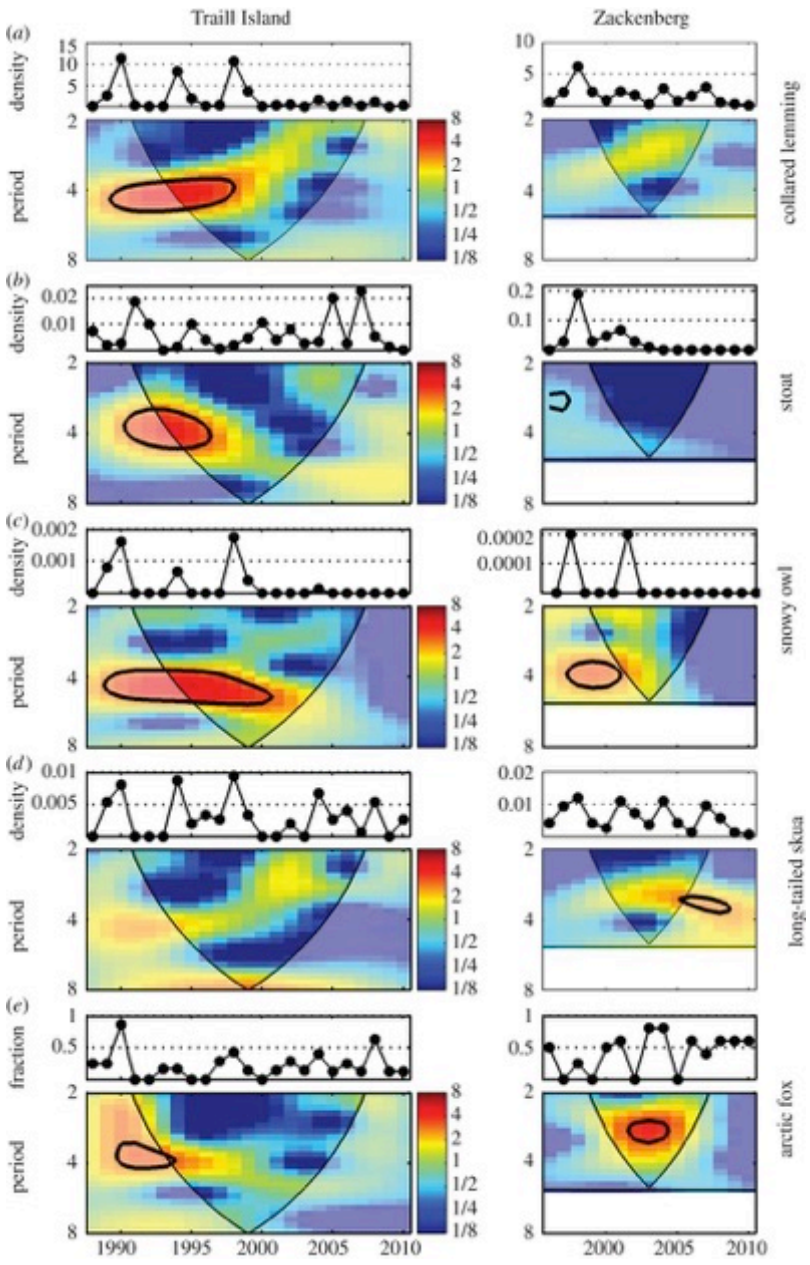
Long-term monitoring

- Traill Ø (1988 ->)
- Community

- Zackenberg (1995->)
- Ecosystem

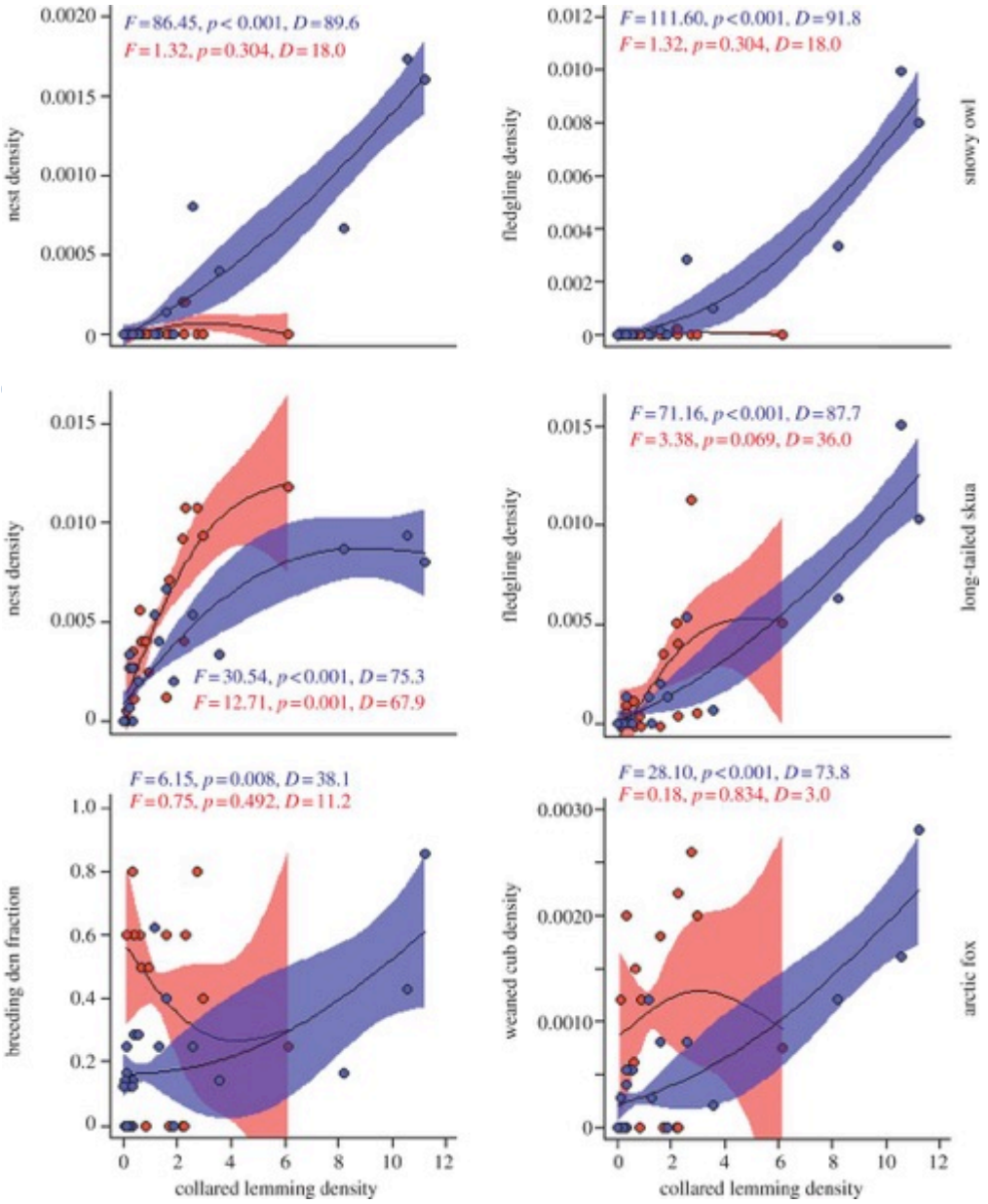
Updated from Schmidt et al. 2012

- 4-year cycles collapse
- Lemming dynamics reflected in predator dynamics
- Site-specifics
- Species-specifics



Schmidt et al. 2012

- Generally close coupling between lemming dynamics an predator reproduction
- Local differences
- Species differences



