

Predator:prey size relationships in the marine plankton: Testing the 10:1 hypothesis with stable isotopes

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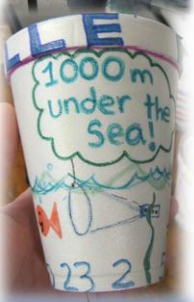










Size-based theories of energy flow in marine plankton ecosystems, as well as numerous conceptual models, generally assume that predators and prey are linked, on average, by a body length ratio of 10:1. This hypothesis was tested using bulk N isotopes and Compound-Specific Isotope Analyses (CSIA) on zooplankton in the 0.2to 5.0 mm size range collected from four regions: the California Current, the Costa Rica Dome, the central equatorial Pacific and the subtropical North Pacific. Bulkδ^{15}N values reflect substantial regional differences in the dominant N cycling processes, which vary from N_2 fixation in the subtropics to denitrification in the eastern tropical region. However, the slopes of bulk δ^{15}N versus size were similar among systems, and not consistent with the 10:1 hypothesis. Some complications are evident in compositional differences of size classes, which affect mean animal length to biomass conversions. In addition, results of this research suggests a new paradigm of expanding predator: prey biomass ratios with increasing organism size, from microbes to large fish, which may alter our current understanding of energy flows in marine food webs.