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CONSERVATION OF WATER AND SWAMP VEGETATION IN THE BIAŁA RIVER VALLEY (SILESIAN FOOTHILLS, OŚWIĘCIM BASIN)

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Summary. In the years 2007–2008 a phytosociological survey of water and swamp vegetation was carried out in the valley of river Biała, as a result of which 32 groups and 6 communities of vegetation were reported. The presence of protected and rare in the scale of the region plant species and nature habitats with European importance bear witness to the huge botanical value of this area. At present, in the area under exploration there exists only one form of protected area, which is a protected landscape area. For the conservation of the water and swamp vegetation and of the beauty of Biała river valley landscape it is proposed to create additional 2 protected nature--landscape areas and 3 ecological areas.

Key words: water and swamp vegetation, nature habitats, the Silesian Foothills, the Oświęcim Basin, nature conservation

INTRODUCTION

The valley of river Biała, starting from Bielsko-Biała Komorowice till Czechowice-Dziedzice is a part of the so-called „Land of Ponds" (about 5000 ha) which is one of the biggest groups of ponds in Poland [Wróbel 1997]. Komorowickie Ponds, initially a part of a private property, for ages were an important element of the north part of the landscape of Bielsko-Biała. After World War II the ponds were nationalised – they became property of the State Treasury Agency for Agricultural Property. In 1999 the complex of Komorowickie Ponds was given to the Roman Catholic Parish in Komorowice as compensation for other lands. The Parish then sold them to the Joint Stock Company AQUA in Bielsko-Biała [Operat... 2004] dealing with water supply and purification of sewage. The main goal of taking over the ponds was willingness to use the out-

flow water from the AQUA biological wastewater treatment facility in Komorowice for fish production, and beside that to eliminate nitrogen and phosphorus compounds [Wróbel 1997].

The history of fish farming in the valley of river Biała dates back to the end of the 15th century. In the beginning the ponds located in this area belonged to nobility, which had a lot of benefits from them, later they passed the ownership of the ponds to the peasants. Peasant pond farms existed already in the 16th century. This area was the place of origin of specific strain of carp, so-called „Polish carp" which was bred in the Upper Silesia since 1882 and from there it spread to other countries. In spite of the transformation of many ponds existing before to crop fields, to these days there remained a big complex of them, determining the specific character of landscape and being a mainstay of water and marsh vegetation [Grygierczyk 1982].

LOCATION AND CHARACTERISTIC OF STUDY AREA

The area under study is situated in the south of Poland, in Silesia, and it lies entirely within the district of Bielsko. The southern part is situated within the borders of the city of Bielsko-Biała, in city district Komorowice, while the northern part is situated in communes Bestwina (villages Bestwina and Kaniów) and Czechowice-Dziedzice. The valley of river Biała river comes by border of two geographic mezoregions: the Silesian Foothills (south part) and Upper Vistula River Valley in the Oświęcim Basin (north part) [Kondracki 2002].

The Biała river is one of the Carpathian, right-bank tributaries of the Vistula river which it joins in Czechowice-Dziedzice. Its source area is located on the slopes of Mount Klimczok in Beskid Śląski. It is an important ecological corridor connecting the Beskid Śląski range with the Vistula river valley – the main ecological corridor of Poland. The valley of the lower part of river Biała, almost on the entire width, is occupied by artificially walled fish ponds. Apart from the numerous ponds, in the area under study there are also water-filled pits formed after the exploitation of gravel and clay, and also small marshy areas and wetlands. The vegetation of the Biała river valley is threatened due to the influence of many negative phenomena associated with human activity. The biggest influence of anthropopressure on the area can be observed within the grounds of the Coal Mine „Silesia" in Czechowice-Dziedzice where, in consequence of strengthening the banks of ponds by with rocks, it is easy to observe an invasion of *Reynoutria japonica*. A negative influence was also observed on the part of the sewage treatment plant of AQUA SA „Komorowice" which uses some of the ponds for wastewater purification of excess biogenic elements. The creation of the Katowice Special Economic Zone in the neighbourhood of the sewage treatment plant and allocation of a part of the area for industrial development also contributed to a change in the water relations and to a reduction of area occupied by wetland vegetation.

METHODS

In 2007–2009, in the area of the valley of river Biała, phytosociological studies were performed with the goal to examine the diversity and distribution of water and swamp plant communities of the fish ponds and their closest environment, the current conservation status of vegetation in the area, and to identify areas deserving legal protection. The phytosociological studies were conducted with the Braun-Blanquet method [1964], making phytosociological releves on areas whose size was selected following the guidelines of Fukarek [1967], including also the size and homogeneity of patches.