Schmidt et al. 2012

Zackenberg	●
Traill Island	●

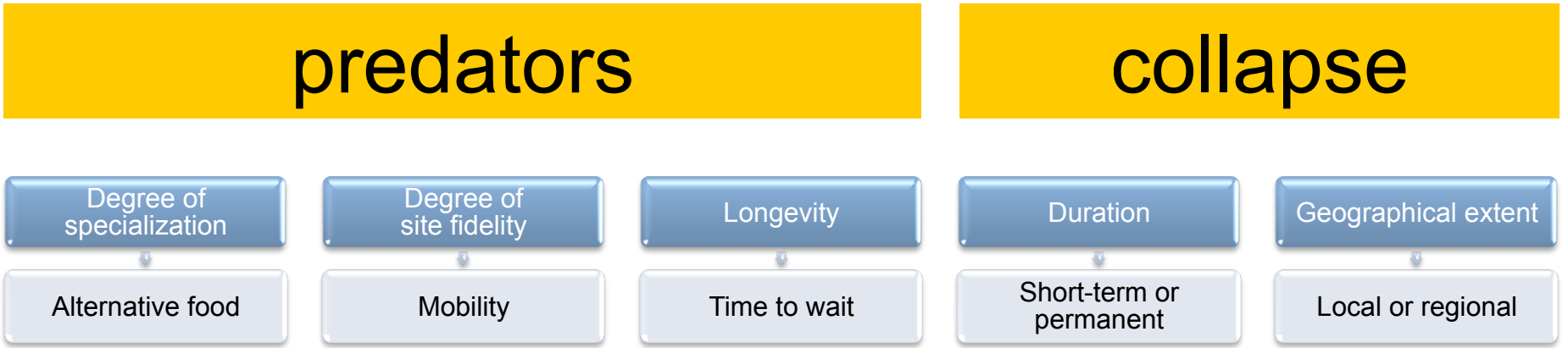
ALTERNATIVE FOOD

IMPACTS ON PRODUCTIVITY

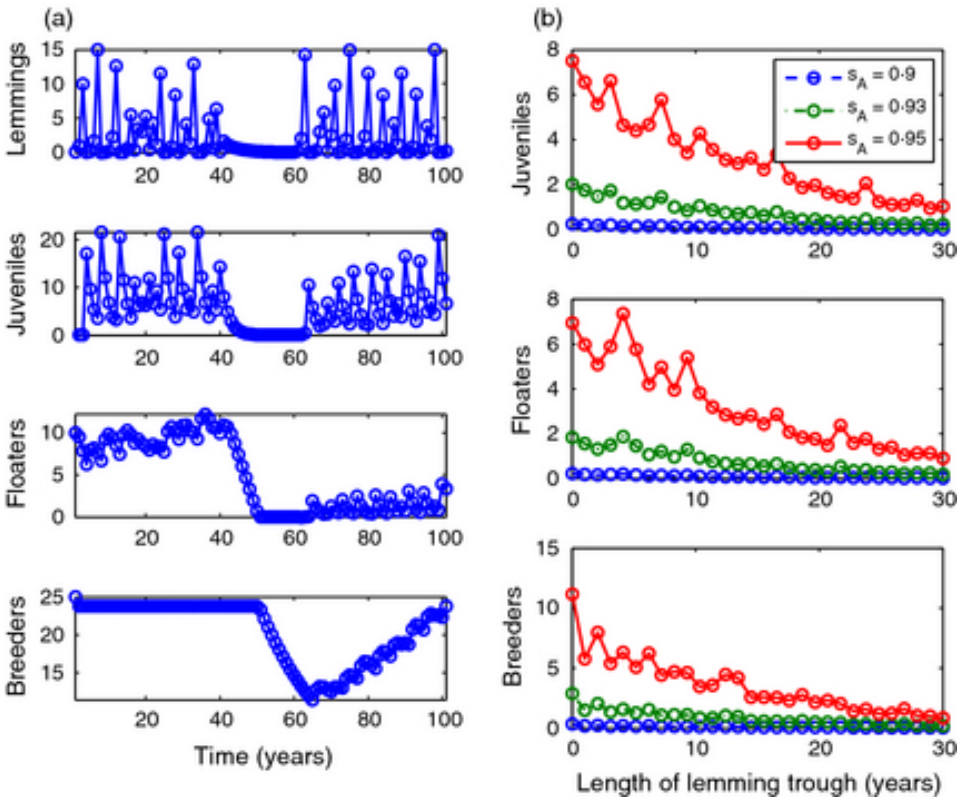
Phase	Arctic fox weaned cubs	Long-tailed skua fledglings	Snowy owl fledglings
Cyclic	0.00057 [0.00024]	0.00307 [0.00138]	0.00203 [0.00099]
Non-cyclic	0.00040 [0.00013]	0.00047 [0.00024]	0.00002 [0.00003]
% change	-29.7	-84.8	-98.7

