

GROUPS OF PLANKTONIC CRUSTACEA (*CLADOCERA*, *COPEPODA*) IN LAKES OF DIFFERENT TROPHY

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Summary. The studies were carried out in three lakes, differing in depth and trophic status. The lakes were: Piaseczno – mesotrophic, Rotcze – eutrophic, Moszne – dystrophic. The material was taken during spring, summer and autumn from three biotic zones: littoral, sublittoral and pelagial. The presence of 29 species of *Cladocera* and 12 species of *Copepoda* was found in the collected material. The species composition and abundance dynamic was changeable in time in each of the studied lakes. Species richness as well as abundance and biomass of *Crustacea* increased in proportion to the trophic status of lakes. In eutrophic Lake Rotcze cladocerans was the predominant group, whereas both in mesotrophic Lake Piaseczno and dystrophic Lake Moszne copepods dominated.

Key words: *Cladocera*, *Copepoda*, lake, trophic status

INTRODUCTION

The studies were carried out in three lakes, differing from each other in limnological character. According to the criteria of lake classification based on physico-chemical and floro-faunistic investigations of the Łęczna-Włodawa Lakes, the studied lakes can be classified into the different limnological types. The aim of the studies was to find links between species composition, abundance and biomass of crustacean plankton and some specific features connected with the trophic status of lakes.

STUDY SITE, MATERIAL AND METHODS

The study was carried out in May, July and September 2001 in mesotrophic lake Piaseczno, eutrophic lake Rotcze and dystrophic lake Moszne [Radwan and Kornijów 1998] located in Łęczna-Włodawa Lakeland. In each of the studied lakes samples were taken in littoral, pelagial and additionally in sublittoral in case of Lake Piaseczno, with „Toń” sampler (volume 10 l), sieved through a 50 µm plankton net and preserved with formalin and glycerin solution. In the laboratory, cladocerans and copepods were coun-

ted and identified to species level. The number of individuals per 1 dm^3 of water was calculated for each sample. Crustacean biomass was calculated for each genus using body length-dry weight regressions [Botirell *et al.* 1976].

RESULTS

In the collected material 41 species of *Crustacea* were found to exist, including 29 species of *Cladocera* and 12 species of *Copepoda*. The species composition was changeable in time and depended on the limnological character of the given reservoir. The greatest variety was found in Lake Rotcze with 32 species, a smaller number of species (24) was found in Lake Piaseczno, and the smallest in Lake Moszne – 19 taxa (Fig. 1). In all cases cladocerans were the predominant group and the number of their taxa ranged from 13 in Lake Moszne to 23 in Lake Rotcze. The Copepods were represented by 4 species in Moszne, 6 species in Piaseczno and 9 species in Rotcze. In each of the studied lakes littoral showed to be the zone of the greatest species richness.

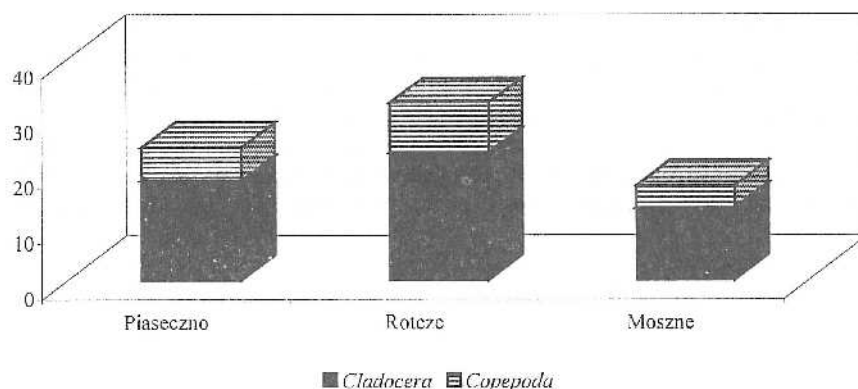


Fig. 1. Number of zooplankton species in the studied lakes

Rys. 1. Liczba gatunków zooplanktonu stwierdzonych w badanych jeziorach

The mean abundance of crustacean zooplankton reached the highest value in Lake Rotcze ($403 \text{ ind.} \cdot \text{dm}^{-3}$) and the smallest one in lake Moszne ($134 \text{ ind.} \cdot \text{dm}^{-3}$). The abundance dynamic was changeable in time in each of the studied lakes. In Rotcze and Moszne the highest number of *Crustacea* occurred in summer, while in Piaseczno – in spring. Both in Piaseczno and Moszne *Copepoda* was the dominant group, whilst in Rotcze *Cladocera* predominated in every season (Fig. 2). Zonal distribution of crustacean zooplankton was clearly noticeable only in Lake Piaseczno, where the number of crustaceans was lowest in littoral and consequently increased in sublittoral and pelagial. In lakes Rotcze and Moszne the abundance distribution in pelagic zone was negligibly lower comparing to the littoral.