RESULTS

Based on 200 phytosociological releves taken within the explored area, 32 assemblages and 6 communities of plants were identified. The systematic composition of the plant communities identified is as listed below:

LEMNETEA MINORIS R.TX. 1955
Lemnetalia minoris R.TX. 1955
Lemnion gibbae R.TX. et A. SCHWABE 1974 in R.TX 1974
1. *Spirodeletum polyrhizae* (KELHOFER 1915) W. KOCH 1954 em. R.TX. et A. SCHWABE 1974 in R.TX. 1974
Riccio fluitantis-Lemnion trisulcae R.TX. et A. SCHWABE 1974 in R.TX. 1974
2. *Ricciocarpetum natantis* SEGAL 1963 em. R.TX. 1974
Lemno minoris-Salvinion natantis SLAVNIĆ 1956 em. R.TX. et A. SCHWABE 1981
3. *Lemno minoris-Salvinietum natantis* (SLAVNIĆ 1956) KORNECK 1959
BIDENTETEA TRIPARTITI R.TX., LOHM. et PRSG 1950
Bidentetalia tripartiti BR.-BL. et R.TX. 1943
Bidention tripartiti NORDH. 1940
4. *Polygono-Bidentetum* (KOCH 1926) LOHM. 1950
5. *Leersio-Bidentetum* (KOCH 1926) POLI et J.TX. 1960
STELLARIETEA MEDIAE R.TX., LOHM. et PRSG, 1950
Polygono-Chenopodietalia (R.TX. et LOHM. 1950) J.TX. 1961
Panico-Setarion SISS. 1946
6. *Echinochloo-Setarietum* KRUSEM. et VILEG. (1939) 1940
POTAMETEA R.TX. et PRSG
Potametalia KOCH.1926
Potamnion KOCH 1926 em. OBERD. 1957
7. *Potametum pectnati* CARSTENSEN 1955
8. Community *Najas minor-Najas marina*
9. *Potametum acutifolii* SEGAL 1961
10. *Ranunculetum circinati* (BENNEMA et WEST. 1943) SEGAL 1965

11. *Elodeetum canadensis* (PIGN. 1953) PASS. 1964
12. *Ceratophylletum demersi* HILD. 1956
13. *Myriphylletum spicati* SOE 1927
14. *Potametum lucentis* HUECK 1931
Nymphaeion OBERD. 1953
15. *Potametum natantis* SOÓ 1923
16. *Trapetum natantis* MÜLL. et GÖRS 1969
17. *Polygonetum natantis* SOÓ 1927
18. Community *Potamogeton crispus*
19. Community *Utricularia vulgaris*
20. Community *Batrachium aquatile*
LITORELLETEA UNIFLORAE BR.-BL. et R.TX. 1943
Litorelletalia uniflorae KOCH 1926
Eleocharition acicularis PIETSCH 1966 em. DIERSS. 1975
21. *Eleocharitetum acicularis* (BAUMANN 1911) KOCH 1926
PHRAGMITETEA R.TX. et PRSG 1942
Phragmitetalia KOCH 1926
Phragmition KOCH 1926
22. *Typhetum angustifoliae* (ALLORGE 1922) SOÓ 1927
23. *Sagittario-Sparganietum emersi* R.TX. 1953
24. *Sparganietum erecti* ROLL 1938
25. *Phragmitetum australis* (GAMS 1927) SCHMALE 1939
26. *Typhetum latifoliae* SOÓ 1927
27. *Acoretum calami* KOBENDZA 1948
28. *Glycerietum maximae* HUECK 1931
Magnocaricion KOCH 1926
29. *Iridetum pseudoacori* EGGLER 1933
30. *Caricetum acutiformis* SAUER 1937
31. *Caricetum gracilis* (GRAEBN. et HUECK 1931) R.TX. 1937
32. *Phalaridetum arundinaceae* (KOCH 1926 n. n.) LIB. 1931
Sparganio-Glycerion fluitants BR.-BL. et SISS. in BOER 1942
33. *Leersietum oryzoidis* (KRAUSE in R.TX. 1955) PASS. 1957
MOLINIO-ARRHENATHERETEA R.TX. 1937
Molinietalia caeruleae W.KOCH 1926
Calthion palustris R.TX. 1936 em. OBERD. 1957
34. *Scirpetum sylvatici* RALSKI 1931
35. *Epilobio-Juncetum effusi* OBERD. 1957
ALNETEA GLUTINOSAE BR.-BL. et R.TX. 1943
Alnetalia glutinosae R.TX. 1937
Alnion glutinosae (MALC. 1929) MEIJER DREES 1936
36. *Salicetum pentandro-cinereae* (ALMQ. 1929) PASS.1961
COMMUNITIES OF NEOPHYTES SPECIES
37. Community *Reynoutria japonica*
38. Community *Impatiens glandulifera*

