Distribution of *Pseudocalanus* spp. in the Pacific-Arctic as revealed by molecular markers

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Introduction

- *Pseudocalanus* are one of the most dominant genera in Arctic and sub-Arctic waters
- Current warming trends may alter the fauna boundaries between species characteristic of specific habitats
- *Pseudocalanus* morphological identification is difficult, and only possible for adults. Therefore detailed specie-specific distribution data is generally lacking for this genera.

Objectives

- Determine spatial distribution and population genetic structure of *Pseudocalanus* spp. in the North Pacific and Pacific-Arctic
- Detect COI haplotype frequency for four sibling species: *P. acuspes, P. newmani, P. minutus,* and *P. mimus*
- Correlate *Pseudocalanus* distribution to large scale water mass circulation

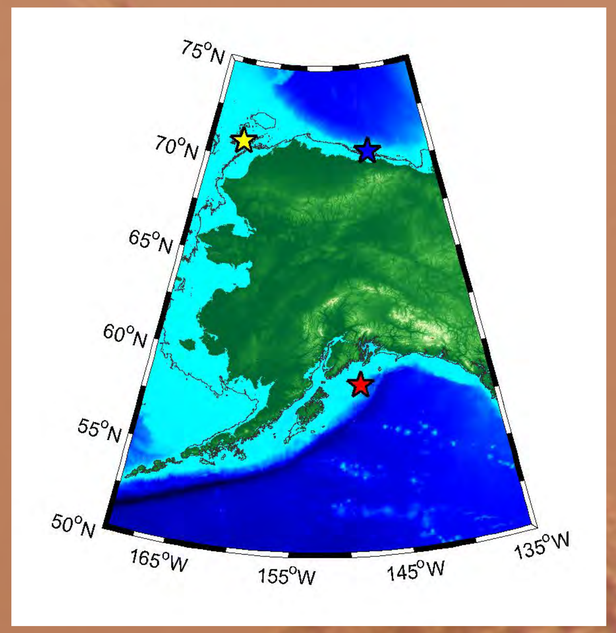

Figure 1.Sampling regions for *Pseudocalanus* in the Gulf of Alaska (red star), Chuckhi Sea (yellow star), and Beaufort Sea (blue star)

Material and Methods

Sampling spatial distribution

- Gulf of Alaska: Seward Line (2009-present)
- Chukchi Sea: Chukchi Sea Environmental Studies Program (2008-present)
- Eastern Beaufort Sea: Camden Bay (2010) and Transboundary program (2012)

Genotyping

- mtDNA: Cytochrome Oxidase I (COI) subunit gene
- 30 individuals per species per basin

Data Analysis

- Sequence alignment using Sequencher 4.9
- MEGA 5.10
  - Neighbor-joining tree
  - Pairwise distances

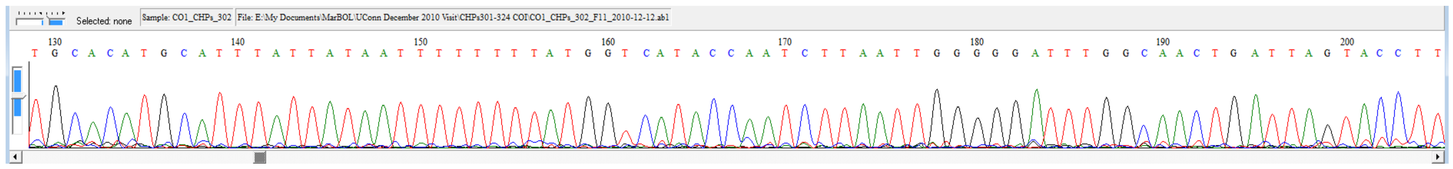

Figure 2. A region of the COI gene for *Pseudocalanus* spp. sequenced from the northeastern Chukchi Sea

	w/i *P. acuspes*	w/i *P. newmani*	w/i *P. minutus*	*P. acuspes/P. newmani*	*P. acuspes/P. minutus*	*P. newmani/P. minutus*
Ave.	0.086	0.011	0.040	0.175	0.227	0.022
StDev.	0.013	0.002	0.008	0.020	0.025	0.022
Min.	0.002	0.002	0.000	0.022	0.146	0.017
Max.	0.495	0.034	0.159	0.361	0.691	0.032

