Chironomid based classification of reservoirs: comparison of schemes

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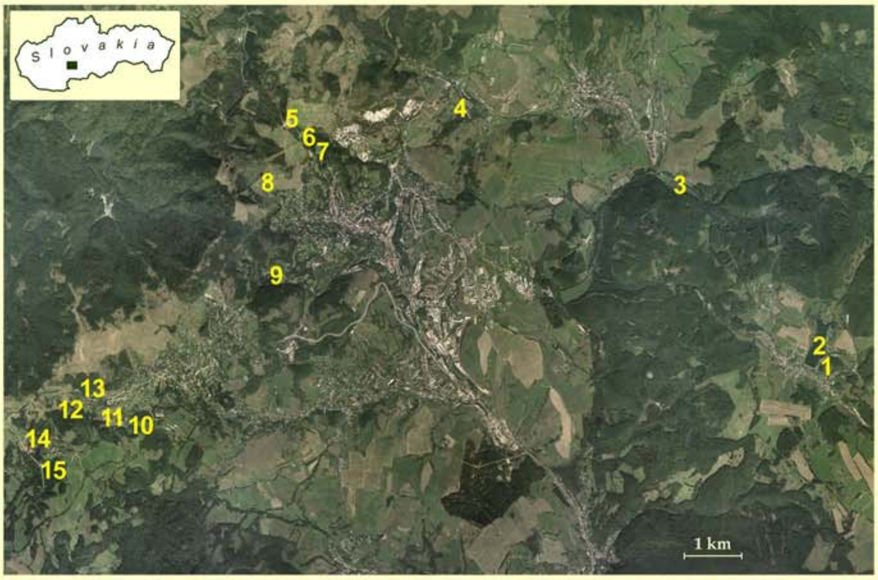
Introduction

In freshwater resource management, subjects (streams, ponds, reservoirs or other water bodies) are often classified into categories with similar climate, physical and biological properties. Well-defined ecologically homogenous classes of subjects can be managed under similar management practices. Moreover, comparison of disturbed and undisturbed (reference) subjects within the same class can serve as a measurement tool of disturbance effect in biomonitoring and ecological quality assessment. This philosophy was adopted under the European Water Framework Directive (Council of the European Communities 2000) and applied for the running waters (e.g. Nijboer et al. 2004, Verdonschot & Nijboer 2004).
In this study we evaluated different classification schemes of man-made reservoirs based on chironomid assemblages.



Location of fifteen studied reservoirs in Štiavnické vrchy Mts.

Field and laboratory

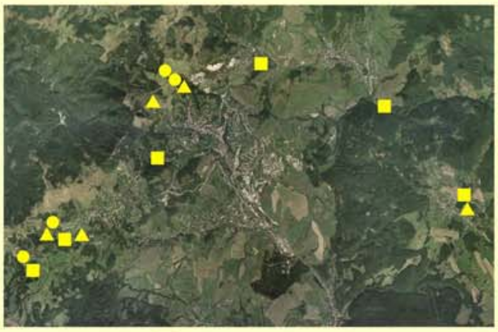
Floating pupal exuviae were collected with a handnet (Chironomid Pupal Exuviae Technique) from leeward shores monthly from May to October 2005. Exuviae were identified under high magnification to species-level, if possible (Langton 1991, Langton & Visser 2003).

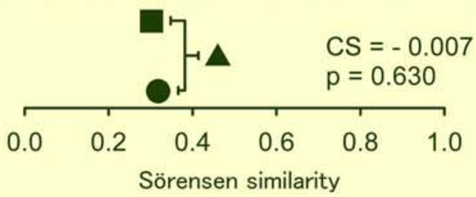
Data analysis

Distribution of chironomid species was recorded as an incidence matrix of 105 taxa by 15 reservoirs. Similarity of assemblages was assessed using Sörensen's index. The reservoirs were *a priori* classified according to two different classification schemes: (a) geographical classification and (b) morphological classification. In both schemes, 15 reservoirs were assigned to 3 groups. The ability of these classification schemes to effectively separate chironomid assemblages into distinct groups was compared using mean similarity analysis (Van Sickle 1997). Classification strength (CS) was computed as the difference between mean similarity within- and between-group of reservoirs. Permutation procedure (9999 permutations) was used to test the null hypothesis that computed CS statistic of particular *a priori* classification was significantly greater than would be seen for randomly chosen grouping of reservoirs (Smith et al. 1990, Van Sickle 1998). Competing classification schemes were graphically compared using mean similarity dendrograms (Van Sickle 1997). Further, the *a priori* classifications were compared to a near-optimal, *a posteriori*, groupings derived from the similarity data matrix.

Morphological classification

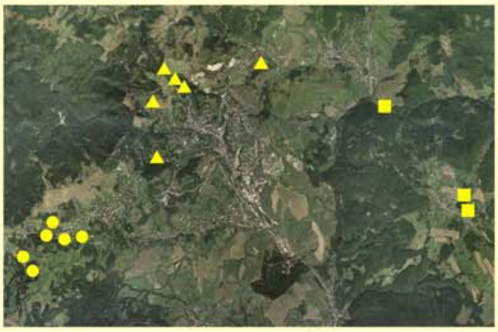
Small (< 1 ha), shallow (< 2 m), unstratified reservoirs (circles).
Medium (< 2 ha), deeper (2 - 8 m), unstable stratification (triangles).
Big (> 2 ha), deep (10 - 20 m), stratified (squares).

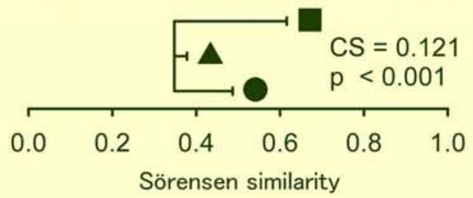




Geographical classification

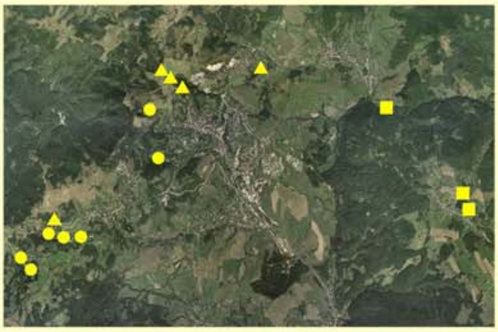
Reservoirs were classified according to the watersheds which usually serve as an a priori spatial framework for monitoring and management decisions (different symbols represent different catchments).

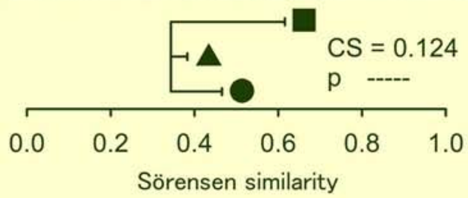




A posteriori classification

Cluster analysis of chironomid incidence matrix revealed three groups characterised by the presence of:
***Tanytarsus lestagei* agg.** (circles)
Tanatarsus buchonius (triangles)
Dicrotendipes pulsus (squares)





Conclusions

Analysed set of data offered little support for the utility of the morphological classification. In contrast, geographical classification was strong and effectively partitioned chironomid assemblages into three distinct categories. Reservoirs clustered in different geographical groups shared, on average, fewer than 40% of their chironomid species. The effectiveness of geographical classification was supported by the results of a posteriori classification scheme.

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