ROTIFER COMMUNITIES IN RESERVOIRS CREATED BY SAND EXTRACTION IN THE SILESIAN UPLAND

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Summary. Reservoirs created by sand extraction are characteristic and important elements of landscape in the Silesian Upland (SW Poland). In 1975–2001, investigations were conducted to compare planktonic rotifer communities in 6 such reservoirs, differing in surface area and age. In total, 102 taxa of rotifers were noted. The highest number and density of species were observed in the oldest reservoir, Łysina, whereas the smallest number and density of species were recorded in the newest reservoir, Gołonóg III. The research showed a great similarity of planktonic rotifer communities in 3 young reservoirs. Our results indicate that the age of reservoir has a greater influence on rotifer communities than its surface area.

Key words: rotifer community, sand extraction, reservoir, Silesian Upland

INTRODUCTION

Industrial development has caused immense transformations of land relief in the area of Upper Silesia. Numerous man-made lakes are effects of intentional or unintentional human activity. These water bodies are characteristic elements of landscape in this region [Jankowski 1987]. Transformation of sand pits into water reservoirs is one of the effects of intentional human activity [Bielańska--Grajner 1978, 1987, Stachowicz and Czernoch 1991]. Such reservoirs are numerous in the Silesian Upland and in its immediate vicinity. Most of these reservoirs are not well studied in respect of biology [Bielańska-Grajner 1978, Kostecki 1974]

This paper aims to compare rotifer communities in 6 reservoirs created by sand extraction. These reservoirs differ in surface area (from 8 to over 600 ha) and in age (from 1 to 40 years old).

STUDY AREA

The investigations were conducted on 6 reservoirs created by sand extraction in different parts of the Silesian Upland and in its immediate vicinity (Dziećkowice, Pławniowice Duże, Gołonóg III, Sosina, Łysina, and Rogoźnik

 Table 1. Surface, age and averages of selected abiotic factors of investigated reservoirs.

 The reservoirs were arranged from the greatest to the smallest

Reservoir	Surface ha	Maximal depth m	Age	Mean tempearture °C	Mean oxygen mg·dm ⁻³	рН
Dziećkowice	673	17	ca. 20	16.59	6.98	7.7
Pławniowice Duże	258	18	6	13.32	9.43	7.9
Gołonóg III	205	15.5	1	13.46	8.32	8.1
Sosina	55	3	15	16.33	10.08	7.3
Łysina	14	< 3	40	18.30	9.89	7.3
Rogoźnik Dolny	8	< 3	10	14.90	9.80	8

Dolny). The first 3 of them can be classified as large, whereas the last 3 as small reservoirs. The reservoirs can be divided into 3 age groups: Gołonóg III, Pławniowice Duże, and Rogoźnik Dolny are <10 years old; Dziećkowice and Sosina are 10–20 years old; and Łysina is >20 years old (Tab. 1).

MATERIALS AND METHODS

Material was sampled in 1975–2001, from spring to autumn, at 2-week intervals, in the littoral and pelagic zones of the reservoirs. Every time, 2 kinds of samples were taken: qualitative and quantitative. Qualitative samples were taken by throwing a plankton net (No. 25) five times. These samples were used for identification of soft-bodied (illoricate) rotifers. Quantitative samples were taken by filtering of 10 dm³ of water through a plankton net and next condensing to 0.05 dm³. Planktonic organisms were counted under a microscope, in Kolkwitz chambers of 0.001 dm³ in volume. The average for 3 chambers was converted per 1 dm³ of water.

Additionally, measurements of selected physical and chemical parameters of water (temperature, pH and dissolved oxygen content) were made.

The communities of rotifers were characterised on the basis of species composition, density, dominance index, as well as Simpson (Ds) and Shannon

(H) species diversity indices. Comparative analysis of the reservoirs was carried out and their similarity was assessed on the basis of Sörensen similarity index (So). MVSP 3.1 and Statistica 7.0 software were used for statistical analysis.

RESULTS AND DISCUSSION

The average temperature of water within the period from spring to autumn differed between the reservoirs and ranged from 13.32 to 18.30°C. Dissolved oxygen ranged from 6.98 mg·dm⁻³ in Dziećkowice to 10.08 mg·dm⁻³ in Sosina. All reservoirs were characterized by alkaline reaction. The lowest values of pH (7.3) were noted in Łysina and Sosina, whereas the highest values of pH (>8) were noted in Rogoźnik Dolny and Gołonóg III (Tab. 1).

In total, 102 taxa of rotifers were recorded. Łysina was characterised by the highest diversity, as 52 species and forms of rotifers were observed in this reservoir. Gołonóg III and Sosina were characterised by the lowest species richness: 24 and 26 taxa, respectively. Only 4 taxa were common to all reservoirs: *Kellicottia longispina, Keartella cochlearis, K. quadrata* and *Lecane lunaris*.