Schmidt et al. 2012

LONG-TERM EFFECTS ON THE PREDATORS



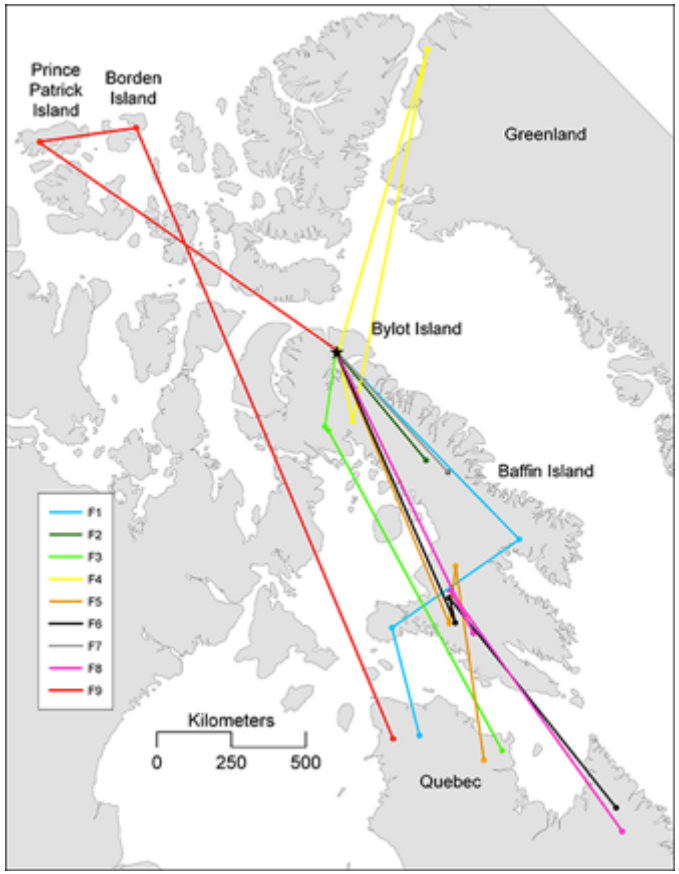
”FLOATERS” AS BUFFER



Barraquand et al. 2014

THE NOMADIC SNOWY OWL

› Follow the lemming peaks

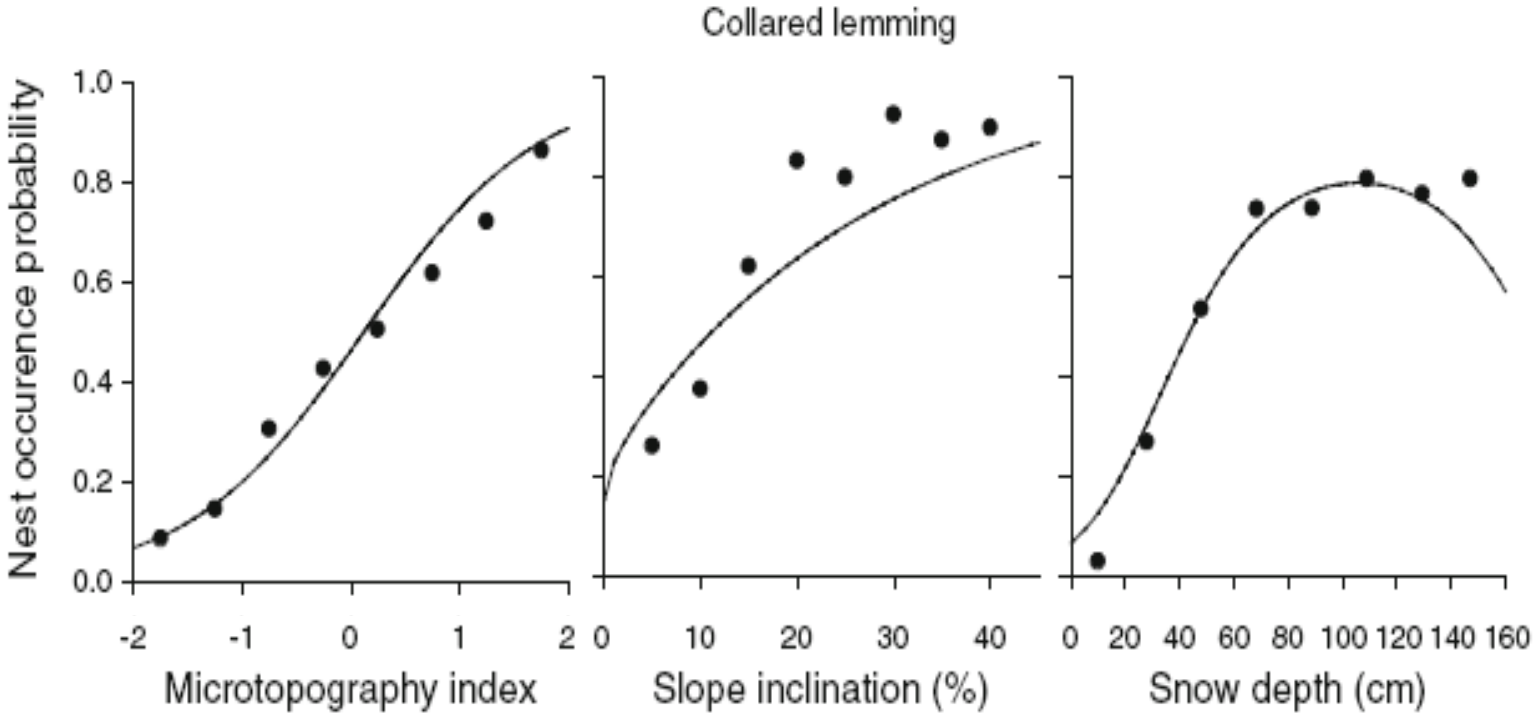


Therrien et al. 2014

