The linkage between temperature, genome-, cell and body size:

shrinking size with global warming?

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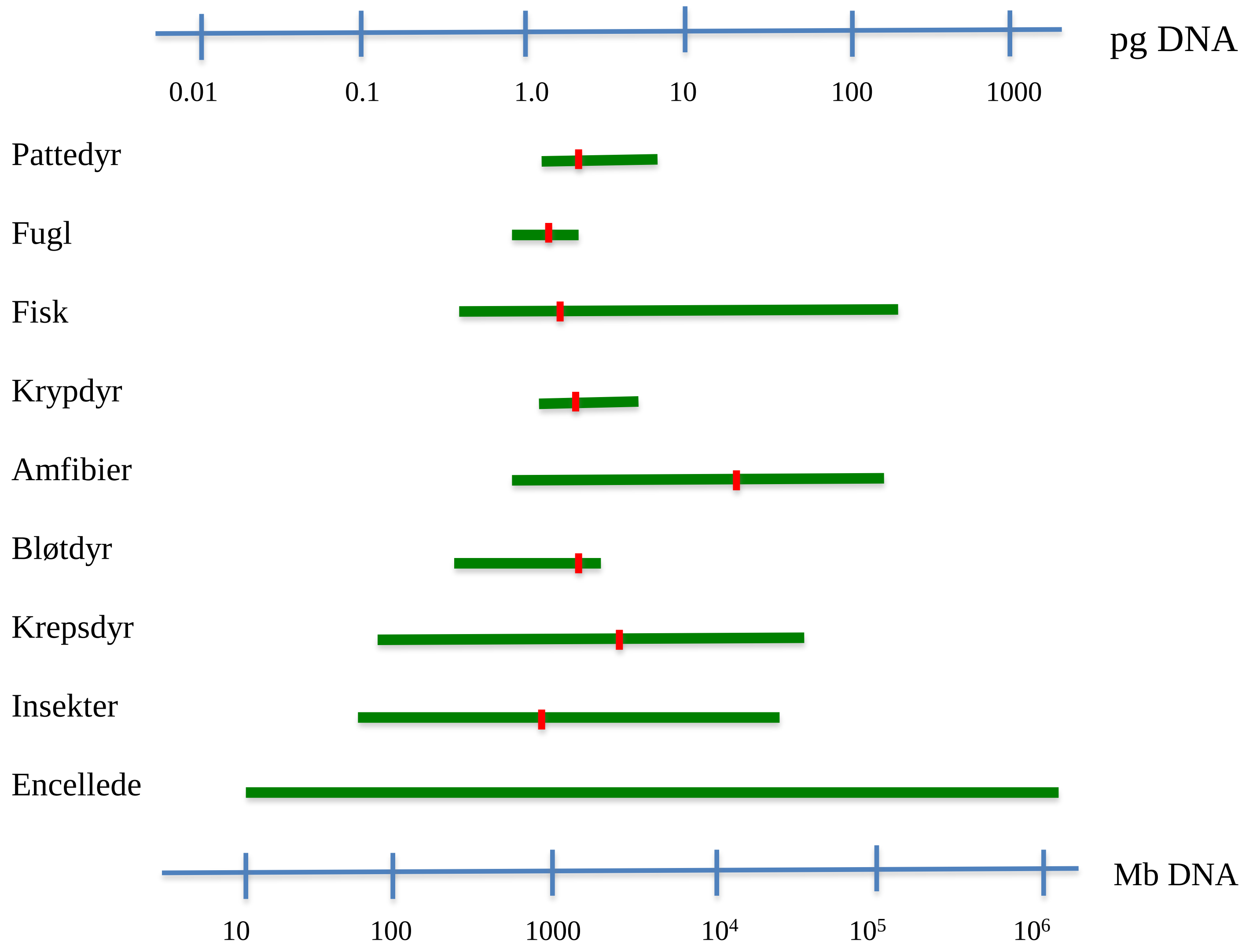
Striking variability in genome size



Crustaceans as a case

Body size evolution
– by cell size or cell number?

