Copepods boost the production but reduce the carbon export efficiency by diatoms - DTU Orbit (02/08/2019)

Copepods boost the production but reduce the carbon export efficiency by diatoms

The fraction of net primary production that is exported from the euphotic zone as sinking particulate organic carbon (POC) varies notably through time and from region to region. Phytoplankton containing biominerals, such as silicified diatoms have long been associated with high export fluxes. However, recent reviews point out that the magnitude of export is not controlled by diatoms alone, but determined by the whole plankton community structure. The combined effect of phytoplankton community composition and zooplankton abundance on export flux dynamics, were explored using a set of 12 large outdoor mesocosms. All mesocosms received a daily addition of minor amounts of nitrate and phosphate, while only 6 mesocosms received silicic acid (dSi). This resulted in a dominance of diatoms and dinoflagellate in the +Si mesocosms and a dominance of dinoflagellate in the -Si mesocosms. Simultaneously, half of the mesocosms had decreased mesozooplankton populations whereas the other half were supplemented with additional zooplankton. In all mesocosms, POC fluxes were positively correlated to Si/C ratios measured in the surface community and additions of dSi globally increased the export fluxes in all treatments highlighting the role of diatoms in C export. The presence of additional copepods resulted in higher standing stocks of POC, most probably through trophic cascades. However it only resulted in higher export fluxes for the +Si mesocosms. In the +Si with copepod addition (+Si +Cops) export was dominated by large diatoms with higher Si/C ratios in sinking material than in standing stocks. During non-bloom situations, the grazing activity of copepods decrease the export efficiency in diatom dominated systems by changing the structure of the phytoplankton community and/or preventing their aggregation. However, in flagellate-dominated system, the copepods increased phytoplankton growth, aggregation and fecal pellet production, with overall higher net export not always visible in term of export efficiency.

General information
Publication status: Published
Organisations: National Institute of Aquatic Resources, Section for Oceans and Arctic, Technical University of Denmark, Universite de Bretagne Occidentale, University of Bremen, Norwegian University of Science and Technology, University of Southampton, Ludwig-Maximilians-Universität München
Publication date: 2018
Peer-reviewed: Yes

Publication information
Journal: Frontiers in Marine Science
Volume: 5
Ratings:
BFI (2018): BFI-level 1
Scopus rating (2018): CiteScore 3.08 SJR 1.367 SNIP 0.995
Original language: English
Keywords: biogenic silica, POC, marine snow, zooplankton, mesocosm, Bay of Hopavagen, plankton community, biological pump, ZOOPLANKTON FECAL PELLETS, MARINE SNOW, VERTICAL FLUX, BIOGENIC SILICA, ORGANIC-MATTER, OCEAN ACIDIFICATION, CALANOID COPEPODS, SINKING VELOCITY, BIOLOGICAL PUMP, COASTAL WATERS, Bay of Hopavægen, Science, Q, General. Including nature conservation, geographical distribution, QH1-199.5
Electronic versions:
Publishers version
DOIs:
10.3389/fmars.2018.00082
Source: FindIt
Source-ID: 2397649223
Research output: Contribution to journal › Journal article – Annual report year: 2019 › Research › peer-review