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LANDSCAPE AND HYDROCHEMICAL SPECIFICS OF CHOKLYOVO WETLAND SYSTEM IN KONIAVSKA MOUNTAIN

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The present research covers two main aspects of Choklyovo wetland system in Koniavska Mountain. The first is connected with determination of the landscape characteristics and productivity of the landscapes. There are higher values of indicator phytoproductivity in comparison of other investigated systems of wetlands. The second aspect includes the investigation of hydrochemical specifics in three parts of the wetland system. Chemical analysis of water shows a higher oxygen concentration and lower values of phosphates, phosphorous, nitrates and ammonia in the southern part of the wetland.

Keywords: landscapes, hydrochemical specifics, wetland

ЛАНДШАФТНА И ХИДРОХИМИЧНА СПЕЦИФИКА НА ЧОКЛЬОВСКА СИСТЕМА ОТ ВЛАЖНИ ЗОНИ В КОНЯВСКА ПЛАНИНА

Георги Железов

Абстракт: Представеното изследване обхваща два основни аспекта на Чокльовската система от влажни зони в Конявска планина. Първият е свързан с определяне на ландшафните характеристики и продуктивността на ландшафтите. Разкриват се по-високи стойности в сравнение с показателите за фитопродуктивността в други изследвани системи от влажни зони. Вторият аспект включва изследване на хидрохимичните особености в три части на системата от влажни зони. Химичните анализи на водите показват по-висока концентрация на кислород и по-ниски стойности на фосфати, фосфор, нитрати и амоняк в южната част на влажната зона.

Ключови думи: ландшафти, хидрохимични особености, влажна зона

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INTRODUCTION

Wetland systems are one of the most important systems in nature. The general definition for wetlands in Ramsar convention (1971) determines these regions as areas on the zone of contact and interaction between water and earth with permanent or temporal waters. Wetland natural systems characterise with different origin, geographical position and landscape specifics. They provide different type of goods and resources. Wetland systems have strong regulation role in nature (flood risk regulation, chemical and biological cycle etc). They are also part of cultural identification of many countries and nations in the world. The whole complex of ecosystem services (provisional, regulation and cultural) are presented in wetland natural system. The origin and position of the wetland system determines the dominant role of different group of ecosystem services.

Cowardin et al. (1979) gave three basic components for determination of one territory as wetland – waters, hydrophyte formations and hydromorphic soils.

Wetland natural systems characterize as one of the most sensitive systems in nature. Small changes in the parameters of natural conditions reflect to the landscape diversity, cycles and functions of the wetlands.

The research will present the landscape and chydrochemical specifics in the region and the transformations in the wetland. It observes environmental history and level of the influence in the region. There were different anthropogenic activities related with transformation of the wetland during the 20-th century.

Choklyovo wetland system is situated in Kraiste mountain region, Western Bulgaria. It is part of the macrostructures of the Koniavska mountain (Fig. 1). Konstantinov (1973–1974) investigated geomorphological and tectonic specific of Choklyovo marsh. The morphographic characteristics of the wetland in the same research are 860 m average elevation and area 1,8 km². The whole water catchments of the system are placed on 16,2 km². The wetland system includes water body, small river Blateshnitsa and the complex of underground waters in the region. The wetland system has an elongated shape. The small river Blateshnitsa, which is situated in the northern part outflows to the near village Baikalsko. Choklyovo wetland system is surrounded by hills with mixed forests, from where it is feeded by water. The shores are surrounded by a reed-belt intermixed with *Typha sp.* and *Iris pseudacorus*. The trophic type of the wetland is determined as eutrophic (Stoyneva, Michev, 2007).

The first general research of the marshes in Bulgaria from Stefan Bonchev (1929) described this wetland as waterlogged meadow, which was 3 km long and 1 km wide and was covered by water mainly in spring, while in summer periods it was almost completely dry.

In Hydrological studies of Anastas Ishirkov (1908–1909) it was also mentioned that this wetland looked like a waterlogged meadow. The wetlands area was larger – 450 ha until 30s of 20-th century. It was classified as a mountain morass which is not typical swamp.

Kochev & Jordanov (1981) noted it as the former swamp.

