Zooplankton Data Compilation, 4/15/2014
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Zooplankton abundance data sets from the region of interest (>63.5 °N, -180 to -135 °W) were collected from a number of data archives and individual PIs and collated. A total of 87 data sets were identified for the analysis (see Compilation of Zooplankton Data sets table included in archive).

Each data set was examined to determine if it met the following set of criteria that would allow us to use it in our analysis: 1) Organisms were identified to genera/species and life stage or at least life stage groups so that sizes could be estimated, 2) The sample integrated the water column from the surface to near bottom or to 100 m in deeper water, 3) The volume of water that was sampled and the depth of the tow was recorded, and 4) The appropriate mesh size to collect the target organism was used (75% of copepod body width).

Four common copepod species groups were chosen for the analysis. *Calanus glacialis/marshallae* is a species complex of large lipidic copepods that inhabits the shelf and slope seas in this region. It generally dominates the zooplankton biomass on the outer shelf and slope regions (Campbell et al. 2009; Hopcroft et al. 2010). Based on genetic analysis, *C. glacialis* is the dominant form in the Chukchi/Beaufort Sea region and contrary to reports in previous papers, the Bering Sea as well (Campbell, Gelfman, and Ashjian unpublished). *Pseudocalanus* spp. is a species complex that consists of up to four different species including, *P. acuspes, P. mimus, P. minutus, and P. newmani* (Frost 1989). *Pseudocalanus* is rarely identified to species in the data sets and when it is, only adult females are distinguished. It is a small copepod that is found throughout the study region and it is often the second most important species in terms of biomass; however, in the inner shelf regions it is often dominant (Campbell et al. 2009, Ashjian and Campbell unpublished). *Metridia* spp. consists of two species: *M. pacifica,* an expatriate from the Bering Sea, and *M. longa,* the Arctic endemic. These are medium sized copepods that are more predatory than the other species groups (Campbell et al. 2009). They are much easier to separate taxonomically than either the *Calanus* or *Pseudocalanus* groups and are often identified to species in the data sets. *Oithona similis* is the final species chosen for analysis. This species is the most important member of the *Oithona* genus in this region and is easy to identify taxonomically, and so it is almost always identified to species in the data sets. It is a small species, smaller than *Pseudocalanus*, and thus normally not very important in terms of biomass; however, it can be extremely important numerically. Like *Pseudocalanus* spp. its younger life stages are often severely under-sampled by the most common used zooplankton nets that generally employ mesh sizes of 150-µm or greater.

Once the data sets that met the first three criteria and could be used in the analysis were identified, the species/life stages that would be quantitatively collected by the different mesh sizes needed to be resolved so that only those stages would be included. To do this

the prosome widths of all species/life stages of interest were measured from archived images of live animals collected from the region from Campbell's and Ashjian's previous projects (SHEBA, SBI, SNACS/AON). In cases where images for a particular life stage were not available, generally younger stages of the smaller species, their widths were measured from archived preserved samples. The minimum mesh size that would quantitatively collect a particular species/life stage was set to be 75% of the mean copepod width as recommended by Omori and Ikeda (1984). Only those net samples that would quantitatively collect the species/stages of interest were used in the analysis. The body widths used for each species/life stage are compiled in the table "CopepodWidths_and_NetMeshSizes.xlsx". The carbon weights (µg C/individual) for each life stage of each species that were used are compiled in the table "CopepodStageWeights.xlsx".

All zooplankton abundances by species/life stage were converted to numbers/m^2 integrated over the upper 100 m or to the depth of the net tow in shallower locations. To convert to carbon biomass the integrated abundances were multiplied by the mean biomass for that species/life stage. The individual species/life stage carbon weights were largely taken from Campbell's and Ashjian's data sets collected during previous projects. For missing values, generally for younger stages of the smaller species, the ratio of the weight of life stage of interest to the adult female weight for closely related species taken from the literature was used to estimate the carbon weight for that stage. The biomasses for the individual stages that were quantitatively collected by the net were then summed to estimate the total biomass for that species.

Of the 87 identified data sets at most about a third, depending on the species since some data sets met the criteria for some species and not others, could not be used in the analysis because they did not meet our criteria. There were several reasons that data sets failed to meet the criteria including: inappropriate mesh size (37 data sets), poor taxonomic resolution (10), no life stage data (16), and water column not integrated (6). Many data sets failed on multiple criteria. The choice of life stages for each species that were used in the analysis was a compromise between maximizing the number of data sets that could be used and the desire to include as many life stages in the analysis as possible. Therefore C1 through adult were included for *Calanus glacialis/marshallae*, C3 through adult for *Pseuodcalanus* spp. and *Metridia* spp., and only adults for *Oithona similis*.

For each of the four species, three files are included. The first (speciesname_All.xlsx) is a compilation of all of the data for each species and is presented as an excel file since some of the data formats in the file would not translate well into ASCII format. Note that there are many more lines of data in these files than in the files presenting only the QA/QC data from the upper 100 m. The second file contains integrated biomass for the 1-00 m depth range for all of the life stages that were of an appropriate size to be captured in the net used and for which the appropriate sampling criteria were met (see below). The third file contains this same 0-100 m integrated biomass but is presented as an ascii file.

Criteria for inclusion of data set in 0-100 m integration

These are the files from which the data used to generate the gridded data and the maps were derived. The compilation data were QA/QC-ed to integrate data over the upper 100 m as best possible. This was difficult because of the varying depth intervals over which the net tows were conducted (for example, 0-125 m). A set of criteria was developed to include data from locations where the sampling depths did not fall directly on the 0-100 m interval.

1) If the upper 30 m of the water column was not sampled (e.g., only 30-100 m was sampled), the tow was not included.

2) At deep stations, only tows that sampled >70% of the upper 100 m were also included.

3) Tows that sampled deeper than the upper 200 m were not included.

List of Files

Cglacialis_marshallae_All.xlsx
Cglacialis_marshallae_Upper100m_Total.xlsx
Cglacialis_marshallae_Upper100m_Total.txt

Mpacifica_longa_All.xlsx
Mpacifica_longa_Upper100m_Total.xls
Mpacifica_longa_Upper100m_Total.txt

Osimilis_all.xlsx
Osimilis_upper100m_Total.xlsx
Osimilis_upper100m_Total.txt

Pseudocalanus_All.xlsx
Pseudocalanus_Upper100m_Total.xlsx
Pseudocalanus_Upper100m_Total.txt

CopepodStageWeights.xlsx
CopepodWidths_and_NetMeshSizes.xlsx

Description_of_Files.doc (this file)

References

Campbell, R.G., E.B. Sherr, C.J. Ashjian, S. Plourde, B.F. Sherr, V. Hill, and D.A. Stockwell, 2009. Mesozooplankton prey preference and grazing impact in the Western Arctic Ocean. DSR II. 56, 1274-1289.

Hopcroft, R.R., K.N. Kosobokova, and A.I. Pinchuk. 2010. Zooplankton community patterns in the Chukchi Sea during summer 2004. Deep Sea Research Part II. 57, 27-39.

Omori, M. and Ikeda, T. 1984. Methods in Marine Zooplankton Ecology. John Wiley & Sons, NY, 332p.