Coexistence relationships among competitors differing in body size

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How similar species can be and still coexist is a principal question of community ecology. It has been assumed that competitors must partition an axis of environmental heterogeneity. Here we consider grazer species differing in size but not in their niches. Smaller species are assumed capable of exploiting resources locally to lower levels than larger ones. However, body size can also lead to a competitive advantage favoring large species with regard to locating and moving to high quality resource patches and depressing resource density there. Competitive relationships between species is studied with a spatially explicit individual based model, where trophic behavior and space use of individuals is modeled from body size-related constraints on individual energetic. Use of the spatially explicit population model allows to integrate the effects of contrast occurring at individual and population levels. We show that, under these circumstances, body size-related constraints on individual foraging can determine coexistence conditions for competing grazers with biologically reasonable size ratios, independently of the niches of the competitors. Spatio-temporal and energetic constraints prevent resource depletion by either the larger or the smaller species, allowing coexistence. This coexistence mechanism is likely to be complementary to niche partitioning in the organization of competitive communities.

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