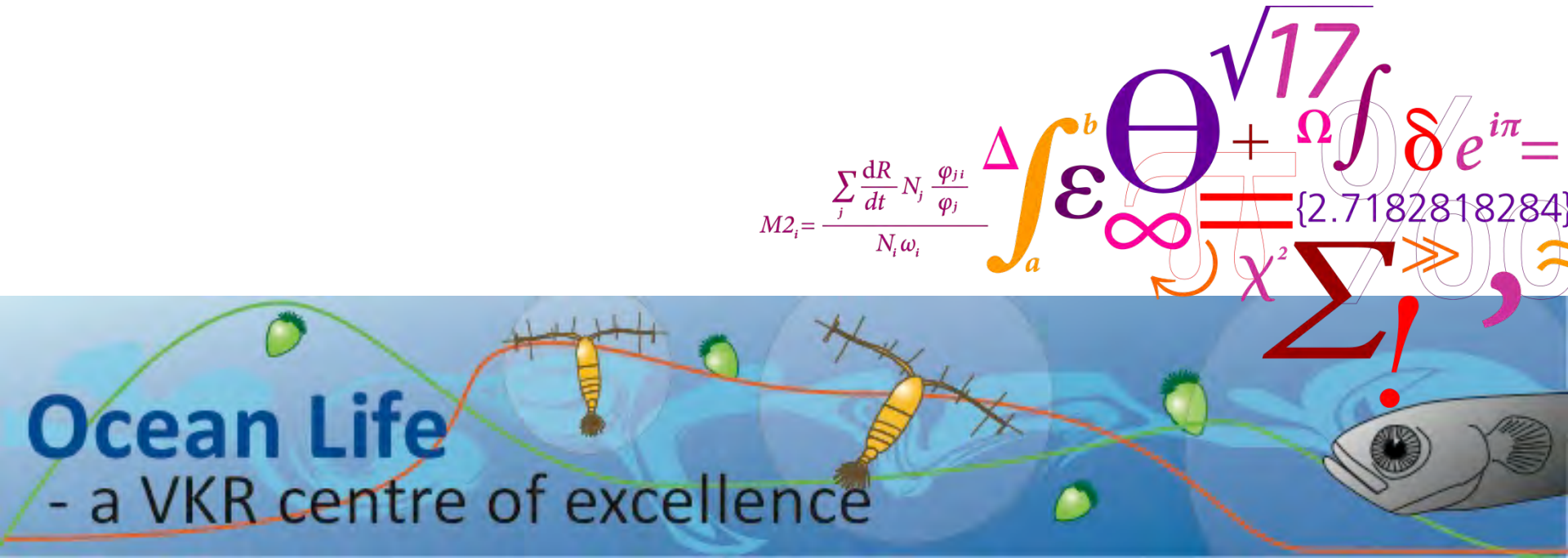
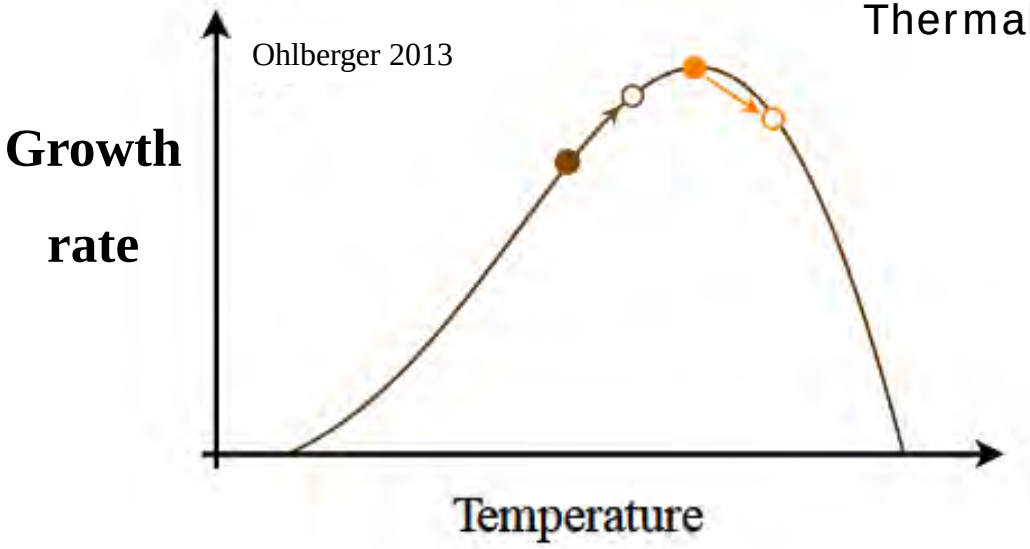
Growth of teleost fish across marine regions and ecological lifestyles

Daniel van Denderen



Fish and climate change:
physiological response of species to changing temperatures

Thermal performance curve



Metabolic rates increase exponentially with temperature. Nearly all other biological rates and times, including individual and population growth rates, and development times and life spans, show a similar temperature dependence (Brown et al. 2004).

