

Capital and income breeding as reproductive strategies in zooplankton

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Photos: Hiroaki Saito



The University Centre in Svalbard



• **University of Bergen**

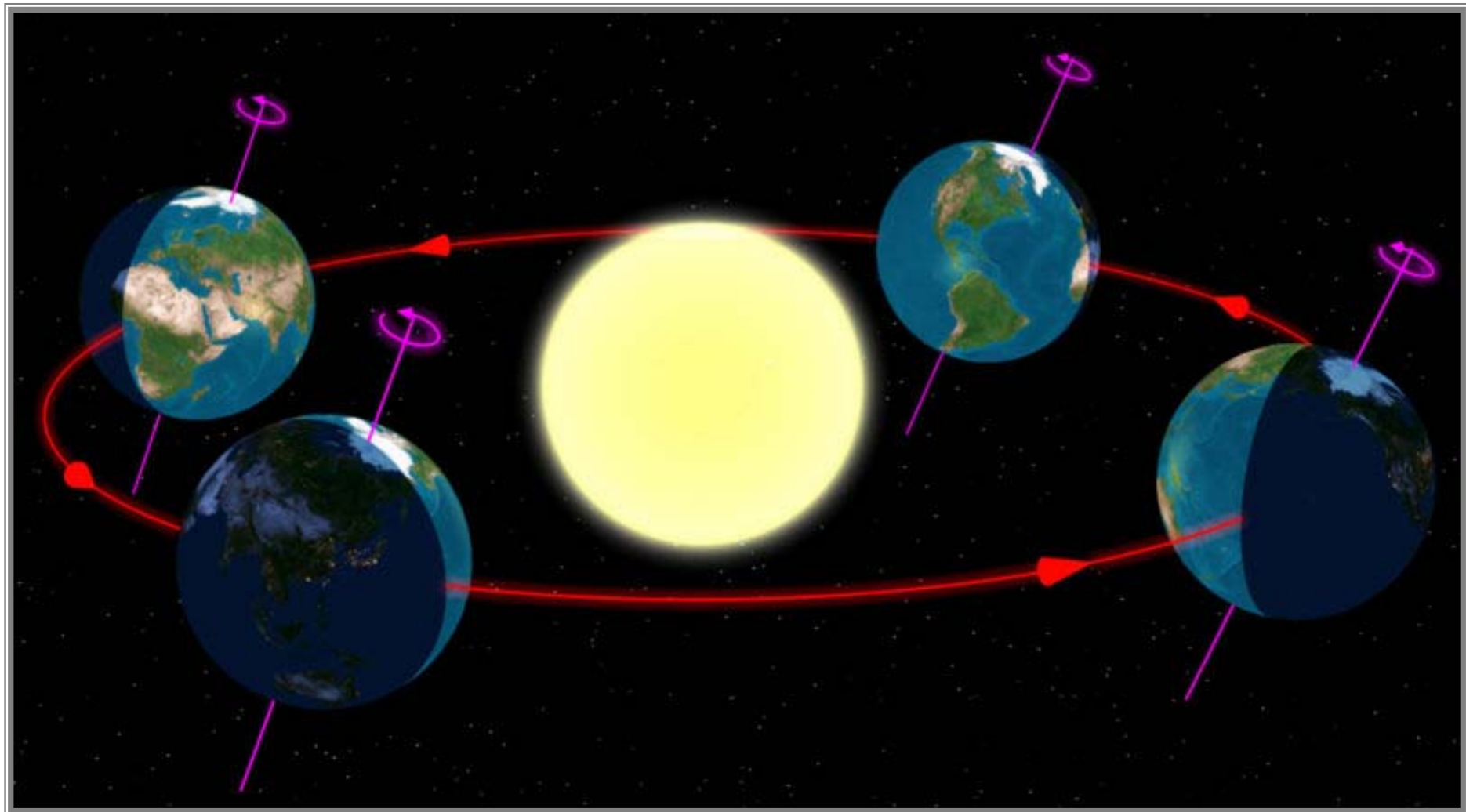
Varpe, Jørgensen, Fiksen

• **British Antarctic Survey**

Tarling



Life history adaptations to **seasonality**



Energy reserves in seasonal environments

Survive the winter



Energy reserves in seasonal environments

Survive the winter



Energy reserves in seasonal environments

For reproduction

