

# Floristic, phytosociological and ecological investigation of the spring plant communities (*Montio-Cardaminetea*) in the Mecsek Mts. and the South-Zselic (Hungary)

Deme Judit<sup>1\*</sup>, Lengyel Attila<sup>2</sup>, Tóth Antónia<sup>1</sup>, Papp Beáta<sup>3</sup> & Csiky János<sup>1</sup>

<sup>1</sup>University of Pécs, Faculty of Sciences, Institute of Biology, H-7624 Pécs, Ifjúság u. 6., Hungary; \*kvarcit2@gamma.ttk.pte.hu

<sup>2</sup>Hungarian Academy of Sciences, Institute of Ecology and Botany, H-2163 Vácraót, Alkotmány u. 2-4, Hungary

<sup>3</sup>Hungarian Natural History Museum, Department of Botany, H-1476 Budapest, Pf. 222, Hungary

The plant communities of the class *Montio-Cardaminetea* are situated at springs and along streams of hills and mountains. These are treeless syntaxa with special features such as cold microclimate, presence of clear water with high oxygen saturation, which steep the soil and the debris. Because of these factors, a selected species pool can be found there, causing serious contrast with the surrounding vegetation. Although the wells possess in Hungary „ex lege” protection, the floristic, phytosociological and ecological investigation of the regionally endangered or critically endangered spring plant communities lag behind from the neighbouring countries. For this reason, their protection achievable only if we possess enough information about these objects, so their investigation is seriously justified. In Hungary there are only few areas, from where spring relevés were published, but the Mecsek Mts. and the South-Zselic are not among them.

We recorded 38 relevés (Fig. 1) along natural, unset fountains in these areas, according to the guidelines of the Zürich-Montpellier School. For classification we used the species composition (R software system: agnes,  $\beta = -0.25$ ; JUICE: frequency of occurrence  $\geq 50\%$ ,  $\phi \geq 0.30$ ) and some abiotic factors (pH, electrical conductivity). Four clusters were distinguished (Fig. 2), three of them can be identified by phytosociological systems, two of them are new associations for Hungary.

