Peterka T., Hájková P., Jiroušek M., Hinterlang D., Chytrý M., Aunina L., Deme J., Lyons M., Seiler H., Zechmeister H., Apostolova I., Beierkuhnlein C., Bischof M., Biţă-Nicolae C., Brancaleoni L., Ćušterevska R., Dengler J., Didukh Ya., Dítě D., Felbaba-Klushyna L., Garbolino E., Gerdol R., Iemelianova S., Jansen F., Juutinen R., Kamberović J., Kapfer J., Klímová B., Knollová I., Kolari T. H. M., Lazarević P., Luostarinen R., Mikulášková E., Milanović Đ., Miserere L., Moeslund J. E., Molina J. A., Pérez-Haase A., Petraglia A., Puglisi M., Ruprecht E., Šmerdová E., Spitale D., Tomaselli M., Vassilev K. & Hájek M. (2023) Formalized classification of the class *Montio-Cardaminetea* in Europe: towards a consistent typology of spring vegetation. – Preslia 95: 347–383.

Supplementary Data S8. Brief guide to the practical use of the expert system.

The expert system file (Supplementary material S7) should be run in the Juice software (Tichý 2002). The Juice installation files can be downloaded from the web pages of the Department of Botany and Zoology (Masaryk University, Brno): https://www.sci.muni.cz/botany/juice/?idm=3. The general manual for using the program (including data import and basic processing) is available here: https://www.sci.muni.cz/botany/juice/?idm=9 .

For more information about expert systems for vegetation classification see Tichý et al. (2019) and Chytrý et al. (2020).
For more detailed instruction on how to use expert system for vegetation classification see:
https://onlinelibrary.wiley.com/action/downloadSupplement?doi=10.1111%2Fjvs.12277&file=jvs12277-sup-0002-AppendixS2.pdf (Appendix S2 of Landucci et al.),
https://onlinelibrary.wiley.com/action/downloadSupplement?doi=10.1111%2Fjvs.12696&file=jvs12696-sup-0001-AppendixS1.pdf (Appendix S1 of Tichý et al. 2019),
https://onlinelibrary.wiley.com/action/downloadSupplement?doi=10.1111%2Favsc.12519&file=avsc12519-sup-0005-AppendixS5.pdf (Appendix S5 of Chytrý et al. 2020).

0. Structure of the expert system

The expert system file is written in TXT-format. The file consists of three sections:

(a) Section 1: Species aggregation. In this section, subspecies (or other infra-specific taxa such as varieties) are merged to the species level, and species of taxonomically difficult groups are merged into aggregates. Furthermore, the most frequent synonyms are converted to the species names used in the expert system.
(b) Section 2: Species groups. Species groups are defined here. *Sociological groups* are labelled by "###". *Discriminating species groups* are identified by "##D" and a two-digit number after the "+" sign at the beginning of the group name (e.g. "##D +10").
(c) Section 3: Group definitions. The section contains the formal definition of *Montio-Cardaminetea* and definitions of subordinate orders and alliances.

1. Nomenclature

To obtain the correct classification result, the nomenclature in the dataset (phytosociological table in Juice) must match species names in the expert system file. As outlined earlier, the expert system partly unifies the species nomenclature by merging synonyms, as well as infra-specific taxa in Section

1. However, only the most common synonyms are included here. Another neglected source of bias may be typing errors, abbreviations, author citations or other special symbols in species names. All these divergences may, at least from time to time, appear in private datasets or even in some checklists used in regional or national vegetation databases.

For example: the names *Anisothecium palustre*, *Dicranella palustris*, *Diobelonella palustris* or *Dicranella squarrosa* are automatically converted to *Dichodontium palustre* by the expert system. Contrary, the current version of the expert system file does not recognise and convert unusual synonyms, rare typing errors in species lists (e.g. *Dicrranela papalustris*), names with abbreviations (e.g. *Dicr. palustr.*), majority of names with author citations or combinations (e.g. *Dichodontium palustre* (Dicks.) M. Stech) or names with special symbols included (e.g. *Dicranella palustris***!@).

Hence, we recommend at least rough visual checking of whether your nomenclature is compatible with the expert system, especially the names of *Spring-positive species* are essential for the correct classification of plots.

