Community structure of spiders in sulphur-polluted habitats in the Karkonosze Mts (Poland)

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INTRODUCTION

A forest decline of the Western Sudetes (in the range of the Karkonosze Mountains near the Czech, Polish, and German border) in the late 1970s and early 1980s, resulting in deforestation of 39 km² and 92.7% of the remaining conifers were classified as partially damaged. Air pollution concentration in this area reached the highest level ever measured in Europe in the period 1979–1982. The most important pollutants were SO₄²⁻-sulfate ions (IV), SO₂-sulphur dioxide, NO₃⁻-nitrate ions and NH₄⁺-ammonium ions. These were anthropogenic contaminants, deriving mainly from brown coal combustion of Polish, Czech, and German coal formation and, to some extent, from local boiler houses and hearths (Jadczyk 2009). The average concentration of pollutants in the air in 1985 was as follows: for SO₂ – 11 μgS m⁻³; for SO₄²⁻ – 4 μgS m⁻³; and for NH₃ + NH₄⁺ – 5 μgN m⁻³ (Godek et al. 2009). Low acid buffering capacity of granite bedrocks and monocultural structure of coniferous forests made the situation worse. As a result of such decline of spruce forests and drop of soil pH, deep transformations occurred within the entire ecosystem. The changes had the character of cascade, they have altered the biological diversity: loss of a given species had cascading effects on the rest of the system (Jadczyk 2009). The influence of forest transformations on living communities was investigated extensively in

ABSTRACT

Spiders are considered to be sensitive to habitat pollution, but the effect of sulphur contamination on spider communities is poorly known and studied, although the impact of sulphur can be realized by the changes of soils and forest community. This work examined the diversity of ground-dwelling spiders in sulphur-contaminated habitat among three types of studied biotopes (deforested area, thicket, spruce forest) in the area of the Karkonosze Mountains (Sudetes Mountain System) in Poland. In the late 1970s and 1980s, a large-area forest decline in Sudetes Mountains, mainly derived from industrial emissions caused drastic changes in abiotic environment leading to the fundamental forest ecosystem transformation. The results of these damages were studied directly after the forest decline took place. Nowadays, more than 20 years after the ecological disaster, 13 sites were chosen according to habitat type to study the long-term impact of sulphur on spiders. The sites with high and low sulphur content in soil were not significantly different with regard to spider species diversity, although the most deforested sites were characterized by the lower values of sulphur. The only significant positive correlation found was the dependence between spiders’ diversity and plant richness. All studied habitats were characterized by different community structure, although thickets was the most diverse with predomination of Linyphiids and Lycosids.