This wetland functioned as a peatery and was completely dried-out in the period 1950–1981. The drainage was of gravitation type: several draining canals were digged-out and they outflow the waters in the direction of the natural outflow of the fen (towards the village).

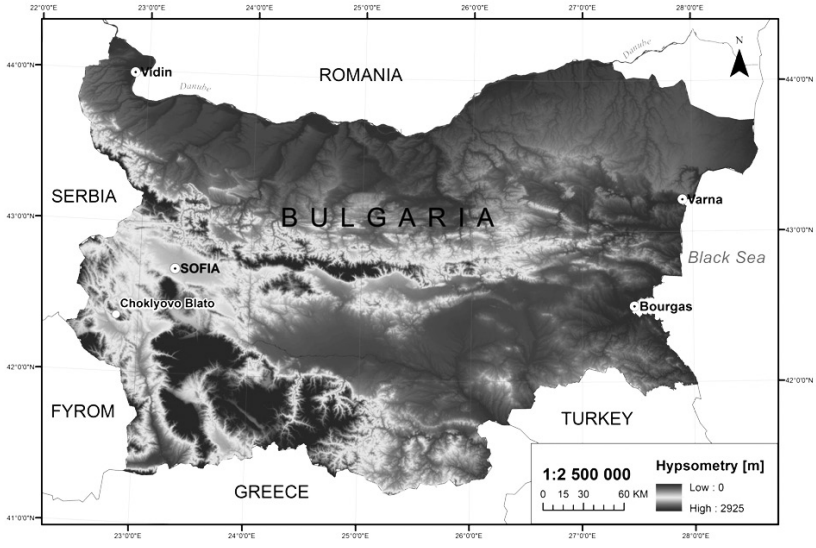

Fig. 1. Geographic position of Choklyovo wetland system

In 1959 the project for building of the reservoir Izvor have been built, which collects the waters from the wetland. Before 1966 an outflowing canal was built with a small spillway-dam. When the water level increses it runs into the canal and when it increases enough it overflows the dam and goes into a tube-spillway. From there the water feeds the near by located small reservoir Izvor and river Orolachka.

The drainage system was removed and the peat bog began to flood again in 1981. The canals which collect the snow waters from the hills were built together with a dyke to restore and support the water level of the wetland. The outflowing canal exists and still the area is relatively smaller in comparison with that reported by previous authors (180 ha) but larger than this reported in 1966 (40 ha). The recent phytoplankton (90s of 20th century) is peculiar due to the newly formed character of the bog and its alkaline water (pH 7,028-7,643).

LANDSCAPE SPECIFICS

The field works have been concentrated in the area of three sample points (Fig. 2). The research is orientated in two general directions. First of them is analysis of the plant productivity as part of the characteristics of the landscape potential. The second is orientated to analysis of water quality. The main part of the region is presented by hydromorphic and subhydromorphic landscapes based on the classification of the landscapes in Bulgaria (Velchev et al., 1992). There is clear stratification of hydromorphic and subhydromorphic landscapes around the water body:

– hydrophite (reed) formations with domination of *Phragmites sp.* and *Thypa sp.* (approximately 50 % of the wetland area);

– hydrophite grass formation with domination of *Carex sp*.;

– narrow tree belt (20 m) with domination of *Populus sp.* and *Salix alba*.

The surrounding area of the wetland system includes artificial landscapes – agricultural lands, thin forest belt along the hill and urban area.

The first point characterizes the region of the wetland system shore in north part close to the village (plant productivity and water quality). It is represented by grass formations with productivity 1,71 t/ha.

The second point investigates the landscapes with grass formation in the south part of the wetland and the water quality. The quantities parameters for productivity of the grass formations are 1.82 t/ha.

The third point includes only analysis of the water quality in artificial channel in the south-eastern part.

Fig. 2. Region of Choklyovo wetland system with sample points

The first two points are comparable as regards landscape specifics and plant productivity, but the position of the first point to the village determines some specific parameters regarding the quality of the water.

