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First-order estimate of the planktic foraminifer biomass in the modern global ocean
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Planktic foraminifers are heterotrophic mesozooplankton of global marine abundance ubiquitously used in paleoecology, paleoceanography, and paleoclimate reconstruction. However, the biomass and trophic role of planktic foraminifers was largely unknown. To better understand the position of planktic foraminifers within the regional and global plankton, we have developed a new analytical method and quantified the individual and species specific planktic foraminifer biomass. With a new non-destructive protocol developed from the bicinchoninic acid (BCA) method and nano-photospectrometry, we have analysed the foraminifer protein-biomass, along with test morphometry. From additional CHN analysis, it can be assumed that protein biomass equals carbon-biomass. The foraminifer cytoplasm is exposed to the analytical reagents without breaking the test by applying an osmotic shock. The new method is quick and easy to apply, and we have so far produced a data set of the protein-biomass in function of test size of 21 planktic foraminifer species from Atlantic, Pacific, and Southern Ocean waters.

Our data include a wide range of oligotrophic to eutrophic conditions covering six orders of magnitude of assemblage biomass. Samples include symbiont bearing and symbiont-barren species from the sea surface down to 2500 m water depth. Being secondary producers with an omnivorous diet, which ranges from algae to small metazoans, planktic foraminifers are not limited to a single food source, and are assumed to occur at a balanced abundance displaying the overall marine biological productivity at a regional scale. Accordingly, the average individual planktic foraminifer protein- and carbon biomass amounts to 0.845 μg. Conversion factors between individual biomass and assemblage-biomass are calculated for test sizes between 72 and 845 μm (minimum test diameter). Assemblage-biomass data presented here include 1128 sites and water depth intervals. The regional coverage of data includes the North Atlantic, Arabian Sea, Red Sea, Caribbean, as well as literature data from the eastern and western North Pacific off Japan, and covers a wide range of oligotrophic to eutrophic waters over six orders of magnitude of planktic foraminifer assemblage-biomass (PFAB). A first order estimate of the average global planktic foraminifer biomass production (>125 μm) ranges from 8.2?32.7 Tg C yr?1 (i.e. 0.008?0.033 Gt C yr?1), and might be more than three times as high including neanic and juvenile individuals adding up to 25?100 Tg C yr?1. However, this is a first estimate of regional PFAB extrapolated to the global scale, and future estimates based on larger data sets might considerably deviate from the one presented here. This paper is supported by, and a contribution to the Marine Ecosystem Data project (MAREDAT). Data are available from http://www.pangaea.de (http://doi.pangaea.de/10.1594/PANGAEA.777386).

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