Fig. 1. Mean density of planktonic rotifers in the studied reservoirs

Average density of rotifers differed between the reservoirs (Fig. 1). The highest density (1424 ind dm⁻³) was noted in Lysina. It was less than half as high in Rogoźnik Dolny (612 ind dm⁻³). Dziećkowice, Pławniowice Duże and Sosina were characterised by markedly lower densities of rotifers (367 ind dm⁻³, 445 in-

 $d \cdot dm^{-3}$, 450 ind $\cdot dm^{-3}$, respectively). The lowest density of rotifers was noted in Gołonóg III (238 ind $\cdot dm^{-3}$).

Dominance structure was similar in all of the investigated reservoirs. Three species were classified as eudominants (i.e. contributed >10.0% of total rotifers density each) in Sosina: *K. cochlearis, Polyarthra dolichoptera* and *P. vulgaris.* The first of them was also a eudominant in Gołonóg III, Łysina, Pławniowice Duże and Rogoźnik Dolny. Apart from *K. cochlearis*, the genus *Polyarthra* was a eudominant in Gołonóg III and *K. cochlearis* f. *macracantha* in Łysina, Pławniowice Duże and Rogoźnik Dolny (Fig. 2). A more precise assessment of species diversity in the investigated reservoirs was enabled by calculation of the Simpson and Shannon species diversity coefficients. Obtained values show very high species diversity in Dziećkowice (Ds = 0.875, H = 2.775). The other reservoirs were characterised by average values of diversity coefficients.



Fig. 2. Dominance structure of planktonic rotifers in the studied reservoirs (% in total numbers)

Dendrogram of mutual similarities shows a considerable similarity of the rotifer communities in the young reservoirs: Rogoźnik Dolny, Pławniowice Duże, and Gołonóg III (Fig. 3). Communities of rotifers were similar in Dziećkowice and Sosina, too, but absolutely different from these 3 young reservoirs. The oldest reservoir (Łysina) was the least similar to the others, mostly in respect of the total abundance of rotifers which was significantly higher than in the other reservoirs.

This study showed that the most similar communities of rotifers were found in young reservoirs. The youngest one (Gołonóg III), because of its character and location, is similar to some dam reservoirs [Bielańska-Grajner 1978]. It was characterised by the lowest average density of rotifers (238 ind ·dm⁻³). A similar density of rotifers was noted in the Przeczyce dam reservoir [Starzykowa 1972].





A considerably higher average density and species richness was observed in other dam reservoirs, such as Kozłowa Góra or Goczałkowice [Mleczko 1965, Starzykowa 1972].

Because of their small surface area and depth (Tab. 1), Rogoźnik Dolny and Łysina were similar to ponds. A similar composition of rotifer species was observed in many ponds, too [Krzeczkowska-Wołoszyn 1972, 1973, Kyselowa 1973, Lewkowicz 1974].

In spite of their similar origin, the investigated reservoirs greatly differ in the composition and density of rotifer communities. This is caused not only by their different age and surface area, but also the direction of reservoir development (resulting from their use for recreation or drinking water intake) and their treatment (e.g. stocking).

CONCLUSIONS

- 1. The oldest reservoir, Lysina, was the richest in respect of qualitative composition and density of rotifers.
- 2. The largest reservoir, Dziećkowice, was characterised by the highest diversity of rotifer species.
- 3. Young reservoirs (Dziećkowice, Pławniowice Duże and Gołonóg III) were characterised by low species richness of rotifers.
- 4. The age of reservoirs has a greater impact on rotifer communities than their surface area.

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ZGRUPOWANIA WROTKÓW (*Rotifera*) W WYROBISKACH POPIASKOWYCH WYŻYNY ŚLĄSKIEJ

Streszczenie. Wyrobiska popiaskowe stanowią charakterystyczny i znaczący element krajobrazu Wyżyny Śląskiej. W latach 1975–2001 powadzono badania zgrupowań wrotków planktonowych w 6 wyrobiskach popiaskowych, różniących się powierzchnią oraz wiekiem. Łącznie oznaczono 102 taksony *Rotifera*. Najwięcej gatunków i form zaobserwowano w najstarszym zbiorniku – Łysinie, najmniej natomiast w najmłodszym – Gołonóg III. Największą liczebność *Rotifera* odnotowano również w zbiorniku Łysina, natomiast najmniejszą w najmłodszym wyrobisku Gołonóg III. Badania wykazały silne podobieństwo zgrupowań planktonowych wrotków w zbiornikach młodych. Uzyskane wyniki wskazują, że większy wpływ na zgrupowania *Rotifera* ma ich wiek niż powierzchnia.

Słowa kluczowe: Rotifera, wyrobisko popiaskowe, Wyżyna Śląska