CHEMICAL SPECIFICS

The investigation of the chemical specifics of the wetland is based on field sampling and laboratory analysis with Photometer HANNA HI 83200. It includes analysis of water samples close to the shore of several basic chemical components – ammonia, nitrate, nitrite, sulfate, phosphate, free chlorine, fluoride, calcium and ozone. The measured concentration is compared to indexes in Ordinance № H-4/14.09.2012 for the characteristics of the surface waters.

The highest concentration of ammonia (Fig. 3) is measured in the first research point. The main reason for this high concentration is neighboring area of different

human activities as agriculture, animal breeding and holiday village area. The other reason is vertical migration along the high slope inclination in the north part of the wetland system. The concentration is 4-time higher than level "Moderate" based on Ordinance № H-4 (0.4 mg/l).

The nitrate have been measured only in point three (channel area) and concentrations are close to the level "Moderate" based on parameters for nitrate in Ordinance № H-4 – 2-4 mg/l (Fig. 4).

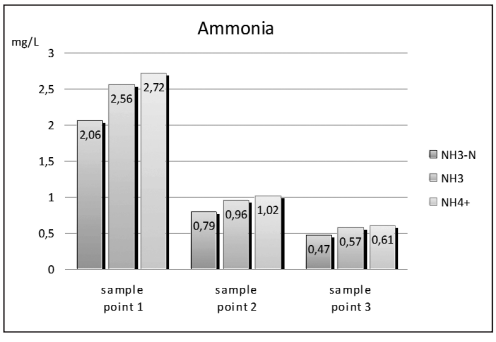

Fig. 3. Concentration of ammonia

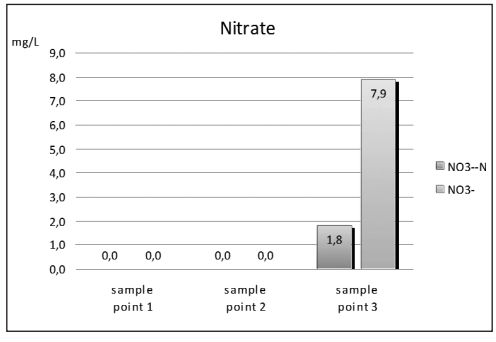

Fig. 4. Concentration of nitrate

The concentration of nitrite is also highest in point one (Fig. 5). This fact is related to position of this investigation point close to the agricultural lands and the use of fertilizes. The levels are several times higher than index for level "Moderate" based on Ordinance № H-4 (0.06-0.09 mg/l).

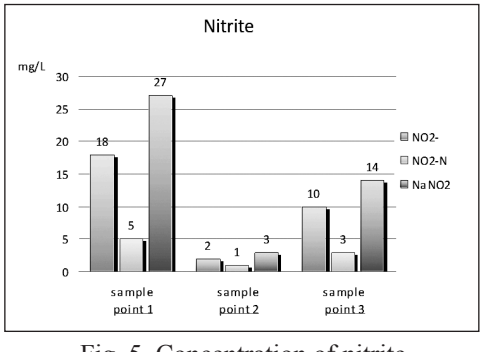

Fig. 5. Concentration of nitrite

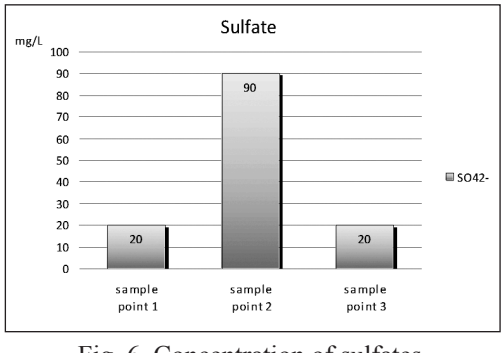

Fig. 6. Concentration of sulfates

The highest concentration of sulfates is determined in point two (Fig. 6).

The highest concentration of phosphates and free phosphor are also in point one (Fig. 7). They can be connected with the situation close to agricultural area. Measured parameters are higher than level "Moderate" for phosphates and "Moderate" for free phosphor based on Ordinance № H-4 (0.06-0.08 mg/l for phosphates and 0.075-0.1 for free phosphor).

