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Phytobase: a tool for the integrated synusial approach of vegetation classification at regional to national scale

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Integrated Synusial Phytosociology

Integrated Synusial Phytosociology (ISP) considers vegetation as organized in nested hierarchical levels, each of them being potentially described in a classification system (1, 2, 3).

The first, finest level is the synusia, a concrete plant community composed of plant species co-occurring in a local similar environment, with comparable size and habitat use. Phytobase distinguishes three categories of synusiae, i.e. tree, shrub, herb and moss synusiae, classified into elementary syntaxa.

Synusiae are integrated into phytocoenoses, the second level of vegetation description, based on a list of synusial elementary syntaxa co-occurring in a given phytocoenosis. Phytocoenoses are classified into elementary coenotaxa according to their synusial composition (elementary syntaxa or alliances).

Phytobase: a relational database for ISP

Phytobase is a relational database management system (RDBMS) devoted to the management of vegetation survey data, following the concepts of the ISP. This application has been developed in the 4D environment (4) from the 1990s at the University of Neuchâtel, at EPFL and now at the University of Besançon.

Phytobase is freely available from the Tela-botanica website (5), including a sample of relevés and a user guide (6). It is used by more than 200 registered users in Europe and registered in the GIVD metadatabase (7).

The current standalone application (version 8.3 for Windows or Mac OS X, built with 4D v13) has a user interface in French language but an English version is planned to allow a broader diffusion to the international community of vegetation scientists.

Phytosociological and ecological diagnostic tools

A comprehensive diagnostic of synusial plot records is implemented in Phytobase, including:

• Synsystematic diagnosis: assignment to a class, an order and an alliance based on the relative number or cover of characteristic and differential species according to Julve’s basevég classification system (8, 9);

• Taxonotaxonomic diagnosis: assignment to an elementary syntaxon stored in the database, based on the combination of various indices (10);

• Ecological diagnosis: ecological indicator values (according to Landolt (11), Ellenberg or Julve), life forms, CSR strategies, taxonomic diversity indices, pastoral value, etc.

Each elementary syntaxon or coenotaxon is described by the centroid of all plot records that were assigned to it. This centroid relevé includes fidelity indices (e.g., PHI (12), IndVal (13)) for species or elementary syntaxa, used in phytosociological diagnostics. An assessment of compositional homogeneity, taking or not into account dominance, is also implemented.

Main applications

Phytobase has been applied to various ecosystems (wood-pastures, forests, floodplains, wetlands and grasslands) in many regions, mostly in Switzerland and in France. ISP and Phytobase have proved particularly useful when studying structurally and dynamically complex vegetation, such as wooded pastures and alluvial forests, which are poorly described by the Braun-Blanquet approach.