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Biodiversity of peat ponds in forest ecosystems of the Polesie National Park: structure, functioning, and implications for climate change

Abstract. The major aim of this study was to determine the effect of hydrological conditions and physicochemical properties of waters on the functioning of selected groups of hydrobionts in peat ponds. Experiments were conducted in three seasons: spring, summer, and autumn 2025, and covered 10 peat ponds of various trophy status and typology located on the area of the Polesie National Park. Significant fluctuations in water level resulting from insufficient atmospheric precipitation accelerate the drying out and overgrowing of peat ponds, particularly those of alkaline and acidic nature. Substantial restructuring of certain taxonomic groups of hydrobionts is observed in peat pond ecosystems due to deteriorating hydrological conditions. Across zoocenotic communities, a decline is observed in the contribution of planktonic species and an increase in the abundance of littoral or periphyton species. These changes are also reflected in increased species richness and abundance of organisms with broad ecological tolerance (primarily ciliates) as well as a decline in the species number and abundance of top-predators (planktonic crustaceans and macroinvertebrates).

Keywords: national park, peat ponds, zooplankton, macroinvertebrates

INTRODUCTION

Climate change models indicate a systematic rise in air temperature ranging from 2°C to 4°C, with dynamics of this process observed to increase significantly in the last dozen or so years [Lara et al. 2015]. Global temperature increases contribute, among other things, to greater frequency of extreme weather events, including the occurrence of periods of exceptionally high summer temperatures and the absence of ice cover in reservoirs in the winter [Cao et al. 2015]. They also affect thermal stratification and the development of primary producers – mainly phytoplankton – and may also accelerate the eutrophication process [Moss 2012, Andersen et al. 2013, Audet et al. 2017]. Small water bodies, including peat ponds, i.e., water bodies formed after peat extraction, are particularly sensitive to these changes [Küppers et al. 2016]. While the functioning of shallow lakes in the times of climate warming is broadly addressed in scientific studies and well understood [i.a., Moss 2012, Audet et al. 2017], the impact of these changes on the biodiversity of peat ponds remains underexplored. In particular, little is known about the functioning of hydrobionts and the impact of environmental factors (including temperature and extremely low water levels) in peat pond ecosystems [Mieczan 2007]. These reservoirs typically exhibit low primary production, often very low pH, and low nutrient concentrations. Slightly different conditions prevail in the so-called carbonate peat ponds, where pH, nutrient concentrations,

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and primary production are significantly higher [Mieczan and Pawlik-Skowrońska 2018]. Due to their shallow depth and small surface area, these ecosystems may be particularly sensitive to increases in average temperature, and the resulting changes can be highly dynamic. To date, only episodic studies of selected hydrobiont groups have been conducted in these ecosystems during the development of the Polesie National Park Conservation Plan [Mieczan 2013]. The lack of comprehensive information on hydrobionts has prompted research on the peat ponds of the Polesie National Park. Observation and better understanding of the functioning of these habitats is essential for establishing rational principles for their protection or developing programs for their maintenance and restoration. Hence, Hypothesis 1 of the present study posited that due to their shallow depth and small surface area, these ecosystems may be particularly sensitive to average temperature increases, and may undergo more dynamic changes than lake ecosystems. Specific study objectives included: analysis of the physical and chemical properties of the peat pond waters; identification of the qualitative and quantitative structure of selected groups of hydrobionts (phytocenoses and zoocenoses: phytoplankton, bacterioplankton, testate amoebae, ciliates, zooplankton, zoobenthos, zoopleuston); and determination of the impact of hydrological conditions and physicochemical properties of water on the functioning of selected groups of hydrobionts.

