Abstract: Growth and ruling rates for copepodites of Neocalanus species were estimated monthly in coastal and offshore waters of the northern Gulf of Alaska during 2001. Incubations of 4 or 5 days duration were executed in waters from 5 to 10°C employing both single 'picked' stages and artificial cohorts. Both methods appeared to yield similar results on ruling rates and growth increment, once one considers initial stage composition. For Neocalanus plumchrus/magnificus, duration of the first 3 copepodite stages appears short—approximately 3 to 5 days at 4°C. In contrast, stage 4 copepodites appear to take significantly longer, 20-65 days. Corresponding growth rate appears to decline with stage, from approximately 0.10 to 0.01 per day.

Introduction: Of the ~15 common species of copepods in the Gulf of Alaska, three Neocalanus species (5 planktonic, 3 levengardii, 1 cinctus) frequently dominate the zooplankton community biomass over the entire spring. Their abundance and large size may make them important prey species for higher trophic levels. As such they are considered the primary copepod target species in the Gulf of Alaska.

Although we have an over all picture of the lifecycle of the large-bodied copepods in the Northern Pacific (see review by Mackas & Tsuda, 1999), the details are largely inferred. Despite their presumed importance, there are three estimates of development rates, and one for growth rate, in copepods of Neocalanus plumchrus (Miller & Nelson, 1986; Miller, 1993) and only two publications considering egg production, naupliar development (Fulton, 1979; Sato & Tsuda, 2000). Here we describe preliminary results to address this deficiency for the copepodites of N. levengardii/ptermagnificus with experimental results from the 2001 field season.

Methods: Experiments have been done during the Gak1 LTOP (cruises at Stations Gak1, 4, 9, 13, and PWS2-Figure 1). Zooplankton for incubation will be collected by slowly pulling a 24 µm plankton ring-net, equipped with a large cod end, from 50 m to the surface (~14 m of water). The zooplankton was sorted into size classes of "artificial cohorts" by serial passage through submerged screens of the following mesh sizes: 1800, 1300, 1000, 800, 600, 500, 400, 300, 200, 150 and 100 µm. Each fraction was divided into equal parts which were then incubated in triplicate in 3 bottles with 80 µm prescreened water. The incubation water was collected from the mixed layer either at surface water temperature. During incubation, ship movement provided constant jostling of the bottles. Carboys were incubated on-deck in large commercial fish-tubs (~1.7 m high, 120 L-capacity) at surface water temperatures.

Results: Growth rates of Neocalanus species in the Gulf of Alaska

Discussion: Preliminary results indicate that both artificial cohorts and single stage populations of copepodites appear to be viable methods for estimation of copepod growth rates. These techniques have been relatively successful even for larger more delicate Neocalanus species, although damage during collection from the ship’s cod end remains a cause for concern.

Figure 1. LTOP sampling area. Typical experimental sites indicated in purple.