Supporting information to the paper

Chytrý M. *et al.*, EUNIS Habitat Classification: expert system, characteristic species combinations and distribution maps of European habitats. *Applied Vegetation Science*.

**Appendix S5.** Brief user guide to the classification of vegetation plots by the expert system EUNIS-ESy using the JUICE program.

# Brief user guide to the classification of vegetation plots by the expert system EUNIS-ESy using the JUICE program

### 1. Preparation and upload of input files

EUNIS-ESy is optimized for data files from the European Vegetation Archive (EVA), which are exported from the TURBOVEG 3 program. These files contain taxon concepts and names that correspond to the Euro+Med PlantBase and all the information that is required for the proper functioning of EUNIS-ESy. However, EUNIS-ESy can also be applied to the files exported from TURBOVEG 2 or any other database management program, provided the taxon concepts and names are unified according to Euro+Med, and the required information is present in header data.

#### 1.1. Input files from EVA

EVA data are stored in the TURBOVEG 3 program and exported in two files with the extensions \*.hea and \*.csv. These files are imported to JUICE using:

File / Import / Table / from TURBOVEG3 and Simple Text File (Database Records)

Fill the numbers of columns with the required data in the form (see the screenshot below). The column names can be shown by unticking the box Omit the first line. As a minimum, the following three columns must be imported:

- 1. Relevé number
- 2. Matched concept this column contains the name converted to Euro+Med PlantBase nomenclature
- 3. Cover value (%)

EUNIS-ESy does not consider information on vegetation layers. Therefore, records of the same taxon in different layers have to be merged by ticking the box Merge same SN (= species name), LC (= layer code) and SD1 (= species data) when importing the data.

	Comma Delimited File Import (Table Data)		
File Name: C:\Users\Milan\Documents\Papers\E Columns: 10 List of First Columns	EA projects\EEA 2020 Expert system U MA\EVA_2020_05_12.csv		
1     EU-Europe     Vascular plant     1       2     EU-Europe     Vascular plant     1       2     EU-Europe     Vascular plant     1	Agrostis stolonifera Paspalum vaginatum Phragmites australis Scirpus lacustris Scirpus maritimus subsp. maritimus Typha angustifolia Agrostis stolonifera	Agrostis stolc ^ Paspalum vagir Phragmites aus Schoenoplectus Scirpus mariti Typha angusti! Agrostis stolc	
<ul> <li>Comma Semi-colon Tabs</li> <li>Column with Relevé Number: 1</li> </ul>	Field names: 6. Matched concept	•	
Column with Species Name: 6 Column with Layer Code: Column with Cover Value (%): 9	This window supports TV3 or other databas import must contain (layer code) and cov	Omit the first line This window supports an easy import of tables from TV3 or other database formats. The file prepared for import must contain relevé number, species code, (layer code) and cover value (in whole percentage)	
<ul> <li>Species Data 1:</li> <li>Species Data 2:</li> <li>Indicator of spec. colour:</li> <li>Show difference between "Species Name" and</li> </ul>	Merge same SN, LC and SD1 numbers 1-100). Oth	cel	

If you want to check how original taxon names were translated to Euro+Med, import the original names from the source databases in the column "Turboveg2 concept" to the field with species data in JUICE:

	Comma Delimited File Import (Table Data)			
File Name: C:\Users\Wilan\Documents\Papers\EEA proje	ts\EEA 2020 Expert system U MA\EVA_2020_05_12.csv			
List of First Columns         1       EU-Europe       Vascular plant       1       Agrost         1       EU-Europe       Vascular plant       1       Paspal         1       EU-Europe       Vascular plant       1       Phragm         1       EU-Europe       Vascular plant       1       Phragm         1       EU-Europe       Vascular plant       1       Scirpu         1       EU-Europe       Vascular plant       1       Scirpu         1       EU-Europe       Vascular plant       1       Scirpu         2       EU-Europe       Vascular plant       1       Agrost           EU-Europe       Vascular plant       1       Agrost	is stolonifera Agrostis stolc um vaginatum Paspalum vagir ites australis Phragmites aus s lacustris Schoenoplectus s maritimus subsp. maritimus Scirpus mariti angustifolia Typha angustif is stolonifera Agrostis stolc >			
Comma Semi-colon Tabs Column with Relevé Number:	Field names: 5. Turboveg2 concept			
Column with Species Name. 5 Column with Layer Code: Column with Cover Value (%): 3 Species Data 1: 5 Merges	This window supports an easy import of tables from TV3 or other database formats. The file prepared for import must contain relevé number, species code, (layer code) and oover value (in whobe percentage numbers 1-100). Other columns will be omited.			
<ul> <li>Species Data 2:</li> <li>Indicator of spec. colour:</li> <li>Show difference between 'Species Name' and 'Specie</li> </ul>	s Data 1' by '+' Cancel <u>C</u> ontinue >>>			

