

DIVERSITY OF MACROPHYTES IN LAKE ROTCZE IN THE ŁĘCZNA-WŁODAWA LAKELAND

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Summary. Lake Rotcze is an eutrophic lake in the Łęczna-Włodawa Lakeland. The catchment area mainly consists of fields, meadows and peat bogs without bushes. This lake is used for recreational purposes. Phytolittoral in Lake Rotcze is well developed. There are all kinds of ecological forms of macrophytes. In 2001 and 2002 this lake was occupied by 18 species of macrophytes. The highest number of species was constituted by submerged macrophytes. Phytolittoral in this lake covered 80% of the lake surface. Relatively high species differentiation of macrophytes in Lake Rotcze is confirmed by a steady index.

Key words: lake, macrophytes, diversity

INTRODUCTION

Freshwater macrophytes include water vascular plants and macroscopic algae. In freshwater ecosystems they have a characteristic spatial distribution, as they occur very often in specific belts. They form different life groups: from emergent macrophytes (helophytes) to plants with floating leaves (nymphaeids) and submerged macrophytes (elodeids). Moreover, the degree of their influence on ecosystem depends on species composition, biomass, distribution in the lake and the surface covered by macrophytes [Pieczyńska 1998]. Considering different habitat needs of macrophytes they can be used as phytoindicator of water conditions [Kłosowski 1985, 1992, Hellsten 2002]. *Charophytes* belong to macrophytes, which play an important role, because they are very sensitive species to any kind of changes in the environment [Kufel and Kufel 2002]. The aim of this study was to determine species composition of macrophytes, abundance, distribution and surface covered by macrophytes.

STUDY AREA, MATERIAL AND METHODS

The studies were carried out in Lake Rotcze. It is located in the Landscape Park Łęczna-Włodawa Lakeland [Chmielewski 1989, Radwan and Kornijów 1998]. In the

1950's this lake was still mesotrophic [Wilgat 1954]. Changes in its trophic status were caused the development of recreation [Radwan and Kornijów 1998]. This lake belongs to a group of shallow lakes (max depth is 4,3 m). The surface of this lake increased from 42.7 ha in the 1950's to 45.8 ha in the 70's [Furtak *et al.* 1998]. The main forms of using the catchment grounds were meadows, pastures and plough lands [Furtak *et al.* 1998]. The dominating type of littoral is a small lake phytolittoral.

The studies were carried out in three seasons: spring, summer and autumn in 2001 and 2002. It covered littoral zone, in which 5 studied transects were selected. The transects were distributed evenly around the lake, beginning from the shoreline to the maximum depth of macrophytes occurrence. The following were determined: the range of occurrence of three macrophytes groups, their qualitative structure, abundance and frequency. In quantitative studies floristic frame and floristic rake of „Bernatowicz” type were used.

In order to determine the diversity of macrophytes in this lake the steady index was used [Falińska 1996].

RESULTS AND DISCUSSION

In Lake Rotcze 18 species of macrophytes occurred. They belonged to three ecological groups: helophytes – 6 species, nymphaeids – 2 species and elodeids – 10 species. The highest number of species was observed within elodeids: they included 8-9 species. The lowest number of species was represented by nymphaeids – only 2 species (Fig. 1). In other authors' research the submerged macrophytes were represented by 17 species [Sugier and Lorens 2002]. All species of macrophytes represented commonly occurring species in Polish lakes. Only one, *Nymphaea candida* is a rare species which occurred in lake Rotcze.

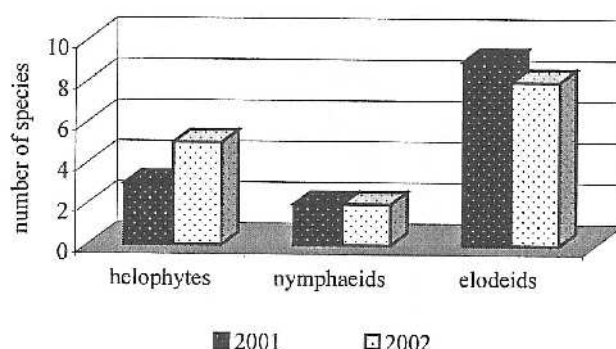


Fig. 1. Number of macrophytes species belong to different ecological groups in Lake Rotcze in 2001 and 2002

Rys. 1. Liczba gatunków makrofitytów należących do różnych grup ekologicznych w jeziorze Rotcze w latach 2001 i 2002

The number of macrophyte species that occurred in littoral zone in the studied lake was significantly low, like in some eutrophic lakes in Mazurskie Lakeland, where 43 species were observed [Ozimek and Balcerzak 1976].

Phytolittoral in Lake Rotcze occupies 80% of lake surface. The surface covered by macrophytes can indicate favorable habitat conditions and the tendency to overgrow this lake. The average overgrowing surface in Polish lakes reaches about 33% [Szczepański 1978].

