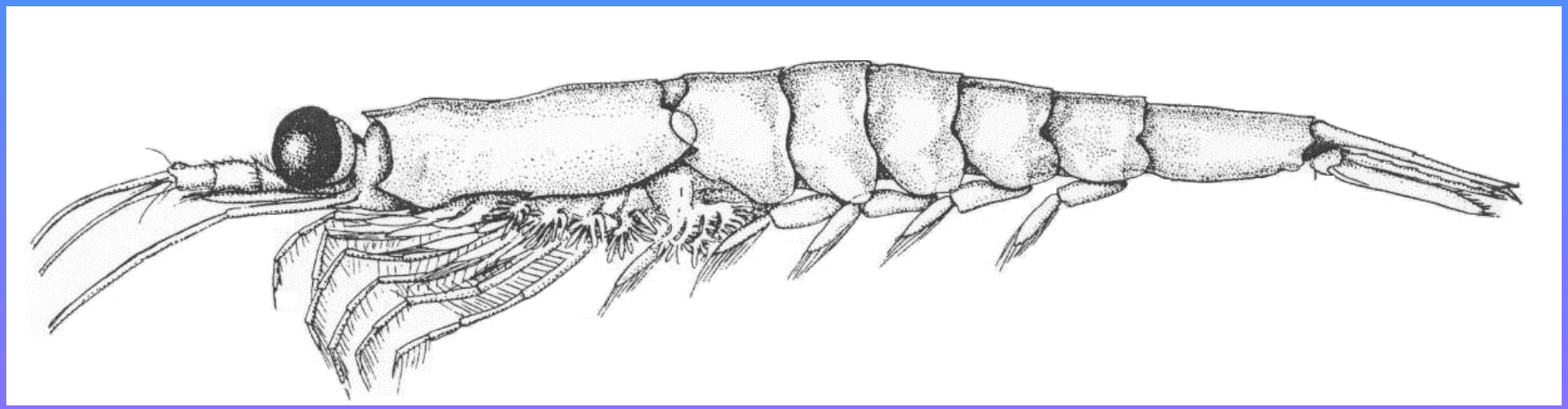
A Pan-Pacific Comparison of the Biology of *Euphausia pacifica*



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Introduction

- *E. pacifica* are keystone species in marine food webs
- Key component of coupled biophysical models (NEMURO)
- Found in coastal and oceanic waters across the Pacific
- Temperature range is subtropical to subarctic
- How does one species adapt to such a broad range of environments?
- To answer this question we need seasonal measurements of basic life history data from different regions: egg production, growth rates, mortality rates, feeding rates, vertical distribution and biomass
- Currently it is difficult to make comparisons because protocols are often vastly different

