Title: Ecosystem diversity along a successional gradient of post-mining spoil heaps

Zróżnicowanie ekosystemów w gradiencie sukcesyjnym zwałowisk pogórniczych

Abstract (in English)

The advantages of spontaneous vegetation as an approach for the restoration of post-coalmining spoil heaps are enormous due to its economic, and conservation importance. However, spontaneously revegetated spoil heaps are faced with the problem of alien species, successional inhibitors, and the need for a robust measure in the assessment of restoration success. The dissertation aimed to investigate the vegetation diversity in post-mining areas and to assess the role of alien species and successional inhibitors in spontaneously vegetated spoil heaps. To achieve this aim, the following hypotheses were tested: H1: Native community characteristics will explain alien species invasion level (alien richness) and ecological success (alien cover) on spontaneously vegetated post-coal mine heaps (Publication 1); H2: The inhibitory effect of invasive alien and expansive native species on diversity will depend on the successional stage (Publication 2); H3: Diversity, functional and phylogenetic distinctiveness of ecosystems will increase along successional gradients (Publication 3). The main results showed that native community characteristics drive alien species invasion level and ecological success. Alien species cover decreased with native species cover. In contrast, alien species richness and cover increased with native functional richness. While community-weighted mean (CWM) of native species seed mass and plant height significantly predict alien species cover, native CWM of specific leaf area (SLA) marginally predicts alien species richness (Publication 1). The impact of Calamagrostis epigejos and Solidago spp. cover on diversity indices was strong in the midsuccessional stage. In the mid-successional stage, species richness and functional richness decreased significantly with the cover of *Calamagrostis* and *Solidago*. Shannon diversity marginally decreased while phylogenetic diversity marginally increased with the cover of *Calamagrostis*. Shannon diversity was negatively while phylogenetic diversity was positively correlated with the cover of Solidago (Publication 2). While species richness and Shannon diversity were significantly higher in the early- and mid-successional stages than in the latesuccessional stage, these response variables reached their maximum in the mid-successional stage, revealing an arch-shaped pattern. Late-successional vegetation had the lowest functional richness and highest functional dispersion, and phylogenetic diversity differed between successional stages (Publication 3). The study concluded that while the mid-successional stage hosts the largest species pool and diversity, it is also threatened by successional inhibitors. The dissertation highlights the significance of biotic interactions, especially competition in postcoal-mining areas; therefore increasing our understanding of ecological dynamics and context dependency, which are vital for the effective conservation and management of post-industrial areas.