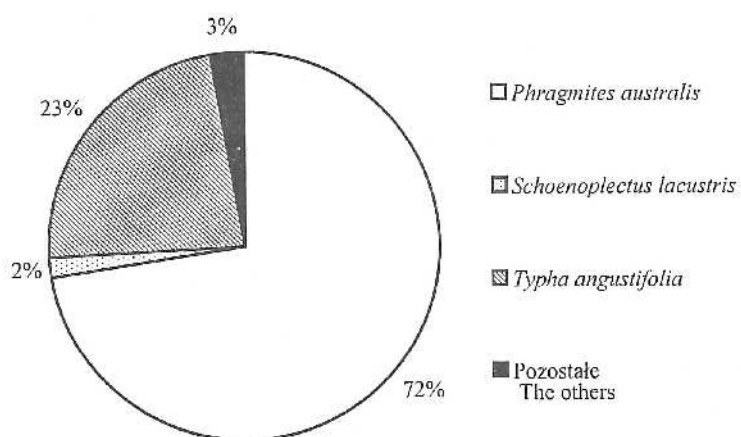


Fig. 2. Frequency of emergent species of macrophytes in Lake Rotcze
Rys. 2. Częstość występowania gatunków należących do wynurzonych makrofitytów w jeziorze Rotcze

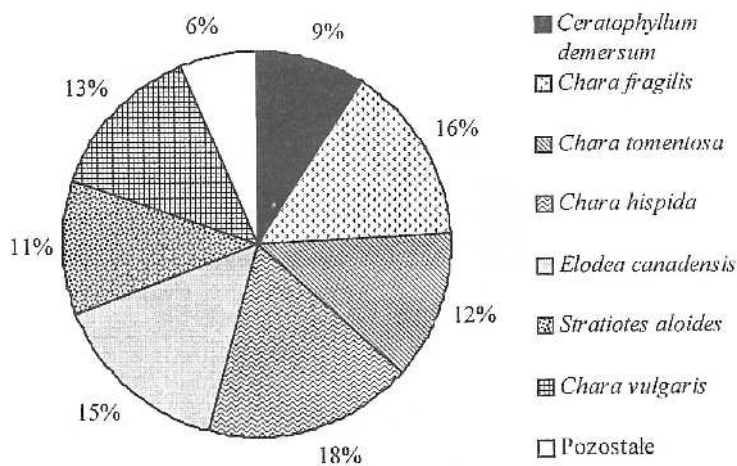


Fig. 3. Frequency of submerged macrophytes in Lake Rotcze
Fig. 3. Częstość występowania gatunków należących do zanurzonych makrofitytów w jeziorze Rotcze

The depth of macrophytes occurrence in the studied lake was considerable and it was 3.7 m. Moreover the visibility of Secchi disc was 3.2 m. There is a phenomenon called „escape effect”, which is very often observed in freshwater ecosystems [Scheffer *et al.* 1992]. In eutrophic lakes in the Mazurian Lakeland and Drawieński National Park macrophytes ranged from 3.0 m to 5.5 m of depth [Ozimek and Kowalczewski 1984, Kraska *et al.* 2002].

In Lake Rotcze the depth of occurrence of each ecological macrophytes group was diverse. Helophytes were observed from 0.6 m to 1.3 m, nymphaeids from 0.6 m to 2.1 m and elodeids up to 3.7 m. There was a different number of macrophyte species depending on depth. In shallow littoral zone up to 1 m of depth there were 6 species and the highest frequency among helophytes was shown by *Phragmites australis* and the lowest one *Eleocharis palustris* (Fig. 2). Among elodeids the highest number of species – 9 – was observed at 1.6 m of depth. The highest frequency was achieved by *Chara fragilis*, while the lowest one by *Nuphar lutea* (Fig. 3). According other authors, *Elodea canadensis* and *Ceratophyllum demersum* were dominant in this lake [Sugier and Lorens 2002]. Only three species were observed at 3 m of depth.

In lake Rotcze high diversity of *Charophyce* occurred. Their development in the lake proves that light conditions are satisfactory. The presence of evergreen plants can be an effective trap for nutrients. Besides, they take control of bottom sediments, provide oxygen, make nitrification and denitrification processes possible, they restrict water decalcification. These species are very sensitive to increasing trophy [Blidow 1992, Van den Berg *et al.* 1998, Kufel and Kufel 2002]. High diversity of macrophytes in Lake Rotcze is confirmed by high values of steady index, which ranged from 0.73 for emergent macrophytes to 0.74 for submerged macrophytes.

CONCLUSIONS

In eutrophic lake Rotcze 18 species of macrophytes occurred, with 10 species belonging to elodeids, 2 species belonging to nymphaeids and 6 species represented by helophytes.

The range of macrophytes occurrence was significant – 3.7 m. It was similar in other eutrophic lakes in the country.

The surface of phytolittoral was rather large, because it was 80%.

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ZRÓŻNICOWANIE MAKROFITÓW W JEZIORZE ROTCZE, POŁOŻONYM NA POJEZIERZU ŁĘCZYŃSKO-WŁODAWSKIM

Streszczenie. Jezioro Rotcze położone jest na Pojezierzu Łęczyńsko-Włodawskim. Jest to jezioro eutroficzne, otoczone polami, łąkami i torfowiskami niskimi. Od północnej i wschodniej strony jeziora w ostatnich latach rozwinęła się także zabudowa lotniskowa. Celem badań było określenie składu gatunkowego i struktury ilościowej makrofitów występujących w litoralu owego jeziora. Przeprowadzone w latach 2001-2002 badania wykazały, że fitolitoral jeziora Rotcze jest bardzo dobrze wykształcony. Występują tu bowiem wszystkie formy ekologiczne makrofitów, obejmujące 18 gatunków. Najwięcej gatunków, bo 10, należało do elodeidów, zaś najmniej, zaledwie 2, do nimfeidów. Fitolitoral jeziora Rotcze zajmował 80% lustra wody.

Słowa kluczowe: jezioro, makrofity, różnorodność