STUDY AREA, MATERIAL AND METHODS

Experiments were conducted in three seasons: spring, summer, and autumn 2025, and covered 10 peat ponds of various trophic status and typology located in the Polesie National Park. These were alkaline peat ponds located on low peatbogs in the area of Lipniak (TL1, TL2, TL3, TL4) and Podkaraśne peat pond (TP) as well as acidic peat ponds located on transitional peat bogs in the area of Lake Moszne (TM1, TM2, TM3), and carbonate peat ponds located on the carbonate peat bog Bagno Bubnów (TBB1, TBB2) (Table 1). The water level in the reservoirs was measured using a water-level gauge with centimeter graduations. Physicochemical analyses included determinations of: temperature, pH, electrolytic conductivity, oxygen concentration, water oxygen saturation, concentration of nutrients, TSS, TOC, COD, BOD, concentration of chlorophyll *a*, turbidity, and PC. Temperature, oxygen concentration, electrolytic conductivity, pH, and chlorophyll *a* concentration were determined directly in peat pond water using multiparameter probes. Concentrations of nutrients were analyzed using colorimetric methods [Golterman 1969]. A UV spectrophotometer was used to determine COD, BOD, TSS, and TOC. Macrophyte surveys were conducted in accordance with the GIOŚ methodological guide, following the prior determination of the number of transects [Kolada 2020]. Plankton samples were collected using a TON plankton collector and identified using an inverted microscope (Nikon Eclipse TE 200).

Table 1. List of the examined peat pools, their locations and abbreviations of the site names used in the text

Site/peat pool	Abbreviation of the position name	Location
Peat pool Lipniak 1	TL1	51.458 N, 23.147 E
Peat pool Lipniak 2	TL2	51.461 N, 23.146 E
Peat pool Lipniak 3	TL3	51.461 N, 23.148 E
Peat pool Lipniak 4	TL4	51.458 N, 23.151 E
Peat pool Moszne 1	TM1	51.457 N, 23.111 E
Peat pool Moszne 2	TM2	51.457 N, 23.112 E
Peat pool Moszne 3	TM3	51.458 N, 23.113 E
Peat pool Podkaraśne	TP	51.431 N, 23.110 E
Peat pool Bagno Bubnów 1	TBB1	51.371 N, 23.273 E
Peat pool Bagno Bubnów 2	TBB2	51.372 N, 23.273 E

Table 2. Physicochemical properties of the waters of the tested peat pools (average values for three seasons, 2025)

Parameter	Unit	TL1	TL2	TL3	TL4	TM1	TM2	TM3	TP	TB81	TB82
Temperature	°C	19.1	20.2	19.2	19.4	19.1	18.2	17.9	20.1	20.8	20.53
pH	pH	7.2	7.1	7.0	7.1	4.8	4.3	5.2	6.8	7.4	7.30
Conductivity	µS/cm	360.5	241.2	140.4	192.7	246.2	69.7	80.9	124.6	251.9	250.90
O ₂	%O ₂	58.7	72.3	63.4	76.4	39.6	60.8	39.1	74.9	82.6	79.77
O ₂	mg O ₂ /dm ³	5.5	6.4	6.0	7.5	3.8	5.6	3.8	6.7	7.4	6.93
NTU	NTU	166.4	60.5	74.3	65.3	50.8	123.1	45.3	43.0	46.8	46.68
Chlorofil a	ug/L	22.0	34.7	22.1	32.4	81.5	33.3	47.9	21.6	13.1	11.93
PC	ug/l	0.0	0.1	0.0	0.2	2.5	0.8	2.1	0.4	0.1	0.110
N-NH ₄ ⁺	mg N/L	0.071	0.930	0.012	0.9	2.182	1.402	1.207	0.307	0.031	0.021
N-NO ₃	mg N/L	0.093	1.063	0.725	1.913	0.015	0.029	0.043	0.022	0.012	0.013
P-PO ₄ ³⁻	mg P/L	0.006	0.087	0.005	0.005	0.017	0.047	0.015	0.048	0.027	0.024
P tot	mg P/L	0.081	0.489	0.072	0.057	0.479	0.264	0.242	0.134	0.072	0.070
N tot	mgN/L	2.528	7.300	2.796	2.066	5.109	2.764	4.021	2.263	1.291	1.327
TSS	mg/L	103.5	450.0	160.5	202.0	401.5	713.3	460.0	59.4	70.3	69.47
TOC	mg C/L	35.0	78.0	34.5	34.2	31.1	81.2	72.0	16.5	17.1	17.10