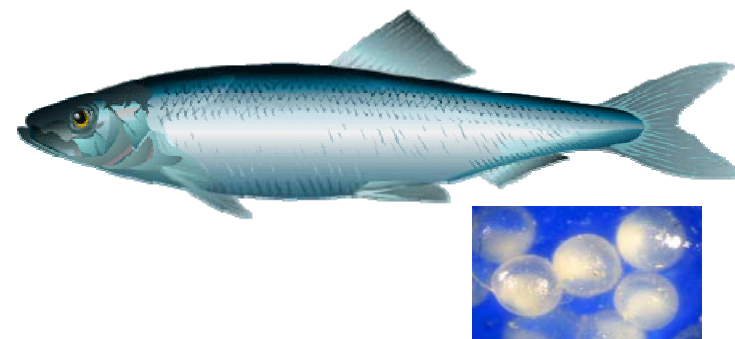
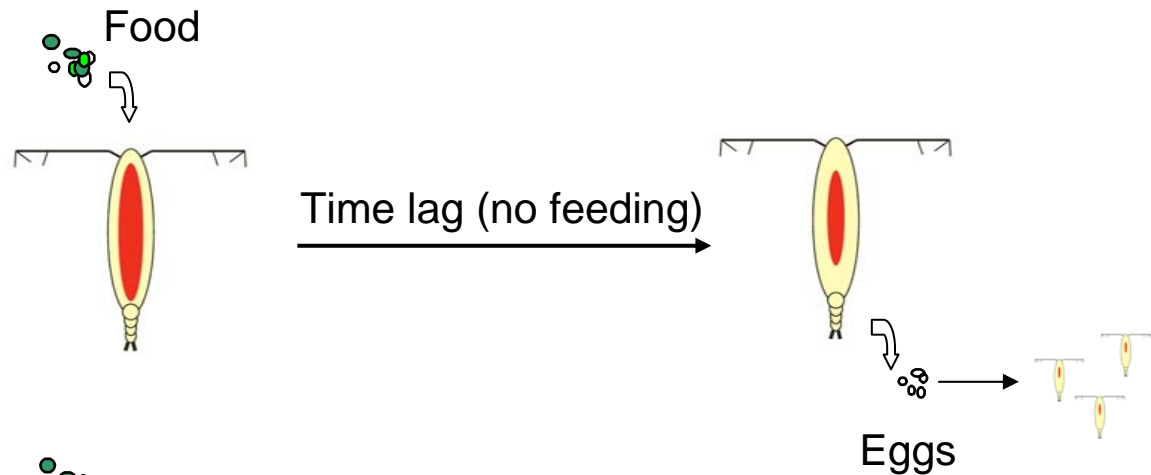


Photo: H. Saito

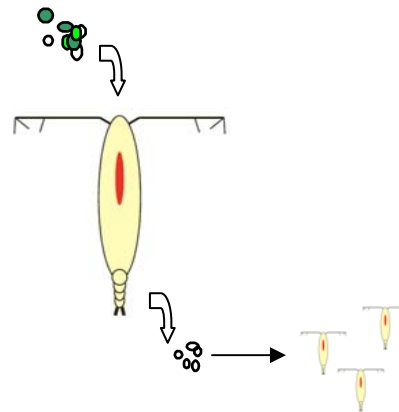
Capital and income breeders

e.g. Jönsson 1997 Oikos

Capital breeders:
reproduce based on
resources acquired
and stored *prior to* the
breeding season



Income breeders:
reproduce based on
resources acquired
during the breeding
season



A mixed strategy is common



Copepod family Calanidae

Capital breeder

Neocalanus spp

Calanus hyperboreus

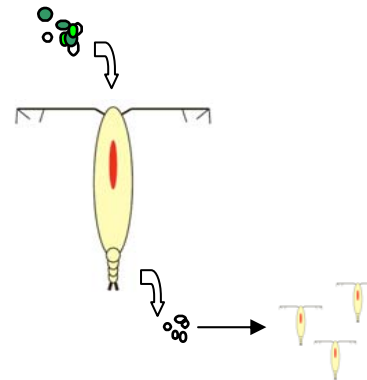
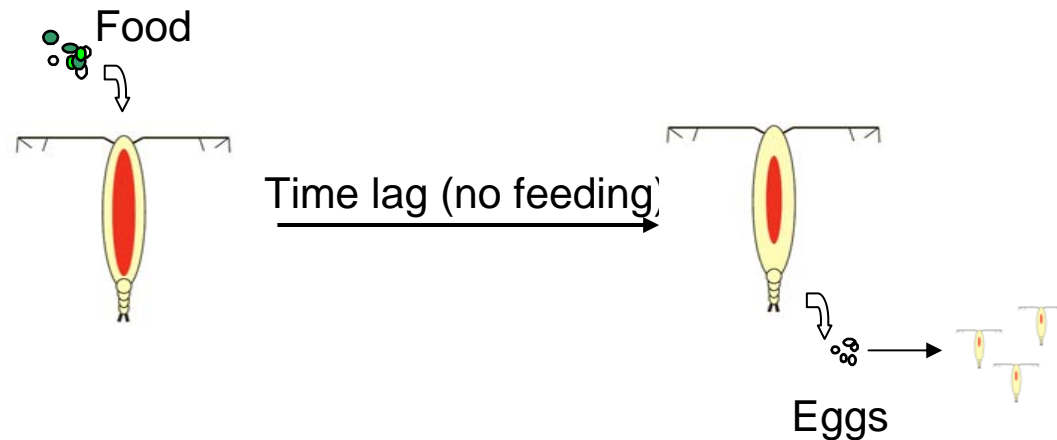
Calanus glacialis

