TITLE: BEST Calanus spp. egg production rates

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DATA SET OVERVIEW:
Egg production was determined for Calanus marshallae/glacialis. The two species were not differentiated, as they are almost impossible to identify visually during sorting of live animals because of their overlapping body size and very similar morphology and pigmentation (Frost, 1974).

The data are in a spreadsheet. For each egg production experiment, the date and location for the collection of the animals used are listed. The experiment number is internal to the project. The station number corresponds to station numbers in the hly0902 event log. Listed for each experiment are the numbers of females used, the spawning frequency (the proportion of the total females that laid eggs each day), the average clutch size (total number of eggs laid/number of females that laid eggs), the egg production rate (total number of eggs laid/total number of females), and the mean hatching (the mean proportion of eggs that hatched in each of three sets of 100 eggs that were incubated for up to 8 days).

METHODS:
The following was adapted from Plourde et al. (2005). The same methods were used for the egg production measurements on HLY0802. In the data, egg-hatching success is available only when the cruise had sufficient days left to permit an 8-day hatching period; eggs collected within 10 days of the end of the cruise could not be retained to determine hatching success.
Animals for egg production (EP) were collected with a 1-m2 mouth area, 300-µm net equipped with a non-filtering cod-end towed obliquely or vertically from 100 m or 10 m above bottom to surface at 20 m min-1. Depending on plankton density, one to three net hauls were performed at each station to collect enough animals for the experiments and other measurements. The plankton catch was immediately diluted in 4-L jars filled with surface water and stored in coolers until work began in the laboratory.

Animal sorting and incubations were conducted in a walk-in cold room maintained at a temperature close to the ambient conditions (-1°C). As quickly as possible after collection, 40 adult females were sorted randomly from the plankton catch with a large bore pipette and incubated individually in 45-ml dishes filled with 0.2-µm filtered seawater (FSW) for 24 h in dim light. Care was taken to select only animals in good condition, i.e. bearing intact setae on the antennules and on the furca. Incubation of individuals during 24 h immediately after capture allowed the measurement of in situ EP, clutch size, and spawning frequency (Runge and Roff, 2000). Cannibalism was assumed negligible as feeding of females on their eggs has been observed only on few occasions, females generally swam on their back when they were in contact with the bottom on the dishes, and comparison of the Petri dish method with the egg separator method for C.

finmarchicus has demonstrated that cannibalism is negligible (Plourde and Joly, 2008; Plourde et al. pers. observation). At the end of the 24 h incubation, eggs were counted and gently transferred to a large dish with a pipette.

Hatching success was determined at most stations. Eggs were randomly sorted with a pipette from the single batch and incubated in three replicates of 100 eggs in 45-ml dishes filled with 0.2µm FSW in dim light at –1°C. Eggs were checked daily until hatching. Non-hatched eggs and abnormal nauplii (either showing malformations or non-swimming on the bottom of the dish) were first enumerated. After the addition of 2-3 ml of 5% acetic acid, the total number of nauplii was determined and the percentage of viable nauplii calculated after subtraction of the number of abnormal ones.

REFERENCES:

Frost, B.W. 1974. Calanus marshallae, a new species of calanoid copepod closely allied to the sibling species C. finmarchicus and C. glacialis. Marine Biology 26, 77-99.

Plourde, S., Campbell, R.G., Ashjian, C.J., Stockwell, D. 2005. Seasonal and Regional Patterns in Egg Production of Calanus glacialis/marshallae in the Chukchi and Beaufort Seas during Spring and Summer, 2002. Deep-Sea Research II 52: 3411-3426.

Plourde, S., and P. Joly. 2009. Comparison of in situ egg production rate in Calanus finmarchicus and Metridia longa: discriminating between methodological and species-specific effects. Mar. Ecol. Prog. Ser. 353: 165-175.