- Body volume and genome size: slope = 1 means growth by cell number, slope = 0 means growth by cell size
- Different evolutionary strategies? I.e. with finite cell number you can only grow by cell enlargement
- Often mixed strategies or endopolyploidy
- The role of (endo)polyploidy is not well understood

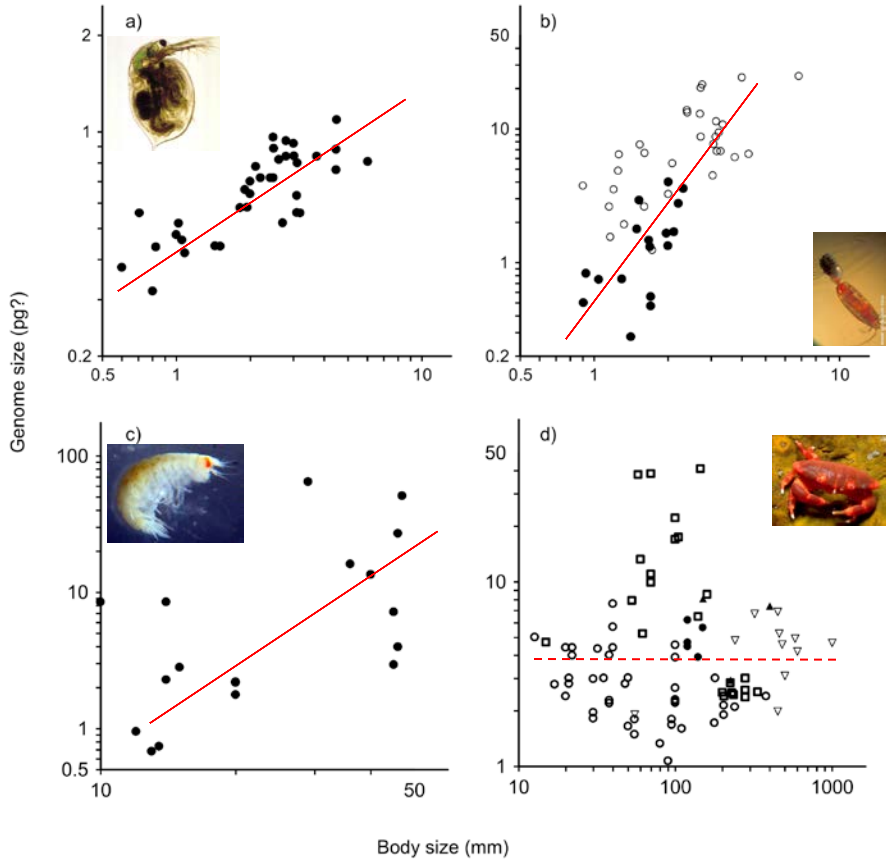


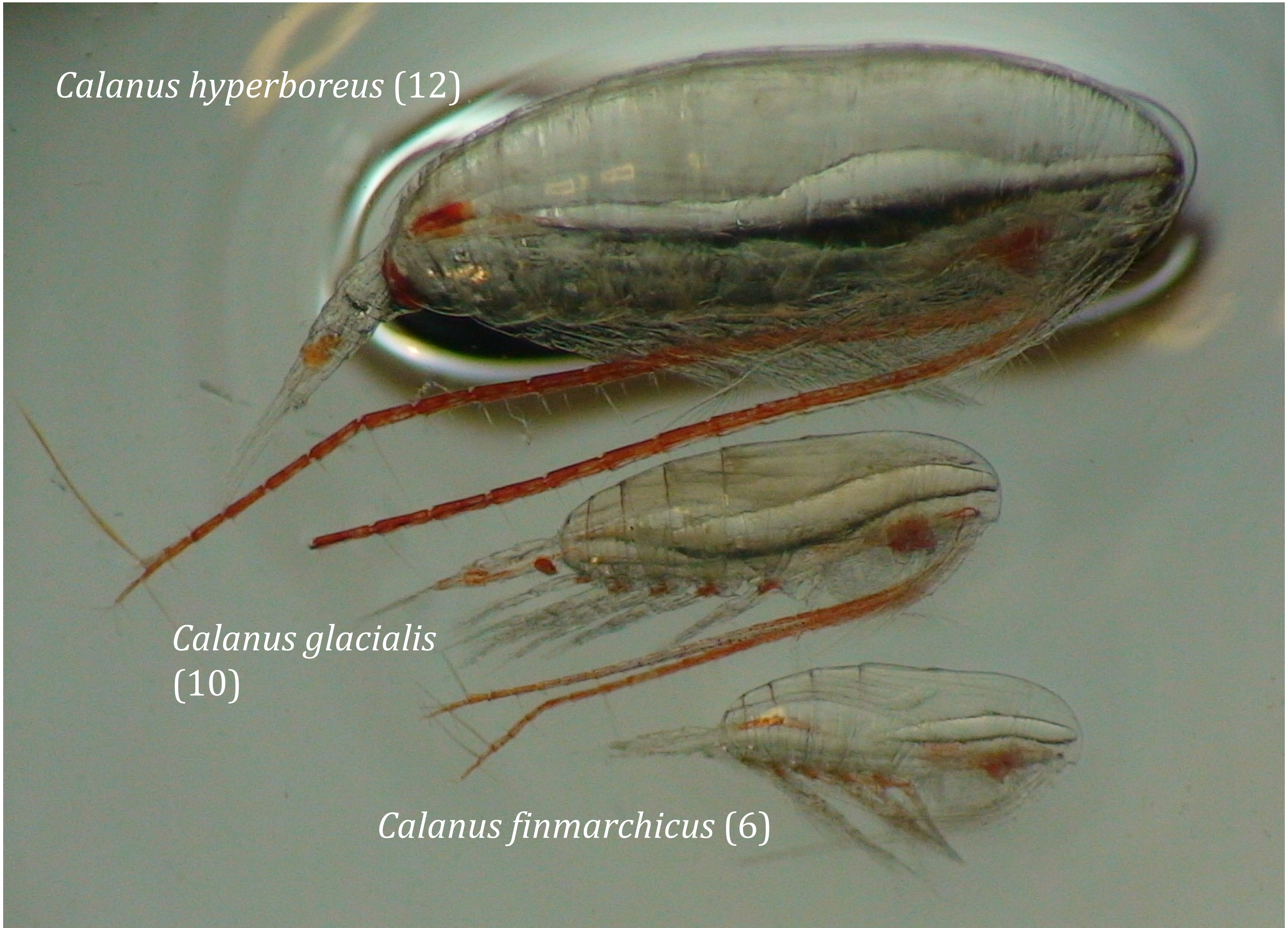
Figure 2. a) Cladocerans b) ● Calanoids ○ Cyclopoids c) Amphipods d) ○ Crabs ● Crayfish ▲Prawns □ Shrimps Δ Lobsters