Calanoides acutus

Calanus finmarchicus

Calanus helgolandicus

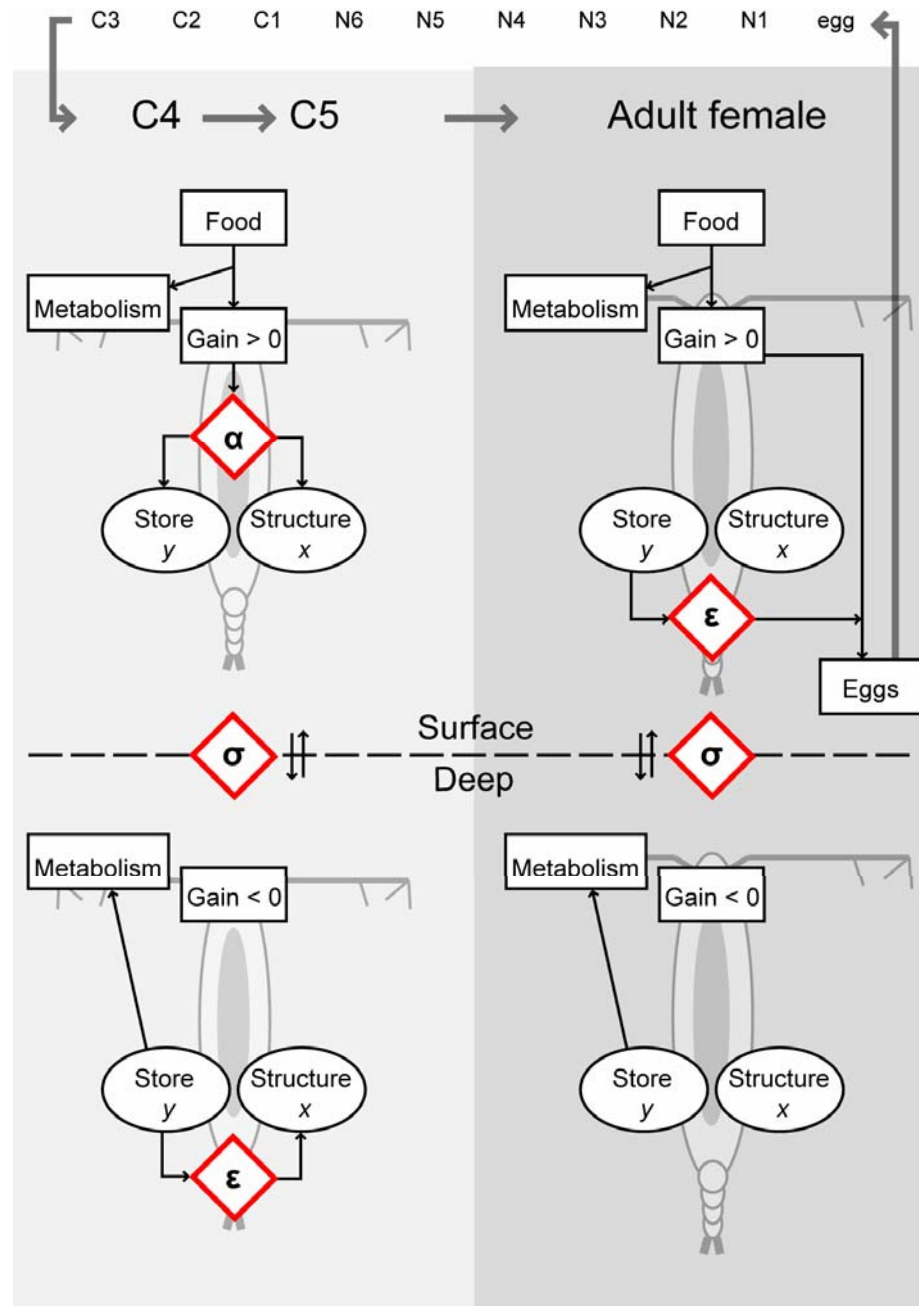
Income breeder



