DOCTORAL DISSERTATION ABSTRACT

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Plant functional traits drive plant associations in European inland salt marshes

The vegetation of inland salt marshes has been considered valuable and unique in Europe. Therefore, under the Council of Europe Directive 92/43/EEC of 1992, it is legally protected as part of the Natura 2000 network. However, the number of sites in this habitat is constantly decreasing, so they were placed on the European Red List of Habitats. Existing conservation programs refer to syntaxonomical units of vegetation. Therefore, effective protection should be based on a unified syntaxonomical system based on data from various European locations. Such a system has not been created yet. Moreover, existing conservation strategies do not consider the relationship between the syntaxonomical and functional concepts of vegetation. Therefore, in the first step, this doctoral dissertation aimed to create a unified syntaxonomical classification system of the European temperate inland salt marsh vegetation to the associations level and identify the environmental parameters most important in differentiating individual groups. The next step aimed to identify functional traits characteristic of individual plant units and link these traits with environmental factors. In the last step, the aim was to verify the role of diagnostic species in shaping the functional traits of syntaxonomical units and to consider biochemical traits previously omitted in vegetation ecology. The research hypothesis assumed that environmental factors determining the occurrence of plant species in individual communities result in differences in functional traits that may determine the distinctive functioning of individual syntaxonomical units. Based on literature data, a database containing nearly 1,000 phytosociological plots was created, covering the main areas of inland salt marshes in temperate Europe. Classification analysis was performed using the Cocktail method and an expert system to distinguish plant syntaxonomical units. Then, the occurrence of individual units in the gradient of environmental variables was analyzed. Data on the functional traits of individual plant species were obtained from the existing CLO-PLA and LEDA databases. Means of functional traits were calculated for individual plots, weighted by species cover. Then, the means for the previously distinguished syntaxonomical units were compared. Numerical analyzes were used to create models combining functional traits with particular plant classes and associations as well as environmental parameters. The role of diagnostic species in the functioning of plant associations was analyzed based on data from databases and field and laboratory research of species considered diagnostic for typical salt marsh associations. Morphometric measurements of the collected plants and analyzes of biochemical parameters were performed. As a result of the conducted research, the vegetation occurring on inland salt marshes was classified into nine classes: *Ruppietea maritimae*, *Polygono-Poetea annuae*, *Artemisietea vulgaris*, *Potamogetonetea*, *Bidentetea*, *Phragmito-Magnocaricetea*, and *Molinio-Arrhenatheretea*, including two classes typical of salt marshes – *Therosalicornietea* and *Festuco-Puccinellietea*. Within these two classes, two alliances and a total of five associations were distinguished, i.e., *Salicornietum ramosissimae*, *Puccinellio-Spergularietum salinae*, *Triglochino maritimae-Glaucetum maritimae*, *Scorzonero parviflorae-Juncetum gerardii* and *Agrostio stoloniferae-Juncetum ranarii*. Vegetation classes differed most in terms of species' preferences regarding salinity, soil moisture, light availability, and nitrogen content in the substrate, and the salt marsh associations also differed in preferences regarding pH and organic matter content in the soil. The most important functional traits distinguishing particular classes and associations were those related to the species'

persistence. The values of these traits were mostly negatively correlated with soil salinity and positively correlated with moisture and the cessation of mowing and grazing. Vegetation classes typical of salt marshes showed the lowest ability to regenerate, indicating that they are the most sensitive to environmental changes. *Salicornietum ramosissimae* can be considered the most sensitive association. The *Puccinellio-Spergularietum salinae* and *Agrostio stoloniferae-Juncetum ranarii* associations were characterized by significantly lower stability but higher regenerative capacity. The *Triglochino maritimae-Glaucetum maritimae* and *Scorzonero parviflorae-Juncetum gerardii* associations were characterized by low regenerative capacity, but the second was significantly more stable. Analyzes of biochemical traits showed that the best adaptation to abiotic osmotic and oxidative stress conditions characterizes the associations typical of sites with the highest soil salinity. The results indicate that syntaxonomical units of salt marsh vegetation are also functional. Diagnostic species play a key role in their functioning. Therefore, attention should be paid to them when planning protection, including the protection of species. The research demonstrated a close relationship between the syntaxonomical and functional concepts of vegetation. Also, it indicated the functional traits of salt marsh plant associations, which may be helpful in planning the sustainable management of salt marshes and play an important role in creating new strategies for their regeneration and protection.

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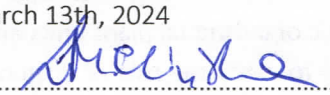

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