2. Selection of definitions

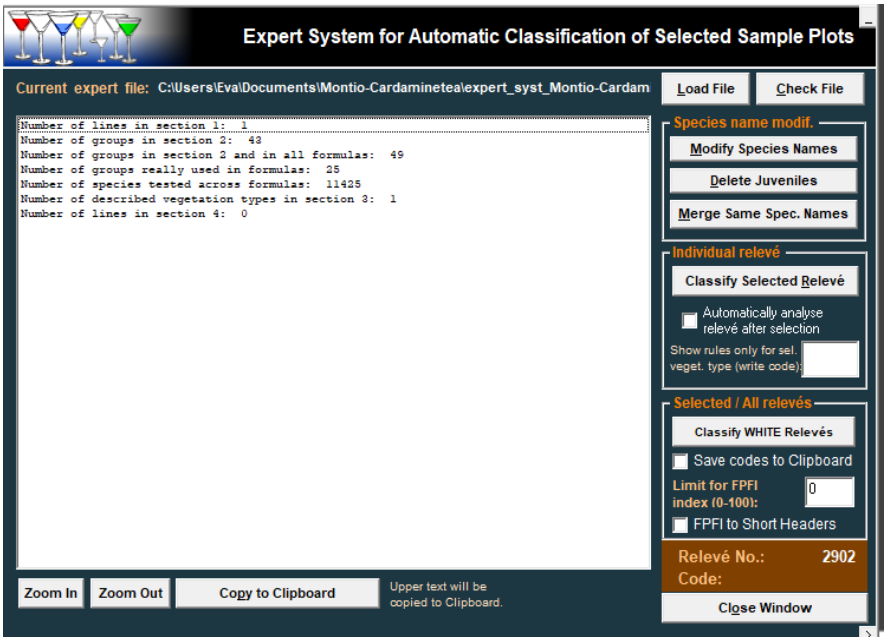
Selected formal definition can be temporarily disabled by the user by inserting the characters "---" at the beginning of the line with the name of vegetation type and the beginning of the line with the formula:

```
---5          Ant Anthelion-CORE
---<#02 Anthelia julacea>
```

For an appropriate classification of spring plot(s), we recommend first checking whether the plot(s) match the *Montio-Cardamineta* class and only then classifying the plot(s) by definitions of subordinate orders and alliances (see below).

3. Classification

- Import vegetation plot(s) into the Juice software.
- Change the species layers into "0" (*Species – Combine layers*).
- Store the expert system (TXT-file) on the computer.
- Open the expert system file, and make the formulas disabled except for the definition of *Montio-Cardaminetea*. (This definition is the first within *Section 3: Group definitions.*) Save the file.
- Upload the expert system file (*Analysis – Expert System Classificator*).



- Modify species names.
- Check (for sure) the nomenclature in your table against species names in the expert system (especially check the names against *Spring-positive-species* and names in sociological species groups). If necessary, change some names manually.
- Run the expert system by *Classify Selected Relevé* (the plot selected by your last click will be classified) or *Classify COLOUR Relevés* (all plots of the selected colour will be classified).
- Remove all plots that did not match the definition of *Montio-Cardaminetea*.
- Open the expert system file, remove "---" from the disabled definitions, and save the file.
- Upload and run the expert system file again.

References:

Chytrý M., Tichý L., Hennekens S. M., Knollová I., Janssen J. A. M., Rodwell J. S., Peterka T., Marcenò C., Landucci F., Danihelka J., Hájek M., Dengler J., Novák P., Zukal D., Jiménez-Alfaro B., Mucina L., Abdulhak S., Aćić S., Agrillo E., Attorre F., Bergmeier E., Biurrun I., Boch S., Bölöni J., Bonari G., Braslavskaya T., Bruelheide H., Campos J.A., Čarni A., Casella L., Ćuk M., Ćušterevska R., De Bie E., Delbosc P., Demina O., Didukh Y., Dítě D., Dziuba T., Ewald J., Gavilán R. G., Gégout J.-C., Giusso del Galdo G.P., Golub V., Goncharova N., Goral F., Graf U., Indreica A., Isermann M., Jandt U., Jansen F., Jansen J., Jašková A., Jiroušek M., Kącki Z., Kalníková V., Kavgacı A., Khanina L., Korolyuk A. Yu., Kozhevnikova M., Kuzemko A., Küzmič F., Kuznetsov O.L., Laiviņš M., Lavrinenko I., Lavrinenko O., Lebedeva M., Lososová Z., Lysenko T., Maciejewski L., Mardari C., Marinšek A., Napreenko M. G., Onyshchenko V., Pérez-Haase A., Pielech R., Prokhorov V., Rašomavičius V., Rodríguez Rojo M. P., Rūsiņa S., Schrautzer J., Šibík J., Šilc U., Škvorc Ž., Smagin V. A., Stančić Z., Stanisci A., Tikhonova E., Tonteri T., Uogintas D., Valachovič M., Vassilev K., Vynokurov D., Willner W., Yamalov S., Evans D., Palitzsch Lund M., Spyropoulou R., Tryfon E. & Schaminée J. H. J. (2020): EUNIS Habitat Classification: expert system, characteristic species combinations and distribution maps of European habitats. – Applied Vegetation Science 23: 648–675.

Landucci F., Tichý L., Šumberová K. & Chytrý M. (2015): Formalized classification of species-poor vegetation: a proposal of a consistent protocol for aquatic vegetation. – Journal of Vegetation Science 26: 791–803.

Tichý L. (2002): JUICE, software for vegetation classification. – Journal of Vegetation Science 13: 451–453.

Tichý L., Chytrý M. & Landucci F. (2019): GRIMP: A machine-learning method for improving groups of discriminating species in expert systems for vegetation classification. – Journal of Vegetation Science 30: 5–17.