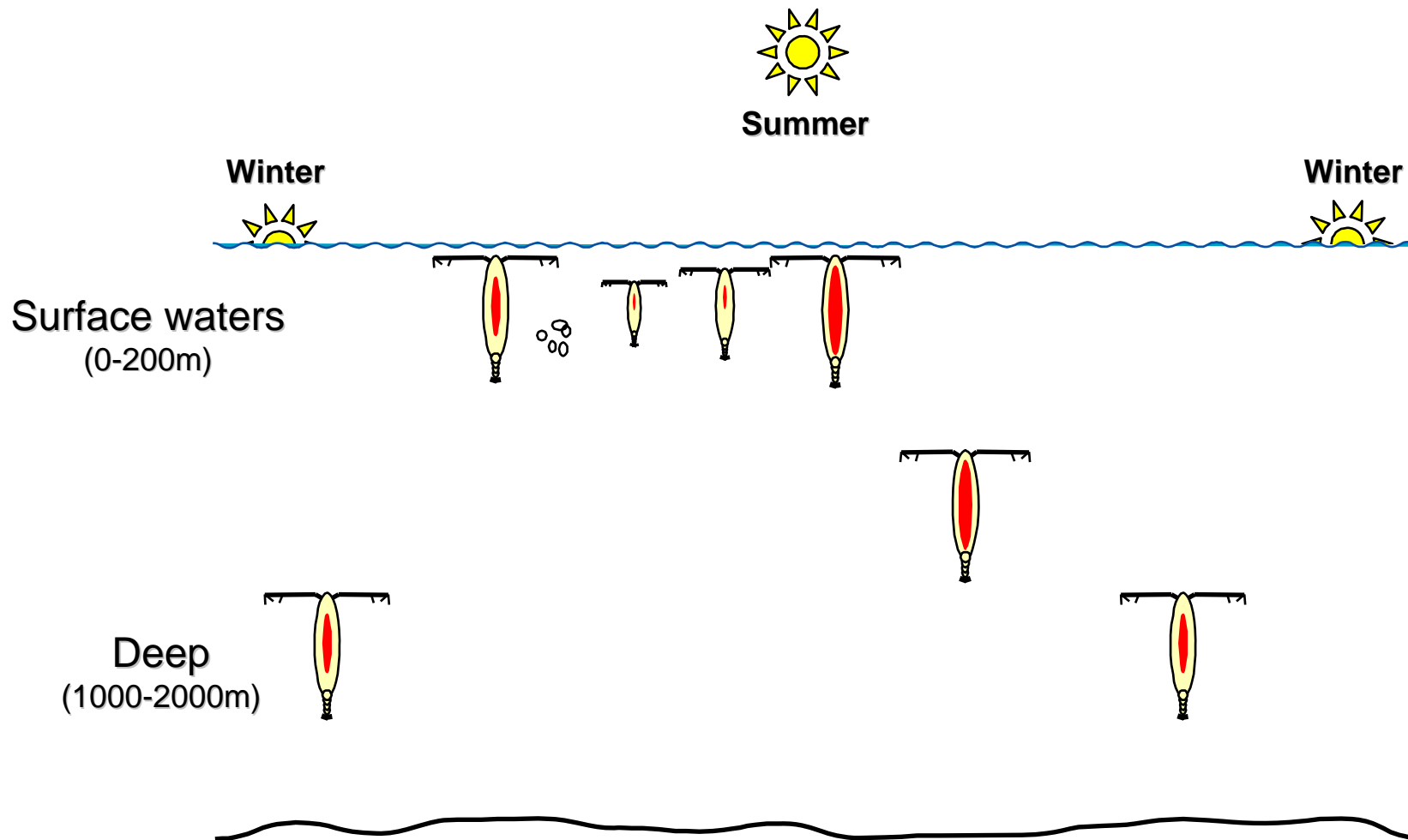
Model

Optimal life history

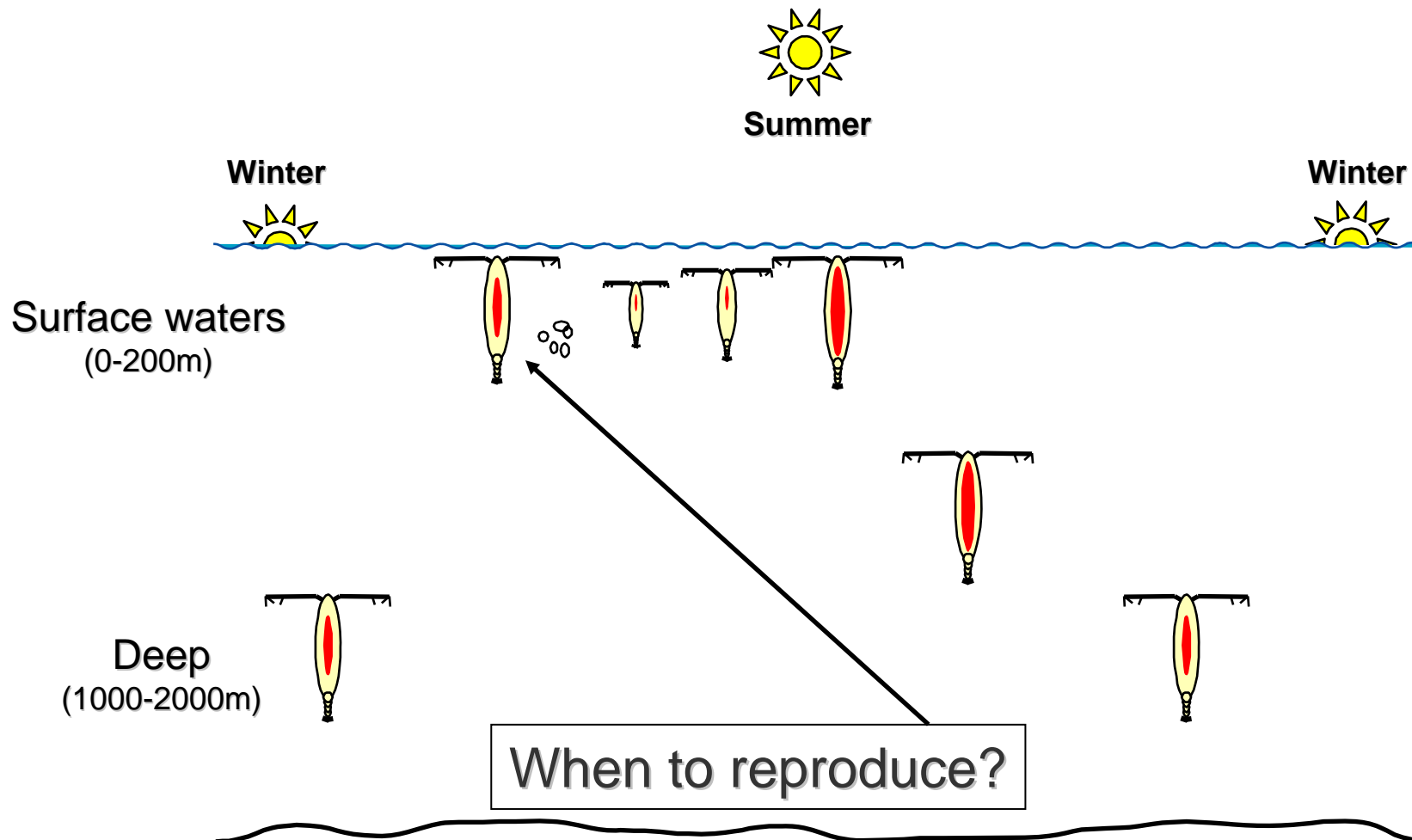
- for a given environment and constraints
- state-dependent actions
- dynamic programming
- Varpe et al. (in press) *Oikos*



