Community composition and production of larvaceans in the Northern Bering Sea

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- July 2002, station depths 30-50m
- Warmer, fresher, stratified water in east
  - Alaska Coastal water
- Cooler less stratified water in remainder
  - Bering Shelf water
Only three species:

- *Oikopleura vanhoeffeni*
- *(O. labradoriensis)*
- *Fritillaria borealis typica*
**O. vanhoeffeni** egg production

- Animals collected by large volume non-filtering cod end on a 64-µm net during a dead-flat clam day
- Diluted into large pail, and bright orange-headed animals captured underwater into a jar
- 7 successfully retrieved with rip ovary intact
- Trunks length averaged 3665 µm (3050-4350 µm)
- Egg counts averaged 2690±1320 STD, range 1210-4730
- Diameter 127 ± 4 µm (STD), n=139
Hatching time

• Some spawned eggs were fertilized *in vitro* over a 2 hr interval using sperm released from other animals
• ~200 of these were incubated in incubators at each of 3°C & 6°C
• Eggs hatched at 3°C after 36-39 hrs, at 45-48 hrs tail rotation occurred, at 59 hrs close to initiating feeding
• Eggs at 6°C appeared to develop, but never hatched
Growth Rate Experiments

- 2 stations – water collected at 5m using 10L Niskin bottles & pre-screened through 200 µm mesh to create “artificial cohorts”
- 360L screened onto 45 µm mesh as T0
- 720L incubated on deck at sea-surface temperature, and 360L screened onto 45µm mesh after 3 & 5 (HIS36) or 3 & 7 days (HIS5)
- Trunk lengths measured in preserved samples, and growth estimated from change in predicted weight at mean size
Experimental Temperatures

His5 averaged 5.7°C, His36 averaged 5.8°C
**Fritillaria borealis**

- **HIS5**
- To avoid bias we used T3-T7 because:
  - hatching continues between T0 & T3
  - size dependent mortality may occur at T0 (i.e. larger individuals damaged by screening)
- **Growth rate**
  - = 18% per day
Oikopleura vanhoeffeni

- HIS5
- Growth rate = 25% per day
Oikopleura vanhoeffeni

- HIS36
- Growth rate = 41% per day
- No animals at T0
Growth rate implications:

- Using these growth rates, size at hatching & size of adults, we can make preliminary estimates of generation times

- These will be underestimates because laboratory work suggests growth may decline with increasing size

- For *Oikopleura vanhoeffeni* estimates are 42 and 26 days

- For *Fritillaria borealis*, estimate is 28 days
**O. vanhoeffeni** house production rates

- Collected by large volume non-filtering cod end on a 64 µm net on “dead-flat” clam day
- Diluted into large pail, animals reforming houses captured underwater into a jar
- 3-5 individuals placed into each of 6 20L pails
- Checked every 3-6 hrs for 24 hrs; discarded houses counted & removed

<table>
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<th>Pail</th>
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<th>house/day</th>
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<td>3.00</td>
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<tr>
<td>6</td>
<td>4</td>
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</table>

• Mean 2.4 ± 0.7 day⁻¹
Survey Mode

- Simultaneous collections with metered 53 and 150 µm nets, hauled vertically from 5m above bottom to surface
- Nauplii, small copepods (Oncaea, Oithona, Pseudocalanus, Acartia), Fritillaria, and small Oikopleura processed from 53 µm net
- All other taxa processed from 150 µm net
- Lengths measured; biomass predicted from taxa-specific length-weight relationships
- Only ~1/3 of stations processed to date
Preliminary Results

- Larvacean biomass averages 34.5% (arithmetic) or 16.4% (geometric) of copepod biomass.
Conclusions

• Estimates of growth rates and generation times of larvaceans range from ~equal, to several fold faster than copepods

• Life-time fecundity of larvaceans is also several fold, to an order of magnitude higher

• Both of these would allow quicker response to environmental variation in resources than is possible for the copepods

• These rate differences offset differences in observed biomass, implying that larvacean production may be equal, if not greater than that of the copepods
A picture is worth a thousand words