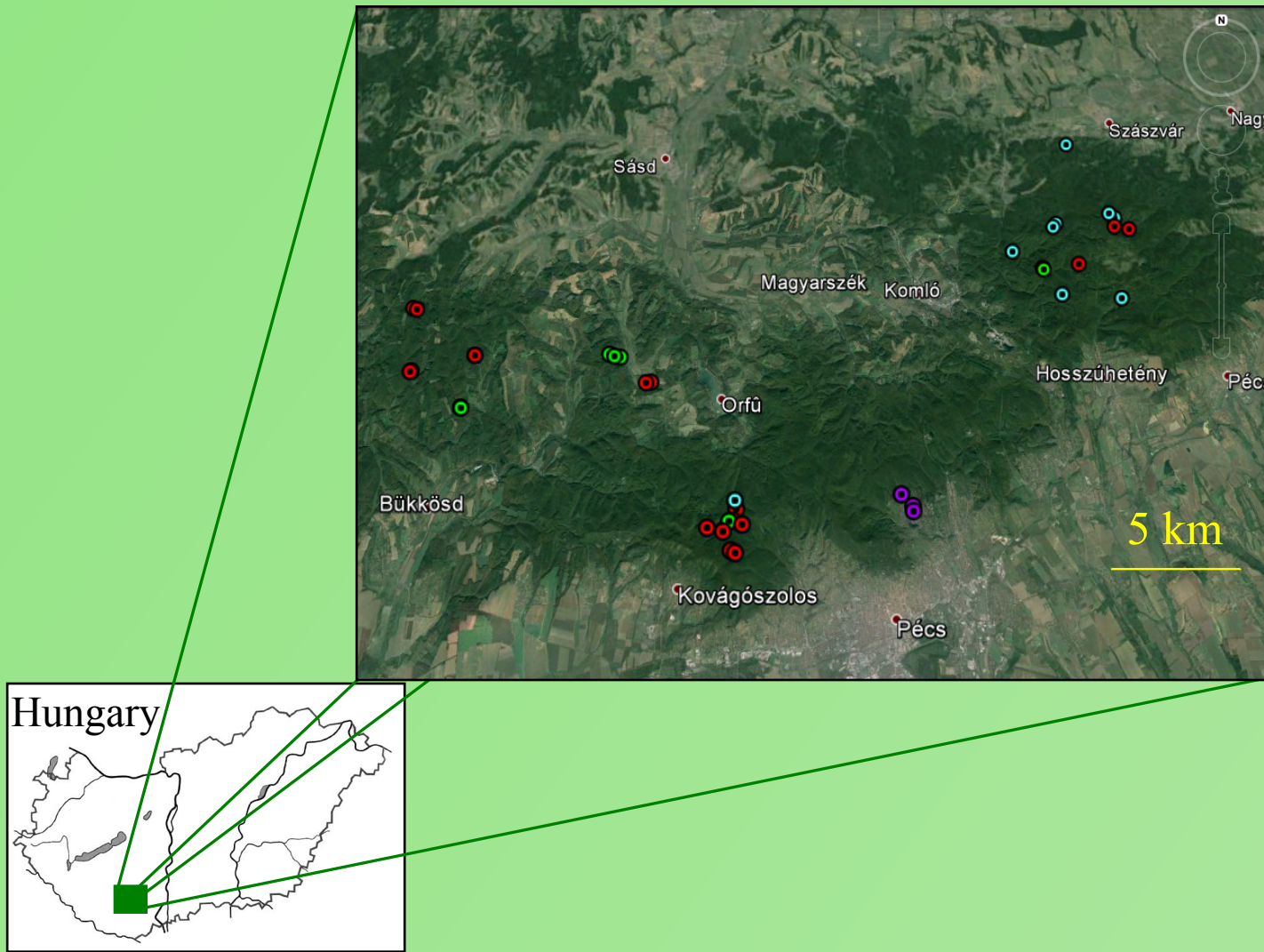


Fig. 1. Distribution of the relevés

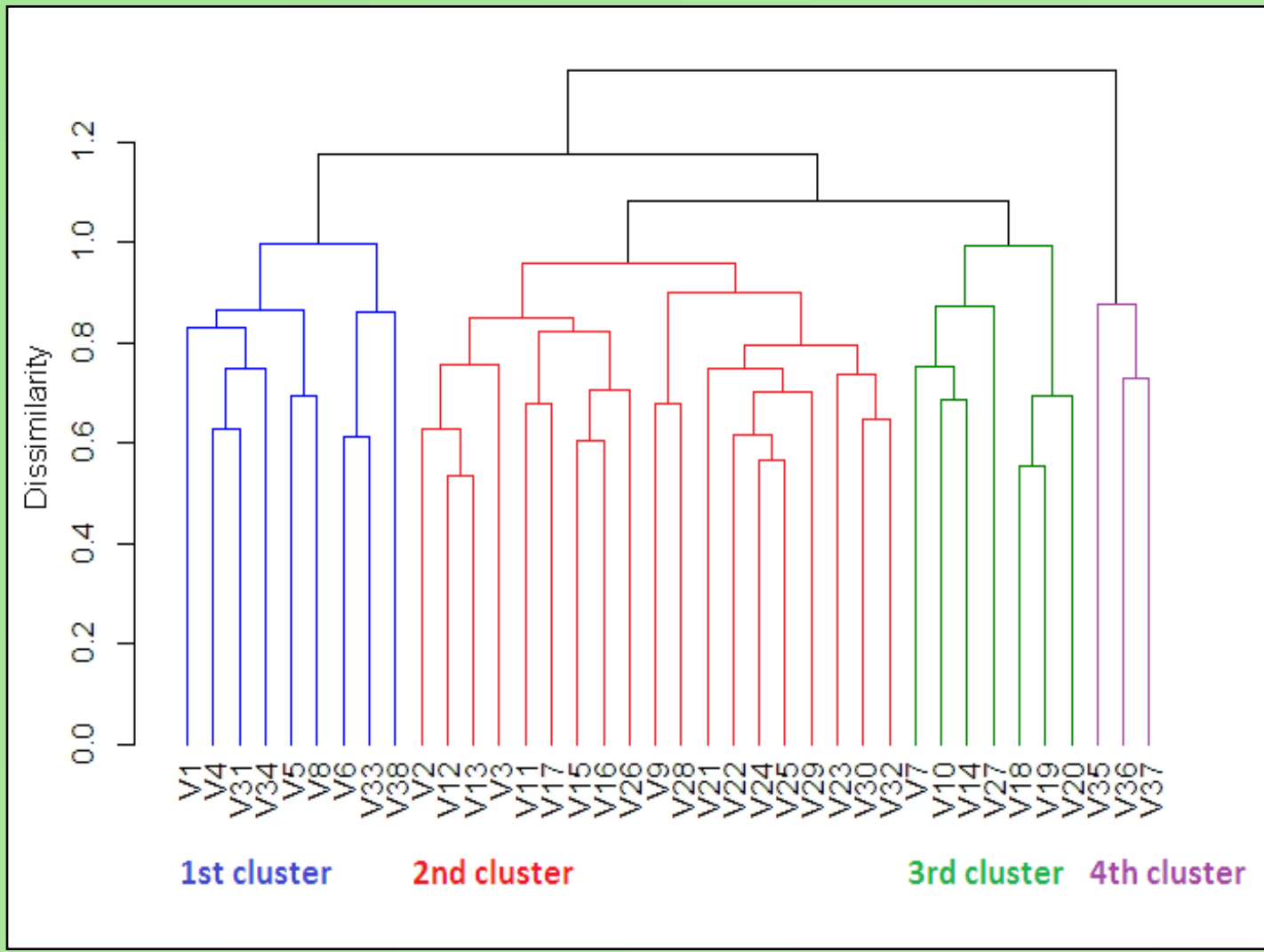


Fig. 2. Result of the cluster analysis



|                    | <i>Brachythecio rivularis-Cratoneuretum</i>                                                 | <i>Caricetum remotae</i>                                                                                                                                                           | <i>Cardamino-Chrysosplenietum alternifolii</i>                                                                                            | „4th cluster”                                       |
|--------------------|---------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| cluster            | 1th                                                                                         | 2nd                                                                                                                                                                                | 3rd                                                                                                                                       | 4th                                                 |
| alliance           | <i>Lycopodo europaei-Cratoneurion commutati</i>                                             | <i>Caricion remotae</i>                                                                                                                                                            | <i>Caricion remotae</i>                                                                                                                   |                                                     |
| diagnostic species | <i>Brachythecium rivulare</i> , <i>Geranium robertianum</i> , <i>Palustriella commutata</i> | <i>Cardamine flexuosa</i> , <i>Carex remota</i> , <i>Ranunculus repens</i> , <i>Rumex sanguineus</i> , <i>Urtica dioica</i> , <i>Veronica beccabunga</i> , <i>Veronica montana</i> | <i>Cardamine amara</i> , <i>Carex remota</i> , <i>Chrysosplenium alternifolium</i> , <i>Myosotis palustris</i> , <i>Ranunculus repens</i> | can not be identified because of the pioneer stands |
