DIATOMS COMMUNITIES IN HIMALAYAN HILLSTREAMS

L. JÜTTNER, H. ROTHFRITZ, AND S.J. ORMEROD
Catchment Research Group, PABIO, UWCC, Cardiff CF1 3TL, UK

Diatoms are siliceous algae and an abundant component of all aquatic ecosystems. Throughout the world, they are recognised as important indicators of ecological conditions and quality in surface waters. They are important primary producers in aquatic ecosystems and make a large contribution to their biodiversity. So far, however, there are few data on the occurrence and community composition of diatoms in Himalayan rivers. This is unfortunate in view of the opportunities for fundamental study, and in view of the growing interest in the development of biological indicators of environmental change in this sensitive region.

As part of a larger and ongoing hydrobiological study (Ormerod et al. 1994, this volume) we have now investigated riverine diatom communities across a wide ecological gradient in Nepal. Six geographical regions have been visited in the far west (Simikot-Jumla, Dunai), Central Nepal (Langtang, Likkhu *Khola*, Kathmandu Valley) and the east (Arun valley). Study sites incorporate catchments under terraced agriculture at lower altitudes, in streams through forest, alpine scrub, and tundra at higher altitudes.

Working within the general aims of establishing baseline conditions for Nepalese streams while developing biological indicators of change, the specific aims of this study have been:

i) to assess the richness, diversity, and composition of diatom communities in relation to altitude, stream chemistry, geomorphological character, land use, and pollution; and
ii) to assess the community composition of diatoms in different stream habitats, so permitting the development of sound sampling strategies;

We review some of the key results to date. Diatom communities changed markedly between sites: high altitude streams were characterised by species

from the genera *Fragilaria*, *Achnanthes*, and *Diatoma*, which are tolerant to turbulent flow; lower altitude streams contained more motile *Navicula* and *Nitzschia* species. Polluted streams in Kathmandu Valley were characterised by species which occur typically where there is organic enrichment (e.g. *Gomphonema parvulum*, *Navicula atomus*, *N. minima*, *N. cryptocephala*, *Nitzschia palea*).

From the regions analysed so far, species richness, diversity, and evenness were highest in tributaries of the Likhu *Khola* in the middle hills, but lower at high altitude. These effects might reflect flow conditions, habitat structure, and chemistry, for which we will provide correlative evidence. Diversity was also markedly reduced at polluted sites in the Kathmandu Valley.

Since diatoms are usually collected during monitoring only from riffles, we examined whether this strategy effectively recorded biodiversity, and faithfully revealed effects of pollution. Species richness, evenness and diversity did not differ between pools, riffles, and vegetation in the Likkhu *Khola*, but pools in the Kathmandu Valley tended to have the highest values of all these measures ($P<0.1$). In addition, there were significant variations between habitats in the percentage of the total number of species recorded at each site; riffles on an average held the fewest (55.7%) and pools, the most (76%). The relative abundances of species also varied between habitats, but effects by organic enrichment were nevertheless apparent in all habitats sampled.

These results provide an important new insight into the biology and biodiversity of Himalayan rivers, and into the role of diatoms as ecological indicators.

REFERENCE

Ormerod, S.J.; Rundle, S.D.; Wilkinson, S.M.; Daly, G.P.; Dale, K.M.; and Jüttner, I., 1994. 'Altitudinal Trends in the Diatoms, Bryophytes, Macroinvertebrates and Fish of a Nepalese River System'. In *Freshwater Biology*, 32 (pp309-322).