



Conference Abstract

Four phases of changes in carabid assemblages during secondary succession in a pine forest disturbed by windthrow

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Abstract

A 16-year study of carabid assemblages was carried out in pine stands disturbed by windthrow in Pisz Forest (north-eastern Poland). Three classes of disturbed stands were distinguished based on the severity of canopy cover disturbance: severely disturbed stands (10-30% surviving canopy cover), moderately disturbed stands (40-60% canopy cover), and the least disturbed stands, in which all or nearly all trees had survived (canopy cover of 70-90%). Each class was replicated 6 times, for a total of 18 research plots. All replicated classes were subjected to environmental analyses – soil pH, soil CO₂ diffusion rate, decomposition rate of organic matter, and Leaf Area Index (LAI). Also analyzed were changes in the percentage cover of forest floor vegetation and its species composition in the research plots, and changes in the natural regeneration of the stands.

Using the number of carabid species and selected ecological traits, I confirmed the hypothesis that the changes in carabid assemblages inhabiting the severely and moderately disturbed stands following windthrow were greater than in the least disturbed stands. In the first few years after the windthrow, the changes in carabid assemblages were linked to environmental indices. Carabids inhabiting the severely and moderately disturbed stands were associated with increased soil pH and carbon and nitrogen content in the soil, while those inhabiting the least disturbed stands were associated with high values for soil respiration, decomposition rate of organic matter, and LAI index.

The study also confirmed the hypothesis that broken pine crowns lying on the soil would have a protective effect on forest carabid fauna, whose disappearance was delayed by three years.

Four phases of changes in carabid assemblages were identified:

1. slight changes in the number of species and ecological traits of the carabids, lasting for four years;
2. "rapid" changes, lasting for three years, involving an increase in the number of species and a rapid replacement of non-forest fauna with forest fauna;
3. slow recovery of the forest carabid fauna combined with a withdrawal of non-forest fauna; and
4. lessening of the differences between the ecological traits of carabid assemblages inhabiting the severely and moderately disturbed stands and those inhabiting the least disturbed stands.

The Principal Response Curve (PRC) analysis confirmed these phases. The fourth phase of changes in carabid assemblages was associated with the growth of spontaneously emerging pines and birches. In this phase, the recovery of the carabid assemblages inhabiting the severely and moderately disturbed stands was faster, which brought them closer to the assemblages inhabiting the least disturbed stands.

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