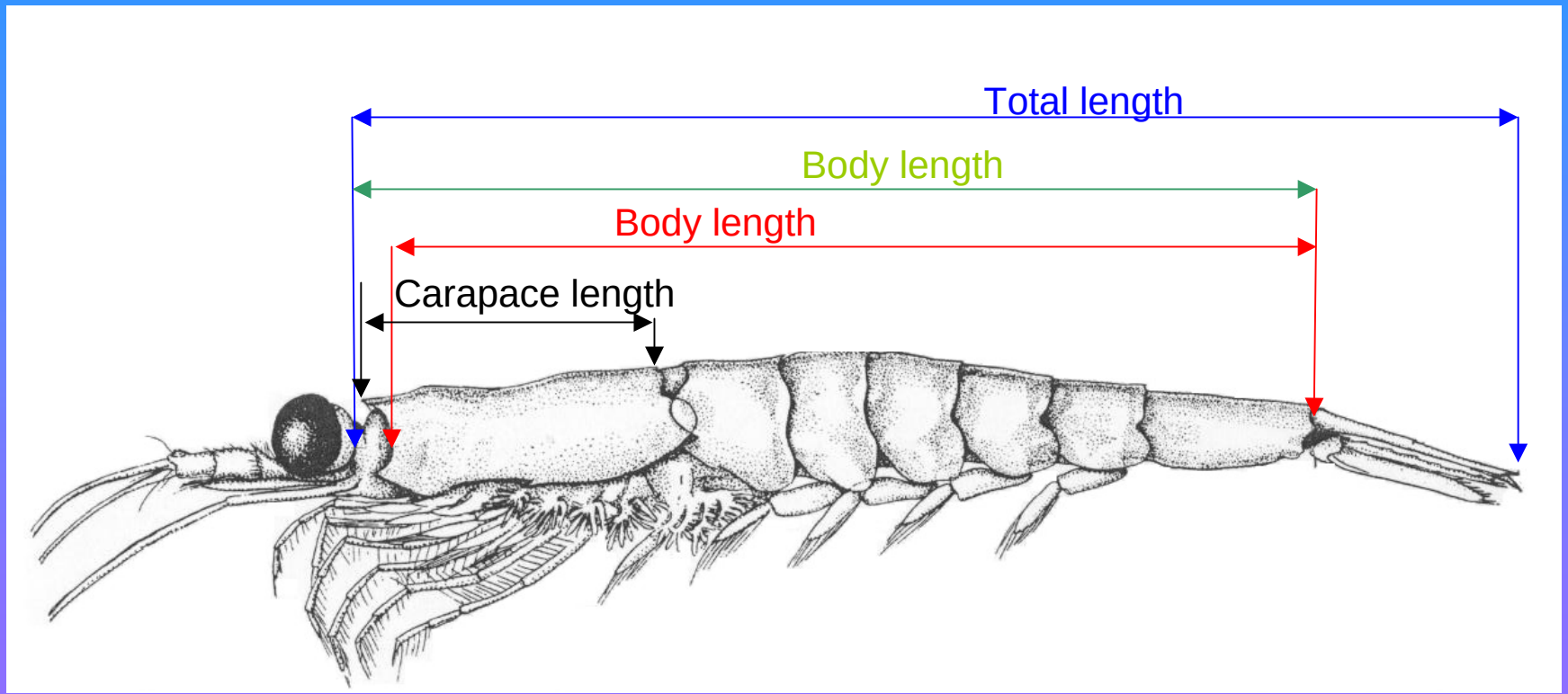
Outline

- Methods of studying euphausiids
- Distribution and biomass
- Growth rates
- Reproduction/brood sizes
- Gaps in current *E. pacifica* knowledge
- Year of the Euphausiid

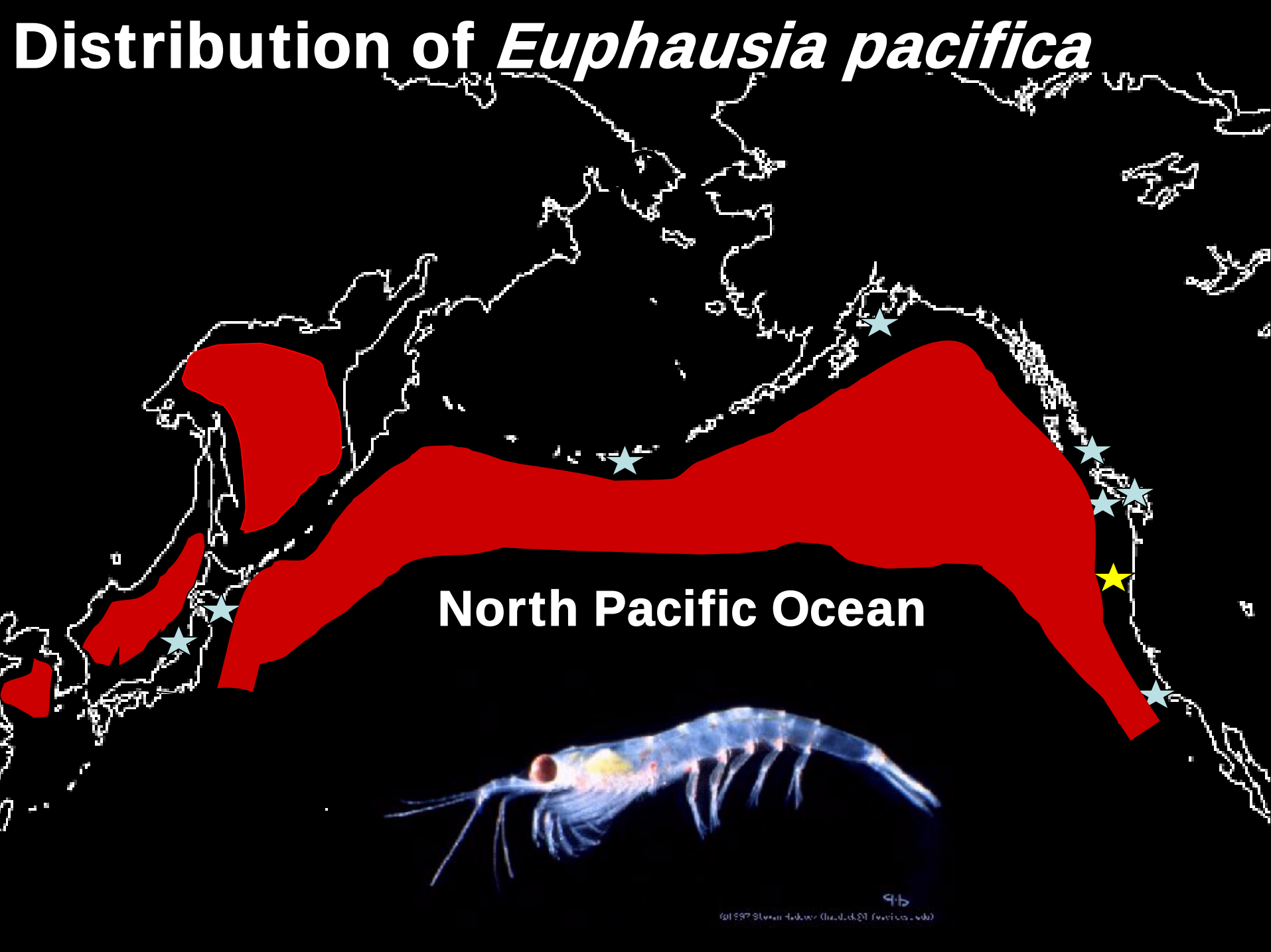
How euphausiids are sampled

- Net types: Tucker, Juday, Bongo, Norpac, Omori, MOCNESS, BIONESS
- Mouth sizes: 10cm-1.3m
- Mesh sizes: 112-550µm
- Tow types: vertical, oblique
- Tow depths: 20-1280m
- Some studies conduct tows day or night

