

PLANKTON PATCHINESS AND ECOSYSTEM STABILITY

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ABSTRACT

Spatial variability in the controlling rate functions of planktonic ecosystems has been hypothesized to add stability or persistence of species. I have determined the spatial variability in three measures of rate functions in the Kaneohe Bay planktonic ecosystem, one indirect and two direct. 1) The indirect measure, copepod stage frequency distribution, showed spatial variation which was transient. Temporal variation, however, was greater than spatial variation. 2) Copepod production:biomass (P:B) ratios were surprisingly uniform; in only one case out of three was there significant spatial variability, apparently caused by food limitation at one station. 3) Egg production rate was more variable both in space and in time. As with stage frequency distribution, the variability did not occur in a fixed pattern, and temporal variability was greater. Thus spatial heterogeneity of rate functions does exist in Kaneohe Bay but may not be as important to the ecosystem as temporal heterogeneity.

To examine the effect on simple ecosystems of mixing between patches, I enclosed parcels of Bay water in 1.3 m^3 tanks and exchanged water daily between two of them. In both experiments the plankton populations underwent drastic shifts in composition, with the copepods starving and being replaced by rotifers. The experimental ecosystems bore little resemblance to the Kaneohe Bay planktonic ecosystem after

only two weeks of incubation. Mixing between tanks did not affect either persistence of species or variability in their abundances. It therefore appears that horizontal spatial heterogeneity may not be important to the stability of planktonic ecosystems.