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Primary succession seen through the shifted patterns of plant traits and soil macrofauna above/under-ground activity, a different ecological perspective towards post mining sites

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Using of trait distribution is becoming a promising field of ecology. Community weighted mean (CWM) values, in this regard, can summarize the shifts in the mean trait values within communities via environmental selection for a specific functional trait. Although traits have been widely used to describe relationships between plants and environmental variables, they are less used in study of interactions with other trophical levels. In 2013, we conducted a study to see the effect of plant community traits on soil and soil macrofauna epigeic/endogeic activity. We used sites of 10, 18, 28 and 55 years old in a succession sequence located at Sokolov post-mining site, Czech Republic. In each site we studied bare, grassy and woody patches. Vegetation traits, namely plant forms (i.e. grass, forb, legume, shrub and tree), canopy height, LDMC (leaf dry matter content), seed mass, and presence/absence of taproot during the whole life cycle were identified in 1-m×1-m quadrates. Soil fauna samples were collected from the same patches. Four patches were sampled in each plot and patch type. Fauna were extracted with a Tullgren apparatus, identified to family and counted. Their numbers were expressed per m2. CWM values of plan traits and faunal surface activity were calculated using the FD package in R. The computed values were transferred afterwards to CANOCO for further analyses. The effect of patches and age on dependent variables was determined with two-way ANOVAs. The higher LDMC in grassy and woody patches, particularly its correlation with 28 yrs site, can be related to higher reported P levels in 28 yrs site in specific, and generally higher nutrient return and C accumulation in vegetated sites. The absence of taproot in vegetated patches and 28 yrs site can be because of more competition with other species. It seems that the correlation between seed mass with oldest site and legume form is, roughly, a result of the change in community composition from forbs and grasses to “late succession species” of the oldest ages such as legumes.We infer that by time passing, thru soil development in older sites, soil medium became more favorable for larval stages and endogeic lifestyle of fauna, in other words, environmental selection and consequently the successful colonization of fauna holding the similar trait (i.e. epigeic activity) ended up in an endogeic community shift towards developed soils under older sites. The shift in CWM value of fauna community clearly shows importance of soil development for a stable colonization and regeneration of migrated communities. Traits related to life history of fauna, e.g. epigeic and endogeic, as well as correlated plant traits instead of plant species communities, i.e. LDMC and plant forms, can be of great value for an enhanced perception of the community pattern dynamics through time and space. The incorporation of trait diversity in primary and secondary successional studies seems to be promising in order to gain a better understanding of the successional changes.