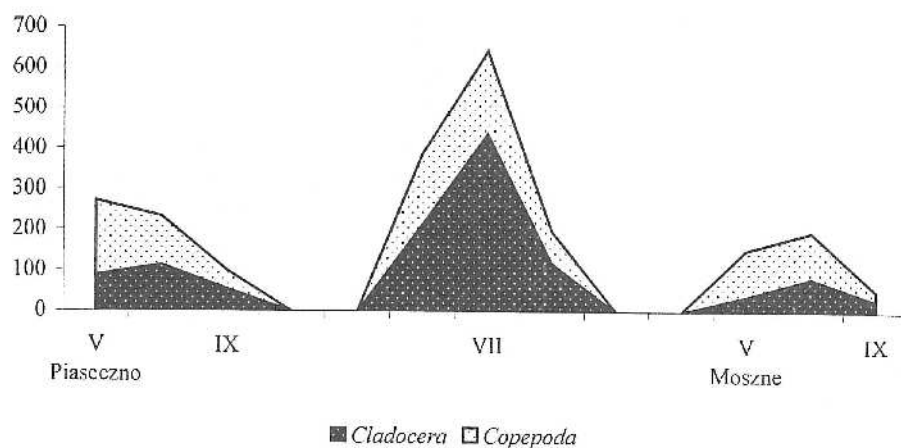


Fig. 2. Seasonal changes of crustaceans abundance in the studied lakes
Rys. 2. Sezonowe zmiany liczebności skorupiaków planktonowych w badanych jeziorach

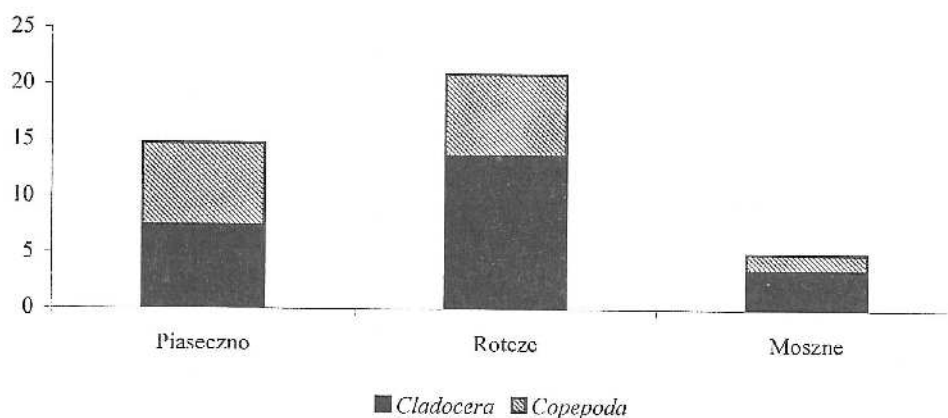


Fig. 3. Average biomass of crustacean plankton in the studied lakes
Rys. 3. Średnia biomasa skorupiaków planktonowych w badanych jeziorach

There was great differentiation in terms of the predominating species, especially in the group of *Cladocera*. In Lake Piaseczno 4 species of cladocerans were regarded as dominants: *Diaphanosoma brachyurum*, *Bosmina coregoni*, *Daphnia cucullata* and *Bosmina longirostris*. In Lake Rotcze predominated: *Ceriodaphnia quadrangula*, *Bosmina longirostris*, *Diaphanosoma brachyurum* and *Chydorus sphaericus*. In lake Moszne the most numerous were *Bosmina longirostris*, *Chydorus sphaericus* and *Bosmina coregoni*. Among copepods, in all the reservoirs the dominant group was formed by two minor species: *Eudiaptomus graciloides* and *Mesocyclops leuckarti*. That assembly was completed by *Eucyclops serrulatus* in Lake Rotcze and *Thermocyclops oithonoides* in Lake Moszne.

Table 1. Species composition of crustaceans in particular biotic zones of three lakes:
Piaseczno, Rotcze, Moszne

Tabela 1. Skład gatunkowy skorupiaków w poszczególnych strefach biotycznych
jezior Piaseczno, Rotcze, Moszne