To assess algal abundance, 1 L of water was transferred from the collected samples and then preserved with Lugol's iodine. One portion of the fixed sample was used to concentrate the material (50 mL), while the remaining portion was used to prepare specimens for the taxonomic identification of phytoplankton. Bacterioplankton was identified using the direct count method according to the methodology of Porter and Feig [1981] using epifluorescence and DAPI, whereas zooplankton was identified according to the methodology of Foissner and Berger [1996]. To assess amoebae and ciliate abundance, 1 L of water was subsampled from the collected samples and preserved with Lugol's iodine. A portion of the fixed sample was used to concentrate the material (50 mL), while the remaining portion was used to prepare specimens for the taxonomic identification of amoebas and ciliates. For the analysis of rotifers and crustaceans, 10-L water samples were collected, strained through a no. 25 plankton net, and concentrated to a constant volume of 100 mL. Afterwards, they were fixed with Lugol's iodine and, after several hours, preserved with a 4% formalin solution with added glycerin. The fixed samples were identified for species profile and abundance of rotifers. The number of individuals found in the sample was converted to 1 dm³ of water. Quantitative samples of zoobenthos were collected using a Kajak tube catcher with a catch area of 19.6 cm². The bottom sediment collected in this way was washed using a benthic net with a mesh size of 0.28 mm, while zoopluston was collected using a rectangular frame with an area of 0.25 m² made of duralumin sheet, from which the material was extracted using a hydrobiological scoop. In total, 60 samples were collected across three seasons for each of the studied groups of organisms (10 peat bogs × 3 seasons × 2 sites: littoral and pelagic zones). Because the analyzed data were normally distributed, parametric methods were used. They are more powerful (providing greater test power), and their use was justified by the requirement of normality of the distribution of the studied variables. Differences in the physical and chemical parameters and in the abundance of hydrobiont communities among the studied sites were tested using factorial ANOVA (peat pond, season). Pearson's correlation coefficients were calculated in order to specify the dependence between physical and chemical parameters and hydrobiont communities. The analysis was performed using Statistica 7.0 software.

RESULTS

Physicochemical properties of waters

Over the study period, the water level in peat ponds L1–L4 was very low, reaching a maximum of approximately 10 cm in the spring. No open water table was observed in the autumn. In TP, the water level changed very dynamically throughout the seasons, reaching approximately 60 cm in the spring, approx. 40 cm in the summer, and 30 cm in the autumn. In TM1–TM3, the water level was very low, reaching a maximum of approx. 10 cm in the spring, while no open water table was observed in TM3 in the autumn. A relatively stable water level was observed in peat ponds TBB1–2, where it reached approx. 60 to 80 cm. Waters of the peat ponds exhibited distinct physical and chemical properties that varied depending on the genetic type of the peatbog. The pH values of water differed significantly and ranged from pH = 4.3 in peat ponds TM1–2 through pH of 7.0–7.4 in TL1–4 and TP to pH of 7.3–7.4 in TBB1–2 ($F = 11.87$; $p < 0.001$). Water temperature was similar across all water bodies, whereas oxygen concentration was the highest in water from peat ponds TL4 and TBB1. Electrolytic conductivity was significantly higher in the peat pond TL1 ($>360 \mu\text{S cm}^{-1}$) and reached significantly lower values in the acidic peat ponds ($F = 12.37$; $p < 0.001$). The highest concentrations of nutrients and TOC were determined in water from TL1–4 and TM1–3. A similar observation was made for total suspended solids ($F = 11.82$; $p < 0.001$). In turn, chlorophyll *a* concentration was the highest in water from peat ponds TM1–3 and the lowest in TBB1–2 and TL1–2, with values observed to increase significantly in the summer season ($F = 4.28$; $p < 0.015$), as in Table 2.

Macrophytes

The vegetation of peat ponds varied significantly depending on their type. Alkaline peat ponds were mainly predominated by *Hottonia palustris*, *Oenanthe aquatica*, and a few sedges and grasses.