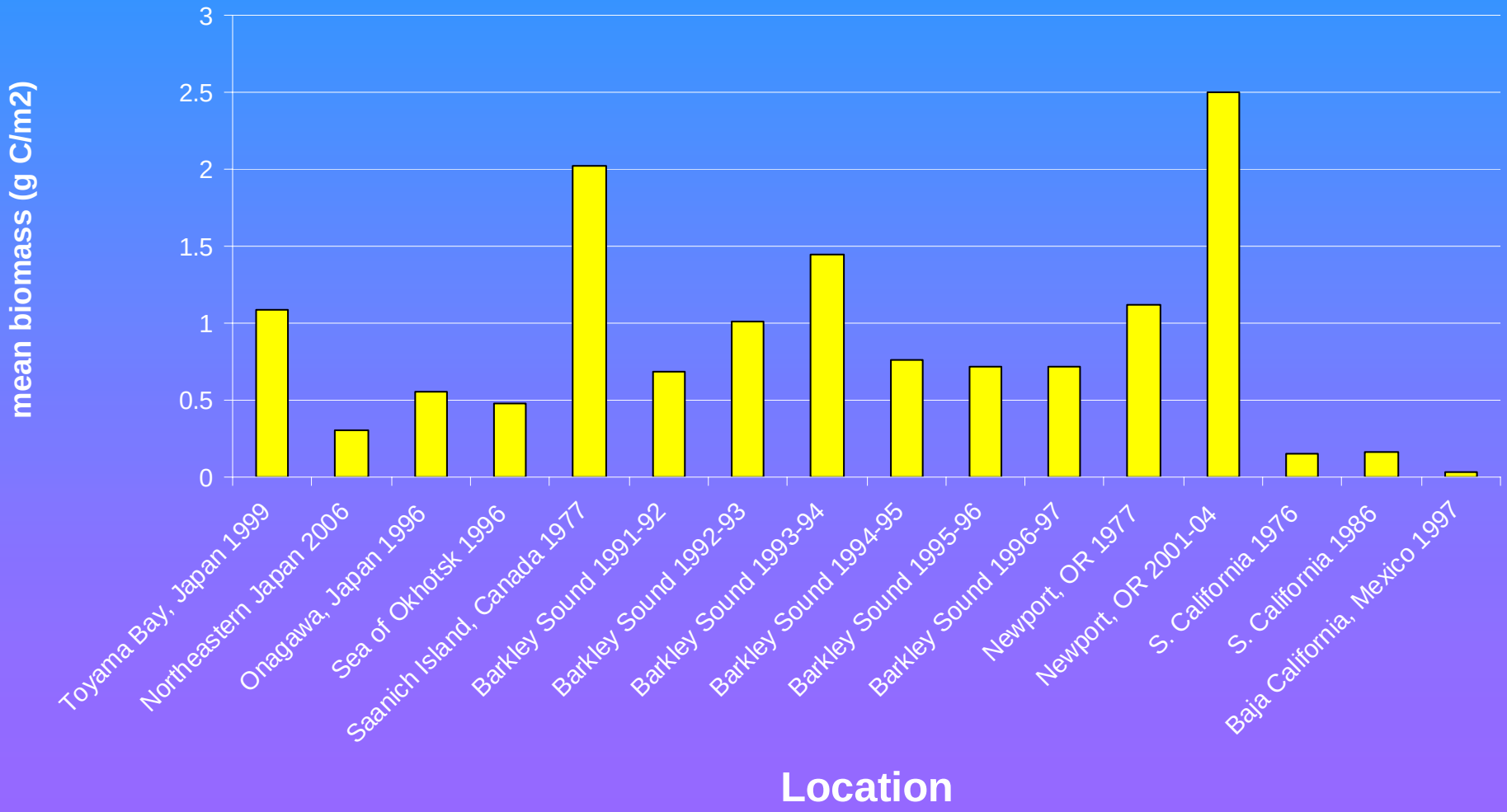
How euphausiids are measured



Distribution of *Euphausia pacifica*



Biomass Comparison



Growth Rates: Adults vs. Sub-adults

0.09
0.06
0.03
0
Iguchi et al. 1993

0.09
0.06
0.03
0
Heath 1977

0.09
0.06
0.03
0
Bollens et al. 1992

0.09
0.06
0.03
0
