Secondary Production in a Downwelling Ecosystem: Egg Production Rates of Calanus marshallae and Pseudocalanus spp. in the Coastal Gulf of Alaska, 2001

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Introduction

The Northeast Pacific Global Ocean Ecosystems Dynamics Program (NEP GLOBEC) seeks to understand the effects of climate variability and climate change on the distribution, abundance and production of marine animals (including salmon and other commercially important living marine resources). As one of the studies funded to examine the processes by which climate and physical forcing affects production at lower trophic levels, we examined copepod egg production rates of several copepod taxa in April, May, and July of 2001 during the GLOBEC Process cruises. Both GLOBEC target species and other taxa suspected of having a strong influence on mesozooplankton production, and of being potential prey items for juvenile salmonids, were selected.

Methods

Plankton abundance and distribution were quantified using established GLOBEC protocols. Large mesozooplankton were sampled in April using a 1 M MCNESS with 500 µm mesh nets. Small mesozooplankton were sampled in depth integrated vertical tows of a 20 cm diameter CaViET frame or QuadNet equipped with 150 µm mesh nets. Volume filtered was estimated with flow meters. Samples were preserved in 5% formalin and individuals were identified to the lowest possible taxon at the Polish Plankton Sorting Center, Szczecin, Poland.

Individual females for egg production studies were captured using a 0.8 m diameter Ring net (150 or 200 µm mesh) equipped with a large volume cod end. Copepods were incubated individually in plastic scintillation vials. All females were incubated in the dark for 24 hr at the mixed layer temperature.

Conclusions

• Calanus marshallae, a GLOBEC target species, was only abundant during the May cruise.

• All Calanus females were ovigerous and egg production rates were approximately 40 eggs female⁻¹ day⁻¹ with clutch intervals of 1-3 days.

• Pseudocalanus spp. were nearly 100X as abundant as Calanus females during the May cruise.

• P. newmani dominated in Prince William Sound and P. minus dominated in the Alaska Coastal Current and on the middle shelf.

• Pseudocalanus clutch size (as volume or number of eggs) increased with female prosome length.

• Pseudocalanus individual egg production rates were lower in August than in April and May, but total egg production was higher on the shelf in May and July due to higher female concentrations.

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