In turn, the acidic peat ponds were predominated by *Sphagnum* sp. followed by *Utricularia vulgaris*, *Phragmites australis*, *Schoenoplectus lacustris*, and *Calla palustris*. In turn, the major plant species identified in carbonate peat ponds included *Phragmites australis*, *Chara fragilis*, *Utricularia vulgaris*, and *Potamogeton natans*.

Bacterioplankton and phytoplankton

The abundance of bacterioplankton varied significantly across peat ponds ($F = 18.5\text{--}19.56$, $p = 0.001$). It was the highest in peat ponds TBB1-2 and TM1-3 ($8 \times 10^6 \text{ mL}^{-1}$ and $7 \times 10^6 \text{ mL}^{-1}$, respectively) and slightly lower in TP ($6.4 \times 10^6 \text{ mL}^{-1}$; $F = 4.37$; $p < 0.015$), as in Figure 1a. Regardless of peat pond genesis, the highest abundance of planktonic bacteria was recorded in the spring or autumn in the case of peat ponds with an open water table in a given season (TM1-3, TBB1-2, whereas the lowest one was observed in the summer. The community of phytoplankton was represented by 36 taxa. The lowest number of species was identified in peat ponds TM1-TM3 (12) and TL1-TL4 (16), whereas the highest one in TP (18) and TBB1-2 (19). The major classes of phytoplankton included *Cryptophyceae* and *Bacillariophyceae*. The abundance of phytoplankton differed significantly among the analyzed peat ponds and ranged from $0.06 \times 10^6 \text{ ind. dm}^{-3}$ in TM1-3 to $1.41 \times 10^6 \text{ ind. dm}^{-3}$ in TBB1-2 ($F = 6.26$; $p < 0.015$), as in Figure 1b.

Zooplankton

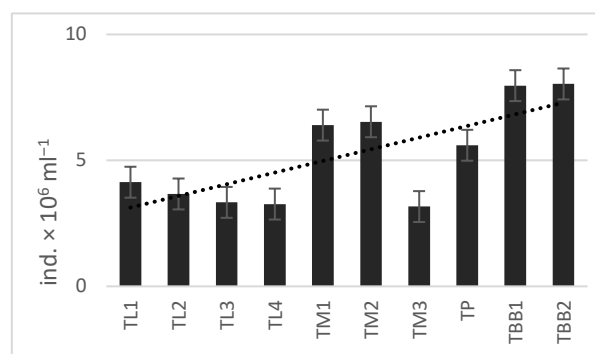
The analyzed peat ponds exhibited low biodiversity and abundance of testate amoebae, as only a total of 4 taxa of these protozoa were identified. However, their 6 taxa were detected in acidic peat ponds and only 3 taxa in those of carbonate nature. The highest abundance of testate amoebae was determined in acidic peat ponds and the lowest one in the carbonate ponds (13 and 6 ind. mL^{-1} , respectively; $F = 6.27$; $p < 0.015$), as in Figure 1c–d. In the dominance structure, *Arcella vulgaris* and *Nebela* sp. were the major representatives of the testate amoebae population in the acidic peat ponds, whereas *Centropyxis* sp. in the carbonate ponds. In investigated peat ponds 17 taxa of ciliates identified, with 7 taxa detected in TL1-TL4, 9–11 taxa in TM1-3, and up to 16 taxa in TBB1-2. The results of factorial ANOVA showed that the abundance of ciliates was affected by peat pond type ($F = 22.84$, $p < 0.001$). Their highest abundance was recorded in the carbonate peat ponds and the lowest one in acidic peat ponds (44 and 22 ind. mL^{-1} , respectively). The dominance structure showed Scuticociliatida (mainly *Cinetochilum margaritaceum*) and Oligotrichida to prevail in all ponds. Species richness of rotifers ranged from 12 species in TP, 14–16 species in peat ponds TL1-4 and TM1-3, and up to 26 species in TBB1-2. Their abundance in TM1-3, TP, and TL1-4–2 ranged from 21 ind. dm^{-3} to 32 ind. dm^{-3} , while in TBB1-2 it was significantly higher and reached 49 ind. dm^{-3} ($F = 5.28$; $p < 0.014$), as in Figure 1e. Among the crustacean plankton, 17 species of cladocerans (Cladocera) and 8 species of copepods (Copepoda) were recorded in the peat ponds of the Polesie National Park, with the largest number of species identified in TBB1-2 (14). The abundance of cladocerans ranged from 11 ind. dm^{-3} to 28 ind. dm^{-3} , whereas that of copepods from 4 ind. dm^{-3} to 14 ind. dm^{-3} ($F = 6.24$; $p < 0.015$), as in Figure 1f–g. Among the Cladocera, *Chydorus sphaericus* predominated in the acidic peat ponds and *Ceriodaphnia quadrangularis* in the carbonate ones. In the case of Copepoda population, the prevailing species included *Mesocyclops leuckartii* in TP, *Thermocyclops crassus* in TM1-3 and TL1-4, and *Eucyclops graciloides* in TBB1-2.