LONG-TERM EFFECTS ON THE PREDATORS

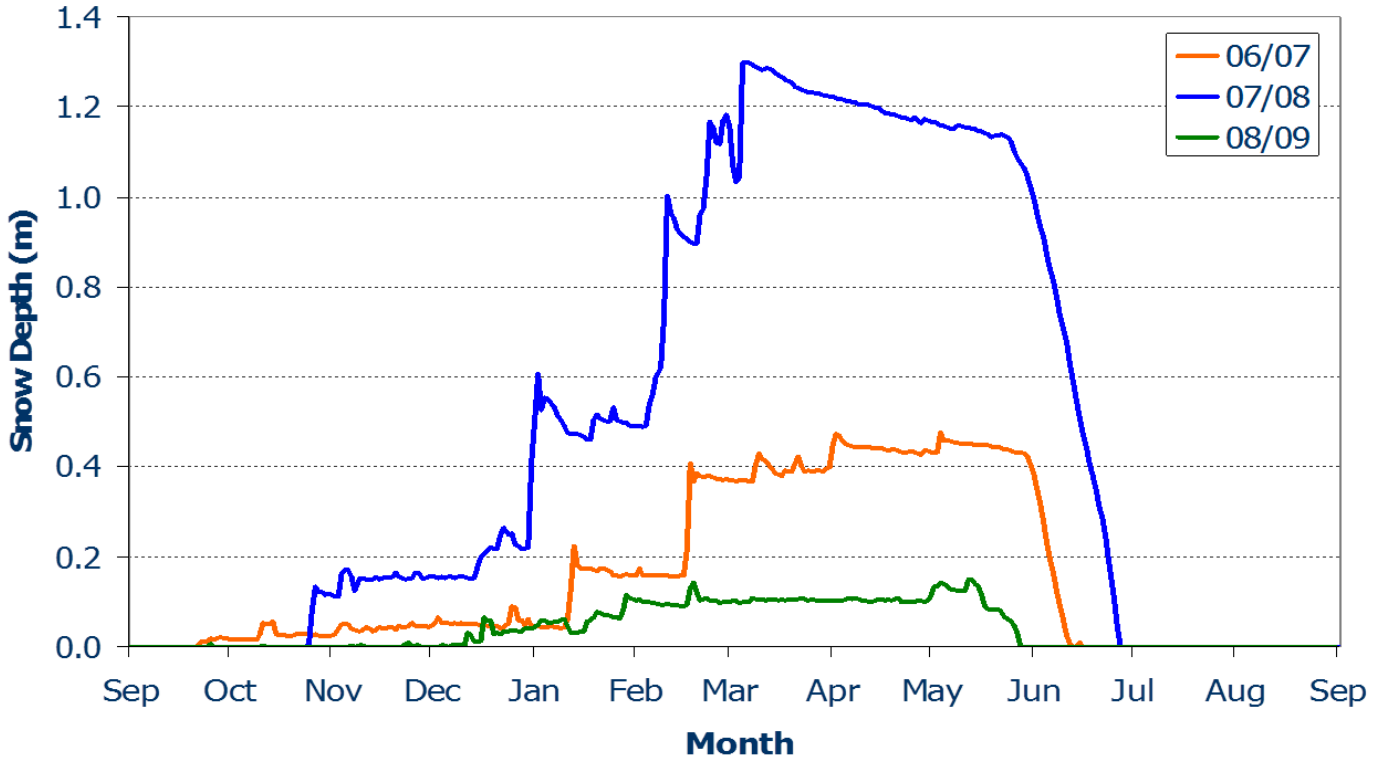
Extent	Local collapse		Regional collapse	
Duration	**Temporary**	**Permanent**	**Temporary**	**Permanent**
Snowy owl	(†)	†	††	†††
Stoat	(†)	†	†	††
LT skua	~	†	~	†
Arctic fox	~	~	~	~