Cooney 1971

12C
8C
0.09
0.06
0.03
0
Ross 1982

0.09
0.06
0.03
0
Hulsizer 1971

10.5C
0.09
0.06
0.03
0
Current Study

0.09
0.06
0.03
0
Smiles & Pearcy 1971

10C
0.09
0.06
0.03
0
Lasker 1966

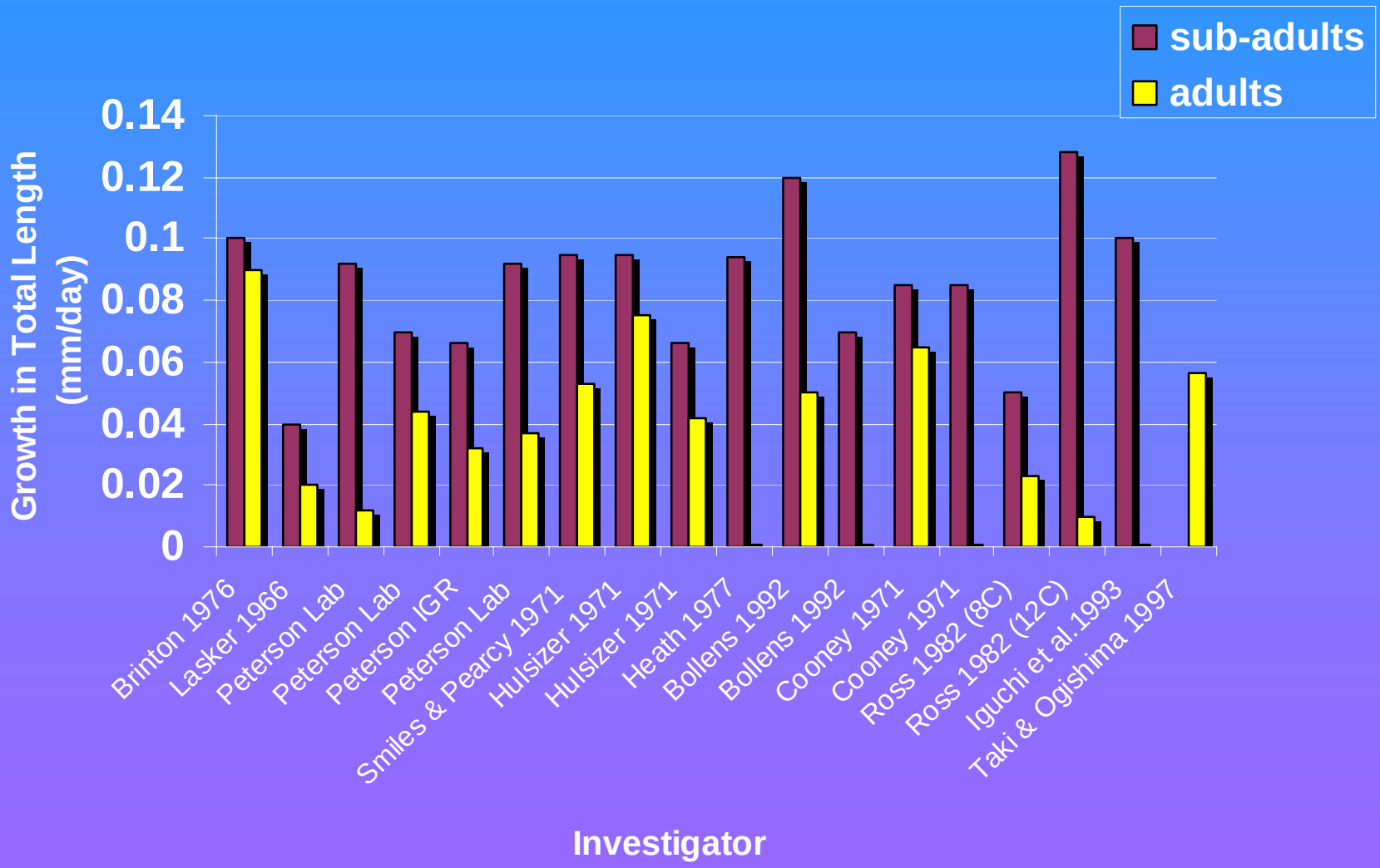
0.09
0.06
0.03
0
Brinton 1976

Growth in mm / day (Total length)

