

Interactions between invading benthivorous fish and native whitefish in subarctic lakes

Impacts of Climate Change on Arctic Environment, Ecosystems services and Society (CLICHE)

Work Package 6 - Impacts of climate change on food web structure, top consumer production and fisheries yield

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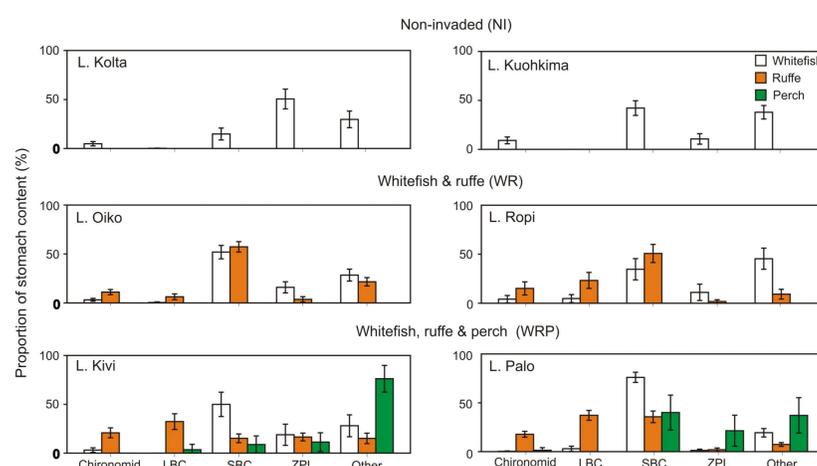


Introduction:

- Increasing water temperatures allow warm water adapted species to establish at previously inaccessible latitudes
- In Finnish Lapland, perch (*Perca fluviatilis*) and ruffe (*Gymnocephalus cernuus*) are expanding their range into northern lakes, currently dominated by whitefish (*Coregonus lavaretus*).
- Both invasive species are specialist benthivores and will potentially limit prey availability for generalist whitefish.
- To determine the levels of resource competition and associated impact on native whitefish, we compared diet and stable isotopes of whitefish, ruffe and perch with resource availability and life history characteristics of whitefish in six subarctic lakes

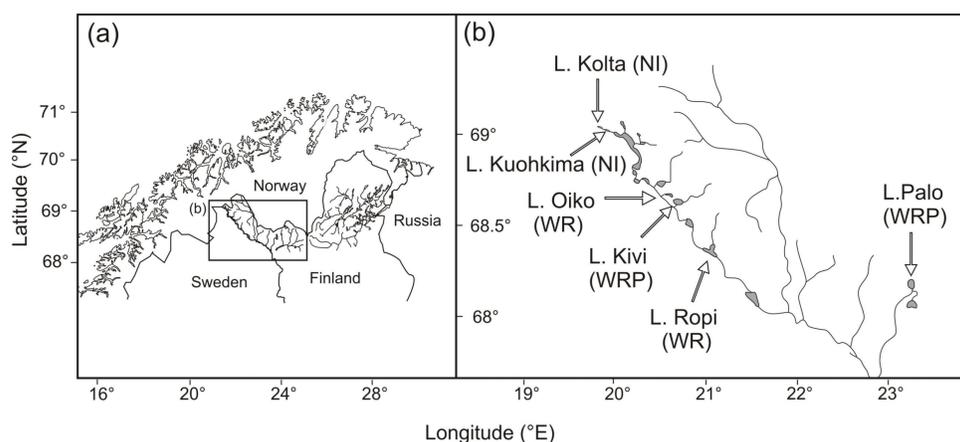
Stomach content analysis:

- Diet varied between species and lakes
- Small benthic crustaceans (SBC; *Eurycercus* sp. & *Megacyclops* sp.) were an important prey resource for all species



Life history characteristics:

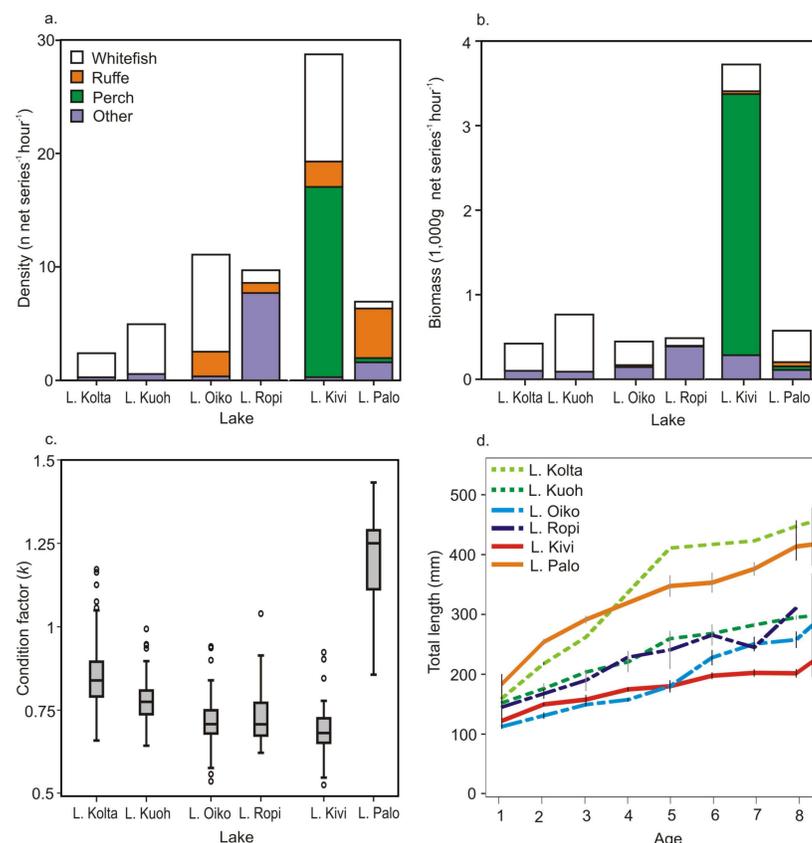
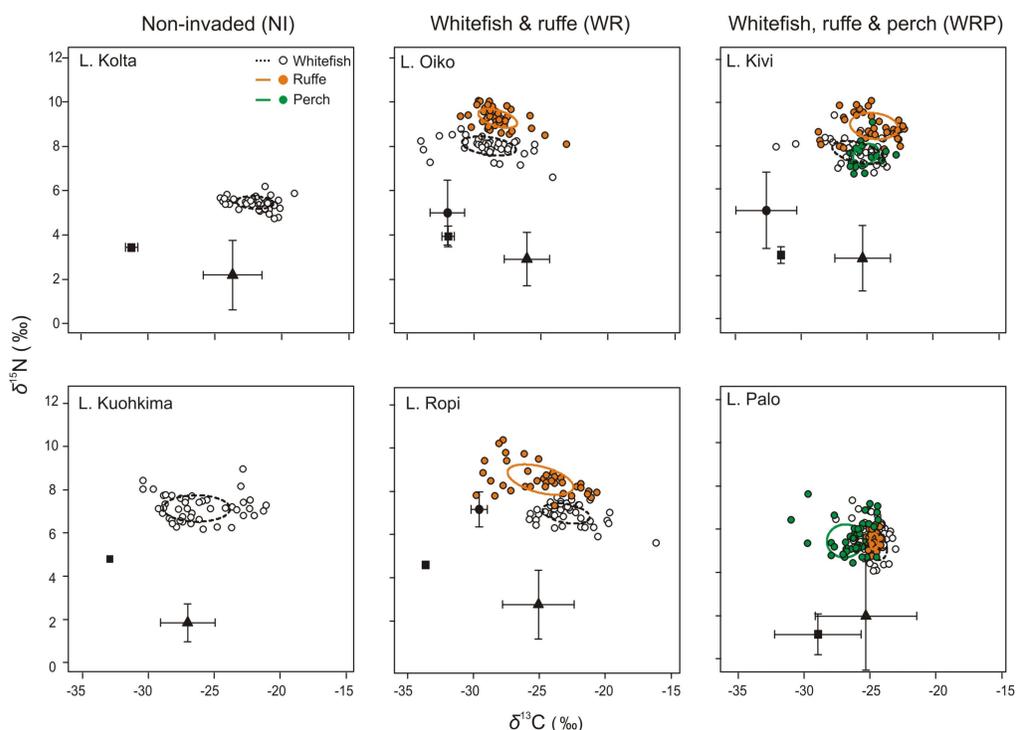
- Density and biomass of whitefish were not related to the presence of invasives.
- Whitefish condition (length:weight ratio) reduced in line with invasive density however the highest levels were recorded in mesotrophic L. Palo despite the presence of both invasive species
- Growth rate of whitefish more closely related to prey availability than the presence of invasives



Location of study sites in Finnish Lapland. Lakes are classified as non-invaded (NI), dominated by whitefish and ruffe (WR) or dominated by whitefish, ruffe and perch (WRP)

Stable isotope analysis:

- Whitefish acted as a trophic generalist in all systems
- Ruffe predominantly utilised profundal resources, displaying niche segregation with whitefish
- Perch and whitefish both utilised the same littoral resources



Discussion:

- Invading species compete with whitefish for food, but the impact of this is regulated by lake productivity and prey density
- Ruffe and perch are at an early stage of invasion in these lakes and will likely increase in density in coming years. Future investigations in southern lakes will detail the effects of increased invading fish densities on whitefish

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