SNOW AND LEMMINGS



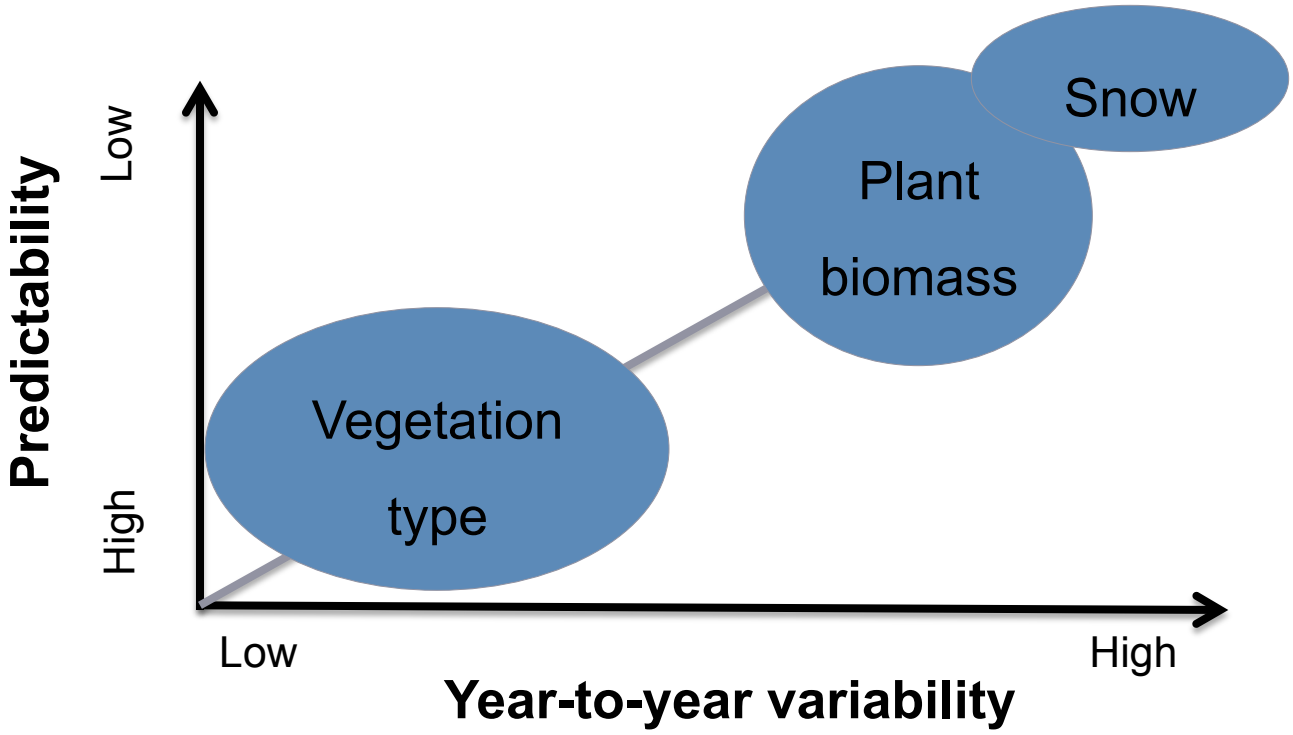
Duchesne et al. 2011

YEAR-TO-YEAR VARIATION IN SNOW



GeoBasis, unpublished data

DETERMINANTS OF LEMMING HABITAT CHOICE



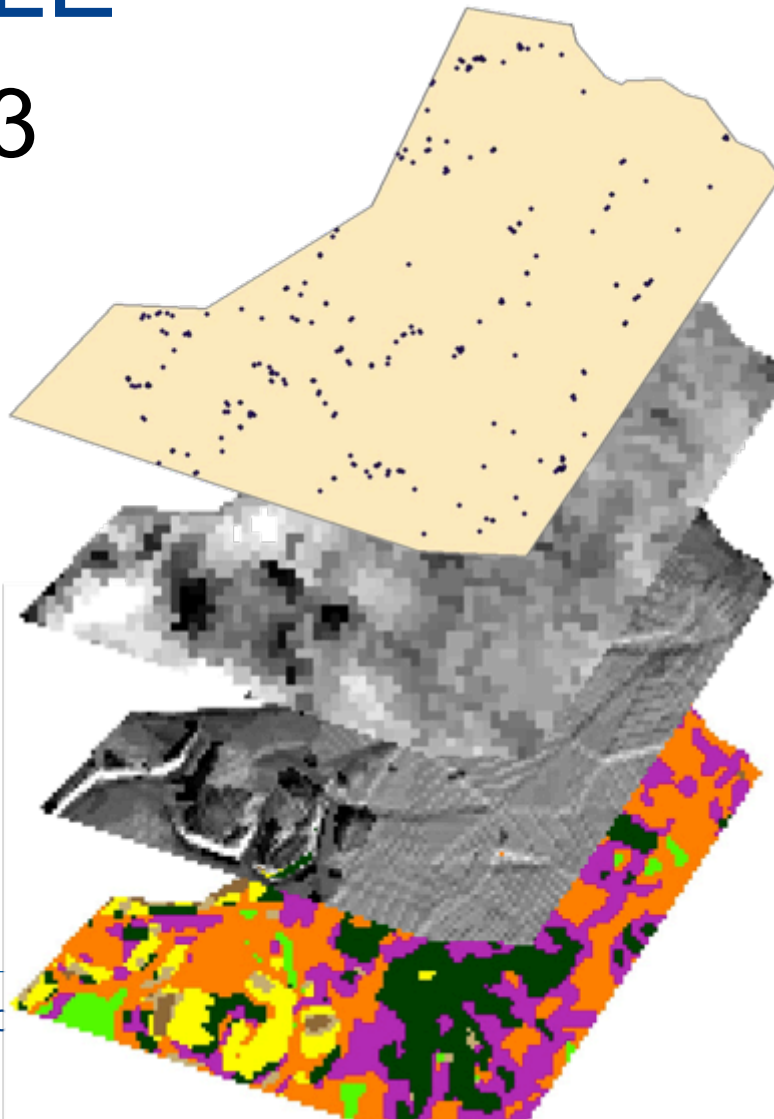
STABLE VS. UNSTABLE PREDICTORS

Nest positions, 1996-2013

NDVI (plant biomass)

Snow measures

Vegetation types



STABLE VS. UNSTABLE PREDICTORS

› More temporally stable than unstable environmental factors determines lemming habitat choice

› Areas with **average deep snow cover and low inter-annual variability** are preferred
› Current snow depth is not important

› **Habitat type** important
› Salix snowbed prefered
› Areas close to summer habitats (Dryas heath) preferred

› Only **limited density-dependence** in habitat choice

MONITORING SMALL MAMMALS IN THE ARCTIC

- Small mammal monitoring is very time consuming
- Indicator of ecosystem state
- Predators as ecosystem sentinels?
  - Stoat - impossible
  - Skuas – buffer-problem
  - Snowy owls – nomadic
  - Arctic fox - omni-present