Hessen & Persson 2010

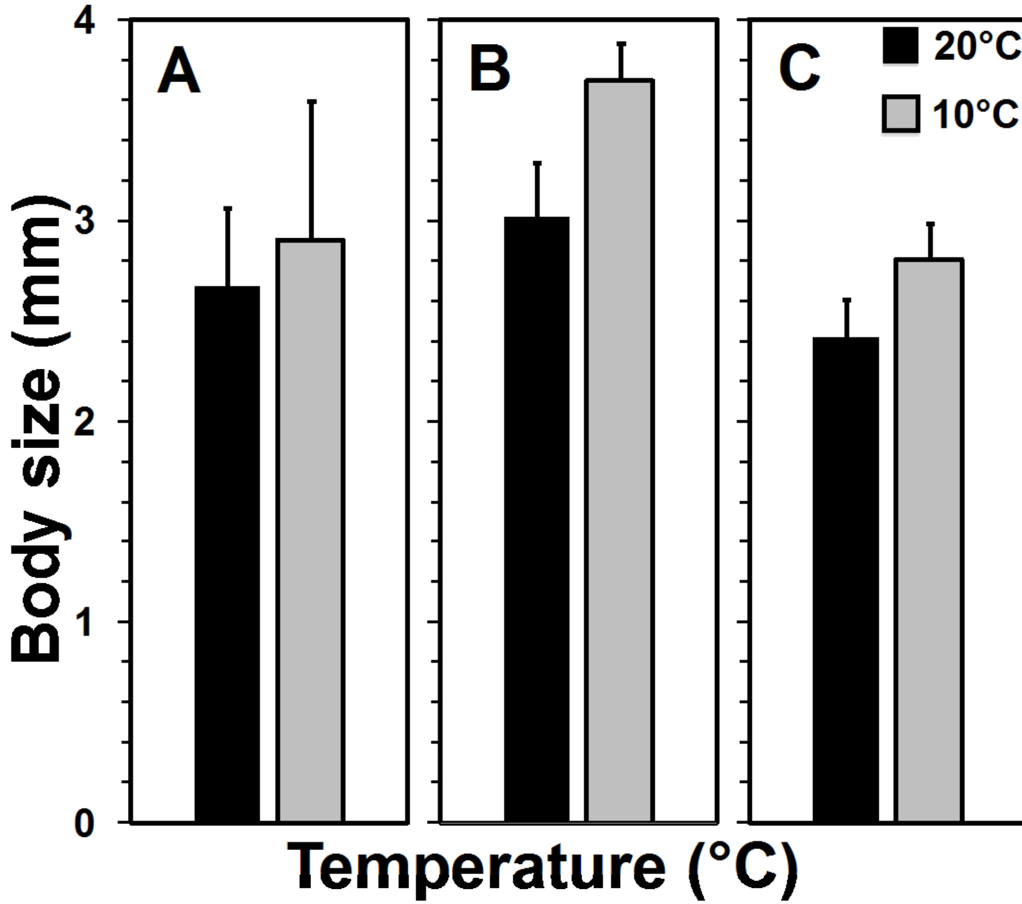
Temperature, Bergmann and TRS

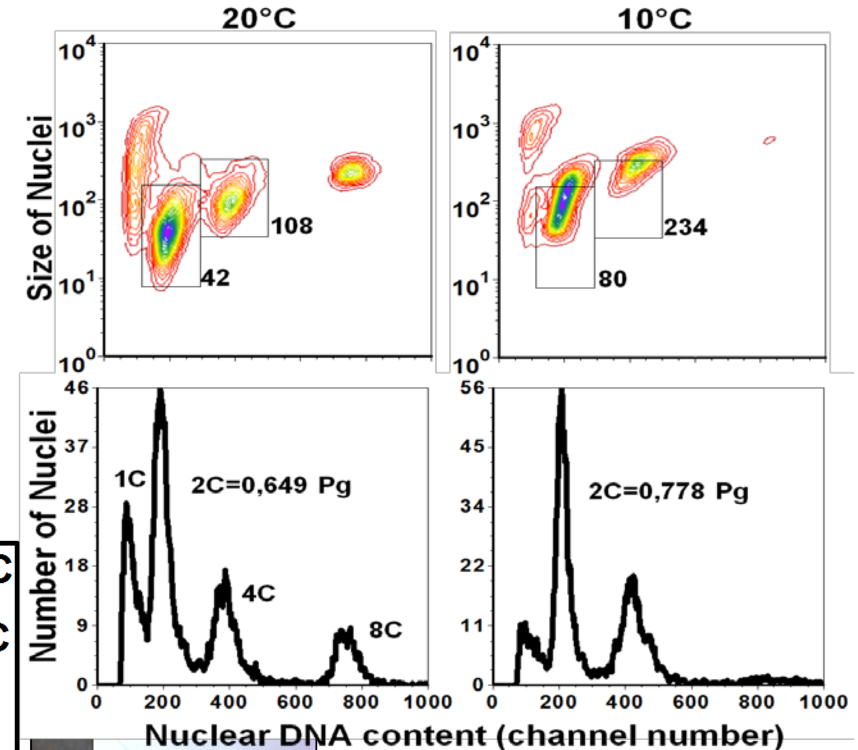
- Large size at low temperature ecosystems (Bergmann type rules)
- Large size when raised at low temp (Temperature-Size Rules)
- Phenotypic or genotypic effects?
- Same effect, but for different reasons?
- How and why does size increase?
- Does this imply “shrinking” of cells and species at elevated temperatures?

