Gelatinous zooplankton in Alaskan waters: from nets to ROVs

Russ Hopcroft & Dhugal Lindsay
(plus students, technicians & associates)
The crustacean exoskeleton allows them to take a great deal of abuse... and still look great!
Other species may be more fragile, highly deformable, or lack easily observed differences.
Scaling for size, being hit by a highway bus equals ~16 body lengths/second.

Zooplankton are typically collected at 100-1000 body lengths/second – the equivalent of being hit by a commercial jet or supersonic military fighter.

Will jello or a suit of armour survive better?
The Players
Seward Line

- Alaska’s most deeply multidisciplinary oceanographic time-series
- Physical data over 5 decades (anchored by GAK1)
- Chemical & biological data ~2 decades
- GLOBEC 1997-2004 sampled 6-7x yearly
- 2005-2017 sampling reduced to early May & mid September
- Beginning in 2018, NSF LTER allows for program expansion
Seward Line May Temperatures
(aver. upper 100m)
Pelagic Tunicates: larvaceans

### Late Summer Total Larvacean Abundance

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<tr>
<th>Year</th>
<th>GAK 1</th>
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<th>GAK 4</th>
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### Spring Total Larvacean Abundance

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50 µm net
Spring dominated by large cold-water \textit{O. labradoriensis}, summer by small eurythermal \textit{O. dioica}

- Summers have strong cross-shelf gradient
- Warm summers have reduced \textit{O. labradoriensis} and larger contributions by warm-water \textit{F. pellucida}

\textbf{GAK} 1  \textbf{GAK} 2  \textbf{GAK} 4  \textbf{GAK} 9  \textbf{GAK} 12  \textbf{GAK} 13

\textit{Oikopleura labradoriensis}  \textit{O. dioica}  \textit{Fritillaria borealis}  \textit{F. pellucida}
Gulf of Alaska Project

- Connection between oceanography and fish
- Three full surveys in 2011 and 2013

505 µm Bongo
Upper 200m
During spring 10-20% of upper waters filtered daily
Where did they come from?

2011 salps
-150° -140° -130° -120°
47°
48°
49°
50°
51°
52°
53°
54°
55°
56°
57°
58°
59°
60°
61°
62°

Salpa spp
Cyclosalpa bakeri

0.5
0.05

Fall 2010
salps

Fall 2011
salps
How common are Salps in the transition zone?

- Both genera of salps are common in the region where the North Pacific current bifurcates
- 2010 & 2011 were NOT particularly unusual in abundance of salps
“Commercial” trawling

Jellyfish biomass typically exceeds fin-fish

<table>
<thead>
<tr>
<th>Year</th>
<th>Wet-weight (kg km⁻²)</th>
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Macrojellies Eastern Gulf of Alaska
Methot trawl

- 5 m² towed @ 2-3 knots
- 20-30 min. filters 10,000 m³
How do macro-jellies compare to smaller predators?

c.f. to gram last slide
Ctenophores are typically minor contributors to jelly biomass in the Gulf of Alaska shelf, but there are exceptions.
Arctic Shelves

- Traditional nets (150µm & 505 µm)
- Light table sorting, ID & measurement of Bongo nets

In particular, this documents contributions of ctenophores to these shallow-water systems

esp. *Mertensia ovum* and *Bolinopsis infundibulum* that do not preserve well
Samples examined
The average?

• Over 15 years of sampling highlights extreme variability in relative importance of gelatinous zooplankton

• Larvaceans are typically important

• Some years jellies and/or ctenophores are rare, other years they are the entire catch of Bongo nets displacing 100’s of ml
Done in near real-time, multivariate analysis of jelly communities can show the same community boundaries as will the crustacean communities (analyzed many months later).
Arctic Basins

- Multinets to bottom
- ROV to 3000m
- Molecular sequencing
Video