Protected plant species

Based on the Regulation of the Minister of Environment of 9th July, 2004, in the case of protected species of wild plants (Dz. U. No 168, item 1764) in the explored area there were identified 6 plant species under legal protection, 5 of which are under strict protection:

– ***Najas minor*** – observed in patches: *Typhetum latifoliae*, *Glycerietum maximae*, *Ceratophylletum demersi*, *Elodeetum canadensis*, *Myriophylletum spicati*, also builds phytocenoses in which it dominates, classified as assemblage *Najas minor-Najas marina*, this species can be found throughout the research area;

– ***Ranunculus aquatilis*** – found in patches *Potametum natantis* (on the Bestwińskie Ponds), where he also creates phytocenoses in which it is dominant;

– ***Salvinia natans*** – in the study area it creates numerous patches; *Lemno minoris-Salvinion natantis*, occurring in the Bestwińskie Ponds area;

– ***Trapa natans*** – creates numerous phytocenoses in the study area: *Trapetum natantis*, this species can be also found in patches of communities such as *Lemno minoris-Salvinion natantis*, *Ceratophylletum demersi*; *Trapa natans* occurs only in the area of Bestwińskie Ponds;

– ***Utricularia vulgaris*** – numerous presence of this species was reported in one pond in Kaniowo, where he creates its own community; in the area of Bestwińskie Ponds it was accompanied by *Najas marina* in panel communities of *Najas minor-Najas marina*.

In the area of the ponds in the valley of river Biała one species under partial protection was identified, i.e. ***Nuphar lutea*** – appearing individually in phytocenoses of *Elodeetum canadensis* and *Typhetum angustifoliae*.

Natural habitats with European importance

In the valley of river Biała there have also been noted areas with habitats with European importance, included in the Regulation of the Minister of Environment of 16th May, 2005, concerning natural habitat types and species of plants and animals requiring protection in the form of the designation of Natura 2000 areas (Dz. U. No 94, item 795). They include:

• **3130** – Edges or dried bottom of water reservoirs with communities of *Litorelletea*, *Isoëto-Nanojuncetea*.

Subtype 3130-1 – Vegetation of mesotrophic water belonging to the communities *Lobelion*, *Hydrocotylo-Baldenion* and *Eleocharition acicularis*.

This habitat in the research area is identified by a group of phytocenoses *Eleocharitetum acicularis*. Patches of those phytocenoses occur around water reservoirs created as a result of the activity of the Gravel Mine „Kaniów". The high value of those communities and of the species included in their composition results from fact of their existence in Poland on the eastern boundary of the range. These communities are rare, they are at a high risk of extinction, and also very poorly tested [Popiela 2004].

• **3150** – Eutrophic oxbow lakes and natural eutrophic water reservoirs with communities of *Nympeion*, *Potamion*.

Subtype 3150-2 oxbow lakes and small reservoirs.

Phytosociological indicators of the type of habitat covered by the study area are:

– for the community *Potamion*: *Potametum pectinati*, *Potametum acutifolii*, *Ranunculetum circinati*, *Elodeetum canadensis*, *Ceratophylletum demersi*, *Myriophylletum spicati*, *Potametum lucentis*;

– for the community *Nymphaeion*: *Potametum natantis*, *Trapetum natantis*, *Polygonetum natantis*;

– for the community *Lemnion gibbae*: *Spirodeletum polyrhizae*;

– for the community *Riccio fluitantis-Lemnion trisulcae*: *Ricciocarpetum natantis*;

– for the community *Lemno minoris–Salvinion natantis*: *Lemno minoris–Salvinietum natantis*.

These habitats occur in Poland quite often, and many of them include stands of rare plants on the scale of the country [Klimaszyk 2004].