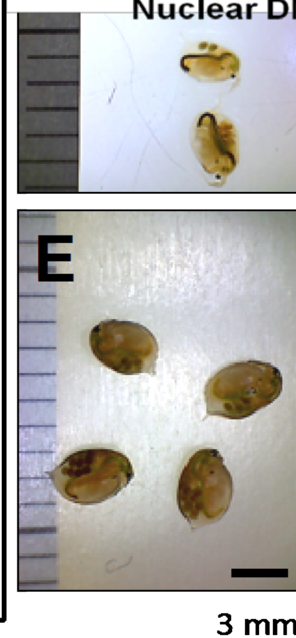
Speciation by genome-cell and body size?



Daphnia genome size and temp

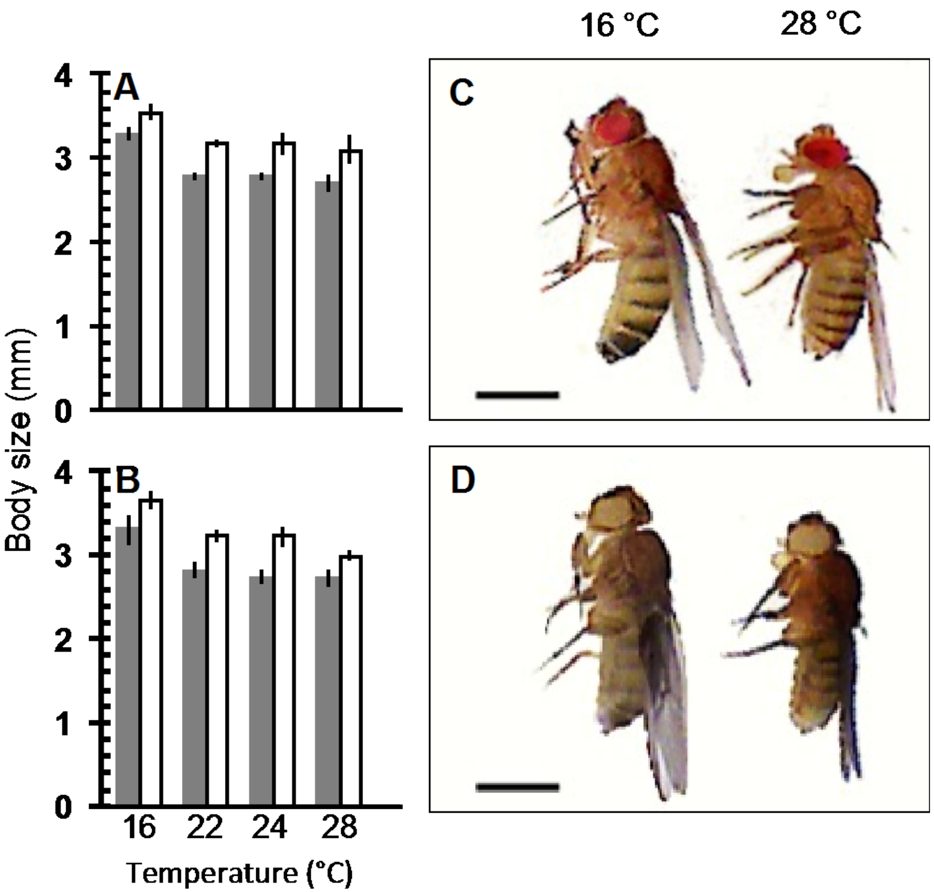