| new to Hungary     | ✓                                                                                           | ✓                                                                                                                                                                                  | X                                                                                                                                         |                                                     |
| dominant layer     | moss                                                                                        | herb                                                                                                                                                                               | herb                                                                                                                                      | moss                                                |
| pH                 | basic                                                                                       | indifferent                                                                                                                                                                        | indifferent                                                                                                                               | basic                                               |

131 vascular plant as well as 48 bryophyte and liverwort species were detected in 38 stands. Some of them are protected and/or rare, Red Listed taxa in Hungary, e.g. *Aruncus dioicus*, *Asplenium scolopendrium* (NT), *Cardamine amara* (Fig. 3), *Cardamine flexuosa* (NT) (Fig. 4), *Carex strigosa*, *Catabrosa aquatica* (NT), *Epilobium obscurum* (VU), *Fissidens incurvus* (EN), *Palustriella commutata* (EN) (Fig. 5), *Philonotis marchica* (DD) (Fig. 6). Moreover, we have found zoological rarities in the investigated wells (e.g. *Cordulegaster heros* (NT), *Pomatias rivulare*) which are protected and/or Natura 2000 species in Hungary (Fig. 7-8). One of them (*Carabus nodulosus*) is thought to be extinct from the Mecsek Mts.

Considering these data, the further research of springs is recommended in the aspect of syntaxonomy, botany and zoology as well.



Fig. 3. *Cardamine amara*



Fig. 4. *Cardamine flexuosa*



Fig. 5. *Palustriella commutata*



Fig. 6. *Philonotis marchica*



Fig. 7. *Cordulegaster heros*



Fig. 8. *Pomatias rivulare*

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