Small copepods channel missing carbon through metazoan predation

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Global ecosystem models are essential tools to predict climate and anthropogenic impacts on marine ecosystems. These models include all pelagic components –abiotic and biotic- and their accuracy depends on our ability to model their complex relationships at different spatio-temporal scales. However, uncertainties or misconceptions coupling different components add up through the trophic web puzzling our capacity to match observed and predicted carbon at a global scale, predict biogeochemical budgets or fisheries yields. A key component of the pelagic ecosystem is the mesozooplankton (0.2-2 mm), which is represented in global models by copepods -the most abundant metazoans in the ocean-. Despite their key role, small copepods (<2 mm) are modelled in a simplistic fashion as unicellular feeders grazing on phyto and microzooplankton. However, tracking molecular trophic links we found intraguild predation in small copepods, thus revealing a metazoan-copepod link in up to 17 copepod species. A global scale calculation of this overlooked metazoan link using field and laboratory estimates of weight-specific ingestion rates revealed a marked effect on current estimates of carbon flux in pelagic ecosystems. We found that small copepods could ingest between 1.79 (field) and 27.20 (lab) Gt C/yr of hitherto ignored metazoan production. Based on field data the overlooked metazoan link would increase the current estimates of secondary production and copepod mediated biogeochemical fluxes -remineralization, respiration, biological pump- by 15.6-24.4%. It also helps to clarify the global discrepancies between measured daily ingestion and metabolic demands/growth of copepods. The inclusion of intraguild predation into global scale models will enhance our understanding of the role of mesozooplankton under different climate change scenarios.

Keywords: Copepods, trophic ecology, intraguild predation, biogeochemical cycles, missing carbon, food webs