Macroinvertebrates

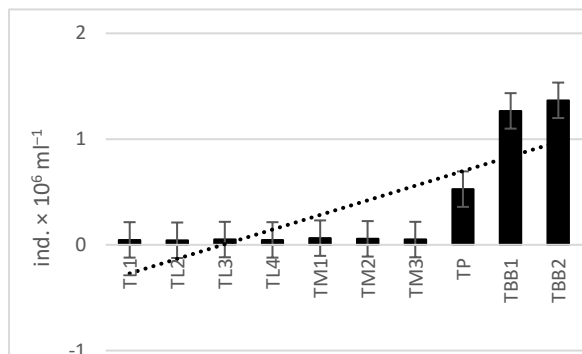
From 2 to 12 taxa of benthic fauna were identified in the analyzed peat ponds. The highest number of zoobenthic taxa (10–12) was recorded in TBB1-2 and TP, with Chironomidae predominating in both the peat ponds and carbonate ponds. In the other peat ponds, the observations demonstrated a significantly lower number of taxa of benthic invertebrates in the summer and autumn seasons, and even a complete lack of zoobenthos in the autumn months. Similar observations were made for the density of benthic organisms ($F = 8.28$; $p < 0.016$). The community of zoopluston was represented by 2 to 10 taxa, including: water bugs (*Heteroptera aquatica*), water beetles (*Coleoptera aquatica*), springtails (*Collembola*), and

Fig. 1 a–e. Abundance of microbial communities and Metazoa in investigated peat ponds (average values for three seasons, 2025; --- trend line)

