

Community Production

Production = Mass x Growth rate

- Growth rates of dominant copepods are available from Gulf of Alaska (GoA)
- Egg production available for GoA, Bering Sea, RUSALCA and Canada Basin
- GoA Rates are related to life stage and food concentration, at 5-12°C
- Apply Global Q_{10} to adjust for temperature
- Larvacean rate exists that is temperature dependent

First cut:

- Large copepod growth rates: 2-10% per day
- Small copepods less: 1-5% per day)
- Euphausiids much lower <1% per day
- Larvaceans 15-30% per day!
- Note: larvacean production = copepods in 2004 & ~50% of copepods in 2009 & 2012
- Area of Chukchi is 0.6 million km²

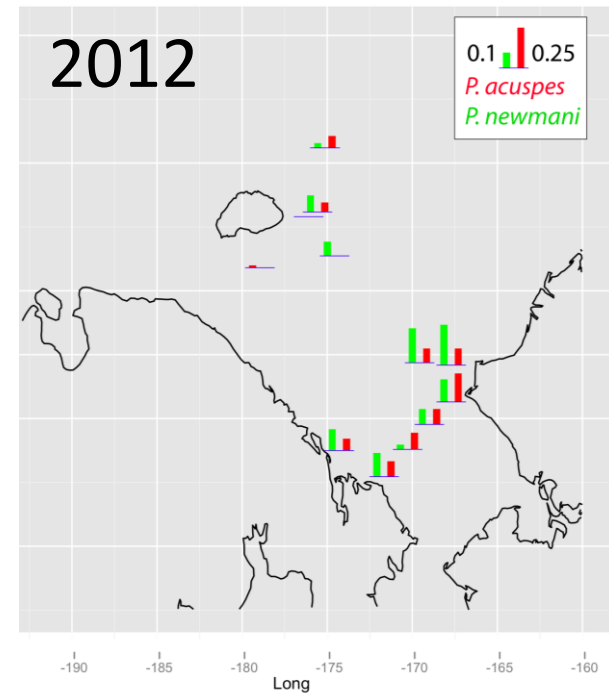
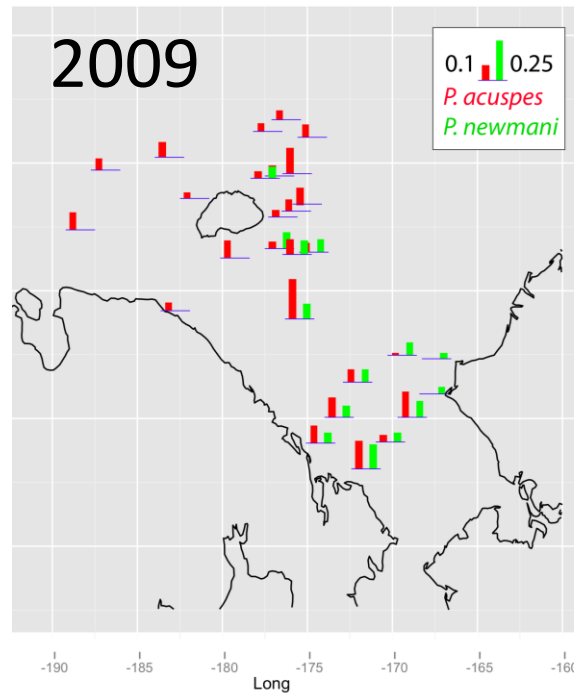
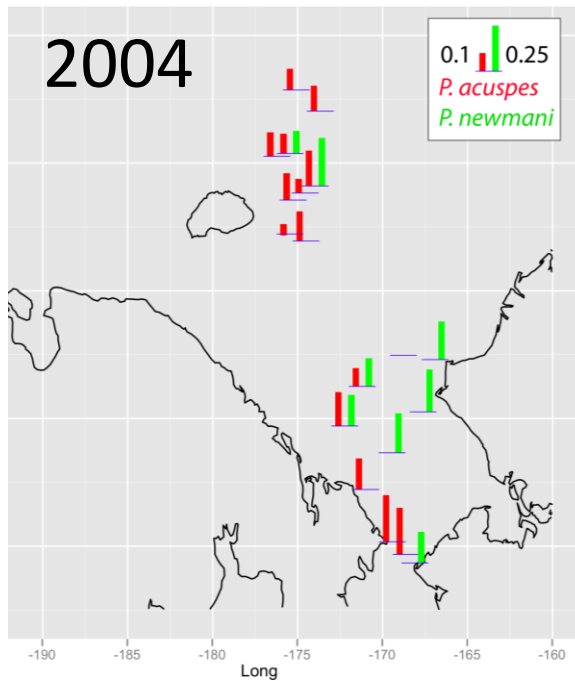
First cut:

- Summer prodn on the order of $70\text{-}150 \text{ mg DW m}^{-2} \text{ d}^{-1}$
 - = $70\text{-}150 \text{ kg DW km}^{-2} \text{ d}^{-1}$
 - = $42,000\text{-}84,000 \text{ DW tonnes d}^{-1}$ for entire Chukchi
 - = $0.02\text{-}0.04 \text{ million t Carbon d}^{-1}$
- Unclear how to scale to annual rates since we don't know appropriate food climate for much of year (temperature can be approximated with season modulation)
- BUT if it applies over 4 months
- THEN $2.3\text{-}4.6 \text{ million tonnes C annually}$
 - Compare to $0.8\text{-}1.6 \text{ million tonnes C}$ from advection

SEP – Specific Egg Production

2 parameters to describe the population:

- EPR (Egg Production Rate) - # eggs/female/day
- **SEP - % body mass/day**



P. acuspes – 17 %mass day⁻¹

P. newmani – 16 %mass day⁻¹

9.1 %mass day⁻¹

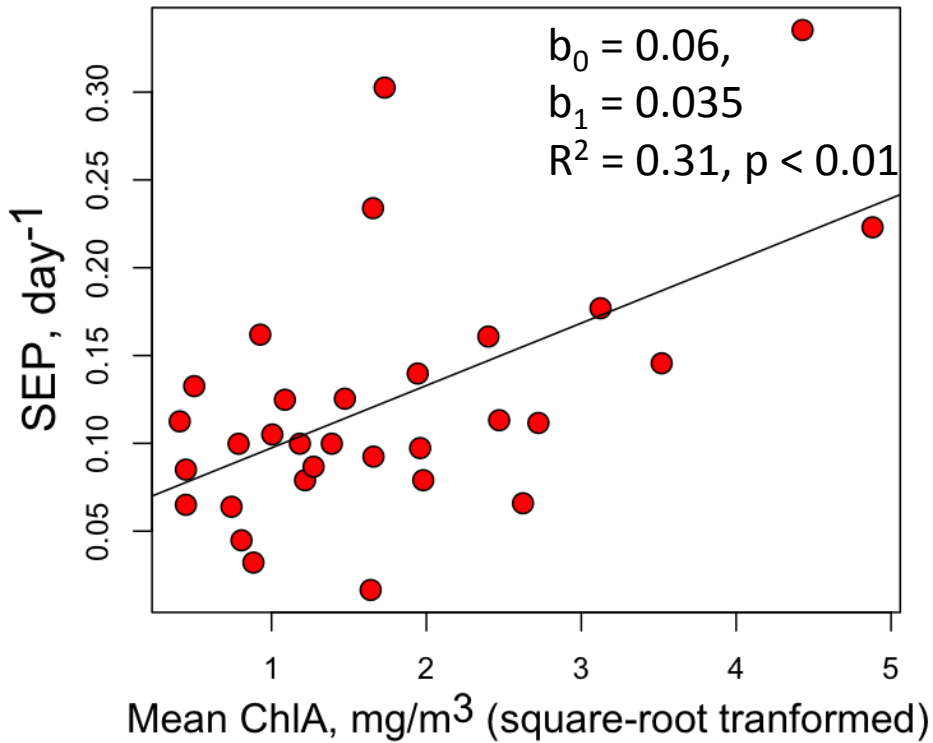
7.8 %mass day⁻¹

7.1 %mass day⁻¹

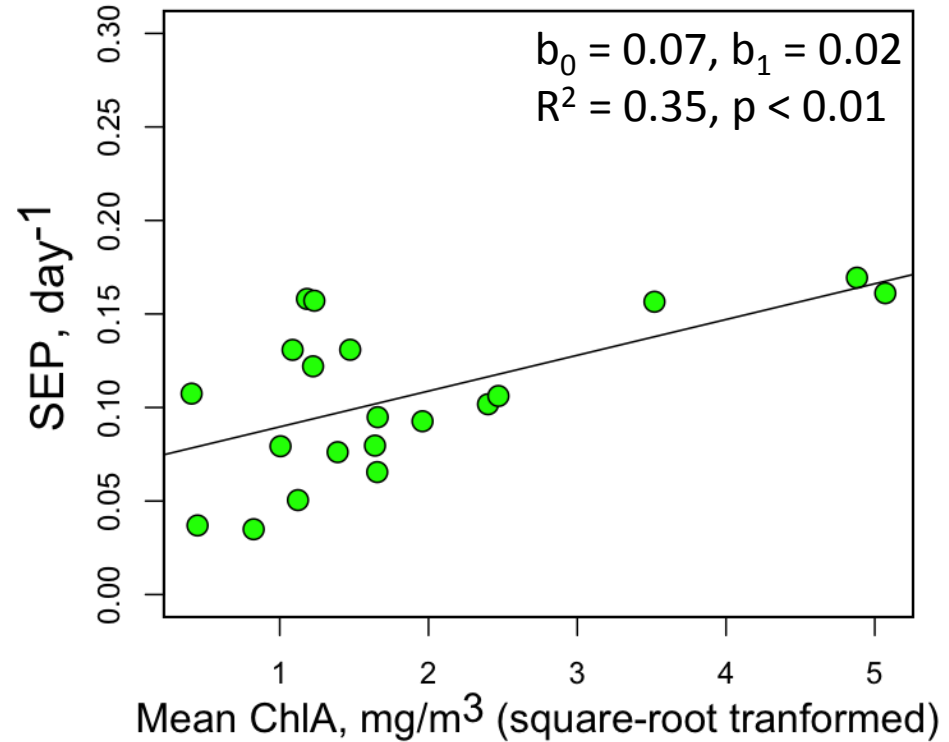
9.6 %mass day⁻¹

Environment - Food

- Chlorophyll A



P. acuspes

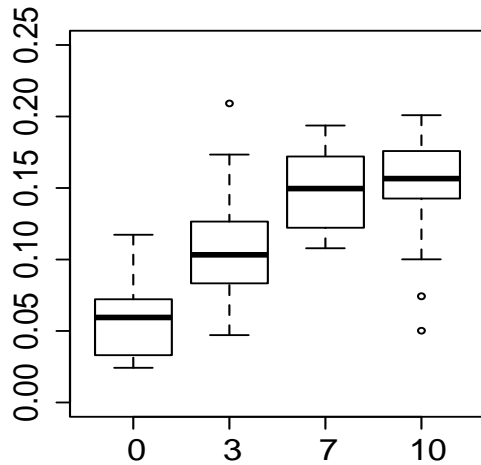


P. newmani

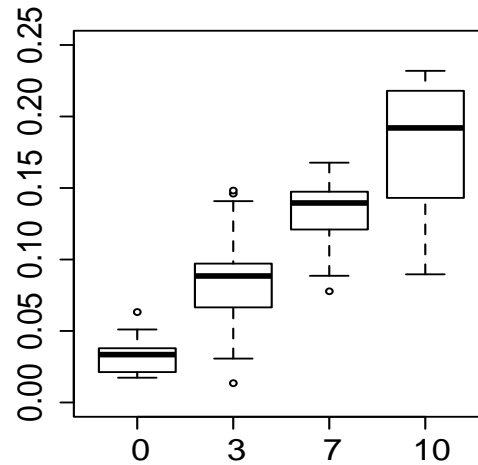
Caveats

- Egg production experiments suggest some species do better than expected in terms of growth rates!
- Alternatively, large Pacific Oceanic species may already be at the end of their growth phase and contribute nothing to local production
- How do different species respond to temperature?

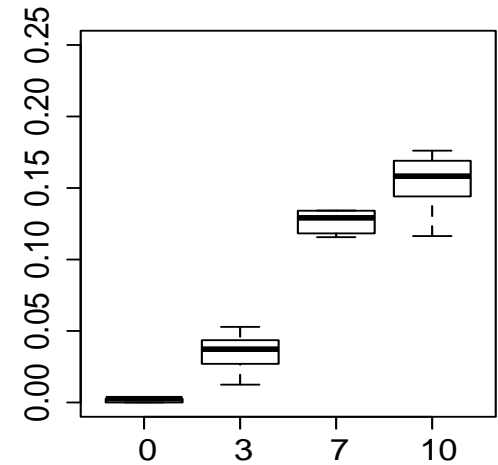
Temperature-dependent SEP (weight specific egg production) - % body weight day⁻¹



