

Estimation of Summer Micro-zooplankton (MZ) Abundance & Biomass, HY0803, KN195-10, TN-250.

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Water samples were obtained using 30 l Niskin bottles. Duplicate samples (250 ml) for MZ were preserved with 10% (final concentration) acid Lugol's solution in amber glass bottles on HY0803 in 2008 and with 5% (final concentration) acid Lugol's solution in 2009 (KN195-10) and 2010 (TN-250). In 2008, a 10 sample subset of MZ samples were fixed with 2%, 5%, and 10% acid Lugol's solution. The estimated abundance with the different strengths were compared; the abundance estimate with 10% acid Lugol's was not higher than with the 5% solution. In 2009 and 2010, we switched to 5% Lugol's since this reduces cell shrinkage and is the concentration used by the Sherr's on the spring BEST cruises.

At Horn Point Laboratory we enumerated $> 20 \mu\text{m}$ MZ ($> \sim 15 \mu\text{m}$ when fixed with acid Lugol's) using settling slides and a Nikon Eclipse TE 2000-U inverted microscope. In our data sheets an "0" indicates < 40 cells/liter. A SPOT v 4.0 RT camera and SPOT diagnostic software were used to record images and to measure cells. In accordance with earlier MZ studies in the Bering Sea, ciliates smaller than $20 \mu\text{m}$ and mixotrophic dinoflagellates as well heterotrophic dinoflagellates were enumerated. Onboard, we examined "fresh" samples, either live or fixed with 1% glutaraldehyde with transmitted light and epifluorescence microscopy to look for the presence or absence of plastids. Our notes from the cruise facilitated in determination of which ciliates and dinoflagellates were photosynthetic (had chlorophyll fluorescence) and which were strictly heterotrophic (no chlorophyll fluorescence except associated with algae in food vacuoles). Separate data sheets are presented for ciliates, dinoflagellates and "other" microzooplankton.

The ciliate abundance and biomass data are presented in 5 categories. **MR**= *Myionecta rubra* (= *Mesodinium rubrum*). This is a photoautotrophic ciliate which consumes cryptophytes and other small prey. **MO**= Mixotrophic oligotrichs; these ciliates graze on phytoplankton (usually nanophytoplankton) but have chlorophyll and are also photosynthetic. Only ciliates which we observed to have chlorophyll at sea and which we could recognize as the same species in the Lugol's fixed samples are included in this category on the data sheets. Thus it is a minimum estimate of mixotrophic ciliates. **OC**= Oligotrich and naked choreotrich ciliates (mostly heterotrophs). This category may include a few MO that we were not able to recognize in the Lugol's samples. The ciliates in the OC category are mostly grazers. **TI**= Tintinnid ciliates. **Other**= All other ciliates.

For the ciliates from 2008, three estimates of biomass are presented in each category based on different biovolume to biomass conversion factors (CF) from the literature. The "Protist" CF is a general cell volume to carbon factor for all protists except diatoms from Menden-Deuer and Lessard (2000). The " $0.19 \cdot V$ " is a conversion factor for ciliates fixed with 2% acid Lugol's from Putt & Stoecker (1989). This

conversion factor is commonly used (for example, in the studies of Bering Sea microzooplankton by Olson & Strom 2002, Strom & Fredrickson 2008). The “0.251*V” is based on the Putt & Stoecker CF, but corrected for greater cell shrinkage in 10% than 2% acid Lugol’s solution calculated from data in Stoecker et al. (1994). In 2009 and 2010, 5% acid Lugol’s was used, and thus the third estimate was (0.251*V) was not applicable.

The dinoflagellate abundance and biomass data are presented in 4 categories. **PD**=plastidic dinoflagellates; these dinoflagellates had chlorophyll and were probably mixotrophic since most photosynthetic dinoflagellates can also graze. **THD**=thecate heterotrophic dinoflagellates. **NTHD**=non-thecate heterotrophic dinoflagellates. **UNK**=Dinoflagellates which we were not able to classify as plastidic or non-plastidic in the Lugol’s fixed samples based on our notes from onboard observations. Biomass estimates are presented using the “protist” CF and the “Dinos” CF from Menden-Deuer & Lessard (2000). Olson & Strom (2002) and Strom & Fredrickson (2008) used 10% acid Lugol’s preservation and the “Dinos” CF in their estimates of the biomass of dinoflagellates from the Bering Sea. They also included mixotrophic dinoflagellates in their total estimate.

The MZ “Other” data includes microzooplankton not identified as ciliates or dinoflagellates. It includes 3 categories. **SF**=silicoflagellates, **OtherHP**= other heterotrophic protists. Biomass estimates use the “Protist” CF and do not include crustacean microzooplankton.

References:

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