

CHARACTERISTICS OF LAKE ROGÓŻNO MACROPHYTES AND THEIR ROLE IN PRESERVATION OF BIODIVERSITY

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Summary. The aim of this work was to present the phytocoenotic and floristic diversity of aquatic vegetation of the lake Rogóžno. The study was carried out during the vegetative season of the year 2006. Aquatic and rush vegetation consists of 15 syntaxons, 4 of which represent the *Charetea* class, 2 – the *Potametea* class, and 9 – the *Phragmitetea*. Phytolittoral, with its clearly marked division into zones, is formed primarily by three associations. The rushes zone is built, first of all, by *Phragmitetum australis*, then *Myriophylletum spicati* appears, and the deepest parts are occupied by *Lychnothamnium barbatum*. Therefore, the site of *Lychnothamnium barbatus* in the lake Rogóžno is a unique phenomenon on the international scale. Most probably it is the greatest area of phytocoenosis of *Lychnothamnium barbatum* in the world.

Key words: macrophytes, Lake Rogóžno, charophytes, *Lychnothamnium barbatus*

INTRODUCTION

Lakes perform various functions and are used in a variety of ways; first and foremost, however, they are a natural environment for plants and animals representing different systematic groups. Phytocoenotic diversity of the littoral is an important indicator of lakes ecological status. Because of the increasing anthropopressure of various forms (e.g. eutrophication, recreation, fishing or hydrotechnical activities), both the floristic and phytocoenotic diversity of those reservoirs tends to diminish [Blindow 1992, Krause 1997, Balevičius 2001, Ciecierska 2004], up to complete disappearance of macrophytes [Fijałkowski 1988, Sugier 2001, Sugier and Czarnecka 2004, Kłosowski *et al.* 2006]. One of the preventive measures taken against these processes are re-naturalising activities which aim at the preservation or reintroduction of biodiversity [Chmielewski *et al.* 2005, Moss 2007].

The aim of this work was to present the phytocoenotic and floristic diversity of aquatic vegetation of the lake Rogóžno. Particular attention has been paid to the only representative of the genus *Lychnothamnium* – *Lychnothamnium barbatum* (Meyen) leonhardtii. It is now a rare charophyte species considered in decline world-wide [Krause 1997, Casanova *et al.* 2003, Blaženčić *et al.* 2006, Chou *et al.* 2007].

MATERIAL AND METHODS

Lake Rogóžno (Łęczna-Włodawa Lakeland) has a mesotrophic status, with an area of 57.1 ha, maximum depth of 25.4 m and mean depth of 7.4 m, and is of the thermokarst origin [Harasimiuk *et al.* 1997]. The water of the lake can be characterised by low concentration of nitrogen and phosphorus, both in spring and summer, and by low concentration of organic substances in the range of 1st and 2nd class of water quality [The report ... 2008]. Nowadays it is used for recreational and fishing purposes. The study of its aquatic and rush vegetation was carried out during the vegetative season of the year 2006. Spatial structure of the phytolittoral was analysed with the help of the transect method. Transects cutting across zone vegetation were traced in 25 representative points of the phytolittoral. Phytosociological reléves were made, according to the Braun-Blanquet method [Braun-Blanquet 1964], using the 11-degree scale of vegetation abundance, and the depth was measured. In order to identify the main environmental gradients, gathered floristic data were analysed using the Detrended Correspondence Analysis – DCA [Hill and Gauch 1980]. The study made use of the GPS.

