

ENGLISH VERSION

ZESZYTY 392

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Assessment of changes in meadow communities from the perspective of preserving post-bog habitats

Rozprawy Naukowe UP w Lublinie 392, Lublin 2018, ss. 105

Post-bog habitats formed due to the draining of peatlands are among endangered ecosystems because the mineralization of organic matter, caused by the desiccation and subsidence of soils, are usually irreversible processes. The desiccation of habitats results in changes in the vegetation cover, leading to the reduced persistence and diversity of habitats. Excessively wet grasslands, on the other hand, are more often excluded from utilization. In consequence, they become overgrown due to secondary succession at a faster rate. Changes occurring in post-bog habitats result from the impact of many factors, and it is difficult to select the best method of preserving them while taking into account both economic and environmental factors. The study objective was to assess the changes that occurred in meadow communities in a post-bog habitat due to the impact of anthropogenic, edaphic and zoobiotic factors. The vegetation cover and the production capacity of the grasslands as well as the physicochemical properties of the soil were analysed. The investigations were also aimed at indicating the optimum method of using meadows with a view to preserving these habitats.

The investigations were conducted on grasslands in a post-bog habitat in Sosnowica, E Poland, in 2006–2015. The formation of this habitat resulted from the draining of the low peat-bog in 1964–1965. A phytosociological survey and assessment of vegetation cover changes depending on the type of meadow and frequency or lack of utilization were conducted in three areas. Utilization-dependent changes of the sward species composition and the influence of damage caused by wild boar and periodic flooding of meadow were monitored in a strict field experiment. Ellenberg indices were calculated based on the vegetation cover, and their usefulness for assessing post-bog habitats was established. The physicochemical analysis of the soil encompassed the determination of the pH, bulk density, organic matter content as well as phosphorus, potassium and magnesium content.

In the light of the investigations conducted, and according to phytosociological classification, the vegetation cover of the grasslands is represented by 20 plant communities, among which the *Poa pratensis-Festuca rubra* community is dominant along with all the differential species (*Poa pratensis*, *Festuca rubra*, *Alopecurus pratensis* and *Holcus lanatus*). This community occurs on organic soils and is more similar to wet meadow habitats of the order *Molinietalia* than to hay meadows of the *Arrhenatheretalia* order, which undermines its affiliation with the *Arrhenatherion* alliance.

The vegetation cover is not a sufficient criterion for assessing a post-bog habitat using the phyto-indication method, particularly in the case of extensive utilization or the lack of it, as evidenced by large differences between the Ellenberg habitat indices after 10 years of varied cutting and fertilization of the grassland. The changes in the species composition of meadows depending on the frequency and date of mowing, and the fertilization doses, occur within a short time span but the changes at the plant community level have a long-term character. The smallest changes of the vegetation cover occur in fertilized, 2- or 3-cut *Poa-Festuca* meadows. The 2-cut meadows are also a habitat for the northern lapwing, an endangered species whose population across Europe is in decline. The extensive, 1-cut use (late mowing and lack of fertilization) or its abandonment leads to an increasing acreage of *Deschampsia caespitosa* or a total transformation of phytocoenoses into *Deschampsia* meadows and reduction of floristic diversity. Nitrogen fertilization at the dose of 30 kg ha⁻¹, even on a 1-cut meadow at a late date, is favourable to the development of *Phalaris arundinacea* that limits the occurrence of *D. caespitosa*. After the damage caused by wild boar, the meadows are subject to degradation manifested in a greater proportion of herb and weed species, and subsequently the dominance of *Urtica dioica*. The *Urtica dioica* community can be a habitat for the corncrake but, from the perspective of economy and preservation of these ecosystems, overdrilling is advisable. This measure brings good results but in a post-bog habitat, its viability depends on the level of humidity because periodic flooding of meadow due to a large volume of precipitation or beaver activity causes the disappearance of the overdrilled species.

The lack of utilization in a post-bog habitat can cause the vegetation cover to change towards *Deschampsia* meadows, subsequently initiating secondary succession, which may cause changes of the physicochemical properties of peat-muck soils. In such conditions, the expanding coverage by downy birch in a periodically dry habitat can accelerate the desiccation and mineralization process. In more humid habitats, the influence of trees is considerably limited, as indicated by the physicochemical properties of the soil which are similar to the properties of 1- or 2-cut meadows. Edaphic and zoobiotic factors have a greater impact on the physicochemical properties of the soil and vegetation in a post-bog habitat than anthropogenic factors.

The preservation of post-bog habitats primarily depends on ensuring the optimum groundwater level that inhibits the muck-formation process affecting peat-muck soils, as well as on the balanced utilization of meadows (preferably 2-cut, with fertilization at 30–60 kg N ha⁻¹) enabling the preservation of the appropriate sward species composition and breeding habitats for endangered bird species.