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## Temporal, spatial, and taxonomic patterns of crustacean zooplankton variability in unmanipulated north-temperate lakes

*J. A. Rusak*<sup>1</sup>

Department of Biology, York University, Toronto, Ontario, Canada M3J 1P3

*N. D. Yan*

Department of Biology, York University, Toronto, Ontario, Canada M3J 1P3; Dorset Environmental Science Centre, Ontario Ministry of the Environment, Dorset, Ontario, Canada P0A 1E0

*K. M. Somers*

Dorset Environmental Science Centre, Ontario Ministry of the Environment, Dorset, Ontario, Canada P0A 1E0

*K. L. Cottingham*<sup>2</sup> and *F. Micheli*<sup>3</sup>

National Center for Ecological Analysis and Synthesis, Santa Barbara, California 93101-3351

*S. R. Carpenter*

Center for Limnology, University of Wisconsin—Madison, Madison, Wisconsin 53706-1492

*T. M. Frost*<sup>4</sup>

Trout Lake Station, University of Wisconsin—Madison, Boulder Junction, Wisconsin 54512

*M. J. Paterson*

Freshwater Institute, Department of Fisheries and Oceans, Winnipeg, Manitoba, Canada R3T 2N6

*D. J. McQueen*

Department of Biology, York University, Toronto, Ontario, Canada M3J 1P3

### *Abstract*

We quantified the spatial and temporal variability of crustacean zooplankton abundance at annual time steps with 261 lake-years of data from 22 lakes in three regions of central North America. None of these lakes had been experimentally manipulated. Using a nested three-way analysis of variance, we apportioned variance among years,

<sup>1</sup> Current address: Department of Biology, University of Regina, Regina, Saskatchewan, Canada S4S0A2.

<sup>2</sup> Current address: Department of Biological Sciences, Dartmouth College, Hanover, New Hampshire 03755-3576.

<sup>3</sup> Current address: Hopkins Marine Station, Stanford University, Pacific Grove, California 93950.

<sup>4</sup> Deceased.

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regions, lakes, and their interactions for 10 functional groups and 4 larger taxonomic aggregates. We proposed that relative variation in the abundance of zooplankton would be greatest among regions and lakes and least among years. We also explored how variability differed among functional groups and changed with taxonomic aggregation. Spatial sources of variation dominated the analysis, but a large interaction between lakes and years indicated that time cannot be ignored. Regional variation was half that found among lakes. Relative variance components differed widely among functional groups, which indicates that species will differ in their response to environmental controls and sensitivity to perturbation. Total explained variation also differed widely among zooplankton and decreased with increasing aggregation of taxa. Whether choosing ecological indicators or designing experiments and monitoring programs, these results clearly show that large-scale temporal and spatial variability will be an important consideration.