Climate change and fish production

PHILOSOPHICAL TRANSACTIONS
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Potential consequences of climate change for primary production and fish production in large marine ecosystems

Julia L. Blanchard, Simon Jennings, Robert Holmes, James Harle, Gorka Merino, J. Icarus Allen, Jason Holt, Nicholas K. Dulvy, Manuel Barange

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e-Structure,

LETTERS
PUBLISHED ONLINE: 30 SEPTEMBER 2012 | DOI: 10.1038/NCLIMATE1691
nature climate change

Shrinking of fishes exacerbates impacts of global ocean changes on marine ecosystems

William W. L. Cheung[1]*, Jorge L. Sarmiento[2], John Dunne[3], Thomas L. Frölicher[2], Vicky W. Y. Lam[1], M. L. Deng Palomares[1], Reg Watson[1] and Daniel Pauly[1]

What about the ecology/community dynamics?

- How to study the combined physiological and ecological response to temperature?

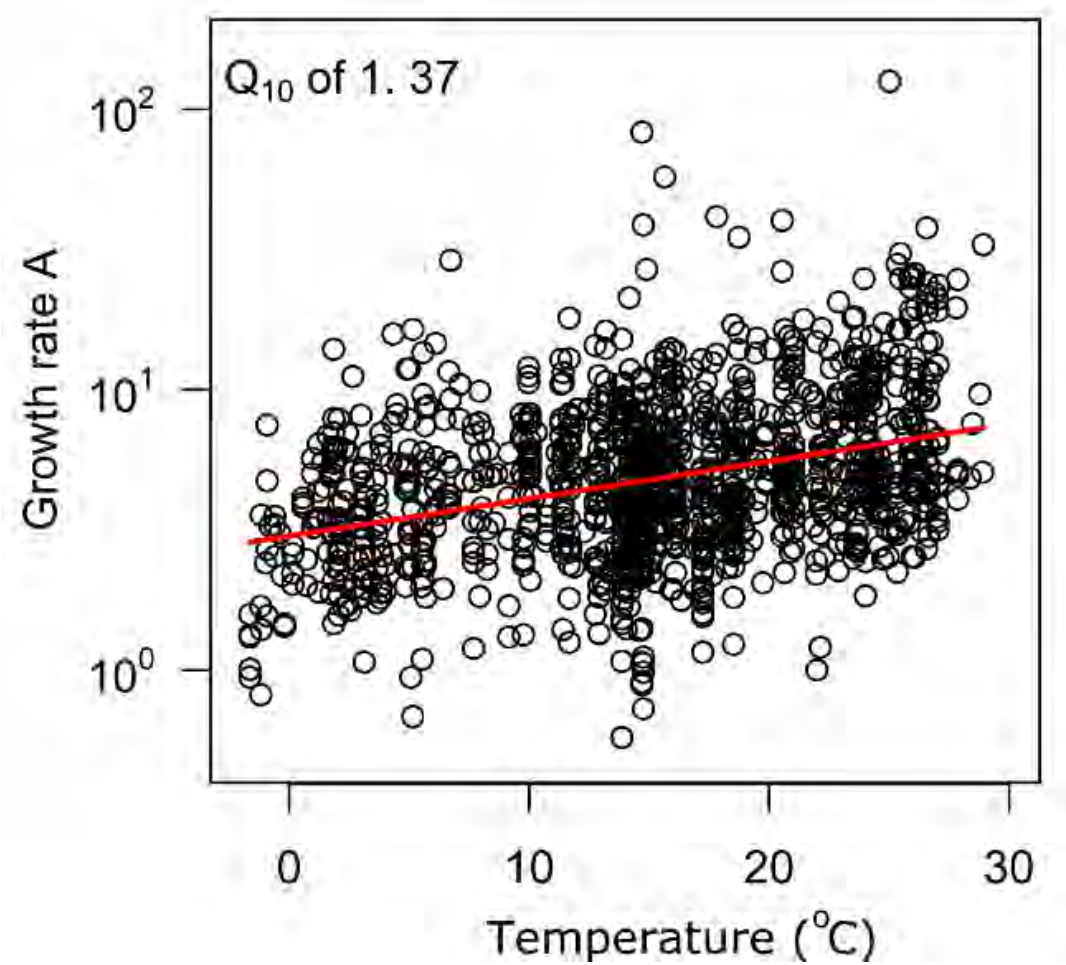
- Examine drivers of existing variation in fish growth across species and regions (from boreal to tropical environments)