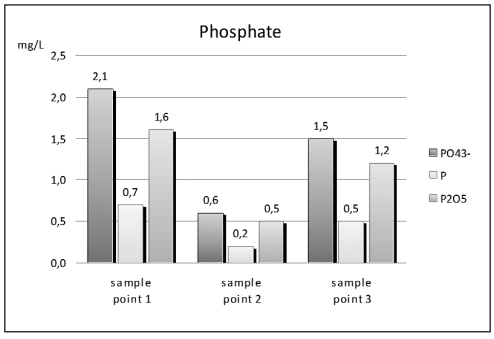

Fig. 7. Concentration of phosphates

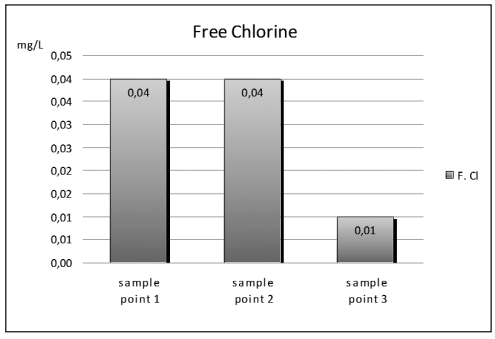

Fig. 8. Concentration of free chlorine

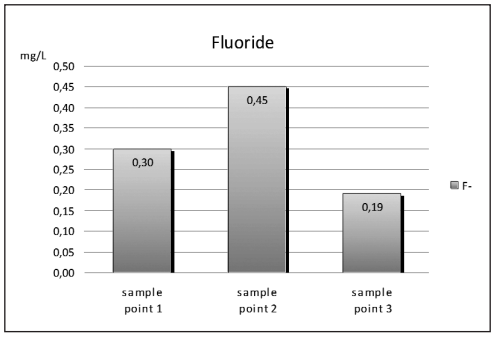

Fig. 9. Concentration of fluoride

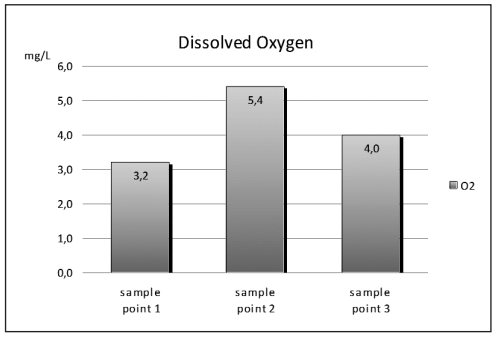

Fig. 10. Concentration of dissolved oxygen

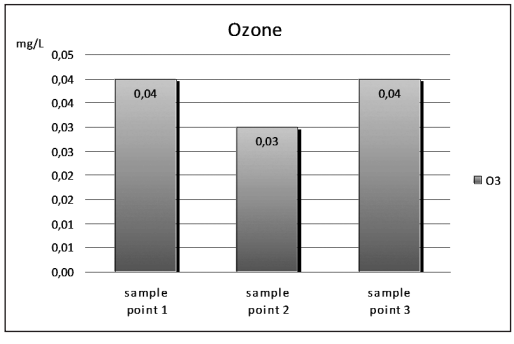

Fig. 11. Concentration of ozone

Measured quantities for free chlorine, fluoride are not high (Fig. 8 and Fig. 9). There are higher concentrations in research points one and two compared with point three – artificial channel. The parameters for ozone are similar (Fig. 11) in the three research points.

The result for dissolved oxygen is one of the basic parameters related to quality of water (Fig. 10). The highest concentration is measured in point two where the concentrations of phosphates, free phosphor, nitrates and ammonia are lower than the other research points. The measured parameters correlate to level “Moderate” based on Ordinance № H-4 (6.0–5.0 mg/l).

CONCLUSIONS

The landscape diversity is presented and dominated by hydromorphic and subhydromorphic landscapes. There is differentiation of plant hydrophytes formations from the water body to the terrestrial part. The plant productivity is comparable to the productivity in wetland regions. The parameters are higher with 0.15–0.25 t/ha if we compare with hydromorphic and subhydromorphic landscapes dominated by grass formation around Srebarna wetland system.

Chemical analysis of water quality shows higher concentration of dissolved oxygen and lower parameters of phosphates, free phosphor, nitrates and ammonia in the south part of the wetland system. This area can determine as the clearer part of the wetland system.

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