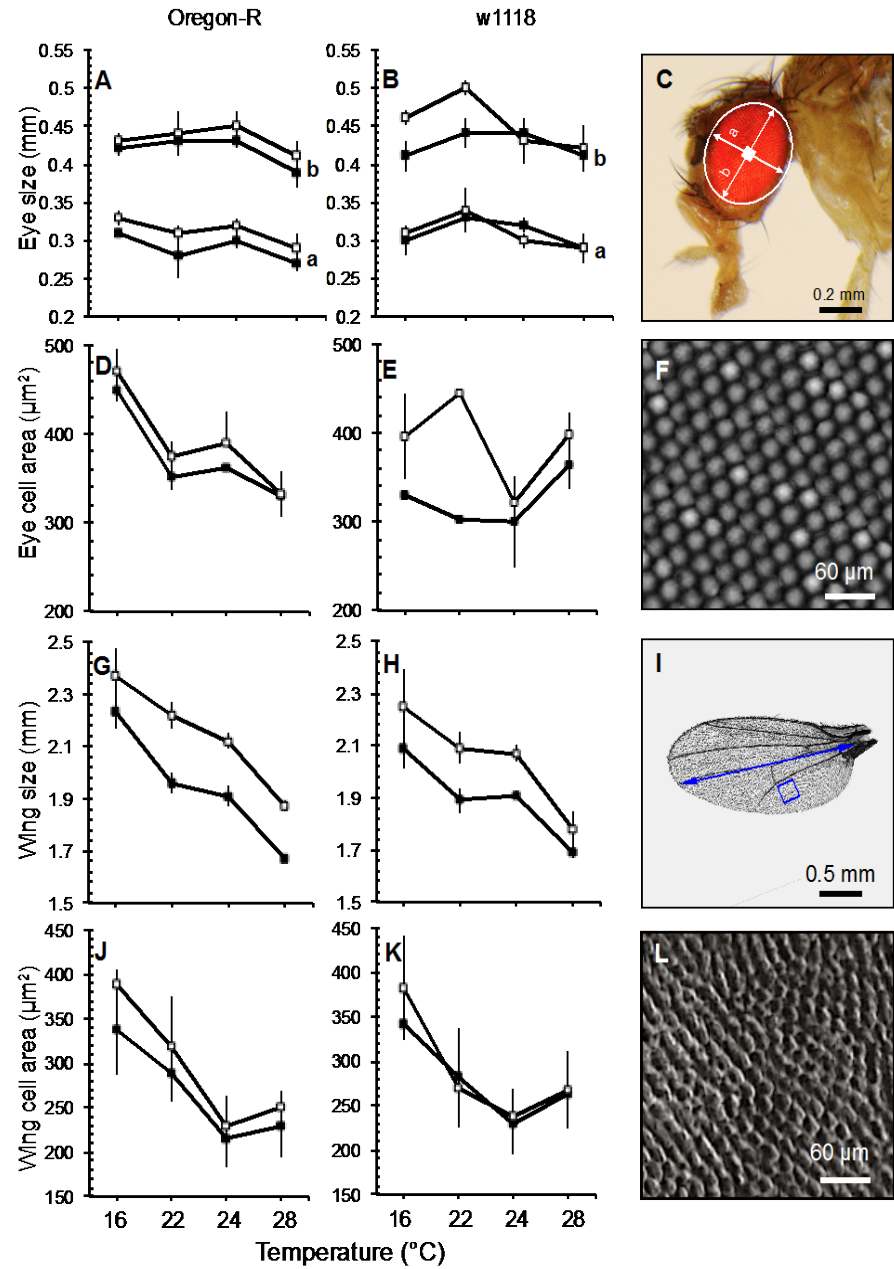




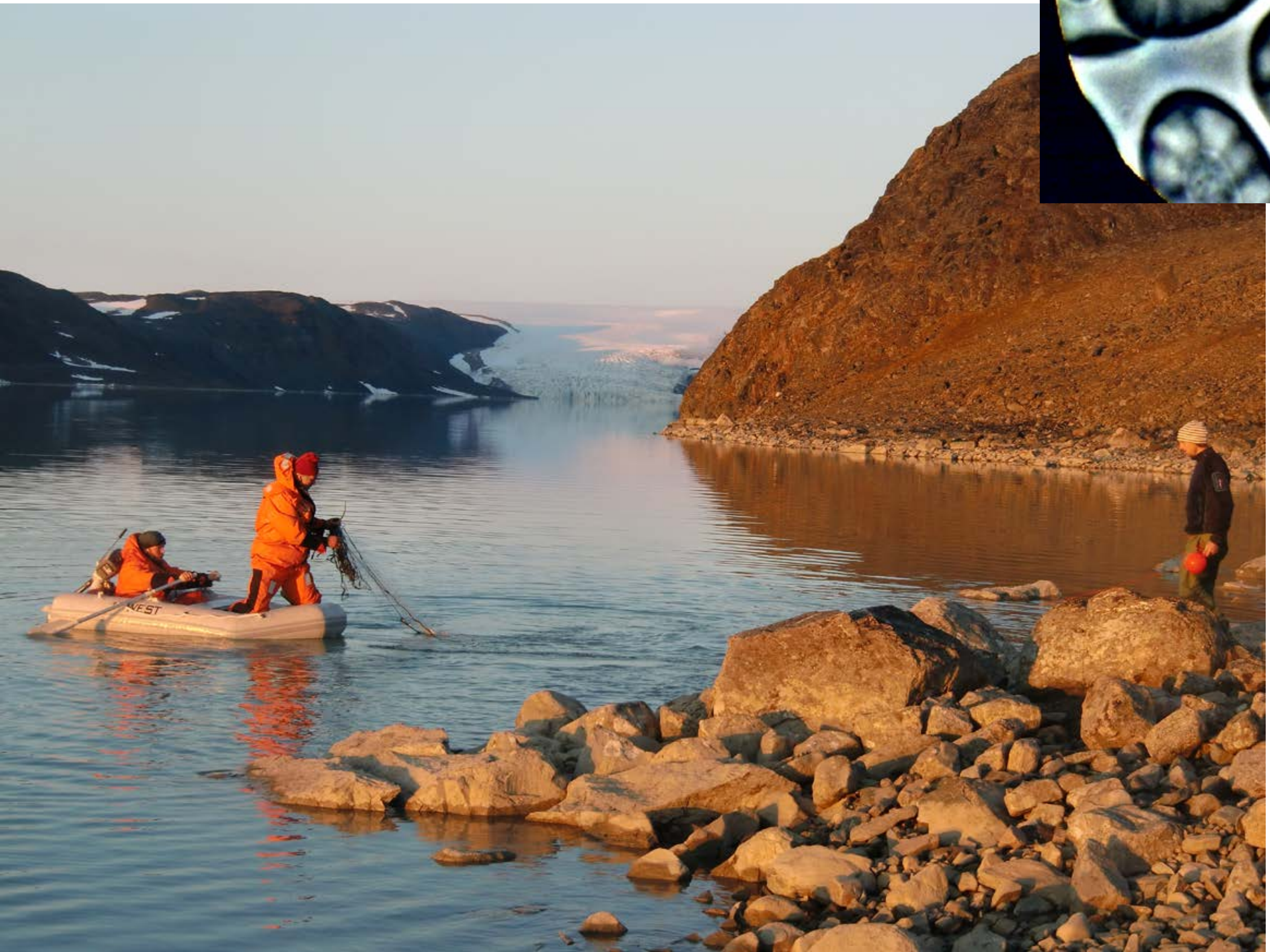
Drosophila: larger animals at lower temperature.