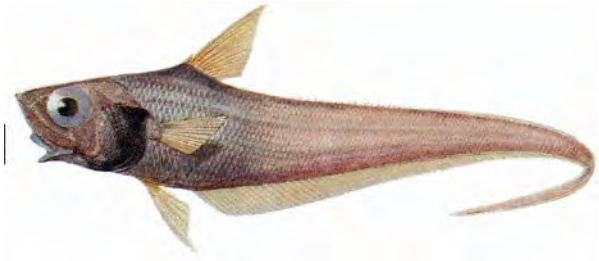
Fish growth

FishBase

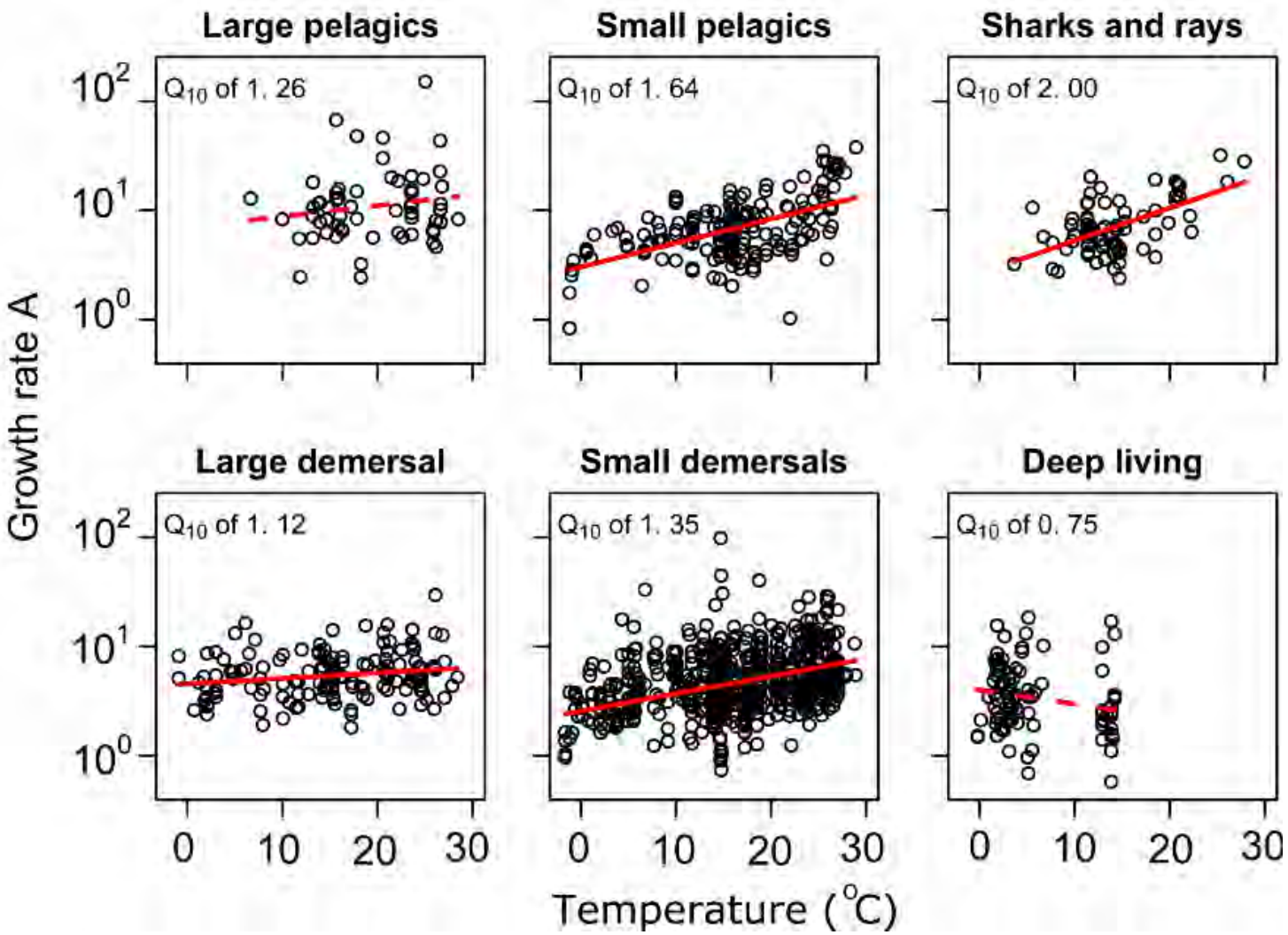
- Von Bertalanffy growth rates
- All fish with $-2 < t_0 < 2$ (n=2554 observations)
- Linked all fish localities to ecoregions (n= 150)
- Calculated L_{inf} independent growth rate A
- Averaged all growth rates per species per ecoregion (n=1284, 781 unique species)