P. acuspes (Chukchi sea / Beaufort Sea)

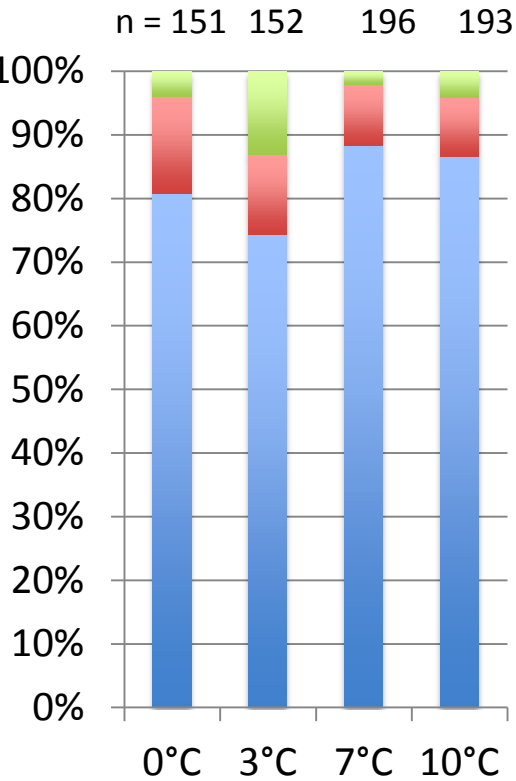


P. newmani (Chukchi sea/Bering Sea/Gulf of Alaska)

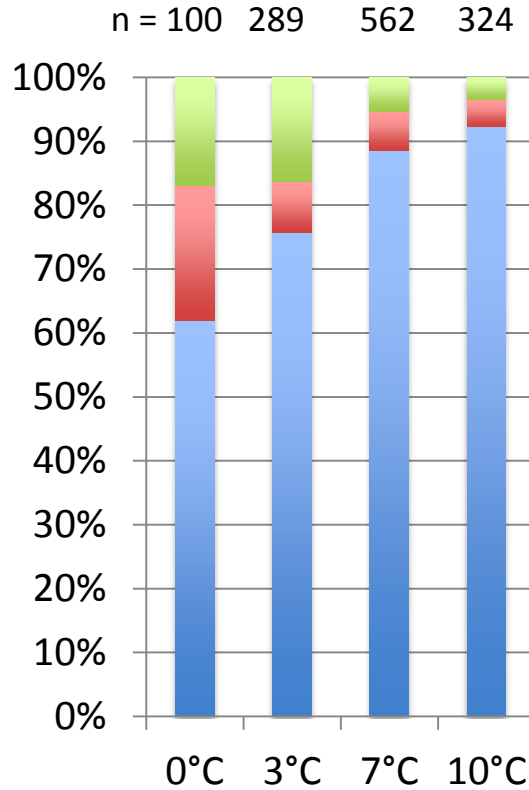


P. mimus (Gulf of Alaska)

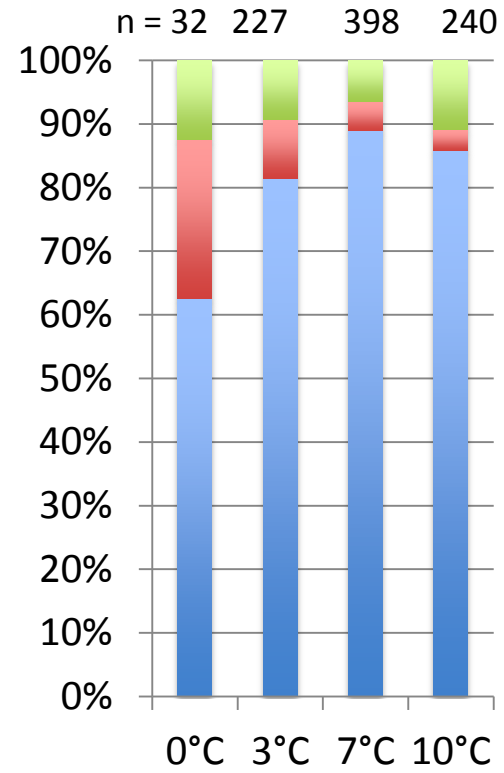
Hatching success rates



P. acuspes (Chukchi sea)



P. newmani (Chukchi sea/Bering Sea/Gulf of Alaska)



P. mimus (Gulf of Alaska)