#### 1.2. Input files from TURBOVEG 2 and other databases

Make sure that the file contains information in the following header data fields:

- Country a qualitative variable containing country names spelled as follows: Albania, Andorra, Armenia, Austria, Belarus, Belgium, Bosnia-Herzegovina, Bulgaria, Canada, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Faroe Islands, Finland, France, Georgia, Germany, Greece, Hungary, Iceland, Ireland, Italy, Kazakhstan, Kosovo, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Moldova, Monaco, Montenegro, Netherlands, North Macedonia, Norway, Poland, Portugal, Romania, Russian Federation, San Marino, Serbia, Slovak Republic, Slovenia, Spain, Svalbard and Jan Mayen Is, Sweden, Switzerland, Turkey, Ukraine, United Kingdom
- ECOREG\_WWF containing three-letter codes of terrestrial ecoregions according to Dinerstein et al. (2017; https://ecoregions2017.appspot.com/)
- COAST\_EEA information whether the site is at the coast (including coastal habitats such as dunes, sea cliffs or coastal saltmarshes) with the following categories (explanation in brackets):
  - ARC COAST (Arctic)
  - ATL COAST (Atlantic)
  - BAL COAST (Baltic)
  - BLA COAST (Black Sea)
  - MED COAST (Mediterranean)
  - N COAST (Outside the coastal area)
- DUNES\_BOHN information whether the site is in coastal dunes (including dune scrub and dune forest); the categories are Y DUNES and N DUNES for the occurrences in and outside dunes, respectively
- DEG\_LAT, DEG\_LON degrees of latitude and longitude of the plot in the coordinate system WGS 84, format DD.DDDD; western longitudes are indicated with a minus sign
- Altitude (m) a quantitative variable containing the altitude of the plot in metres above sea level

Upload the vegetation-plot dataset to JUICE. Remove layer information for all the taxa by selecting "0" layer in:

Species / Renumber Layers for COLOUR Species

Find a file in Zenodo repository (http://doi.org/10.5281/zenodo.3841729) that corresponds to the species list used in your database. Open this file using:

Analysis / Expert System Classificator

Press the button Modify Species Names. After the process finishes, which is indicated by the appearance of the list of modifications in the white window, press Merge Same Spec. Names. The records related to the same species name will be merged, and their covers will be summed using the Jennings–Fischer formula assuming the random overlap of covers (Jennings 2009, *Ecological Monographs*; Fischer 2015, *Applied Vegetation Science*), i.e. the resulting value will never exceed 100%. As a result, each taxon will occur only once in the table.

Expert System for Automatic Classification of Selected Sample Plots					
Current expert file: C:\Users\Milan\Documents\Papers\EEA projects\EEA Paper\Nomenclature translations\Czechia_Slovakia_2015_ExpertSystem.txt	Load File	<u>C</u> heck File			
Number of lines in section 1: 1 Number of groups in section 2 and in all formulas: 0 Number of groups really used in formulas: 0 Number of species tested across formulas: 0 Number of described vegetation types in section 2: 0 Number of lines in section 4: 1	Species nar Modify Sp Delete Merge Sam Individual re Classify Sc Automati relevé al Show rules onl veget. type (wr Selected / A Classify W Save cod Limit for FPF index (0-100) FPFI to S Relevé No	ne modif. ecies Names Juveniles e Spec. Names levé elected <u>R</u> elevé cally analyse er selection y for sel. I relevés HITE Relevés es to Clipboard I 0 hort Headers .: 1			
Zoom In Zoom Out Copy to Clipboard Upper text will be copied to Clipboard.	Code: Cl <u>o</u> se	Window			

## 2. Classification

Check if the colour of plots (Relevés) on the top of the JUICE screen is set to white:



Open:

Analysis / Expert System Classificator

To start the classification, press the button Classify WHITE Relevés. Alternatively, you can colour selected plots and classify only these plots. The classification process can take several minutes. In the case of datasets containing more than 1 million plots, it will take at least two hours or even more, depending on the quality of the processor of your computer. When the process is finished, codes of individual habitats appear in the header of each plot. For further analyses, these headers should be exported to a file using File / Export / Export Short Headers.

The classified plots can be grouped and separated using:

Sorting / Sort Short Headers Separators / Make Separators / Within Short Headers