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USE OF MOSSES AND LICHENS IN EVALUATION OF SEASONAL CHANGES IN HEAVY METALS CONCENTRATION IN FOREST AREAS

Abstract: The studies were carried out under the WICLAP project (Ecosystem stress from the combined effects of winter climate change and air pollution – how do the impacts differ between biomes?). Within the project the aim of our study was determination of accumulation level and changes in concentration over time of heavy metals in mosses and lichens growing on the territories of south Poland: Karkonosze Mountains, Beskids and north-eastern Poland: Borecka and Knyszyńska Forests. The deposition of the following heavy metals was studied: Mn, Ni, Zn, Cd, Hg and Pb. The concentrations of metals were measured with Atomic Absorption Spectrometry (*AAS*). The results in specific areas were established by calculating the comparison factor (*CF*) which is determined by referring the difference in the amount of accumulated heavy metal in lichens and mosses to the average concentration of heavy metal in those biosorbents. The value of the comparison factor (*CF*) over 0.62 testifies to the current deposition of a given analyte in the studied area.

Keywords: biomonitoring, heavy metals, moss *Pleurozium shreberi*, lichen *Hypogymnia physodes*, comparison factor (*CF*)

SAMPLING METHODS AND SAMPLE PREPARATION

The samples of *Pleurozium shreberi* mosses and *Hypogymnia physodes* lichens were collected from forest areas of southern Poland: Karkonosze Mountains and Beskids and forest areas in north-eastern Poland: Borecka and Knyszyńska Forest. The samples were colectedat the beginning (session I), in the middle (session II) and at the end (session III) of the vegetation season. In each test site lichens were collected from horizontally arranged branches of conifers (larch or spruce) at the height of 1.5 to 2 m., while the mosses were collected from the ground level at several points around the tree. From mosses for further study only the green parts was usedn while lichens were cleaned from a dust and fragments of a bark. The samples were mineralized in a microwave digestion system and then heavy metals concentration was determined using atomic absorption spectrometry.

Fig. 1. Atomic Absorption Spectrometer (iCE350) and microwave digestion system (Speedwave Four)

