

Pelagic species size distributions in lakes: Are they discontinuous?

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Abstract

Aquatic ecologists have many models for size distributions of pelagic communities. However, few studies have looked for discontinuities (clumps of similarly sized species or gaps of sizes that contain no or relatively few species) in pelagic community size structure. We investigated size distribution characteristics in aquatic communities by calculating kernel density functions for plankton and fish in 11 lakes in Wisconsin. Size distributions in aquatic communities of these lakes were not smooth. Rather, multiple lump and gap regions were found within each functional group of phytoplankton, zooplankton, and fish. Simulations showed the gaps could not be explained by incomplete censuses of species or by systematic underestimation of intraspecific size variation. In an experimentally enriched lake, before and after comparisons showed lumps were not affected by large additions of P and N, even though biomass and production changed substantially. Lump regions in the two lakes with both food web manipulations and nutrient enrichment were substantially less similar pre- versus postenrichment than the reference lake and the lake with only nutrients added, but lump number remained relatively unchanged. Lakes that differed widely in nutrient status, trophic structure, species diversity, and area had similar size distributions. Comparisons of functional groups showed that phytoplankton had more lumps than zooplankton. In these north temperate lakes, size distribution characteristics seem to be conservative properties shaped by common regional ecosystem processes and organism patterns and not by lake-specific factors.