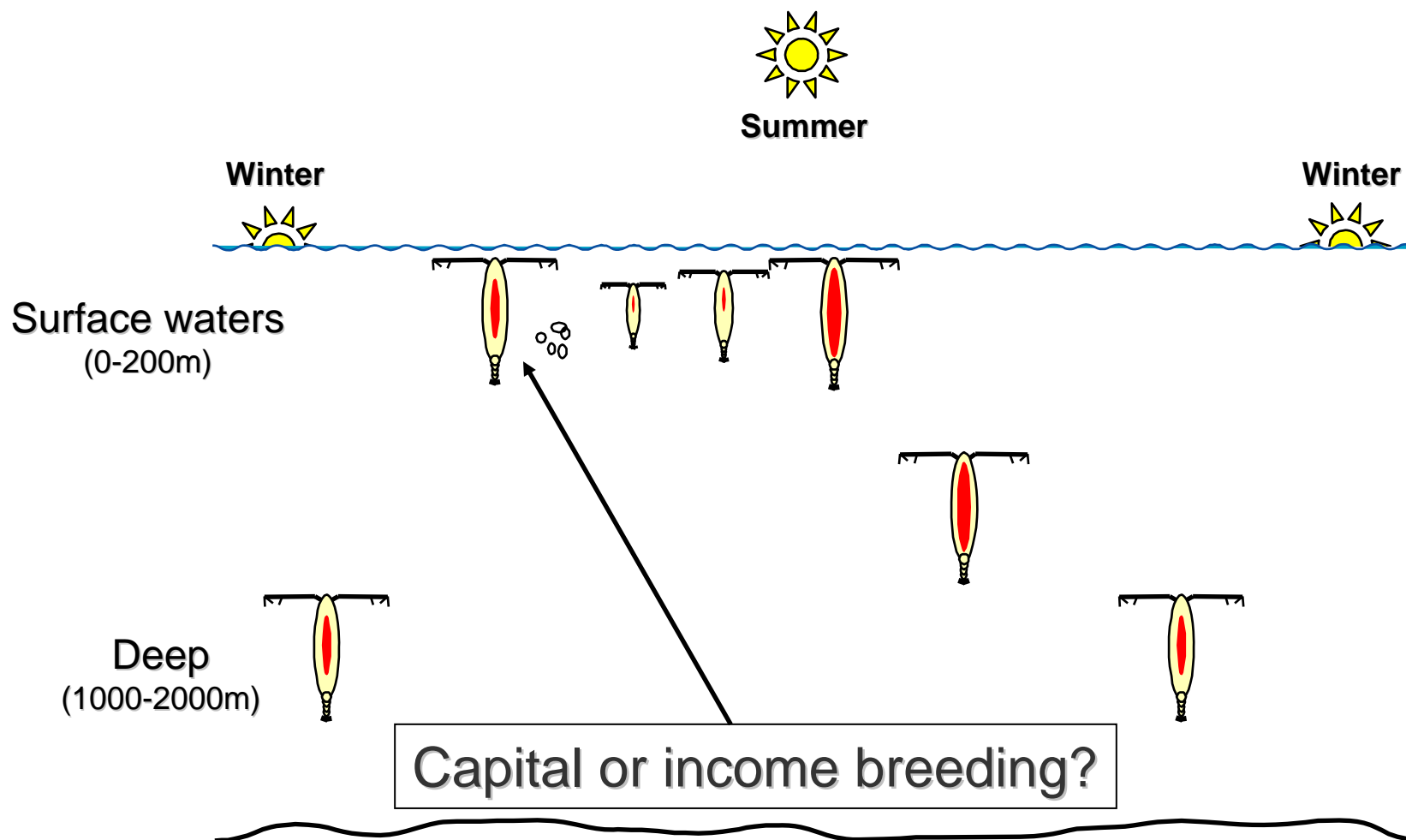
Copepod life histories



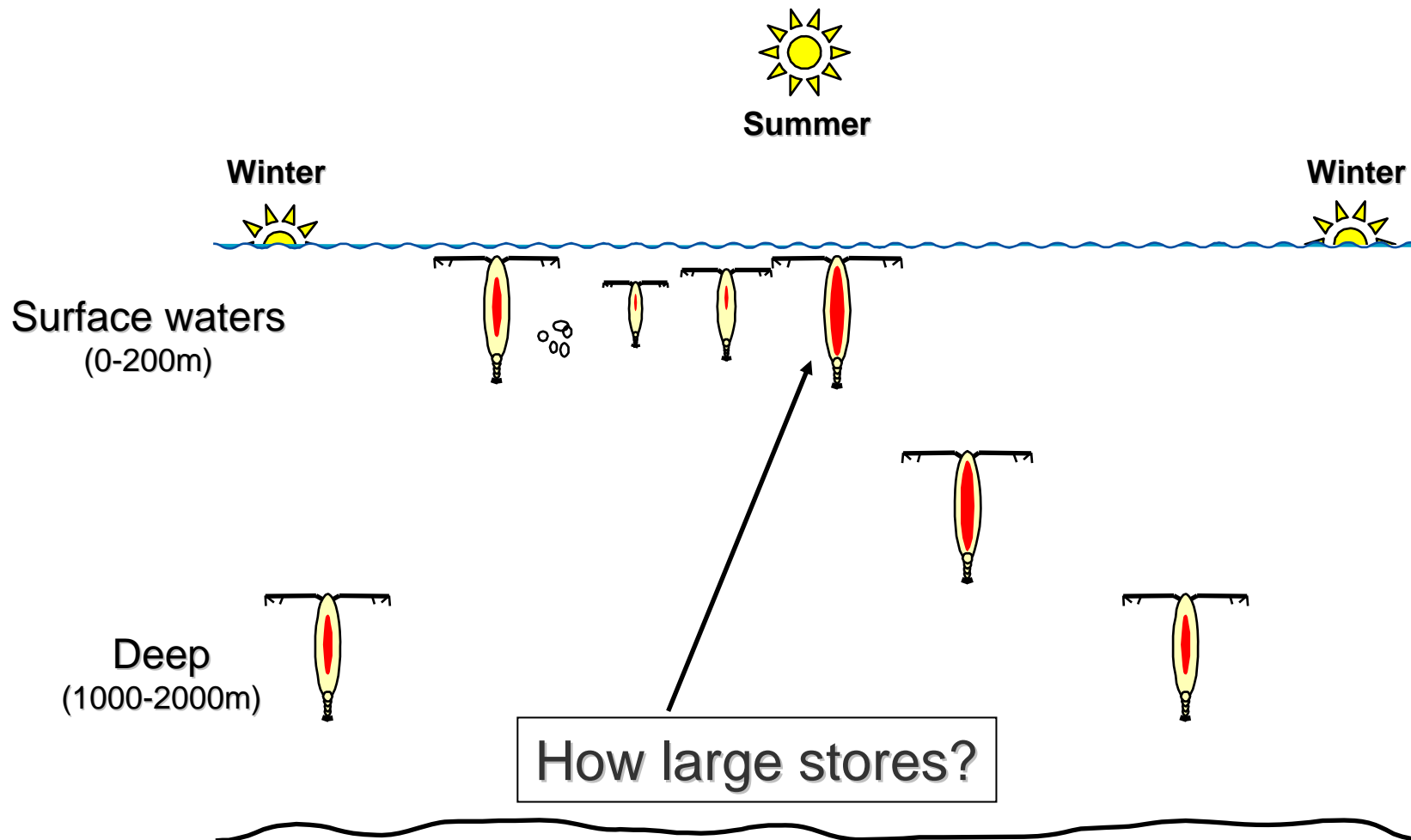
Copepod life histories



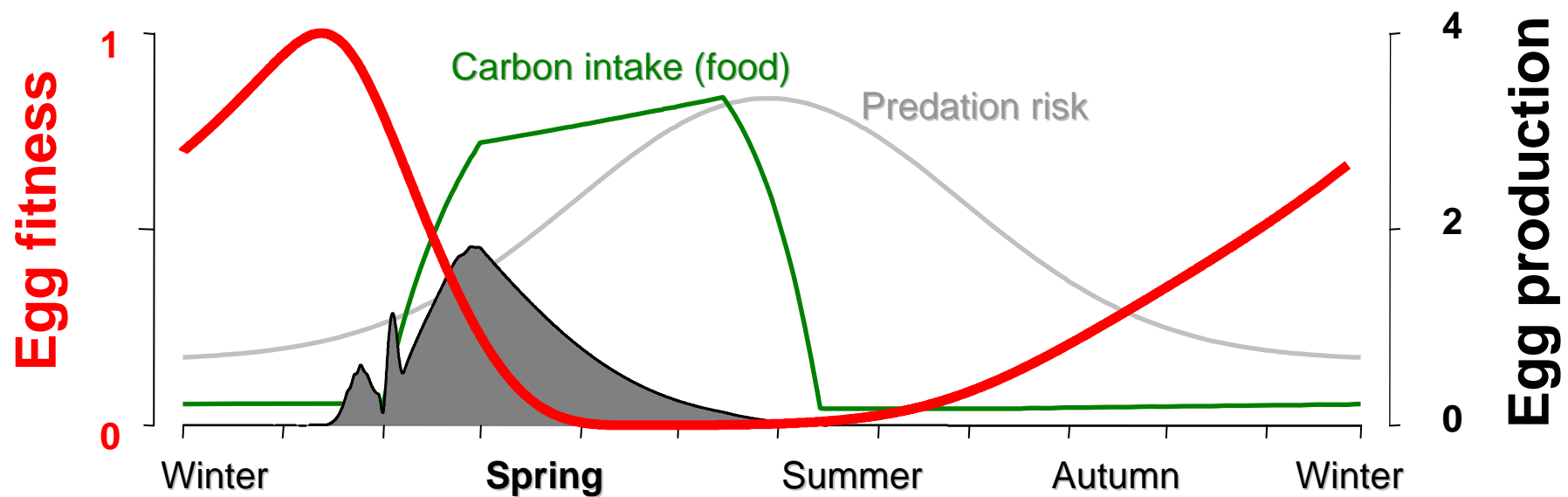
Copepod life histories



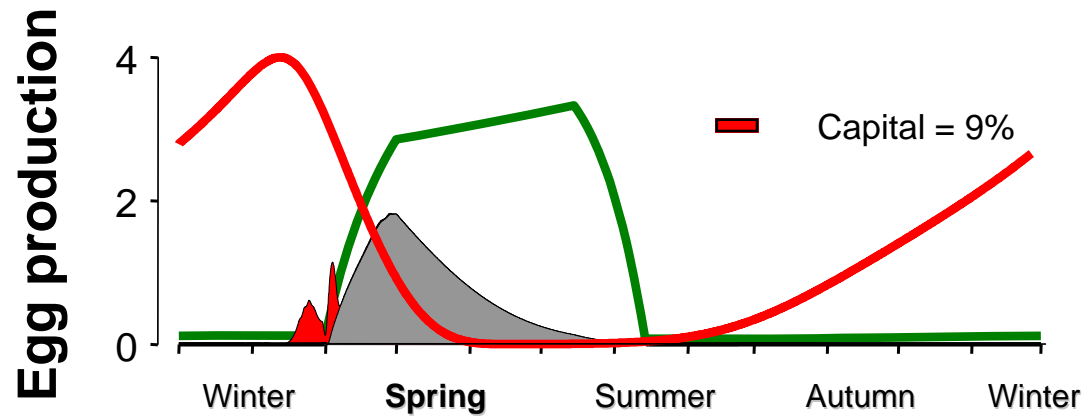
