*The following supplement accompanies the article*

# Spatial variation in right whale food, *Calanus finmarchicus*, in the Bay of Fundy

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## **Supplement.** Calibration of the BIONESS- and TUBSS-OPC

Plankton particles measured and counted by optical particle counters (OPCs) aboard the BIONESS and TUBSS were classified into 4096 digital size (DS) classes corresponding to an OPC equivalent spherical diameter ($ESD_{opc}$ µm) calculated according to an empirical size-calibration (Taggart et al.1996):

$$ESD_{opc} = 10^{(0.575\log(DS) + 1.8770)} \quad (1)$$

The number of DS classes was reduced to 64 new size classes ($S_{opc}$) determined as the integer of the square root of DS and was then used to estimate the geometric mean ESD for each of the 64 size-classes (see also Suthers et al. 2006).

The BIONESS-OPC provided simultaneous Copepodite Stage 5 (C5) abundance-at-size (s) estimates derived from the OPC and the net collection. Regression analysis between the BIONESS net-derived C5s concentrations (using data from 34 different net collections) and BIONESS OPC-derived particle concentration estimates collected concomitantly over the same sampling interval was used to calibrate both OPCs for the C5 abundance-at-size estimates at St-5 (BIONESS) and along the TUBSS transects. In a simpler, though similar manner to that of Heath et al. (1999) and Baumgartner (2003), the derived $S_{opc}$ classes were first summed over different ranges of maximum size and span, starting with the size distribution from net-collected C5s ($ESD_{net}$ maximum size and span, Fig. S1). The derived $S_{opc}$ concentration estimates were then regressed against the observed BIONESS net-specific C5 concentrations.

The $ESD_{net}$ estimates for net-collected C5s were normally distributed ($p = 0.1302$, $n = 752$, Fig. S1) and varied between 826 and 1547 µm $ESD_{net}$ ; we reasonably assumed that the distribution of C5 sizes within the OPC data was similar and also normal. The concentration-at-size distribution of the C5 estimates of $ESD_{opc}$ was, however, shifted to the larger sizes relative to the distribution of sampled C5 $ESD_{net}$ (Fig. S2a,b).

Then, to determine which of the OPC size ranges corresponded to the concentration of C5s from all net collections, we regressed the sum of number at size of BIONESS-OPC data (associated with each net collection) across the expected (i.e. measured from net collections) C5s size range and span, against the estimated C5 concentration of each corresponding net collection ($n = 34$). This regression was repeated

among various size ranges and spans to maximize the coefficient of determination of the relation (see also Heath et al. 1999 and Baumgartner 2003).The BIONESS-net derived C5 concentration was best estimated by the sum of the distribution of the OPC derived concentrations between 943 to 1955 µm $ESD_{opc}$ ($S_{opc}$ 9 to $S_{opc}$16). For both OPCs, and in some cases, the $ESD_{opc}$ C5 distribution clearly reflected the $ESD_{net}$ distribution of C5s (Fig. S1 vs. Fig. S2a); each being near normal. In other cases, the smaller end of the $ESD_{opc}$ C5 distribution was masked by the abundance of other small particles (Fig. S2b) that were not C5s (see also Baumgartner 2003). In such situations, when the sum of the small-end of the distribution ($S_{opc}$9 to $S_{opc}$11) was > the sum of the large-end of the distribution ($S_{opc}$14 to $S_{opc}$16), the sum of the small-end was assumed to be equal to the sum of the large-end; (i.e. mirroring the distribution to differentiate the masked C5s from the other small particles; Fig. S2b). When the sum of the small-end was ≤ the sum of the higher-end of the distribution, the sum at the small-end was left as is. After the adjustment for masking (transformed $ESD_{OPC}$), the OPC-derived C5 concentrations from data collected with both the BIONESS and the TUBSS OPCs were estimated by linear regression (Fig. S3; $r^2 = 0.84$, $p < 0.0001$, f-ratio = 170, n = 34) according to:

$$\text{OPC derived [C5]} = 10^{(-0.313+1.25\log \sum_{943}^{1955} \text{adjusted}(ESD_{opc}))} \quad (2)$$

## LITERATURE CITED


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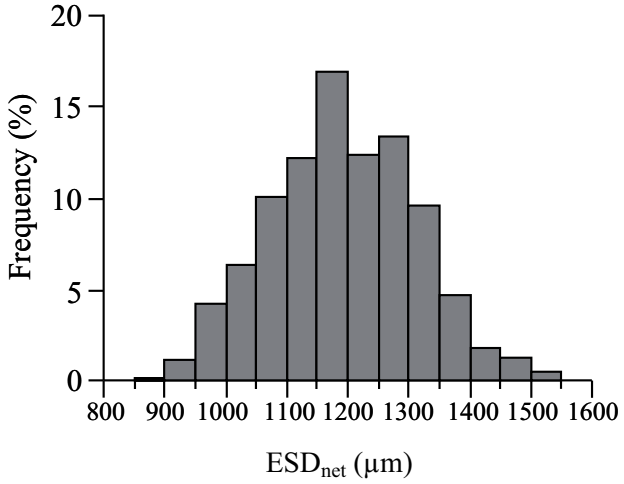


