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ALLOMETRIC THEORY: EXTRAPOLATIONS FROM INDIVIDUALS TO COMMUNITIES[1]

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Abstract. Physiological rates of individual organisms are well related to their body size. These allometric relationships suggest that ecological rates should also be related to the size structure of organisms in populations, communities, and ecosystems. We describe size distributions of zooplankton communities and explore the implications of such distributions on community grazing rates. Ninety zooplankton communities, varying in biomass and in size distributions, were sampled in 28 lakes in northeastern North America and their grazing rates were predicted with an allometric equation. Zooplankton size distributions vary in shape but, on average, can be described as bimodal. Predicted community mass-specific grazing rate decreases with increasing mean body size ($r^2 = 0.92$) and is only slightly affected by the shape of community size distributions. Community biomass on the other hand increases with mean body size ($r^2 = 0.39$). Total zooplankton grazing rate is expected to be higher in communities dominated by large zooplankton, but this relationship is obscured ($r^2 = 0.15$) by temporal and spatial variability in zooplankton biomass. Although body size is a powerful predictor of individual physiological rates, its importance is expected to be largely masked at the level of communities.

Key words: allometry; community rate; community structure; ecological rate; grazing; size distribution; zooplankton.