

### Ecosystem size modulates trophic diversity in Arctic charr

Hans Recknagel,

Oliver Hooker, Colin Adams and Kathryn Elmer

#### **Replicate adaptive radiations**



#### **Replicate adaptive radiations**



• Diversification into different ecological niches (specialization)

### **Replicate adaptive radiations**



- Diversification into different ecological niches (specialization)
- Repeated evolution of similar body morphologies adapted to similar ecological niches across distribution range (replicated radiation)

#### **Replicate Arctic charr radiation**



### Loch characteristics

- <u>abiotic</u>: volume, depth, surface area, proportion of littoral area
- <u>biotic</u>: fish community size, N predators, N competitors
- <u>intrinsic</u>: population genetic variation



N = 30

#### **Charr characteristics**





**Benthic zone** 

deep-headed

macroinvertebrate diet

narrow-headed

zooplankton diet





# Populations between lochs vary in overall head depth and variation



# Head depth variation increases with ecosystem size



# Extreme phenotypes predicted by ecosystem size

Extreme deep-headed

Extreme narrow-headed



#### Conclusions

- Phenotypic variability and extremity of phenotypes increases with larger ecosystems
- Phenotypic variability does not depend on genetic diversity
- Extent of Arctic charr diversification depends on environment (ecological opportunity) and is not restricted by intrinsic (genetic) factors