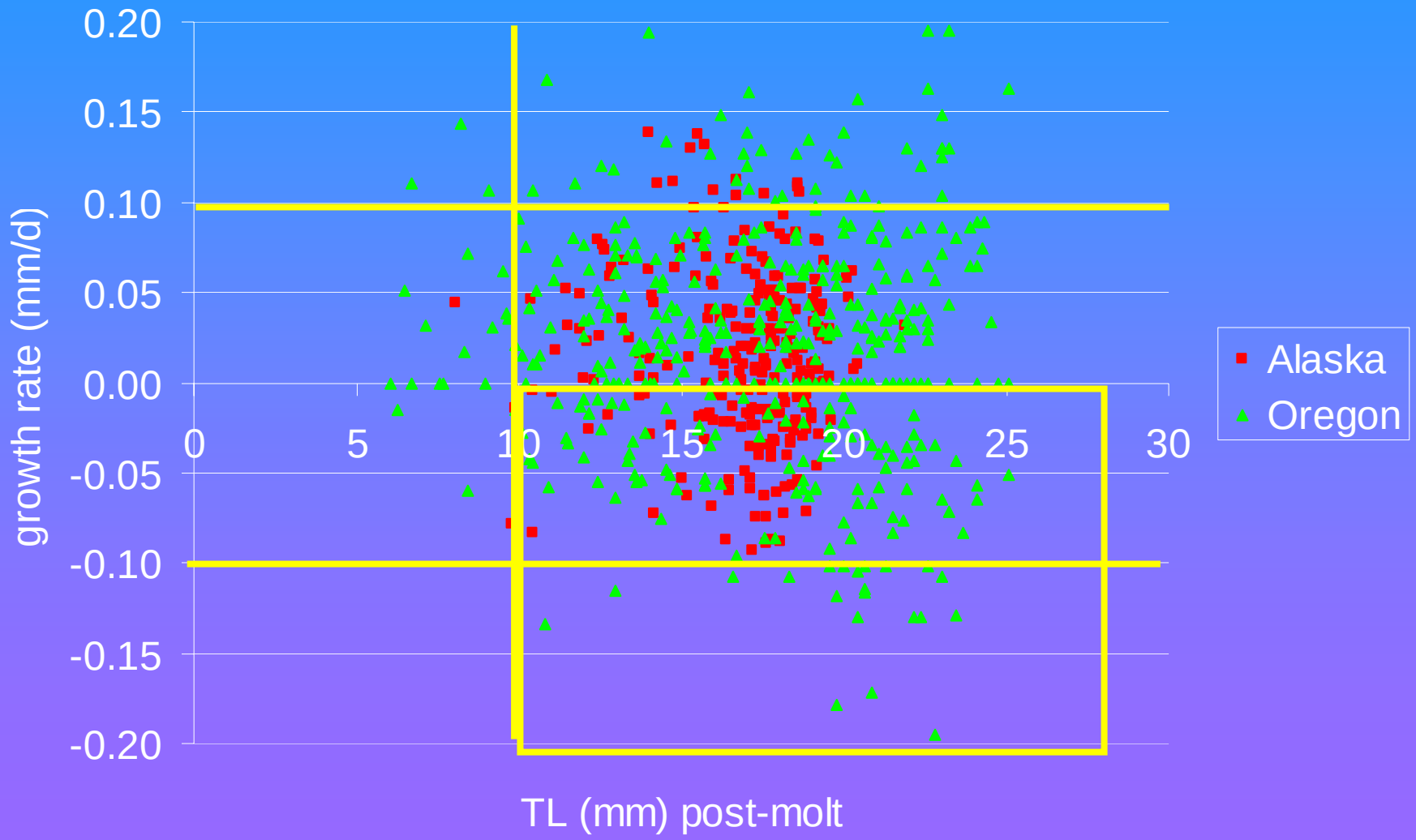
Adults

Sub-adults

Growth Rates



Individual Growth Rates

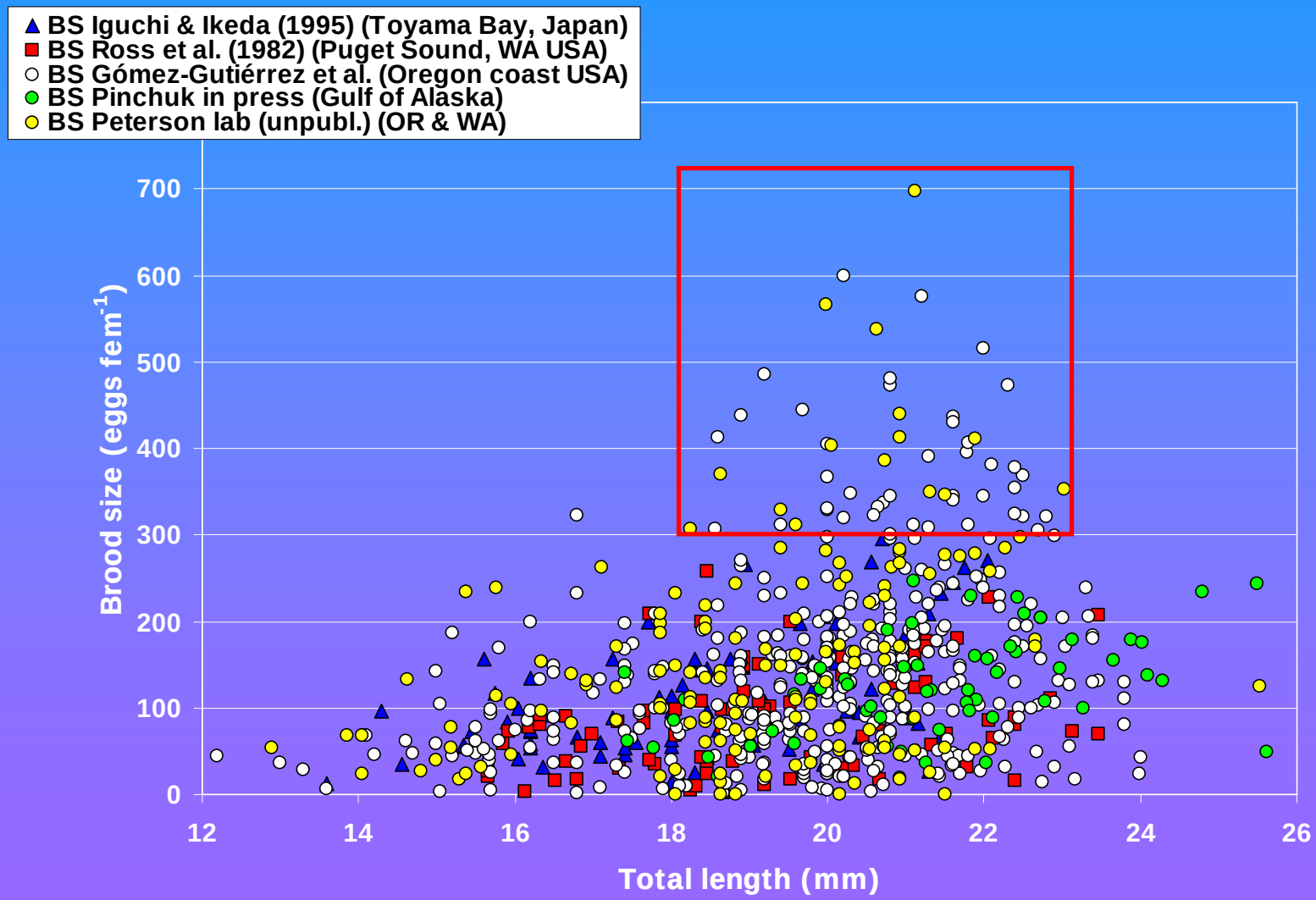


