Abundance, biomass and production of *Oithona similis* in the Gulf of Alaska.

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Introduction

Oithona similis is the most abundant copepod in the Gulf of Alaska, and is a dominant in many ecosystems from the poles to the sub-tropics (Nielson et al. 2002). Although abundant, *O. similis* is one of the smallest copepod species, but remains important due to its year round presence and continual reproduction. In the past most studies were focused on the larger copepod species, which are typically considered the most important secondary pelagic producers. Smaller species may be more important in energy flow due to faster growth rates than the larger species (Hopcroft et al. 1998). This work will determine if such an hypothesis holds for sub-polar environments.

Estimation of secondary production in copepods has focused mainly on the female of the species as it is often the largest, longest lived and easiest to stage (Hopcroft and Roff, 1996, 1998). Thus, female egg production in copepod species may be the largest component of copepod production, and is therefore a parameter routinely monitored in ecosystem studies. The number of eggs produced per female can be seen as a direct affect of the environment and has often been related to resources such as temperature and resource quality and concentration.

Methods

Four stations along the Seward Line in the Gulf of Alaska (GAK1, 4, 9 and 13) and one station in Prince William Sound (PWS2) were sampled six times in 2001. Two 0.25m diameter 53µm mesh nets was deployed to a depth of 100m collecting plankton on the upward tow. The invertebrates caught were immediately combined and preserved with 10% formalin. Flow meters were used to record the volume fished (~10m^3 per pair).

The copepods were enumerated, staged, and measured using a digitizer to estimate the biomass of *O. similis*. Eggs and egg sacs were counted to determine egg sacs per female.

Egg carrying species generally produce fewer clutches of eggs than egg dispersing species, and often carry the clutch for many days. Specific egg production (SEP) in egg-carrying species can be estimated by the egg-ratio method, which takes into account egg:female ratio of the population (including females not carrying eggs), the egg hatching rate (HR d^{-1}) at an *in situ* temperature and carbon content of the egg and female:

SEP = (egg/female) HR (eggC/femaleC) (Nielson et al. 2002)

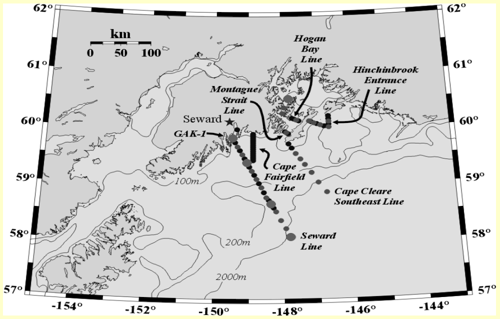

Figure 1. Map of study area. Larger cyan circles indicate the 5 stations emphasized in this study.

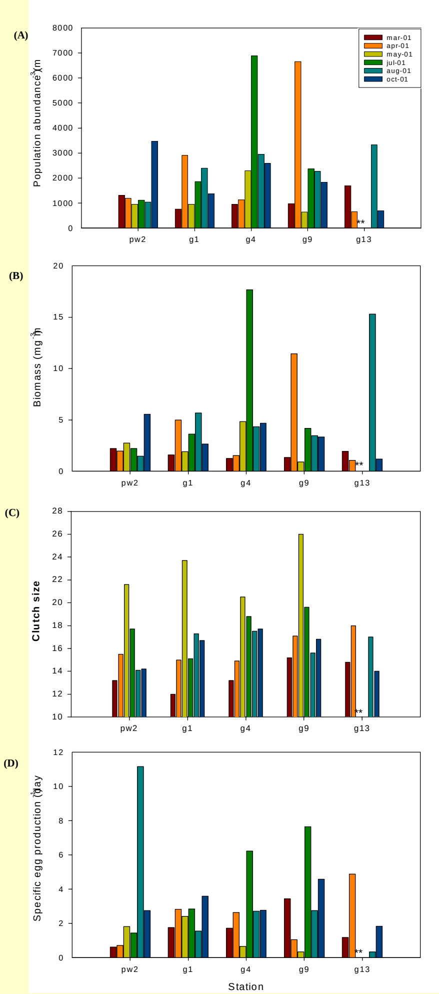

Figure 2 Population abundances (A), Biomass (B), Clutch size per female (C), and Daily specific egg production (D) at each station over the six sample occasions in 2001.

Results

The average population abundance and biomass were 2049 individuals m^{-3} and 4.16 mg m^{-3}, respectively, across all months and stations. The peak of population abundance (Figure 1A) of *O. similis* for the Seward line was in July with 7000 *O. similis* m^{-3}, and with a biomass (Figure 1B) of 17.7mg m^{-3} at GAK4. The peak at GAK9 was April with a population abundance of 6650 individuals m^{-3} and a biomass of 11.4mg m^{-3}. GAK1 and PW2 had consistently low population abundance and population biomass throughout the year, followed by GAK13.

Clutch sizes (Figure 1C) and average female length were consistently highest in May and consistently low in March. GAK9 had the highest clutch size in May with 26 eggs per clutch. Egg Clutches ranged from 12 to 26 eggs per clutch with an average of 17 eggs per clutch.

Specific Egg Production was relatively consistent across all five stations with a mean of 2.52% daily (Figure 1D), though is highest at PW2 in August with 11.16%, with GAKs 4 and 9 having their highest in July with 6% and 7% respectively. GAK13 measured a low SEP in all months except April. There is little evidence of a seasonal pattern.

Discussion

Data suggests slightly higher biomass and abundance at GAK4 and GAK9 which could be attributed to the characteristics of the shelf habitats. GAK4 is located on an inner shelf with a semi-permanent eddy, and GAK9 is located on the shelf break where front often occur. The higher abundances could be due to a concentration of prey and *O. similis* on the shelf. With the exception of August, GAK13 has the lowest biomass, which could be attributed to an oligotrophic oceanic habitat.

Specific egg production is affected by in-situ temperature and hatching rate. Nielson et al. (2002) note that temperature is the main factor in determining hatching rate. Specific egg production has a similar pattern to biomass.

In May clutch sizes were highest, consistent with that observed for all five stations. March's lowest clutch sizes could be due to the lower temperatures and lower food concentrations in the water. The clutch sizes increased from March to May, where a maximum was reached. The temperatures also increase as do the prey concentrations through this time period. From July the clutches begin to reduce in size.

Conclusion

Based on the current findings, there does not appear to be any pronounced seasonal or site differences. In future when the data is correlated to environmental and biological data, a pattern may be revealed. Data for 2002 is still to come and in the future will include comparisons to other species.

Literature cited

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