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Research in tropical streams and rivers: introduction to a series of papers

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Many benthologists find it difficult to stay abreast of research progress in tropical streams and rivers. First, research papers are relatively rare. Second, the literature is widely scattered, not only in the standard journals for stream research, but also in journals specializing in tropical research and in unpublished reports and grey literature with only local or regional distributions. We organized this group of papers in an effort to provide readers with a variety of articles on tropical stream research in a single issue of *J-NABS*.

The first paper (Jackson and Sweeney 1995a) presents the results of a survey that assessed the current status of tropical stream and river research (based on the opinions of colleagues working in the tropics) and presents the recommendations of the survey respondents for future research directions. These recommendations were used to organize the subsequent 13 papers.

The most common recommendation given was that future studies of tropical streams and rivers should incorporate large spatial-scale perspectives (i.e., catchments or drainage basins including estuaries and oceanic connections) so that preservation, conservation, and management are more successful. The need for this perspective is pragmatic and reflects the spatial scale of human activities in tropical drainage basins. Three papers in this issue present research that incorporates this large spatial scale. McDowell et al. (1995) and Newbold et al. (1995) provide analyses of spatial and seasonal variation in chemical composition (i.e., nutrient dynamics and solute transport) from several tropical catchments that range from having primary forest to having substantial human usage. Examination of such a range of conditions is required if present and future impacts of upland development are to be assessed. Interpretations of these results may change as we begin to better understand that even isolated locations in the tropics may have a history of direct human impact, and are therefore not "pristine". Standley and Sweeney (1995) add a modern dimension to this issue by presenting evidence of aerial transport of pesticides into isolated areas. The past and present impact of these toxins on aquatic or terrestrial environments remains to be examined. The importance of a large spatial-scale perspective is also apparent in other papers in this issue (e.g., species distributions, geographic variation in life history traits, and population structure within and among drainage basins).

The second most common recommendation was that future studies of tropical streams and rivers should involve studies of biodiversity (Jackson and Sweeney 1995a). This topic includes taxonomic descriptions and distributions of new or poorly defined species as well as the examination of factors responsible for maintaining biodiversity. Four taxonomic papers in this issue provide descriptions of new species of aquatic insects (Chironomidae: Epler and de la Rosa 1995; Leptoceridae: Holzenthal 1995; Hydropsychidae: Blahnik 1995; Corydalidae: Contreras-Ramos 1995) and, where possible, each paper begins to clarify relationships among congeneric species through the initiation of subgeneric revisions and/or the presentation of a taxonomic key. These initial taxonomic descriptions provide the basis for subsequent studies needed to understand the ecological aspects of biodiversity. Such studies will initially be autecological, quantifying life history traits such as growth and development rates, habitat and dietary requirements, and various adult and larval behaviors. Two papers in this volume detail life histories of tropical stream insects. Jackson and Sweeney (1995b) present egg and larval development times for 35 species of tropical stream insects that strongly support earlier suggestions that many tropical stream insects have aseasonal, multivoltine life histories. In contrast, Sweeney et al. (1995) describe the life history of a seasonal, semivoltine mayfly that

may provide insight into seasonality of insects in temperate streams. Interpretation of life history as well as taxonomic studies is often facilitated by an understanding of population genetic structure, especially how factors such as isolation, dispersal, adaptation, and chance are operating at large and small spatial scales. Two papers (Schmidt et al. 1995, Hughes et al. 1995) examine the population genetic structure of two common macroinvertebrate species (a baetid mayfly and a freshwater shrimp) that differ in their ability to disperse within and between drainages.

Finally, the survey indicated that future research in tropical streams should determine if models describing the structure and function of temperate streams can be used for tropical streams (Jackson and Sweeney 1995a). For example, extensive research over the last 20 years has documented the important roles of allochthonous organic matter and disturbance in determining the structure and function of streams and rivers in temperate regions. In this issue, both of these subjects are examined for tropical streams. Campbell and Fuchshuber (1995) look at the effects of plant secondary compounds on processing rates of tropical and temperate leaves. Rosser and Pearson (1995) experimentally examine the resistance and resilience of benthic macroinvertebrate assemblages to flow-induced disturbance in two tropical streams.

The 13 research papers in this issue of *J-NABS* are descriptive and experimental studies of taxonomy, life histories, population structure and gene flow, community structure, and ecosystem properties. These are primary research papers (not general review papers such as were published by *J-NABS* in 1988) that are representative of the range of studies currently being conducted in the tropics. Unfortunately, we could not include all regions, subjects, or taxa. We hope that these papers serve as an introduction to tropical stream research for some *J-NABS* readers while providing other readers with an update of recent findings and conceptional advances. We also hope this issue stimulates more thought about stream research in both tropical and temperate regions.

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