Reproductive Season

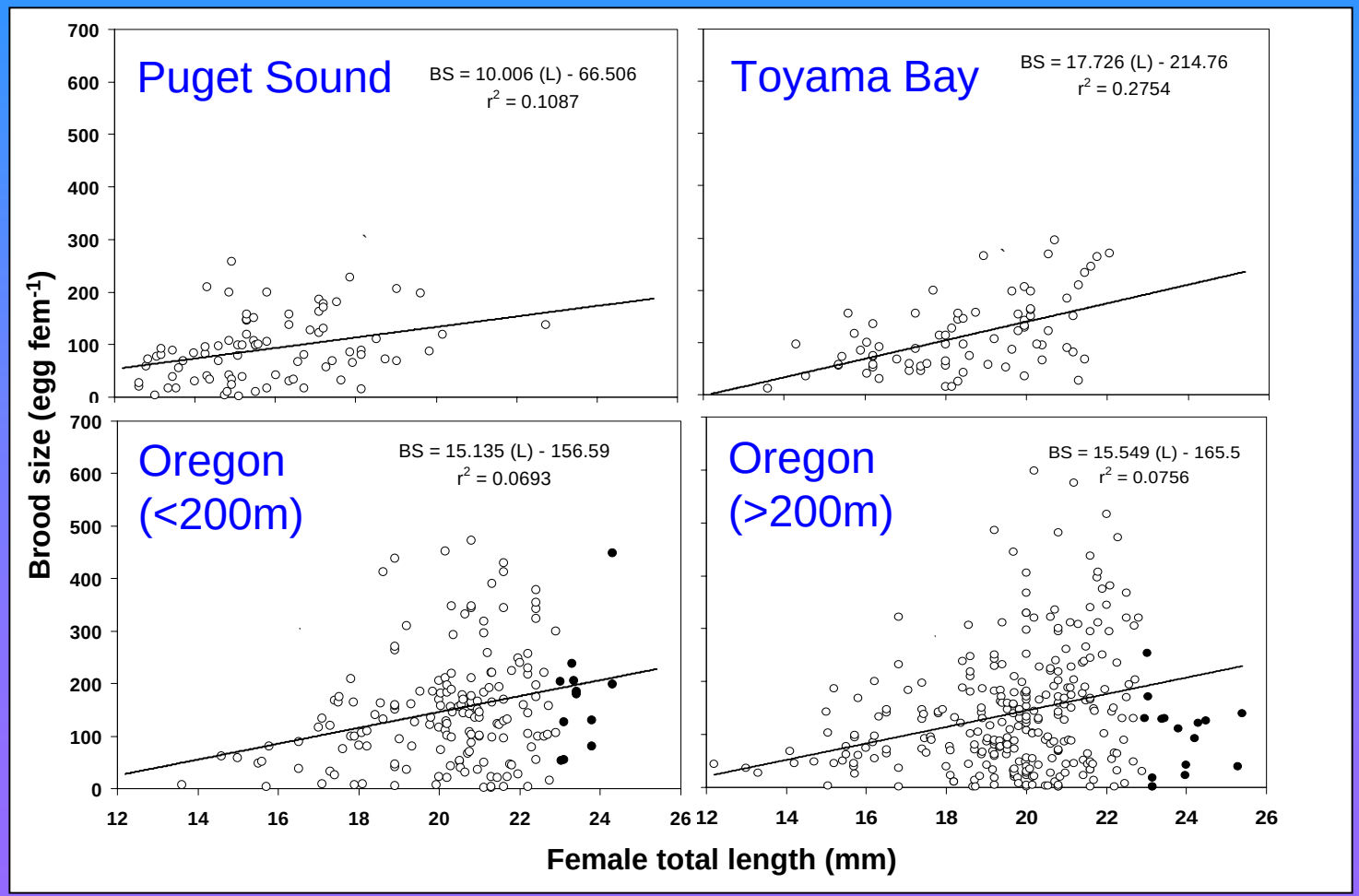
Spawning periods usually associated with phytoplankton blooms