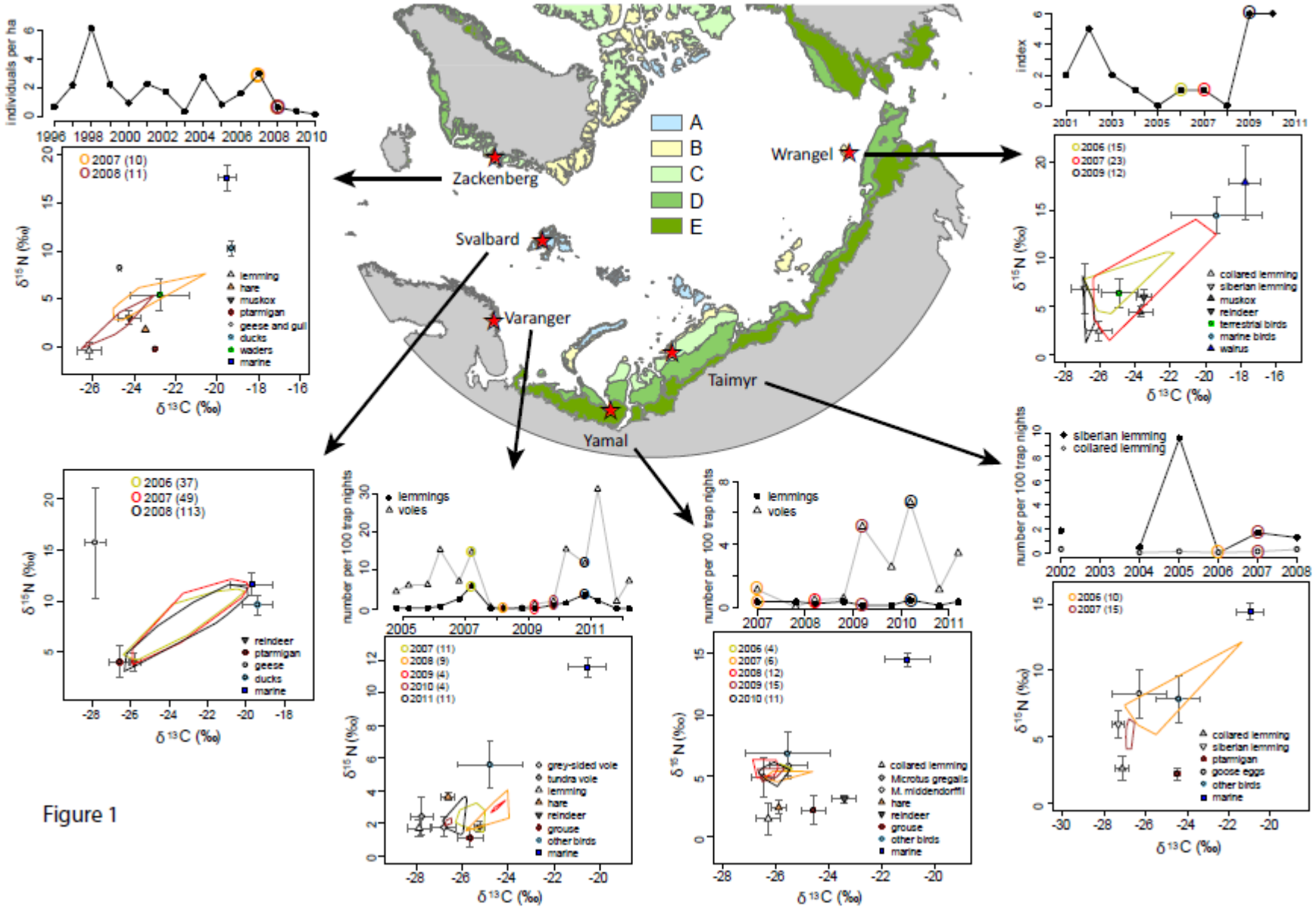
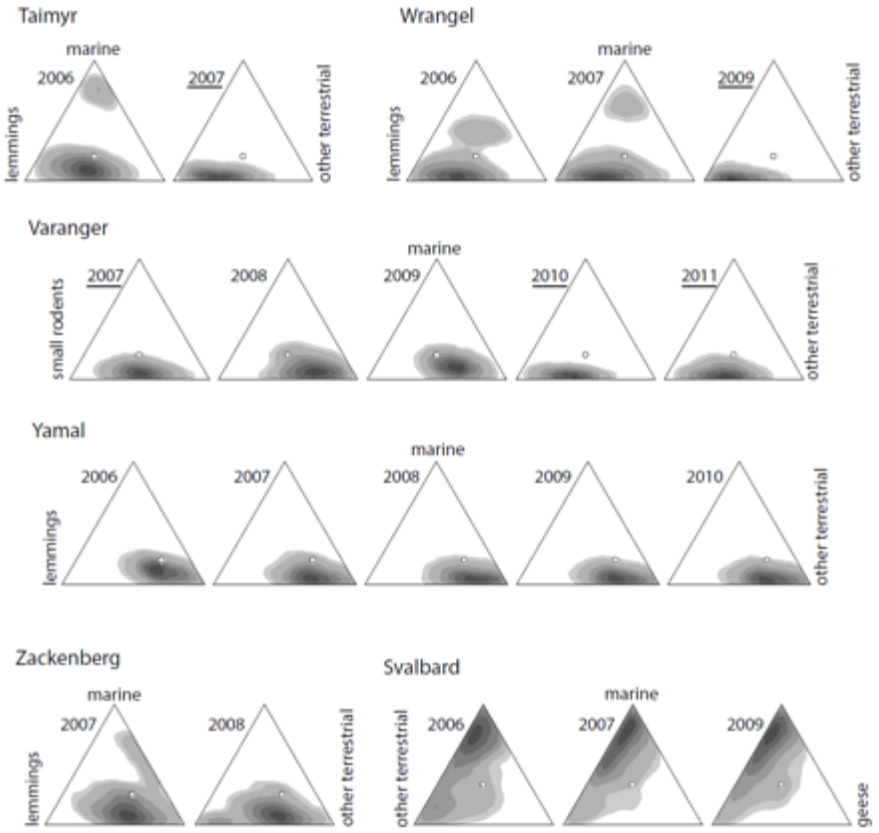


Figure 1

Ehrich et al. Ecosystems (accepted)

ARCTIC FOX AS AN ECOSYSTEM SENTINEL

- Isotopic signature changes with small mammal abundance
- Overlap in prey SI signatures
- Limited useability
- No short cut…



Ehrich et al. Ecosystems (accepted)


Thank you!