Interactive comment on "Distribution of mesozooplankton biomass in the global ocean" by R. Moriarty and T. D. O'Brien

Anonymous Referee #2

General Comments

I read this manuscript with great interest. The authors and their colleagues have collected and standardized a great number of mesozooplankton biomass measurements in order to obtain a global perspective on the distribution of this important element of the marine food web. I believe that the new compendium of mesozooplankton biomass data will be a great resource, and I complement the authors on their work. In my opinion, however, the authors should consider providing additional context for their study by discussing in greater detail: a) potential errors and biases in the data, b) important regional variations in mesozooplankton biomass, c) how their biomass estimates compare with other, independent efforts, and d) what additional data or studies are needed. The impact of the paper will be increased by this additional commentary.

My main critiques of the study are as follows: a) I confess that I am not an expert on zooplankton measurements, but I think the manuscript would benefit from greater discussion of the potential errors and biases within the new, aggregated data set. Figure 2, for example, shows how mesh size use varies from place to place. What possible errors and biases might this introduce? How well have they been corrected for? Similarly, there are likely to be errors associated with clogging of the meshes. With a large mesh, many of the smaller, more numerous zooplankton may pass through undetected. Does a large mesh size underestimate the mesozooplankton biomass? The authors should touch upon these and other similar issues. Rather than confusing the central message, I believe this discussion will help modelers and other data end users interpret the outstanding work that's been done here. b) Other than a looking at latitudinal variations in mesozooplankton biomass, the authors do not comment on regional variations. The Kuroshio and Bering Sea regions seem to have high biomass, while the South Indian and central North Pacific have low biomass. It would be useful for the authors to consider summarizing the mesozooplankton biomass by dynamical (e.g., subtropical vs. subpolar), ecological (e.g., Longhurst provinces), or other boundaries. c) I understand that the goal of this manuscript is to report a significant new source of data on mesozooplankton biomass. The results are reported with little context, however. What does it mean if the global mean mesozooplankton biomass is 5.9 micrograms C/l? How does this compare with phytoplankton, microzooplankton, or other groups? A full interpretation of observed mesozooplankton variability is out of the scope of this paper, but it would be useful to know if these numbers fall within the range of expected values. Consider that biomass between log size bins should be roughly equivalent (Sheldon, 1972, Limnology and Oceanography, 17(3), 327-340). Perhaps this, or other modeling and observational studies, could be used to provide additional perspective on the data reported in this manuscript? d) Based on this manuscript, I cannot conclude whether we currently have insufficient data to estimate mesozooplankton biomass. Do we need more data? Where? Where do we have sufficient data? What sorts of data should be collected in the future? I encourage the authors to add a few sentences talking about

the general state of our knowledge about mesozooplankton biomass, and how this field should/may develop in the coming years.

Specific Comments

Page 893, Abstract: "Global mesozooplankton biomass...." It is not clear if this is an annual average. It would also be informative to see this compared, here or elsewhere, to the biomass of other important groups such as phytoplankton and microzooplankton. Is there any meaningful seasonal variability? Page 894, Line 9: What does "classical food web" mean? To my mind, there are many classical food webs. Page 894, Line 12: I believe there are good regional, if not global, maps of mesozooplankton biomass. Consider the Continuous Plankton Recorder data and publications, such as Planque and Fromentin (Planque and Fromentin, Marine Ecology Progress Series, 1996, Vol. 134: 101-109). Page 897, Line 14: It is not clear whether or not microscopy enumeration data are used. If they are not, why? Section 2.2.2: Based on this discussion, it is not clear to me if there are any potentially important biases associated with the different mesh sizes. Could, for example, differences between Pacific and Atlantic have anything to do with different mesh sizes employed by different survey efforts? Also, is there any biasing associated with clogging of the sampling mesh? If you used a larger mesh, it might not capture smaller zooplankton until the mesh was clogged by larger zooplankton. Is this sort of potential error important? If not, why? Perhaps these errors are taken care of by equations in Table 3. Section 3.3: It is not clear what is meant by "...global annual average of mesozooplankton biomass...", both here an in the abstract. Is this a sum over the entire global over all the months? Perhaps it should read "...global sum of monthly mean mesozooplankton biomass estimates."? In calculating this number, have the authors multiplied the average biomass by the global surface seawater volume? Please explain. Page 903, Line 11: In my view, the map of mesozooplankton biomass is a great first start, but perhaps not yet global (see Figs. 4-6). I would say: "An aggregated map of an unprecedented number of mesozooplankton biomass observations, from all the world's oceans, is presented." Table 4, and throughout: I would

replace terms like "i200" and "i010" with actual intervals throughout the text, figures, and tables. Figure 5, c-f: These plots would benefit from using a scatter plot where the density of points is color-coded. Spatial patterns in Fig. 5c, for example, would be more apparent. It is not clear to me what "latitudinal depth distribution" in 5c indicates. I also feel that Figs. 5e and f blur out real seasonal variation in mesozooplankton biomass because the figures are averaging over completely different locations. These figures seem to imply that there is no seasonal cycle in mesozooplankton biomass, which is generally not the case.

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