Fig S1. Normal (Shapiro-Wilk W test p = 0.1302, n = 752) $ESD_{net}$ size-frequency distribution of net-collected C5s from all depth strata in September 2002 where sizes were determined from digital images of C5s and assuming that a copepod is an oblate spheroid

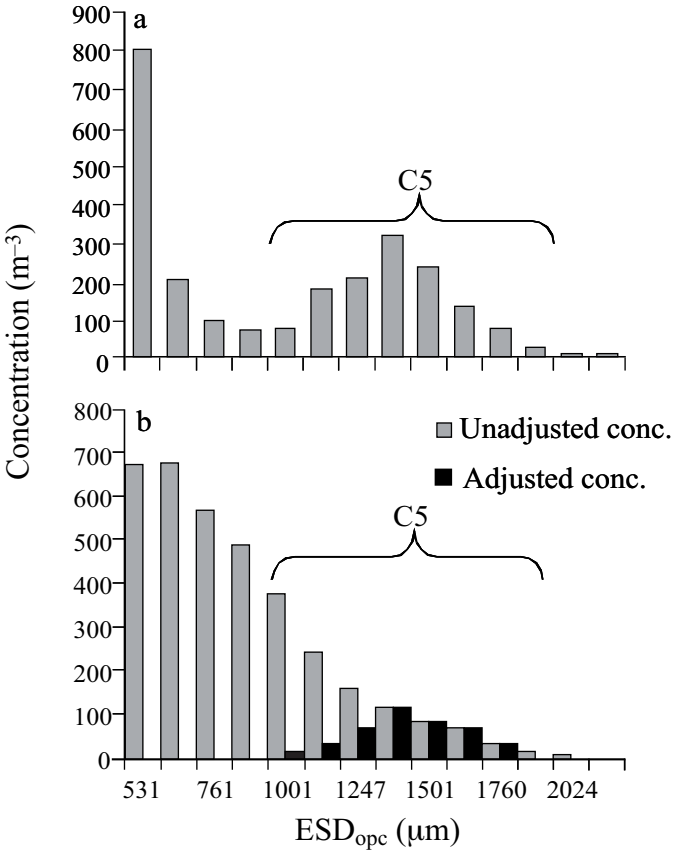


Fig. S2. Concentration-at-size distributions of OPC-derived particles for (a) BIONESS-OPC data from Stn1 collected simultaneously with the net-3 collection (>95% C5 for organisms >1000 μm ESD) where the distribution of the C5 size-classes (μm 1001 to 1891) is not masked, and for (b) BIONESS-OPC data from Stn 7 (data not used except here) collected simultaneously with the net-2 collection where the distribution of C5s is masked by other particles (grey), where the corrected C5s are unmasked with the small end of the distribution being adjusted to mirror the large end (black)

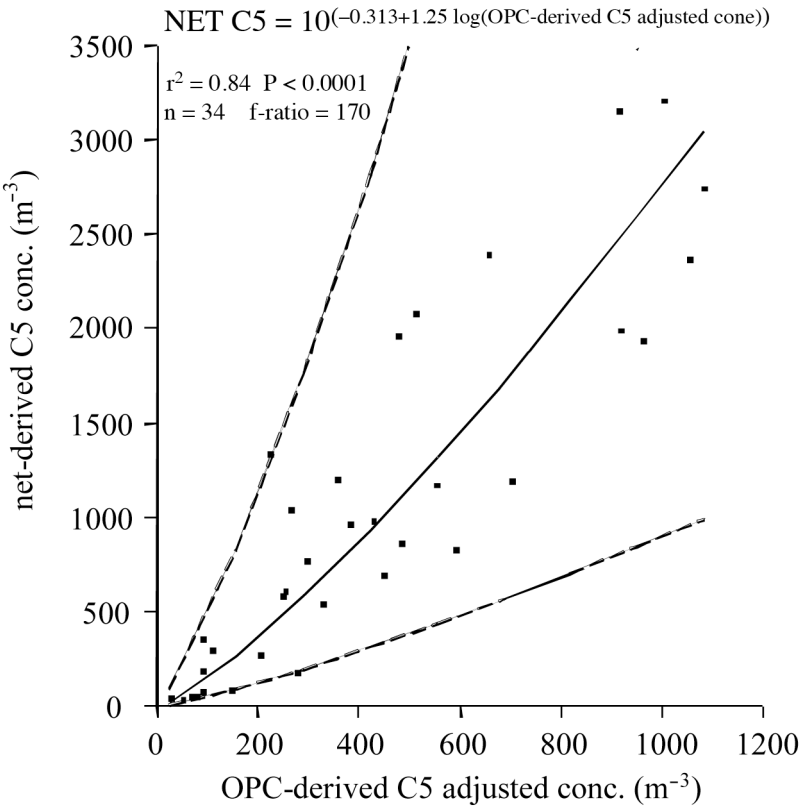


Fig. S3. Regression-based calibration of the OPC- and corresponding net-derived BIONESS C5 concentrations (conc.). Dashed lines denote the 95% confidence intervals around the predictions. OPC-derived concentration was estimated as the sum of plankton between 943 and 1955mm ESD divided by total OPC volume sampled over the net-sampling period and adjusted for potential masking of the small end of the C5 $ESD_{opc}$ distribution by smaller particles