Table 1. Average, standard deviation, maximum, and minimum K2P distances; within (w/i) and between three *Pseudocalanus* spp. from the Chukchi Sea

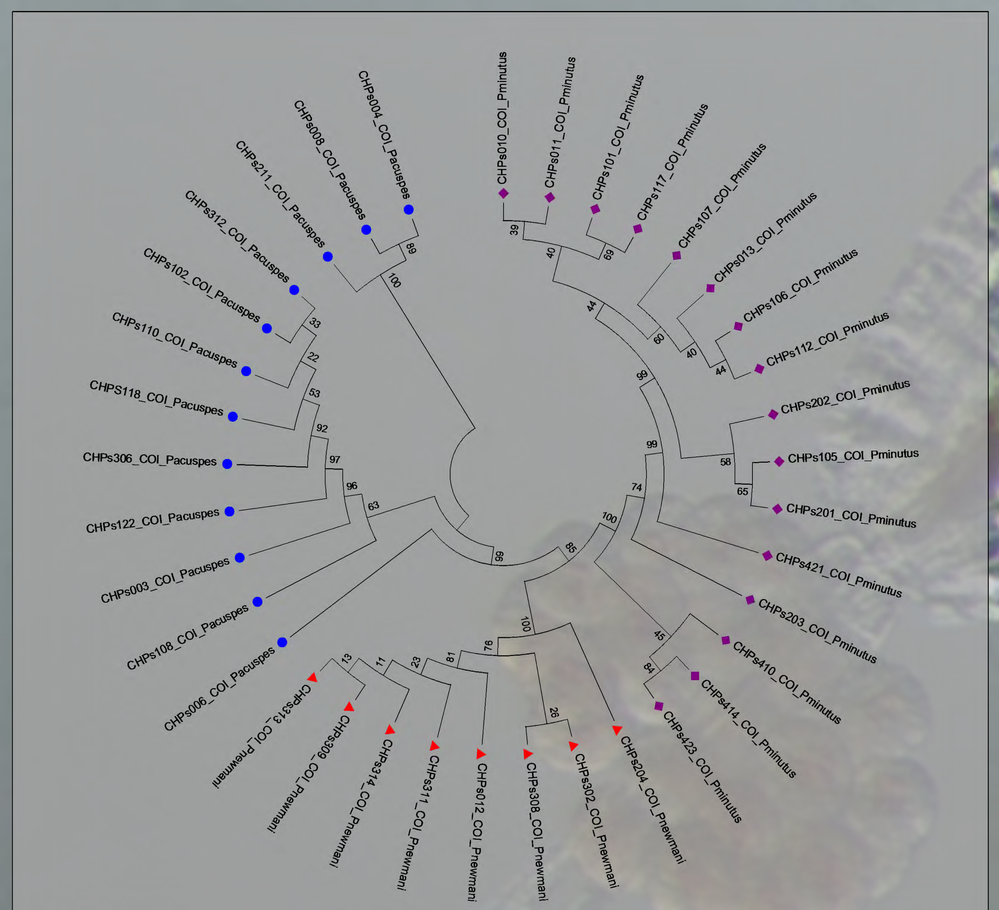

Figure 3. Neighbor-joining tree for the COI gene from three species of *Pseudocalanus* located in the northeastern Chukchi Sea. Numbers are bootstrap values (1000 replicates).

Preliminary Results

- Distinct clustering observed among each species of *Pseudocalanus*
- *Pseudocalanus newmani* shows the least within species distance where P. minutus and P. acuspes shows the greatest between species distance

Mitochondrial COI sequencing creates a tool for positive taxonomic certainty and alleviates any error associated with morphological identification. It will also allow for species identification of juvenile stages.

Next Steps

- Sequence a total of 30 individuals from *P. acuspes, P. newmani, P. minutus,* and *P. mimus* from the Chukchi and Beaufort Seas, and the Gulf of Alaska
- Sequence Prince William Sound's relic population of *P. minutus*
- Possible addition of nuclear and genes: 18S, CytoB, ITS, H3

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