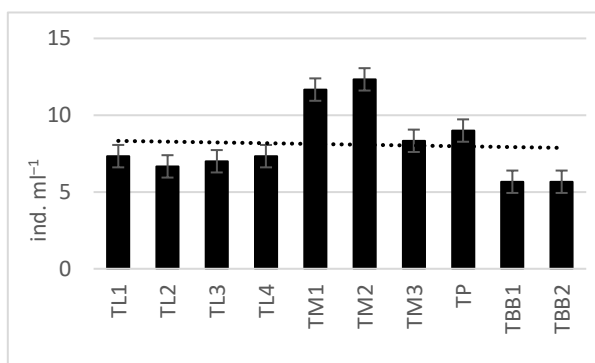
a) Bacteria



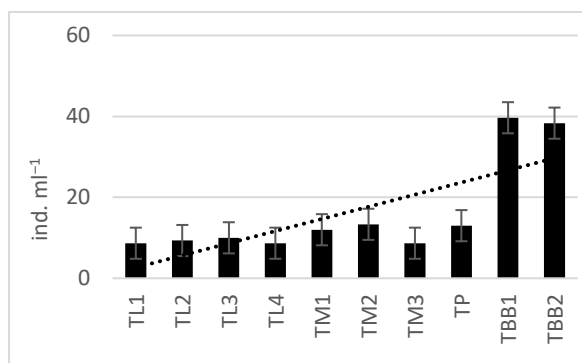
b) Phytoplankton



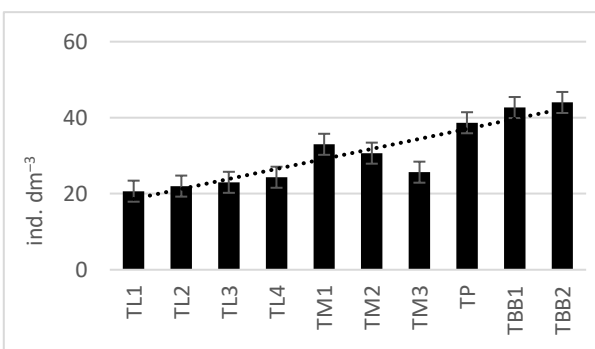
c) Testate amoebae



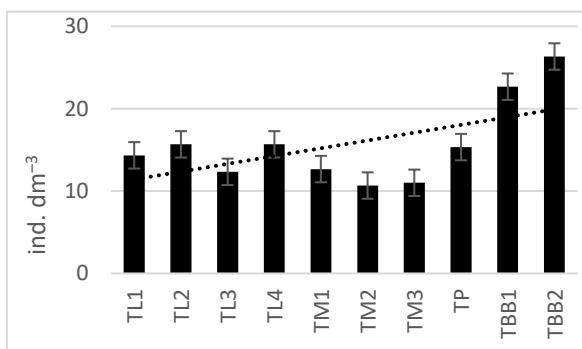
d) Ciliates



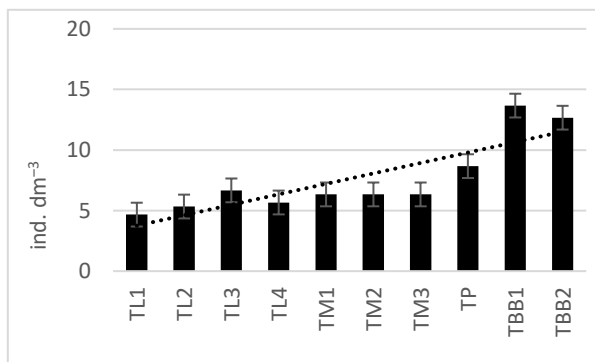
e) Rotifers



f) Cladocera

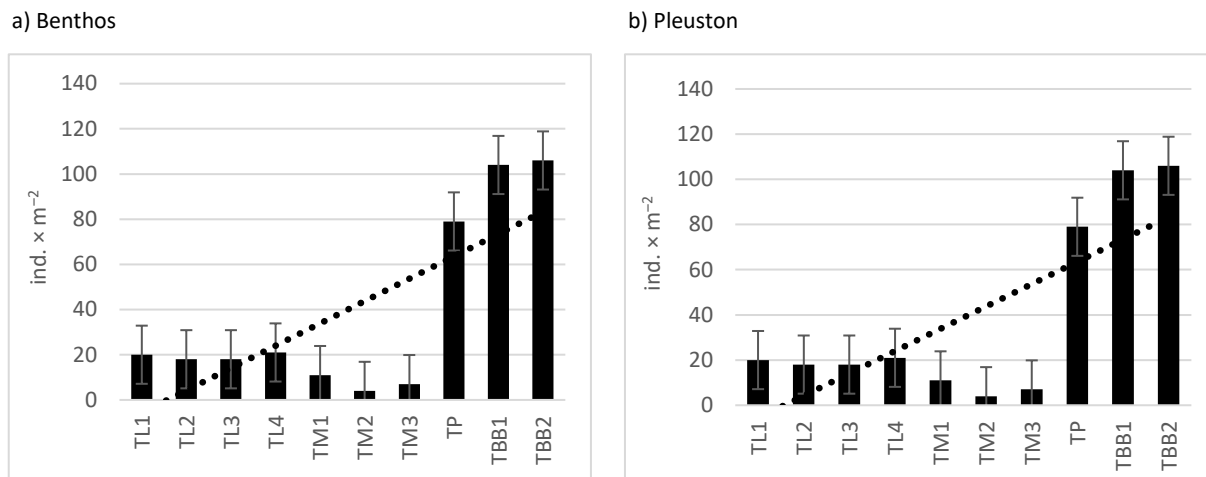


g) Copepods



true flies (*Diptera*). The highest numbers of taxa were recorded in TBB1-2 and TP (7–10 taxa). The number of taxa identified in the other reservoirs was significantly lower, ranging from 2 to maximally 5, occurring practically only in the spring. Significantly greater density (78–107 ind. m⁻², $F = 22.14$; $p < 0.001$) was recorded in TP and TBB1-2, and the lowest one (8–20 ind. m⁻²) in TL1-4 and TM1-3 (Fig. 2a–b).