RESULTS AND DISCUSSION

Lake Rogóžno is one of the few charophyta lakes in the Łęczna-Włodawa Lakeland. Its aquatic and rush vegetation consists of 15 syntaxons; 4 represent the *Charetea* class, 2 – the *Potametea* class, and 9 – the *Phragmitetea* (Tab. 1). Figure 1 presents the distribution of sites and species along environmental gradients. Associations quite frequently present in most of the reservoirs of the Lakeland [Sugier 2001, Sugier and Lorens 2004] are *Nupharo-Nymphaeetum albae*, *Phragmitetum australis* and *Typhetum angustifoliae*. The species with the highest frequency in the Lake Rogóžno include *Lychnothamnus barbatus*, *Nitellopsis obtusa*, *Myriophyllum spicatum*, and *Potamogeton lucens*, and in the rushes zone – *Phragmites australis*. Yet, while the first two charophytes were frequently noticed in the analysed reservoir, the remaining ones (*Chara aculeolata*, *Ch. delicatula*, *Ch. contraria*) were registered only sporadically. Charophytes are a very important component of submerged aquatic vegetation in natural and artificial reservoirs [Coops 2002]. Among submerged macro-phytes, they have a particularly strong effect on water transparency and are regarded as indicators of healthy, clear-water ecosystems [Kufel and Kufel 2002, van Donk and van de Bund 2002]. In the case of Lake Rogóžno, charophyta

Table 1. Percent share of studied phytocoenoses in the phytolittoral and their area of Lake Rogóžno

Associations	%	Area (ha)
<i>Charetum aculeolatae</i>	0.20	0.04
<i>Nitellopsidetum obtusae</i>	1.11	0.27
<i>Charetum delicatulae</i>	0.2	0.04
<i>Lychnothamnetum barbati</i>	58.56	14.27
<i>Myriophylletum spicati</i>	21.61	5.27
<i>Nupharo – Nymphaeetum albae</i>	0.89	0.22
<i>Scirpetum lacustris</i>	0.1	0.02
<i>Typhetum angustifoliae</i>	0.1	0.02
<i>Sparganietum erecti</i>	0.1	0.02
<i>Eleocharitetum palustris</i>	0.1	0.02
<i>Phragmitetum australis</i>	16.55	4.32
<i>Typhetum latifoliae</i>	0.1	0.02
<i>Thelypteridi – Phragmitetum</i>	0.1	0.02
<i>Caricetum rostratae</i>	0.28	0.08
<i>Caricetum acutiformis</i>	0.1	0.02

meadows positively affect the whole ecosystem. The presence of stoneworts is essential for the functioning of the aquatic ecosystem and for biodiversity, taking into account the dying out of charophytes caused primarily by eutrophication [Kłosowski *et al.* 2006]. In many of the presently explored lakes of the Polesie region no representatives of this ecological group, noted for many years, have been recently found [Fijałkowski 1960, Karczmarz 1965, 1967, 1975, 1980, Karczmarz and Malicki 1971].

Lake Rogóžno has an almost identical number of aquatic vegetation syntaxons as the lakes Rotcze and Łukie [Sugier and Lorens 2002, 2004]. In comparison to the Masurian lakes [Ciecierska 2004], however, the number of the syntaxons distinguished in the phytolittoral represents an average level. Phytolittoral, with its clearly marked division into zones, is formed primarily by three associations. The rushes zone is built, first of all, by *Phragmitetum australis*, then *Myriophylletum spicati* appears, and the deepest parts (max. depth 3.6 m) are occupied by *Lychnothamnetum barbati*. Several associations have a very small area in the phytolittoral (Tab. 1).

Interesting is the presence of a large number of stoneworts, infrequently met in recent years in the charophyta lakes of the Łęczna-Włodawa Lakeland. *Nitella flexilis*, however, has not been found. This species, recorded a few years ago, used to form the association *Nitelletum flexilis* which was noted even quite recently [Ciecierska 2001] and now is considered rare in the regions of Wielkopolska and Ziemia Lubuska [Pelechaty *et al.* 2007].