Region	Main Spawning Period	Other Spawning Periods
Toyama Bay, Japan	Feb-May	
Oyashio area, NE Japan	April-May	Aug-Oct
CW Transitional area, NE Japan	April	Aug-Nov (minimal)
WW Transitional area, NE Japan	July	
Kamchatka	May-June	
Sea of Okhotsk	June	
Gulf of Alaska	July-Oct	
Barkley Sound	March-Oct	Nov-Dec (restricted)
Oregon Coast	March-Oct	
Southern California	year-round (probably)	

Brood Size Comparison

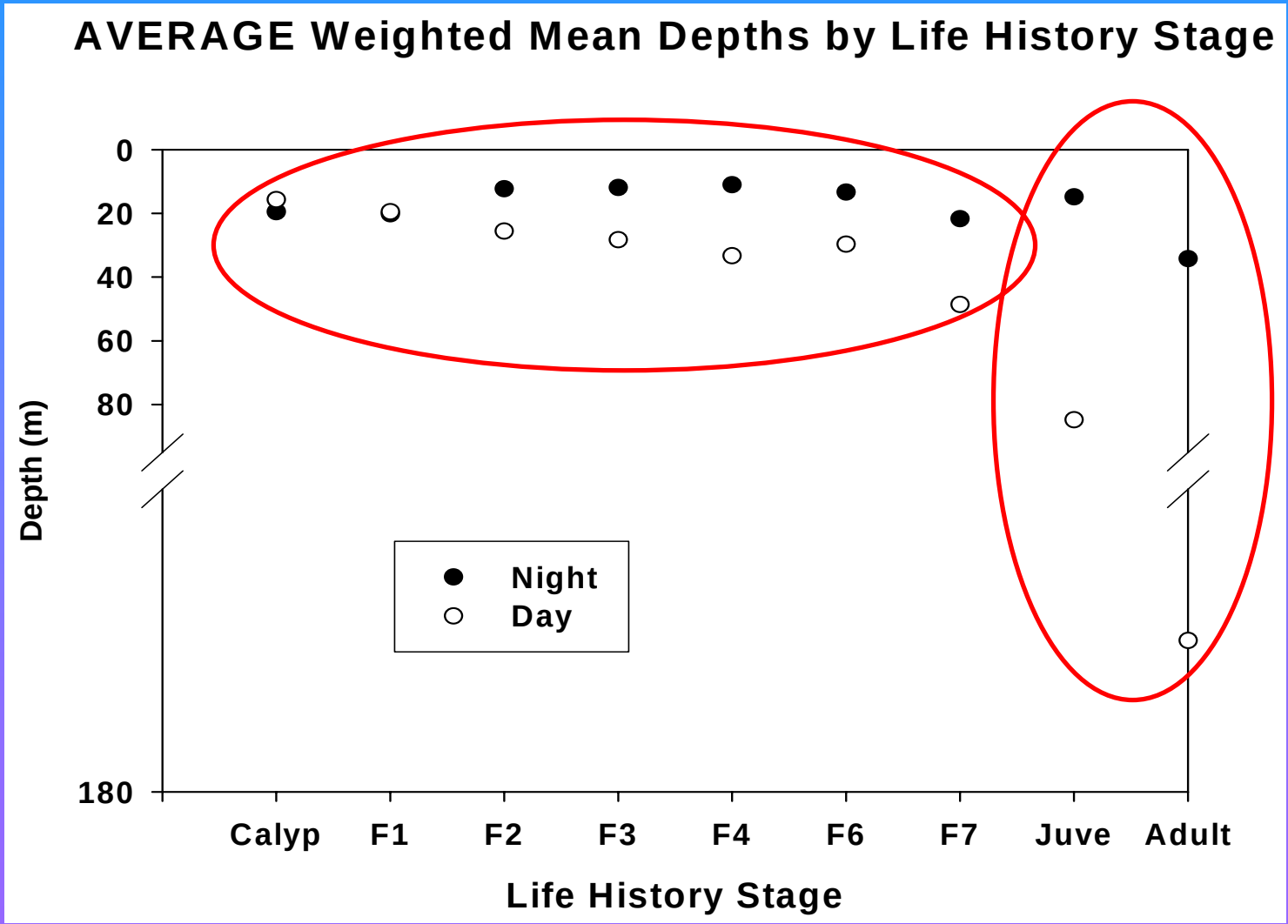


Regional Brood Size Comparisons



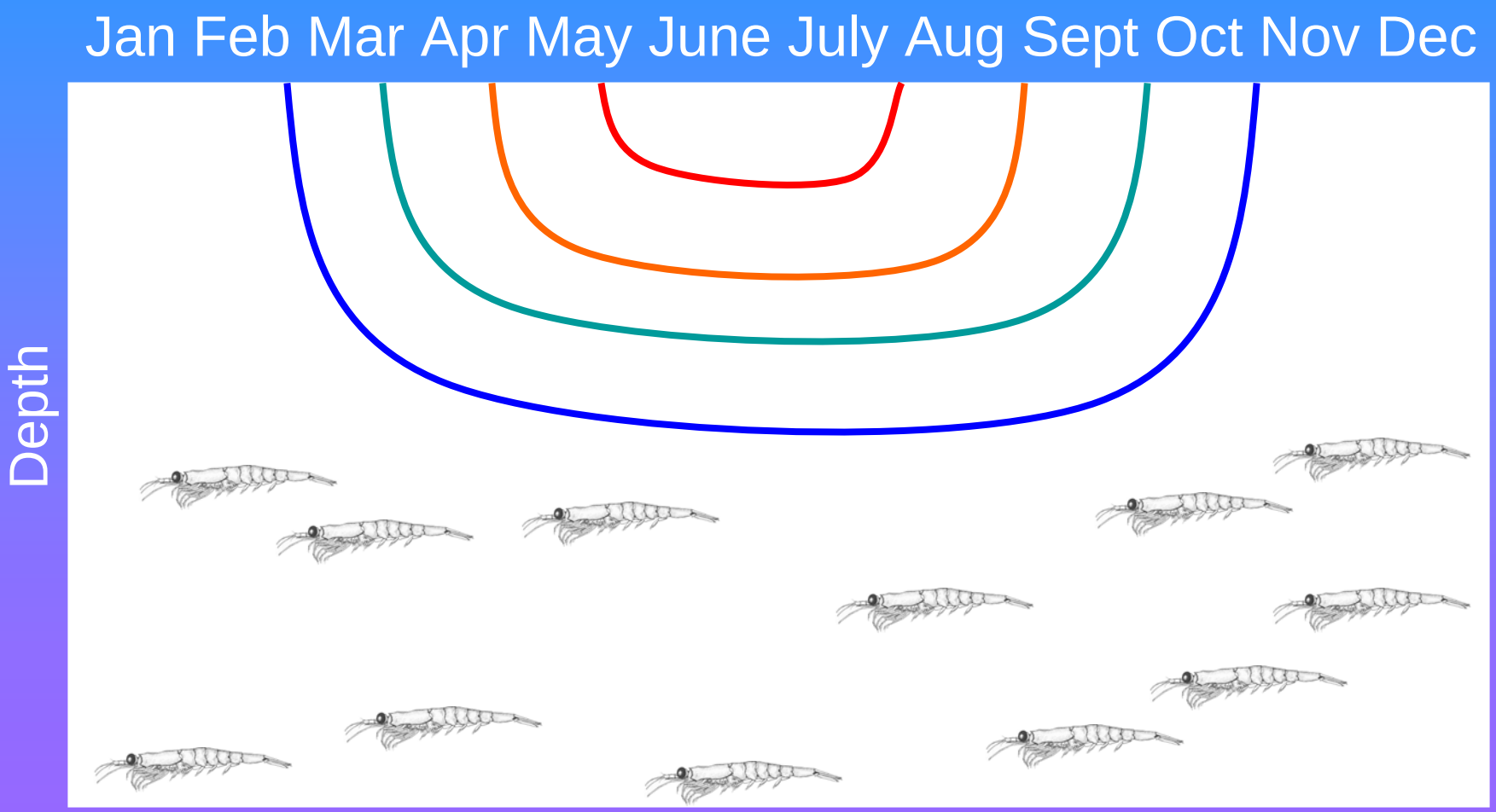
Gómez-Gutiérrez et al. in review

Vertical Migration



Vance et al. in prep.

Temperature Influence on DVM



Gaps in *Euphausia pacifica* Data

- Basic measurements (biomass, egg production, molting, growth, feeding) from different regions
- How closely is the timing of reproduction in *E. pacifica* linked to seasonal cycles of phytoplankton production?
- What is the status of *E. pacifica* in the Bering Sea?
- Life history of *E. pacifica* in open ocean?

Euphausiid Live Work Protocol

Protocols for Measuring Molting Rate and Egg Production of Live Euphausiids

Courtesy of the Peterson Lab at Hatfield Marine Science Center, Newport, Oregon, USA

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- Everything you always wanted to know about working with live euphausiids!
- Now available on the PICES website! (www.pices.int)

  Click on “Projects”

Year of the Euphausiid (YOTE)

- Bill's idea (and it is just an idea at this point) is to have at least one researcher from each PICES nation who conducts live euphausiid experiments using our protocols during a given year
- These data would then be comparable among regions
- Conducting all studies during the same year would minimize the effect of year-to-year variability due to ocean conditions

Conclusions & Future Work

- Variability = plastic life history
- *E. pacifica* can adapt to a wide range of conditions, which makes them successful in so many environments
- May need more than a single year of observations (the “proposed” YOTE may become a DOTE).
- Training in live euphausiid experiment work through available protocol, hands-on workshops or visiting scientist programs
- Future collaboration will be enhanced by establishing consistent units for presenting euphausiid data in the literature

Acknowledgements

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