Fig. 2 a–b. Abundance of macroinvertebrates in investigated peat ponds (average values for three seasons, 2025; ... trend line)



Dependence between physicochemical properties of waters and hydrobionts

The strength of the relationships between the analyzed groups of organisms and physicochemical properties of water varied considerably in particular types of peat ponds. In the acidic ponds, strong correlations were observed for TOC-bacteria and nutrients-phytoplankton and protozoa (from $r = 0.57$ to $r = 0.59$, $P \leq 0.01$). In the carbonate peat ponds, a considerably weaker correlation was found between TOC and bacteria ($r = 0.37$, $P \leq 0.05$), whereas in the base-rich ponds associated with peatbogs the strongest correlation occurred between concentrations of nutrients and protozoa and macroinvertebrates (from $r = 0.53$ to $r = 0.64$, $P \leq 0.01$).

DISCUSSION

To date, there has been a complete lack of comparative data on the physicochemical properties of peat pond waters, particularly those located on low peat bogs (TL1-TL4). Regardless of the peat bog type, an increase in pH, deterioration of aerobic conditions, and an increase in water mineralization in the studied peat ponds were observed with falling water levels, particularly in the summer and autumn. Further increases were recorded in concentrations of chlorophyll *a* and total organic carbon. At the same time, significant concentrations of nutrients were determined not only in the alkaline but also in the acidic peat ponds. This effect was particularly pronounced in reservoirs where surface water levels were significantly reduced. An increase in pH and a decrease in water oxygen concentration were also observed in small moss valleys in the Pradeaux peat bog in France [Gilbert et al. 1998].

The abundance of bacteria increased in peat ponds associated with transitional peat bogs (acidic peat ponds) and in carbonate peat ponds. The study results indicate that TOC levels increased with increasing trophic status. In the acidic and alkaline peat ponds, bacterial abundance strongly correlated with TOC levels, while in the carbonate peat ponds, this correlation was significantly weaker. It therefore appears that TOC, which includes DOC, may influence the abundance of these microorganisms. This observation has also been confirmed by Chróst et al. [2009], who demonstrated that bacterial abundance was influenced not by the content of DOC itself but by its availability, which is primarily determined by the presence of the so-called carbon refractors used after enzymatic degradation. In turn,

the highest abundance of phytoplankton occurred in the carbonate peat ponds. Undoubtedly, one of the significant factors contributing to this finding was the significantly better light conditions than in the other peat ponds studied. Both the qualitative structure and the abundance of phytoplankton in peat ponds were typical for this type of habitat and showed similarity in this respect to the communities found in dystrophic lakes [Gilbert et al. 1998]. In most peat ponds, phytoplankton was predominated by *Cryptomonas* sp. The exception was one of the acidic peat ponds (TM2), where the *Fragilaria ulna* diatom prevailed. Its dominance in the phytoplankton may indicate an increase in the trophic status of TM2 waters, as it is tolerant to mixing and typical of waters of moderate fertility. Furthermore, the invasive species *Gonyostomum semen* was found in the phytoplankton of peat ponds located near Lake Moszne (TM2). This species was first recorded as early as in 2008 and its appearance is likely due to ongoing climate change [Mieczan 2013].