Worth noting in the presence of *Lychnothamnus barbatus*, a rare species in the world, which has its refuge in the lake Rogóžno. The general occurrence of this species in the littoral **indicate** relatively high alkalinity and good water quality. The community of *Lychnothamnetum barbati*, built by this species, is extremely rare world-wide, and considered to be in danger of extinction. It was recorded several times only, in Romania, Croatia and Lithuania [Ionescu-Teculescu 1972, Randjelović *et al.* 1993, Balevičius 2001, Blaženčić *et al.* 2006], and, recently, in Poland [Pelechaty and Pukacz 2005, Gąbka and Owsianny 2007, Kolada 2007]. Therefore, the site of *Lychnothamnus barbatus* in the lake Rogóžno is a unique phenomenon on the international scale. Most probably it is the greatest area of the phytocoenosis of *Lychnothamnetum barbati* in the world. The site is relatively stable: *Lychnothamnus barbatus* occurs massively and has been noted for many years [Karczmarz 1965, 1967, 1980, Karczmarz and Malicki 1971, Ciecierska 2001].

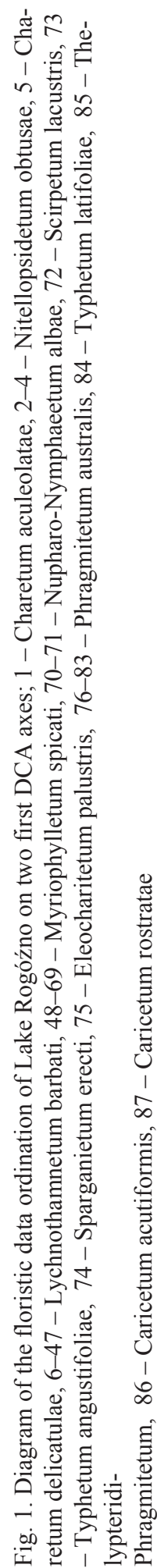


Fig. 1. Diagram of the floristic data ordination of Lake Rogóžno on two first DCA axes; 1 – *Charetrum aculeolatae*, 2–4 – *Nitellopsidetum obtusae*, 5 – *Charetrum delicatulae*, 6–47 – *Lychnothamnetum barbati*, 48–69 – *Myriophylletum spicati*, 70–71 – *Nupharo-Nymphaeetum albae*, 72 – *Scirpetum lacustris*, 73 – *Typhetum angustifoliae*, 74 – *Sparganietum erecti*, 75 – *Eleocharitetum palustris*, 76–83 – *Phragmitetum australis*, 84 – *Typhetum latifoliae*, 85 – *Thelypteridetum*.

CONCLUSIONS

1. Among the lakes of the Łęczna-Włodawa Lakeland, Lake Rogóžno is the basin with the best-preserved charophyta vegetation which positively affects the ecological conditions of the reservoir. It exhibits considerable phytocenotic diversity and a large number of stonewort species which occur in the lake and create a community.
2. The site of *Lychnothamnus barbatus* in the lake Rogóžno is a unique phenomenon on the international scale. It is a bank of genes for any forms of active protection aiming at the preservation of this species.
3. The lake is used for fishing purposes. Particular attention should be paid to the fishing activities (e.g. fish feeding) so as not to increase eutrophication processes.

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CHARAKTERYSTYKA MAKROFITÓW JEZIORA ROGÓŻNO I ICH ROLA W ZACHOWANIU RÓŻNORODNOŚCI BIOLOGICZNEJ

Streszczenie. Celem pracy było ukazanie różnorodności fitocenotycznej i florystycznej roślinności wodnej jeziora Rogóźno. Badania przeprowadzono w sezonie wegetacyjnym 2006 roku. Roślinność tego zbiornika tworzy 15 syntaksonów, spośród których 4 reprezentuje klasę *Charetea*, 2 klasę *Potametea* oraz 9 klasę *Phragmitetea*. Fitolitoral z wyraźnie zaznaczoną zonacją budują przede wszystkim 3 zespoły. Strefę szuwaru tworzy *Phragmitetum australis*, następnie występuje *Myriophylletum spicati*, a najgłębsze partie zajmuje *Lychnothamnium barbatum*. Stanowisko tego gatunku w jeziorze Rogóźno jest fenomenem na skalę światową. To prawdopodobnie największa powierzchnia fitocenozy *Lychnothamnium barbatum* na świecie.

Słowa kluczowe: makrofity, jezioro Rogóźno, charofity, *Lychnothamnium barbatus*