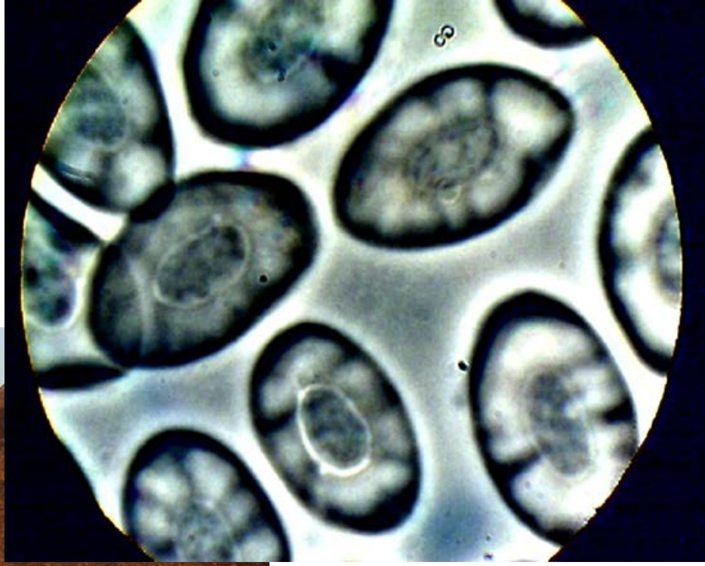
Mixed response in various tissues, no genome size response but more polyploid cells at low temp



