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# Influence of forest management on the changes of organic soil properties in border part of Kragle Mokradlo Peatland (Stolowe Mountains National Park, Poland)

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SUMMARY

The aim of this work was to determine the properties of organic soils modified by man, muddy and fluvial process. Peat horizons were analyzed and classified by types - and species of peat. Three profiles of shallow peat and peaty gley soils identified. Investigation showed that organic soil developed on a sandy weathered sandstone base according to oligotrophic type of sites. Organic horizons were mixed with sand and separated by sandy layers. Those soils were classified as Sapric Histosols Dystric or Sapric Gleysols Histic (WRB 2006). The throphism of organic soil in this object resulted from both natural factors and anthropo-pedogenesis.

key words: peat deposit, organic soils, soil properties, muddy process, sandy layers

## INTRODUCTION

The areas of Stolowe Mountains National Park were influenced by forestry management. Many peatlands in the Park area were drained for forestry before World War II. Several amelioration attempts were undertaken as early as in the nineteenth century. The system of forest roads were built on drained areas. The Kragle Mokradlo Peatland is located in the Skalniak plateau. The object is cut by a melioration ditch. This ditch has been recently blocked to rewet the objects. Several forest roads pass in the close neighbourhood of investigated areas. In a border part of Kragle Mokradlo Peatlands, we can observe artificial spruce habitat. Investigated object represents shallow peat soil developed on sandy basement. The early investigations showed that peaty soils were also covered by sandstone - related deposits, several dozen centimeter thick (BOGACZ 2000). Those layers was developed from sandstone weathered material transported by wind and water. The aim of presented works was to determine the stage of evolution of organic soils on the base on their morphological, physical and chemical properties.

## MATERIAL AND METHODS

Peat soils in different locations (3 profiles, 18 samples) were selected for examination. Peat samples were collected from study areas using a 6.0 cm diameter Instorfu peat auger (HORAWSKI 1987). Soil horizons were determined on the basis of colour, degree of organic matter decomposition and the quality of vegetation remains. Cores were taken to the depth where underlying mineral material was encountered. The cores ware sectioned to subsamples at intervals at major stratigrafic breaks. Some physical, chemical properties and botanical composition of peat were determined in

this material. Differentiation in botanical composition of peat was analyzed by the microscopic method and subsequently classified according to the Polish standards (Oznaczanie gatunku...1977). Peat humification degree was measured using two methods: SPEC method and half syringe method (LYNN at all. 1974). Ash content was estimated by combusting the material in a muffle furnace at 500oC for 4 hours. The texture of mineral horizons was determined using the Bouyoucos hydrometer method

(GEE AND BOUNDER 1986). The specific gravity (W) and bulk density (Z) of organic soils were calculated using the following formula’s (ZAWADZKI 1970): W=0.11A+1.451, (1.451) represents the specific gravity of humus, Z =0.004A+0.0913, A is a ash content and constant (0.0913) represents the bulk density of humus. The following chemical properties of organic soil horizons were analyzed: content of total carbon and nitrogen, acidity in H2O and 1mol dm-3 KCl and CECe in CH3COONH4 at pH 7. Base saturation (BS) of soil sorption complex was calculated. The soils were classified to reference groups in WRB Classification System (WRB 2006).

RESULTS AND DISSCUSION

Based on the cores, -the soils in the border part of Kragle Mokradlo Peatland area were classified as Sapric Histosols Dystric or Sapric Gleysols Histic (WRB 2006). Soils represented ombrogenic type of hydrological conditions. In that site, an ombrogenic type of hydrological input is the predominant mechanism of soil evolution. Soil examined in this study have developed in oligotrophic type of site. Organic soils developed on sandy weathered sandstones. The depth of organic horizons ranged from 40 to 80 cm. The object represented spruce forests habitat introduced by man. Organic horizons were separated by sandy layers. The process of sandstone weathering and forestry management changed morphological features of soils. Presently, the area is under the influence of fluvigenic type of hydrological input, too. Geobotanical analyses of peat layers indicated significant presence of preserved fragments of roots grasses, Sphagnum sp. and Bryales sp. Hemic or sapric material were usually present in organic horizons of this object. Analysis of organic horizons showed that their specific gravity was about 1.58-2.25 g cm-3, the bulk density was 0.14-0.42 g cm-3. The total porosity was in the range 82.0-91.1% and the ash content: in the range 11.74-77.96% of soil dry matter. Organic material consisting of weathered sandstone was likely to move down the profiles, increasing the concentration of sand and silt fractions in organic horizons. The similar phenomenon of residual deposits was reported by KLEMENTOWSKI (1979). The values of bulk density of peatland soils are connected with the high ash content. Ash content was different in situated layers. This is caused by the muddy and fluvial process. This situation was influenced by trophical status of this soils. The pH of sand and peat layers in a border part of Krągłe Mokradło Peatland was strongly acidic: pH H2O 2.92-3.51, pH KCl 2.38-3.07. The acidity was lower in upper horizons than in deeper ones. The ratio C/N in organic horizons ranged between 10:1 to 40:1. Low ratios of C/N in some upper horizons were probably caused by strong mineralization of organic matter. Strongly acidic soil horizons usually exhibited high cation exchange capacity (CECe). In general, the base saturated (BS) did not exceed 50%. Organic surface horizons showed higher content of potassium, calcium and magnesium than lower horizons.

CONCLUSIONS

Shallow organic soils occupy the ombrotrophic sites of a border part of Kragle Mokradlo Peatland. The variety of organic soil throphism in the object resulted from the placement on

the base sandstone, partial mixing of soil horizons as well as from muddy and fluvial processes. Peat horizons present in the studied profiles were generally classified as hemic and sapric, sometimes as fibric. Soil horizons exhibited differed thickness and ash content. Forest management strongly changed the properties of organic soil.

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