Lake size and fish diversity determine trophic niche of Arctic charr in subarctic lakes

Antti Eloranta
Norwegian Institute for Nature Research

Coauthors: Kimmo K. Kahilainen, Per-Arne Amundsen, Rune Knudsen, Chris Harrod & Roger I. Jones
What affects energy flow to top consumers in subarctic lakes?

Importance of littoral benthic production?

Eloranta = Littoral zone
How lake abiotic and biotic characteristics affect charr trophic niche?

H1: Charr shift to a more pelagic diet with increasing lake size

H2: Charr shift to a higher trophic position with increasing fish diversity

$\delta^{13}C = \text{Predominant energy flow pathway}$

$\delta^{15}N = \text{Food chain length}$
Study area

Area: 0.5–1084 km²
Altitude: 12–679 m a.s.l.
Fish species: $n = 2–13$

Other explanatory variables:
- Shoreline development
- Secchi and relative depth
- Total phosphorus and nitrogen

Locations:
- Fjellfrøsvatn
- Saanajärvi
- Kilpisjärvi
- L. Rostavatn
- Takvatn
- V. Spielgajavri
- Datkujavri
- Muddusjärvi
- Tuulisjärvi
- Rahajärvi
- Ukonjärvi
- Inarijärvi
- Pulmankijärvi
Littoral reliance decreases with lake area.

Trophic position increases with fish richness
Stomachs support isotopes

![Bar chart showing proportions of different categories in diets](chart.png)
Impacts on function and structure of subarctic lake food webs
OK, but so what?

- Size and growth
- Parasites
- Heavy metals
- Reproduction
- Ecosystem stability
- Carbon & nutrient cycling
- Species composition

Carbon & nutrient cycling
For more details...

Ecology and Evolution

Lake size and fish diversity determine resource use and trophic position of a top predator in high-latitude lakes

Antti P. Eloranta¹,², Kimmo K. Kahilainen³,⁴, Per-Arne Amundsen⁵, Rune Knudsen⁵, Chris Harrod⁶ & Roger I. Jones²

¹Aquatic Ecology Department, Norwegian Institute for Nature Research, P.O. Box 5685 Sluppen, NO-7485 Trondheim, Norway
²University of Jyväskylä, Department of Biological and Environmental Sciences, P.O. Box 35, FIN-40014 Jyväskylä, Finland
³Department of Environmental Sciences, University of Helsinki, P.O. Box 65, FIN-00014 Helsinki, Finland
⁴Kilpisjärvi Biological Station, University of Helsinki, Käisivarrentie 14622, FIN-99490 Kilpisjärvi, Finland
⁵Department of Arctic and Marine Biology, UiT The Arctic University of Norway, P.O. Box 6050 Langnes, NO-9037 Tromsø, Norway
⁶Universidad de Antofagasta, Instituto de Ciencias Naturales Alexander von Humboldt, Avenida Angamos 601, Antofagasta, Chile

...or antti.eloranta@nina.no
Tusen takk!

See: http://www.cedren.no/Projects/HydroBalance