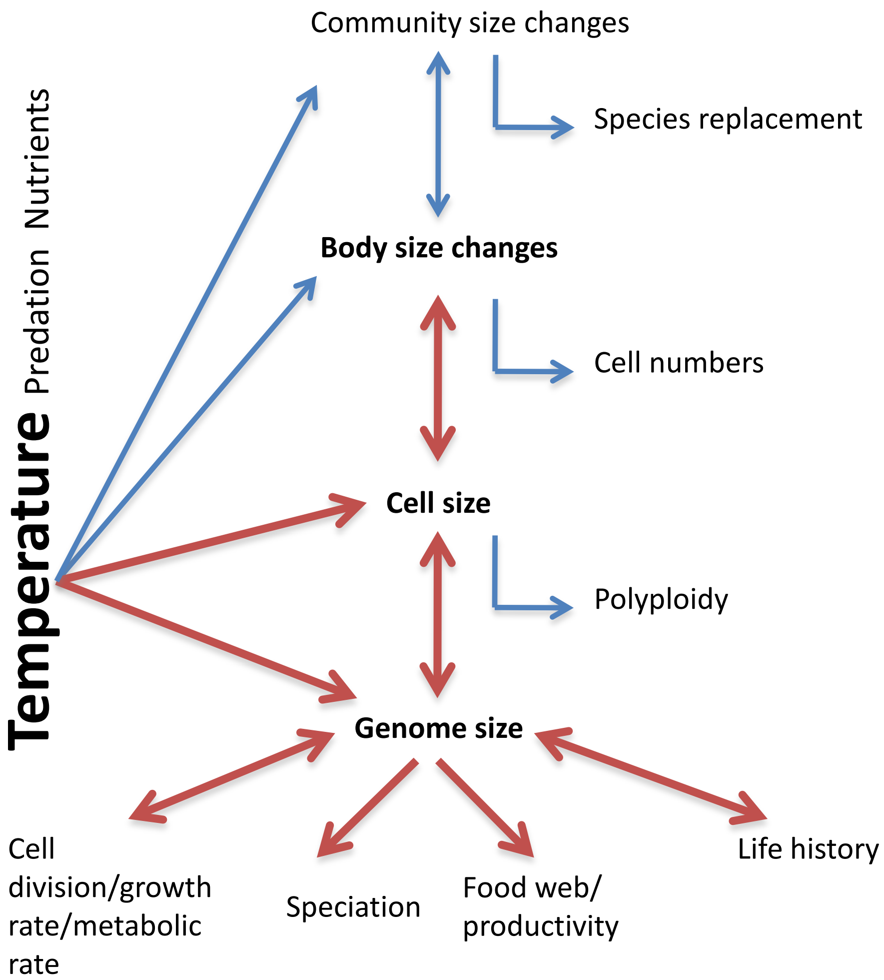


Blood-cells char, size, temp





Temperature and size: summing



Consequences?
(whatever reason)

- Large effects of smaller cells: will affect food web structure, energy flow and C-sequestration
- Life cycle strategies and cell/body size: the causality can work in both directions
- An interesting link between large scale ambient drivers, evolutionary responses and responses both at the organism, cellular and genomic level

To do – within DWARF

- Sample selected terrestrial collembola and insects ……
- ….and aquatic invertebrates (Lepidurus, Mysis, Gammaracanthus, Copepods, Dapnia) … and Arctic charr
- from Nortern Svaldbard to temperate areas
- Search for latitudinal (temperature-related) patterns in adult body size, cell size and genome size (Flow cytometry)
- Predict consequences of global warming

WP 6

- Collect data on genome size, body size and temperature preferences (habitat) from existing data(bases) to search for patterns

- **Additional persons**: A full-year post-doc (Kristian Alfsnes) will work on field and lab analysis on invertebrates, a master student will work with charr and (erythrocyte cell volume and genome size), and another master student will work on terrestrial insects.