Species – Gatunek	Piaseczno			Rotcze		Moszne	
	Littoral	Sublittoral	Pelagial	Littoral	Pelagial	Littoral	Pelagial
Cladocera							
<i>Acroperus harpae</i>	+	+		+	+	+	
<i>Alona affinis</i>	+			+	+	+	+
<i>Alona costata</i>				+	+		
<i>Alona guttata</i>	+				+	+	
<i>Alonella excisa</i>				+	+		
<i>Alonella excigua</i>	+				+		
<i>Alona quadrangularis</i>				+	+	+	+
<i>Alonella nana</i>				+	+	+	
<i>Acroperus elongatus</i>	+						
<i>Bosmina coregoni</i>	+	+	+	+	+	+	+
<i>Bosmina longirostris</i>	+	+	+	+	+	+	+
<i>Camptocercus rectirostris</i>				+	+		
<i>Ceriodaphnia quadrangula</i>	+	+	+	+	+	+	
<i>Chydorus sphaericus</i>	+	+	+	+	+	+	+
<i>Daphnia cucullata</i>	+	+	+	+	+	+	
<i>Daphnia longispina</i>		+	+	+	+		
<i>Daphnia pulex</i>							
<i>Diaphanosoma brachyurum</i>	+	+	+	+	+	+	+
<i>Disparalona rostrata</i>				+			
<i>Graptoleberis testudinaria</i>				+	+		+
<i>Leydygia acanthocercoides</i>			+				
<i>Monospilus dispar</i>	+						
<i>Oxyurella tenuicaudis</i>				+			
<i>Pleuroxus aduncus</i>	+		+	+	+		
<i>Pleuroxus truncatus</i>				+			
<i>Polyphemus pediculus</i>	+	+		+	+		
<i>Rhynchotalona falcata</i>	+						
<i>Sida crystallina</i>						+	
<i>Scapholeberis mucronata</i>				+			
Copepoda							
<i>Acanthocyclops viridis</i>					+		
<i>Cyclops abyssorum</i>		+	+				
<i>Ectocyclops phaleratus</i>	+	+					
<i>Eucyclops macruioides</i>					+		
<i>Eucyclops macrurus</i>				+			
<i>Eucyclops serrulatus</i>				+	+	+	
<i>Macrocyclus albidus</i>					+		
<i>Megacyclops viridis</i>		+					
<i>Mesocyclops leuckarti</i>	+	+	+	+	+	+	+
<i>Thermocyclops crassus</i>				+			
<i>Thermocyclops oithonoides</i>	+	+	+	+	+	+	+
<i>Eudiaptomus graciloides</i>	+	+	+	+	+	+	+

The crustacean biomass, similarly to the abundance, obtained the highest values in Lake Rotcze and the lowest in Lake Moszne (Fig. 3). In each of the studied lakes cladocerans had a greater part in its formation.

CONCLUSIONS

1. The lowest abundance of crustaceans was noted in dystrophic lake and the highest in eutrophic reservoir. That confirms the results obtained by other authors as it was found that the abundance of zooplankton rises with the increasing of trophic status [Holopainen *et al.* 1996, Karjalainen *et al.* 1999].

2. The highest numbers of both *Cladocera* and *Copepoda* species were in samples from the summer period. Especially low number of crustaceans taxa occurred in mesotrophic lake. In eutrophic lake the highest number of taxa as well as appreciable stability of their species composition all over the year were found.

3. Zonal distribution of crustaceans was only seen in Lake Piaseczno. It probably resulted from the fact that only in Piaseczno it is feasible to distinguish typical littoral, pelagic zone and sublittoral as a transition zone between them. It is connected with the lake's depth, because both shallow Lake Rotcze (max. depth 3.4 m) and Lake Moszne (max. depth about 1 m) are almost in all covered by macrophytes [Sugier and Popiołek 1998, Sugier and Lorens 2002]. Thus, it is very difficult to discriminate distinct biotic zones in these lakes.

4. Predominating species of *Cladocera* and *Copepoda* living in the studied lakes belong to the ubiquitous complex with a tendency to exist in water bodies of heightened trophy [Karabin 1985]. Taking into consideration the tolerance for changes of pH, most of the taxa are eurybiontic species. It is especially striking that no acidophilic species were observed in dystrophic lake Moszne.

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ZRÓŻNICOWANIE ZESPOŁÓW SKORUPIAKÓW PLANKTONOWYCH
(*CLADOCERA*, *COPEPODA*) W JEZIORACH O RÓŻNEJ TROFII

Streszczenie. Badania prowadzono w 2002 roku. Próby pobierano w maju, lipcu i wrześniu w trzech jeziorach o różnej głębokości i zróżnicowanym statusie troficznym: meztroficznym jeziorze Piaseczno (głębokość maksymalna 38 m), eutroficznym jeziorze Rotecze (3,4 m) oraz dystroficznym jeziorze Moszne (ok. 1 m).

W zebranych materiale występowało 29 gatunków wioślarek i 12 gatunków widłonogów. Skład gatunkowy oraz dynamika liczebności planktonu skorupiakowego były zależne od warunków środowiskowych w badanych jeziorach. Bogactwo gatunkowe kształtowało się wprost proporcjonalnie do liczebności i biomasy, gdyż zarówno największą liczbę gatunków, jak i najwyższe wartości liczebności i biomasy stwierdzono w eutroficznym jeziorze Rotecze, najniższą – w dystroficznym jeziorze Moszne. Dominującą grupą taksonomiczną w jeziorze Rotecze były wioślarki, natomiast w jeziorach Piaseczno i Rotecze – widłonogi.

Słowa kluczowe: *Cladocera*, *Copepoda*, jezioro, trofia