INTERPRETATION OF THE RESULTS

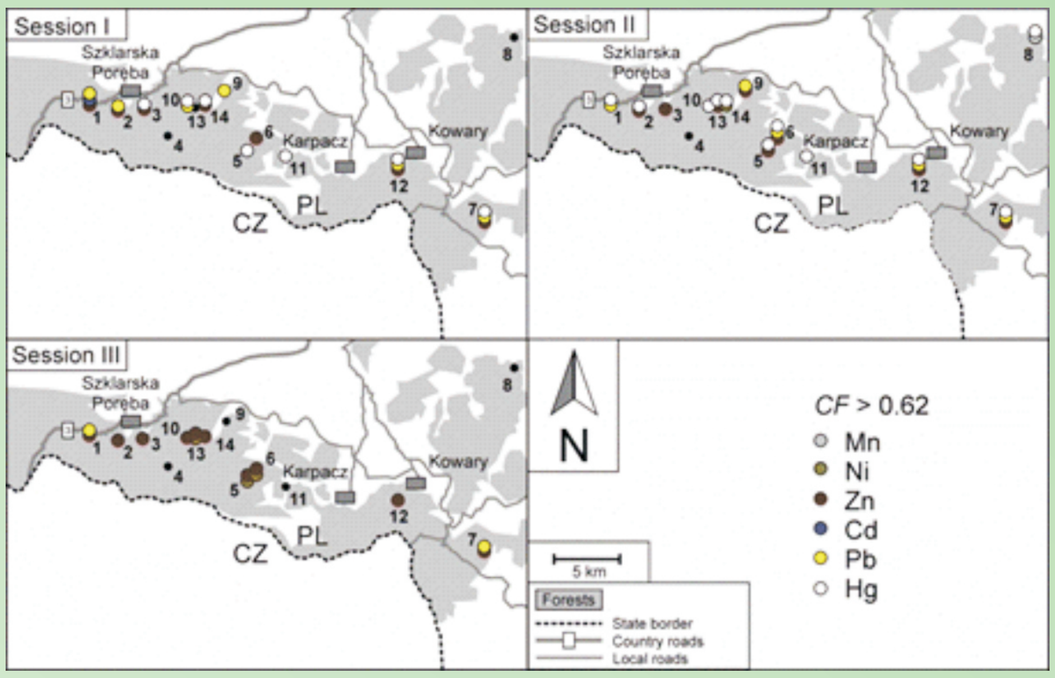

Fig. 2. Locations of current deposition on the areas of Karkosze

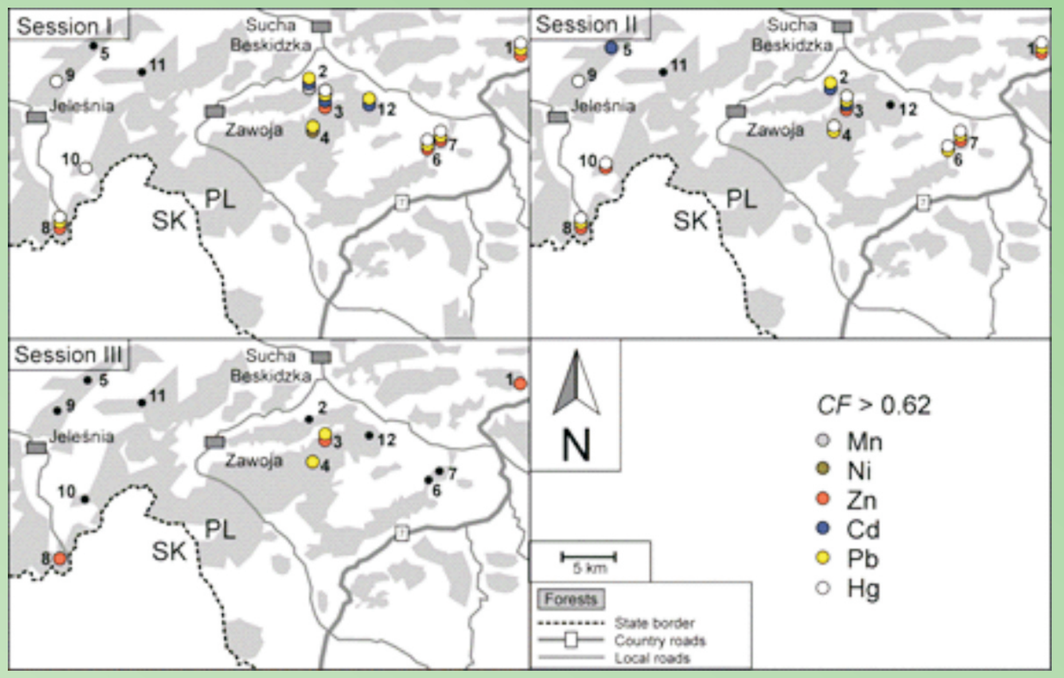

Fig. 3. Locations of current deposition on the areas of Beskids

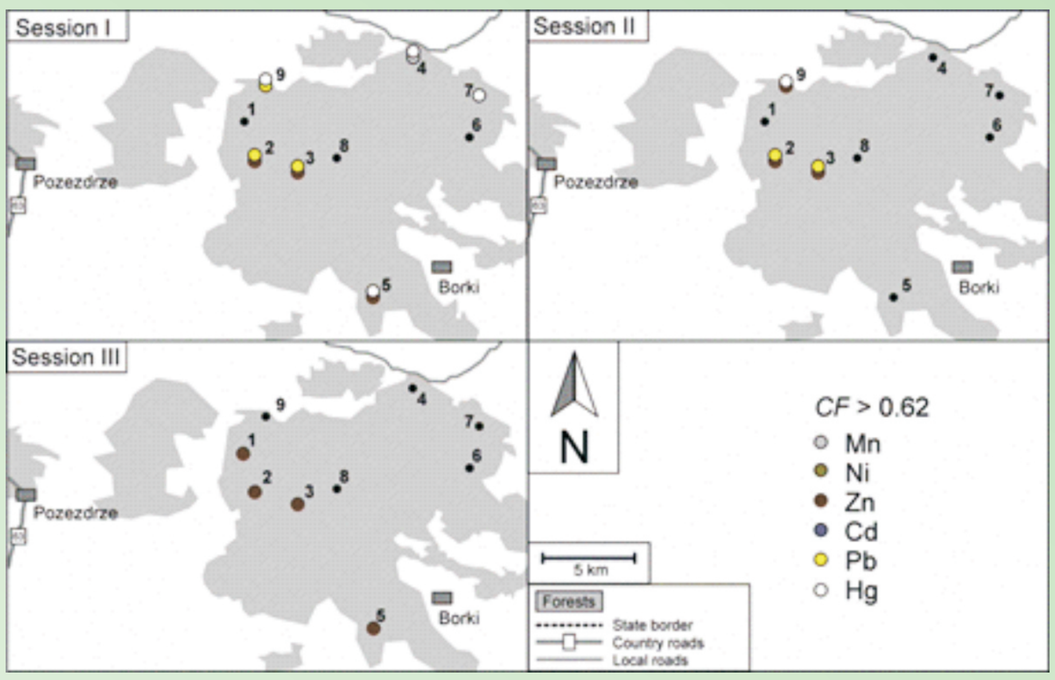

Fig. 4. Locations of current deposition on the areas of Borecka Forest

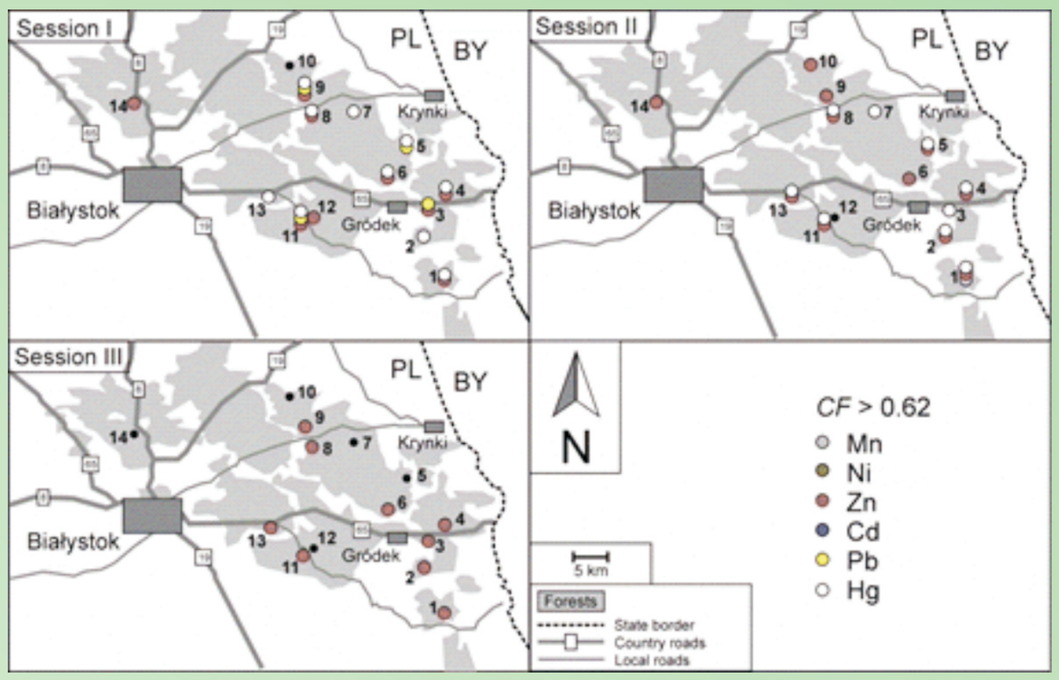

Fig. 5. Locations of current deposition on the areas of Knyszyńska Forest

In all analyzed areas the heavy metals current deposition decrease in accordance with season of the year in a series: the beginning of the vegetation season (spring)>middle of the vegetation season (summer)>end of the vegetation season (autumn). In the case of Karkonosze Mountains it can be seen that the highest level of deposition appears near Szklarska Poreba. In the case of Beskids it can be seen that the highest level of deposition appears near Sucha Beskidzka.

CONCLUSIONS

The reason for high interest of research centers in bioindicators and biomonitors of the natural environmental pollution is the simplicity and low cost of collection of test material. Decrease in deposition level of heavy metals during the season changes from spring to autumn may be casued by increased low emissions during the heating season. The calculated *CF* values testifies the greatest deposition of heavy metals in areas of Karkonosze Mountains and Beskids from all analyzed areas.