Individual zooplankton groups showed significant variations across peat ponds. Increasing nutrient concentrations were accompanied by an increase in species diversity of testate amoebae, ciliates, and crustaceans. Similar observations were also made in sphagnum peat bog ecosystems located in northeastern France [Jassey et al. 2012]. *Arcella vulgaris* prevailed in the studied peat ponds, most likely due to its broad ecological tolerance. As studies by Gilbert et al. [1998] have shown, species of this genus occur in habitats with a high nutrient content. As water levels dropped and nutrient concentrations increased, the share of species of the genera *Nebela* and *Centropyxis* increased. In the zooplankton, the share of eutrophy indicators increased, including: the genus *Keratella* (Rotatoria), *Alona guttata*, *Diaphanosoma brachyurum*, and *Polyphemus pediculus* (Cladocera), as well as *Cyclops strenuus* and *Thermocyclops oithonoides* (Copepoda). Other authors' research indicates that the genera *Nebela* and *Centropyxis*, in particular, are indicators of deteriorating hydrological conditions in peat bog ecosystems [Gilbert et al. 2003]. In the case of ciliates, an increase in their species diversity was observed with increasing trophic status. Similar observations were made for the abundance of these protozoa. It appears that the combined effect of rising temperature and nutrient concentrations may have the greatest impact on the diversity and abundance of these protozoa. This finding confirms earlier reports from lake ecosystems [Anderson et al. 2013]. Ciliates respond very rapidly to changing environmental conditions. Regardless of the reservoir type, ciliate abundance reached the highest values in the spring and summer, while it was the lowest in the autumn. Spring and summer abundance peaks were also noted by Gilbert et al. [1998] in *Sphagnum*-dominated peatlands. Simultaneously, increasing temperatures triggered a decrease in the share of large taxa of testate amoebae with a large diameter of shell aperture. These species feed primarily on ciliates, rotifers, and even small nematodes, i.e., organisms from higher trophic levels. Hence, they could have significantly influenced the control of the abundance of potential consumers of bacteria and other protozoa. According to the "metabolic theory", predators exhibit enhanced activity with increasing temperature, thus intensifying the top-down control [Brown et al., 2004]. It is therefore likely that the increased consumption efficiency by top predators contributed to the decline in the abundance of other microbial groups in the summer.

Between 2 and 12 taxa of benthic fauna were identified in peat ponds studied, which is an extremely low number, indicating a short period of water filling in these reservoirs. The largest number of zoobenthos taxa (12) was identified in the TP peat pond, where open water and benthic invertebrates typical of eutrophic waters were observed in all study seasons. Its complex vegetation structure, similar to that of pond phytolittoral zones, also offered the most suitable habitats for aquatic fauna among all the peat ponds studied. In the carbonate peat ponds, the contribution of *Chironomidae* larvae increased from 60% to 88% in the total benthic fauna in 2013, while mollusks and *Zygoptera* larvae are major contributors today. Taxa typical of fertile waters clearly dominated among the *Chironomidae* [Tarkowska-Kukuryk et al. 2014]. The very low number of taxa and abundance of zoopluston in TL1-4 and TM1-3 likely reflect a significant drop in water level after spring, which rendered these habitats less suitable for this group of organisms. When reservoirs dry out during the breeding season of pleuston insects, these organism soften migrate to other habitats in search of suitable conditions for reproduction. In turn, high abundance of zoopluston in the carbonate peat ponds was due to the appearance of springtails (*Podura aquatica*), which predominated habitats with relatively stable water levels. Large populations of springtails in the littoral zone are often observed in lake littoral areas and in water bodies with constant water levels and a stable water-land interface [Płaska 2013].

SUMMARY

The species composition of the aquatic biocoenoses in the peat excavations was most often consistent with the diverse habitat conditions found in the studied reservoirs (depending on the type of peat bog the reservoirs were formed on). However, the physicochemical properties of the peat pond waters also showed some symptoms indicating eutrophication, which pertains particularly to the peat ponds located near Lake Moszne.

A significant restructuring of certain taxonomic groups of hydrobionts is observed in the peat pond ecosystems, due to deteriorating hydrological conditions. The contribution of planktonic species decreases and that of littoral or periphyton species increases in the zoocenose communities, indicating substantial shallowing of the studied reservoirs.

Significant fluctuations in water level resulting from precipitation deficiencies accelerate the drying and overgrowing of peat ponds, particularly alkaline peat ponds (TL1-4) and acidic peat ponds (TM1-3). The current shape and depth of the basins of these small reservoirs make them dry out completely at low water levels. Based on these observations, a minor reconstruction of the reservoirs should be considered like, e.g., deepening their basins to diminish the dynamics of succession.

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