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# Current and future contribution of filter-feeding gelatinous zooplankton to global marine biogeochemistry

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Filter-feeding gelatinous zooplankton (FFGZ), namely pelagic tunicates (salps, dolioids, appendicularians and pyrosomes), are increasingly recognized as an essential component of the marine ecosystem. Long ignored because they are difficult to sample due to their fragility, these organisms play a poorly understood but essential role in the food web. First, they are prey for many organisms of interest (e.g. fish and turtles). Second, unlike other zooplankton (e.g., crustaceans) that feed on preys that are about an order of magnitude smaller, filter feeding gives them access to a much wider range of organisms, and induces a much lower prey-to-predator ratio. Moreover, salps, appendicularians and pyrosomes produce carcasses and fecal pellets that sink at extremely fast speeds (up to 1500 m/d, 10 times higher than copepods). This implies a rapid and efficient transfer of organic matter to depth. Although these organisms represent only a small proportion of the overall biomass, the induced flux of organic matter could be substantial. Current estimates, based on a very limited amount of observations, range between 0.01 PgC/year and 1 PgC/year from 100 to 1000m and are thus very uncertain. Here, we present an estimate of the influence of FFGZ on global marine biogeochemistry using the marine biogeochemical model PISCES. In our modeling framework, two processes characterize FFGZ: a preference for small prey organisms due to filter-feeding and the rapid sinking of carcasses and fecal pellets. Our simulated contribution of FFGZ to the total living marine biomass is less than 3%, but FFGZ-induced organic matter sinking at 1000m depth reaches 20%. Finally, we explore the impact of climate change on the role played by FFGZ in the marine ecosystem using 21$^{st}$ century climate change simulations. As climate change is expected to benefit small-size phytoplankton in the coming decades, FFGZ could be favored over other groups of the same size range and hence would have an increasing role in sequestering carbon in the deeper ocean.