Fish growth with temperature

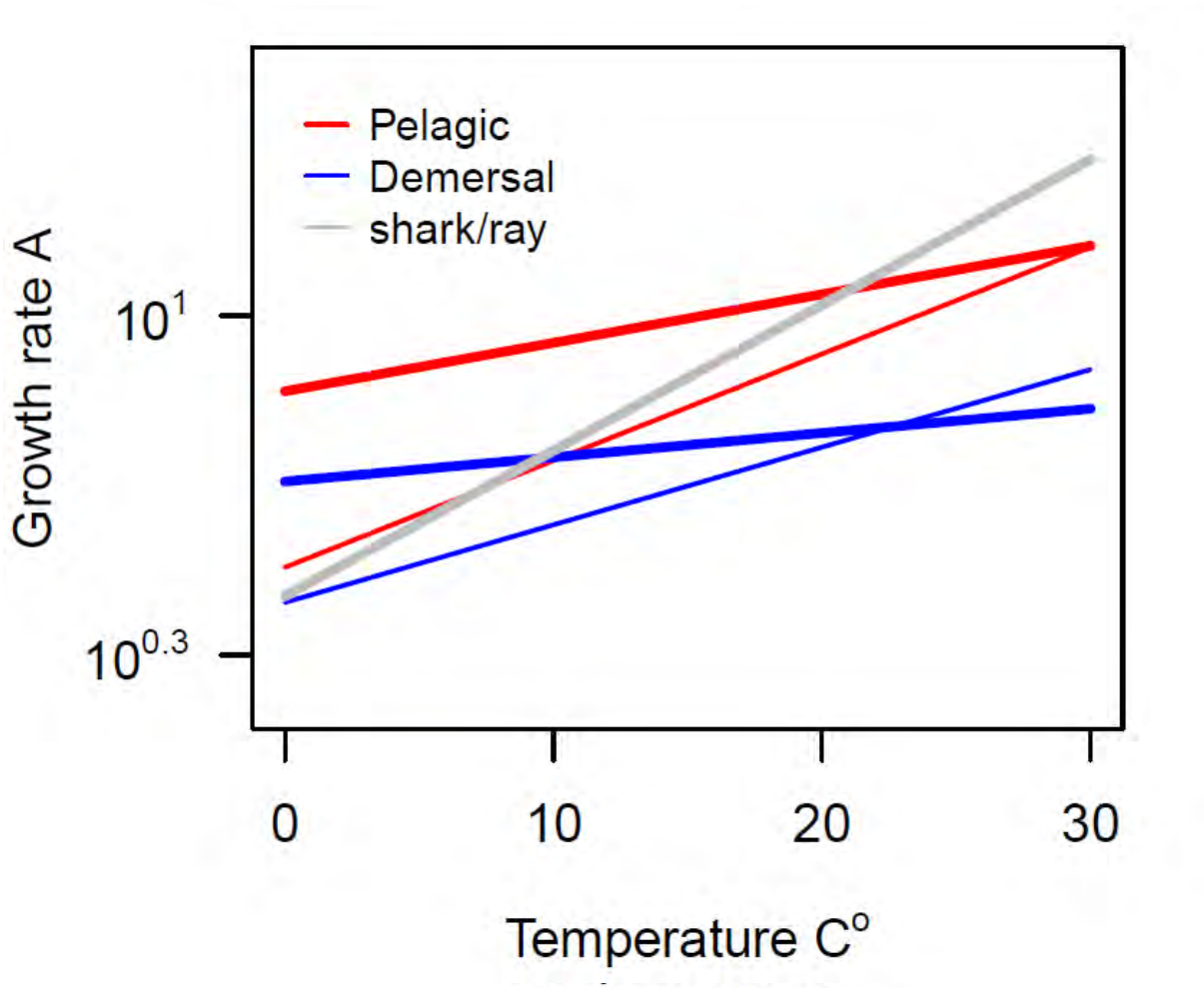




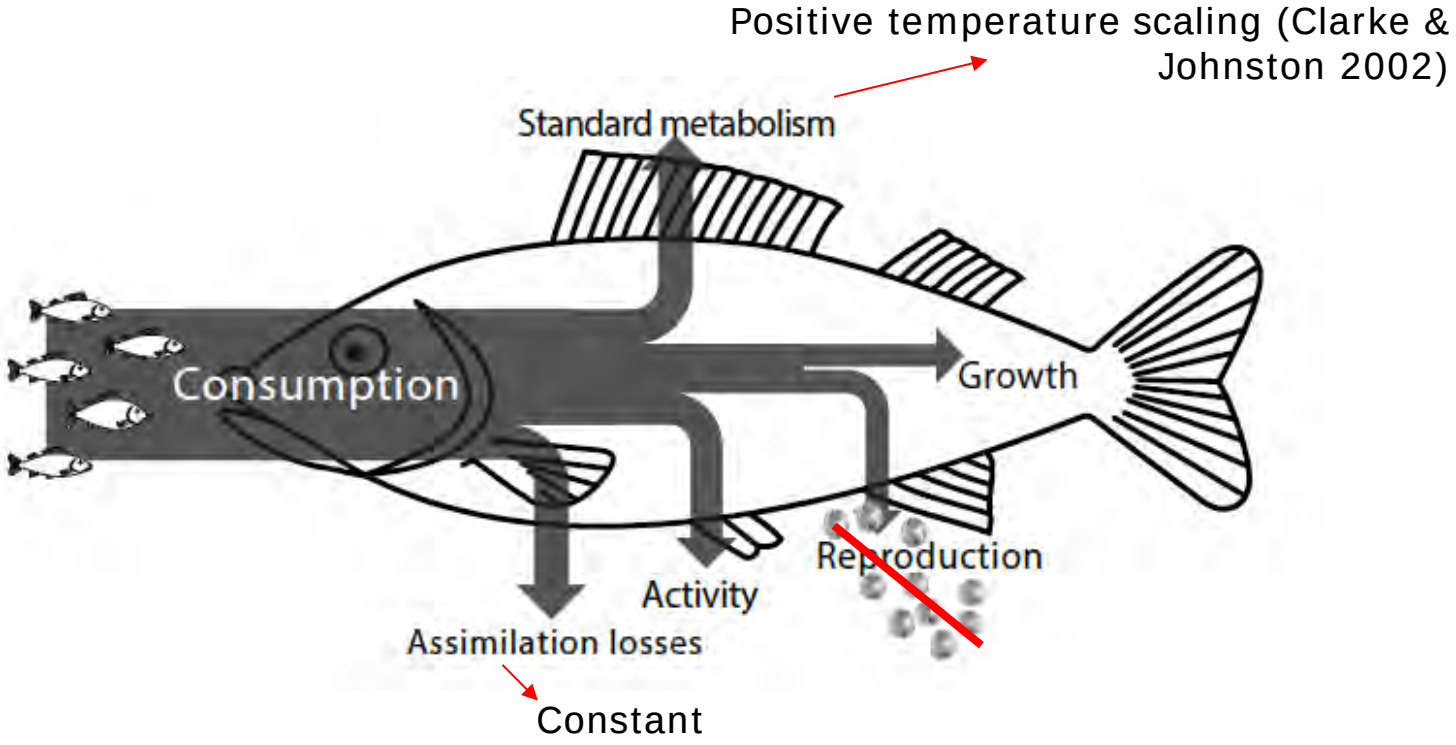
Growth-temperature relationships vary



Growth-temperature relationships vary



Individual fish growth

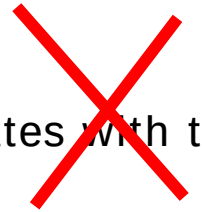


Growth = ass. consumption – (activity + metabolism)

Feeding rates depend on predator and prey responses to temperature

Implications for climate change

- The general perception:
  - Increased growth rates with temperature



- Realized response:
  - Growth-temperature relationships depend on lifestyle, most likely driven by ecological influences (prey type, habitat)

- Climate change will enhance some species groups in growth (and dominance) relative to others
  - Consequences for food webs and energy flow in marine systems
  - Effects of climate change on fish production

Thank you for your attention

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Ken Andersen

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VKR Centre of Excellence