

**B414** Hierarchical Data Grouping in Benthic Macroinvertebrate Communities by Using Unsupervised Artificial Neural Networks

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Data feature of community samples were extracted by a combined use of unsupervised artificial neural networks, and hierarchical organization of data was possible in terms of species grouping, and spatial and temporal classification of collected samples. The neural network algorithms originated from the Carpenter/Grossberg and the Kohonen network were applied in this study. The field data used as inputs for the networks were benthic macroinvertebrate communities collected at various study sites with different environmental impacts in the Suyong river in Korea. Initially densities of species for collected samples were given as inputs to the Kohonen network. It patternized input data, and their conformational characteristics appeared in neurons on a map in a reduced dimension. Subsequently Carpenter/Grossberg was applied to the converged results by the Kohonen network to classify further the patternized neurons at different scales. As vigilance of Carpenter/Grossberg network was increased, grouping of neurons was observed in a characteristic manner at different higher scales. These hierarchical groupings in community data generally reflected environmental impacts and biological organizations within communities.

**B415** Effects of Hg and Cd on the Growth and Nitrogen Fixation of *Melilotus suaveolens* seedlings

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In the presented paper, special attention has been focused on the ecophysiological characteristics of *Melilotus suaveolens*, a biennial leguminous plant, growing under controlled condition through the growth response and nitrogen fixation activity. *M. suaveolens* seedlings were treated with 0, 30 and 100 ppm Hg and Cd by pH 4.2 and pH 6.5 respectively for 1 month. Accumulation of metals in each organ of *M. suaveolens* was increased with the lowering of pH and the increase of their concentrations. Accumulated metals inhibited root growth at the early growth stage and leaf growth at the late growing stage, respectively. Seedlings of *M. suaveolens* showed severe injury symptoms resulted from metals. Heavy metals inhibited considerably nitrogen fixation system rather than growth itself of *M. suaveolens*. However, generally, *M. suaveolens* showed growth adaptation against metal toxicity, effectively regulating metal uptake at root level and restricting metal transport to shoots. It is concluded that *Melilotus suaveolens*, a biennial leguminous plant, could be as a good pioneer plant