Currently existing and proposed forms of nature protection

The research area includes one form of nature conservation, which is one protected landscape area:

Protected landscape area „Podkępie"

It was established by the Resolution of the Commune Council in Bestwina of 29th June, 1995, concerning the designation of protected landscapes areas and covers a specific complex of land extending from the border of Bielsko-Biała to Kaniowo, between river Biała and the stream Młynówka. The main goal of protection is to preserve the river and the surrounding vegetation and the big complex of fish ponds as a „relic" of centuries-old fisheries in the area of the Upper Vistula River Valley. At the same time, the entire complex is an ecological corridor which links the commune of Bestwina with the valley of Vistula river [Herczek *et al*. 1998]. Bestwińskie Ponds are characteristic for the biggest floristic diversity of all the research area. The occurrence of most of the protected species identified in the valley of river Biała was also noted here.

Valuable natural areas of the studied area are proposed to be protected in the form of nature-landscape and ecological areas.

Proposed protected nature-landscape area „The valley of river Biała"

This area is located in the southern part of the study area and includes the low scarp of the valley of river Biała. The river here comes by the natural streambed surrounded with small patches of alluvial forests and wet meadows. The proposed protected area should also include the Komorowickie Ponds, a refuge of water-wetland birds [Rostański *et al*. 1996], but now it seems almost impossible because of the creation of the Katowice Special Economic Zone and use of a part of land for

industrial development. Construction works have led to changes in hydrological relations, and dried adjacent areas which are proposed for protection.

Proposed ecological area „Komorowickie Ponds"

This proposed protected area includes the biggest complex of ponds in Bielsko-Biała, directly adjacent to the ponds in Bestwina. Studies did not confirm the presence of phytocenoses from the class *Lemnetea* with the participation of protected species of water fern *Salvinia natans* previously reported from this area [Wilczek *et al*. 2003], which is probably due to very intensive use of these ponds for breeding fish and for the purification of water from excess biogenic elements by the Sewage Treatment Plant AQUA SA.

Proposed ecological area „Pond in Kaniów"

Protection is proposed to include a small pond located in Kaniów which saw a massive occurrence *Utricularia vulgaris*, a plant classified among strictly protected species. The pond, due to the proximity of the coal mine Silesia, is subject to strong human impact.

Proposed ecological area „Ponds of Marianki"

Floristic research in Ponds Marianki in Czechowice-Dziedzice revealed numerous occurrence of the strictly protected species *Najas minor*. The area is surrounded by woods, the edges of the ponds are overgrown with *Typhetum latifoliae* and *Phragmitetum australis*.

Proposed protected nature-landscape area „Gravel Pits Kaniów"

On areas of former gravel pits, now filled with water, the presence of phytocenoses with *Eleocharitetum acicularis* has been noted, phytosociological indicators of natural habitats with European importance (code 3130). This area is also characterised by significant landscape values. For these reasons, it seems that there is a legitimate demand for protection of the area as a nature-landscape area.

CONCLUSIONS

Ponds located in the river Biała valley are refuges of valuable wildlife, and many of the phytocenoses described here are semi-natural. There are numerous rare and protected plant species. The diversity of aquatic and wetland communities in the described area is very large. The greatest diversity of plant communities was found in Bestwińskie Ponds which are already covered by legal protection as the protected landscape area „Podkępie". The high value of nature and landscape of this area points to the need of further protection of its individual parts. It is proposed here to create two protected nature-landscape areas, and 3 ecological areas. The nature and landscape conservation areas are designed primarily to protect the beauty of the landscape, while ecological areas should protect places of special natural value. Water and marsh vegetation in the river Biała

valley, which is the identifier of natural habitats of European importance, is distinguished not only in our country but also across Europe.

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OCHRONA ROŚLINNOŚCI WODNEJ I BAGIENNEJ W DOLINIE RZEKI BIAŁEJ (POGÓRZE ŚLĄSKIE, KOTLINA OŚWIĘCIMSKA)

Streszczenie. W latach 2007–2008 przeprowadzono na terenie doliny rzeki Białej badania fitosocjologiczne roślinności wodnej i bagiennej, w wyniku których odnotowano 32 zespoły oraz 6 zbiorowisk roślinnych. Obecność chronionych i rzadkich w skali regionu gatunków roślin oraz siedlisk przyrodniczych o znaczeniu europejskim świadczy o dużej wartości botanicznej tego terenu. Obecnie na badanym obszarze istnieje tylko jedna obszarowa forma ochrony przyrody, którą jest obszar chronionego krajobrazu. W celu ochrony roślinności wodnej i bagiennej oraz piękna krajobrazu doliny rzeki Białej proponuje się utworzyć dodatkowo 2 zespoły przyrodniczo-krajobrazowe oraz 3 użytki ekologiczne.

Słowa kluczowe: roślinność wodna i bagienna, siedliska przyrodnicze, Pogórze Śląskie, Kotlina Oświęcimska, ochrona przyrody