Copepod life histories



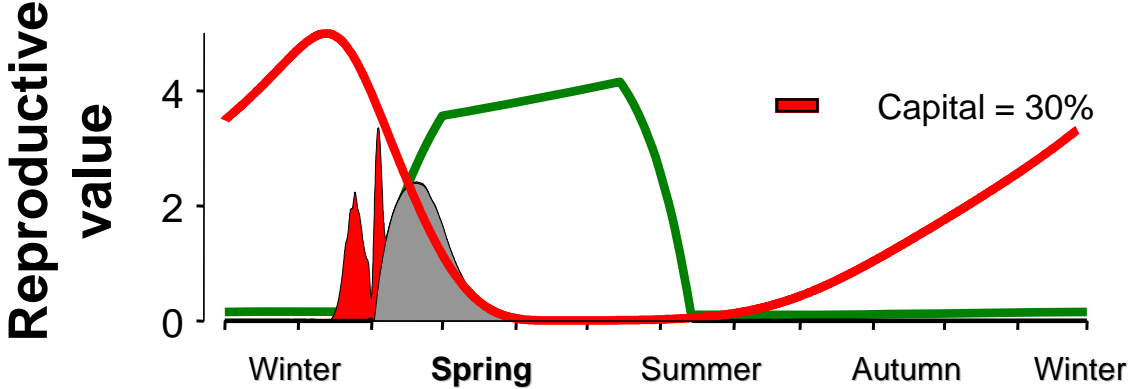
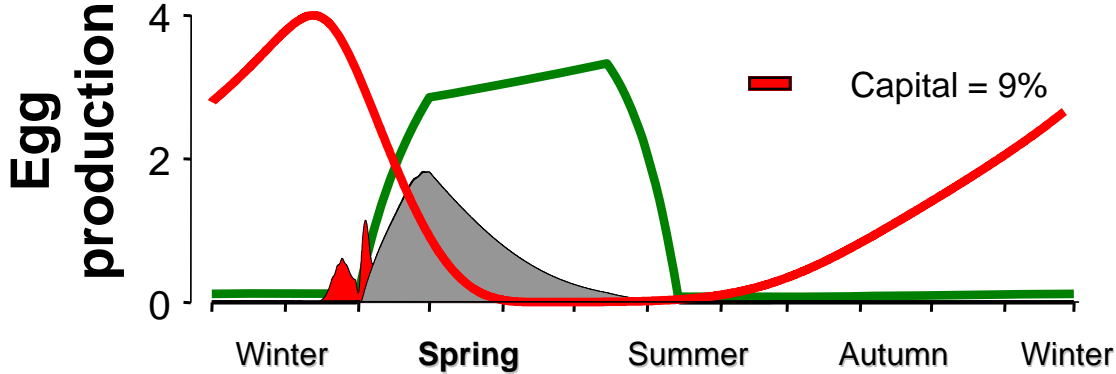
When to reproduce?



Capital vs. income breeding



Capital vs. income breeding



Concluding remarks

- **Are we studying the winners?**
 - numbers vs. reproductive value
- **Focus: capital bred eggs and pre-bloom period**
- **Parent strategies do not necessarily reflect what is best for the offspring**
 - “internal life history mismatch”