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INFLUENCE OF HYDROTECHNICAL WORKS ON CADDISFLIES (*TRICHOPTERA*) AS EXEMPLIFIED BY "ECHO" PONDS IN THE ROZTOCZAŃSKI NATIONAL PARK*

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A b s t r a c t. The paper presents the results of studies on caddisflies of "Echo" ponds in the Roztoczański National Park, before and after their reconstruction in 2002-2004. On the basis of species composition, total numbers and four indices, the following conclusions are given: the caddisfly fauna has been changing its character – small water body species are replaced by lacustrine ones; the number of species has been fluctuating significantly and the process of recolonization of three taxa has been also observed. Species diversity has been decreasing, however, the state of fauna from the last year of studies can be treated as an initial lacustrine stage and next species typical of lake may be expected.

K e y w o r d s: caddisfly, Trichoptera, "Echo" ponds, hydrotechnical works, national park

INTRODUCTION

Very little is known about caddisflies inhabiting fish ponds in Poland. These particular biotopes controlled by humans seem to be underrated by scientists dealing with the biodiversity value of macroinvertebrates. The caddisfly assemblages of Polish lakes and rivers are mostly widely recognised, contrary to the pond ones. Even less is known about the influence of management practices on larval caddisflies. This paper presents the changes of caddisfly fauna of the biggest pond complex called "Echo", situated within the Roztoczański National Park, before and after its reconstruction in the years 2002-2004.

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MATERIAL AND METHODS

"Echo" ponds, established in 1934, cover a total area of 398,696.3 m². They are supplied by the river Świerszcz whose waters flow to the ponds by the inflow canal. The pond outflow canal carries waters to the same river [8]. Initially, the complex comprised 8 water bodies. In 2003 the reconstruction of the complex was started: the aim of the project is the reduction of the water bodies to the number of 4. During the hydrotechnical works, a large area of aquatic plants has been destroyed. This referred especially to helophytes like *Phragmites australis*, *Glyceria maxima*, *Carex gracilis* and *Typha angustifolia* beds.

Caddisfly samples were taken in the years 2002-2004, once a month form March to October. Larvae as well as imagines were caught at study sites (along shore lines) situated in the northern part of the complex: in 2002 this part covered two water bodies, in the next year they were turned into one large pond. The remaining ponds were omitted during the studies because they did not support water for the whole research period. Larvae were collected with a hydrobiological sample as well as picked up from emerged plants, stones etc., imagines – with an entomological net.

The changes of caddisfly fauna as well as the process of recolonization of the large pond were studied. The following indices were calculated in order to compare the situation before and after the hydrotechnical works: dominance (the classes in structures of dominance were used according to Biesiadka [1]), Hurlbert`s index [5], and biocenosis naturalness indices – Wns and Wni [4,6].

RESULTS

The total number of caddisfly species collected in the area of "Echo" ponds within the whole research period was 11 (Tab. 1), the number of specimens was 153. Particular numbers of species (or taxa as well) were clearly fluctuating – the highest number was recorded in the first year of the studies, before the reconstruction of the pond complex. After creating one large pond and destroying aquatic vegetation in 2003, the number of caddisflies dramatically decreased – the species associated with helophytes disappeared as first. However, Euro-Siberian *Limnephilus subcentralis*, the species associated with weedy lochs and ponds, was found for the first time. One year later, when the conditions of this pond had stabilized, the number of species started to increase again. Three taxa: *Agrypnia pagetana*, *Oecetis furva* and Ceraclea sp. reoccurred after the break of absence. At the same time *Leptocerus tineiformis* was a new species for the study area. During the three-year studies only two limnobionts – *Mystacides longicornis* and *Triaenodes bicolor* – turned out to be a stable ecological element of the whole complex. Species composition and numbers of the occurrence showed that caddisfly fauna had changed its character to the lacustrine direction.

Table 1. Trichoptera of „Echo" ponds in the Roztoczański National Park – the changes within three-year studies. The genera Limnephilus marked with * indicates that collected specimens may belong to four species: *Limnephilus flavicornis*, *L. marmoratus*, *L. politus* or *L. rhombicus*

No.	Species/taxon	2002	2003	2004
1	*Agrypnia pagetana* (Curtis, 1835)	●		●
2	*Limnephilus decipiens* (Kolenati, 1848)	●	●	
3	*Limnephilus politus* (McLachlan, 1865)	●		
4	*Limnephilus subcentralis* (Brauer, 1857)		●	●
	Limnephilus sp.*	●		
5	*Triaenodes bicolor* (Curtis, 1834)	●	●	●
	Ceraclea sp.	●		●
6	*Mystacides longicornis* (Linnaeus, 1758)	●	●	●
7	*Mystacides nigra* (Linnaeus, 1758)	●		
8	*Leptocerus tineiformis* (Curtis, 1834)			●
9	*Oecetis furva* (Rambur, 1842)	●		●
10	*Oecetis lacustris* (Pictet, 1834)	●		
Sum of species (taxa)		8(10)	4	6(7)
Wns Index		15	12.25	12.16
Wni Index		16	15.66	15.16
Hurlbert's Index		0.8	0.55	0.47

The representatives of particular dominance classes were calculated for every year. In the first year the eudominants included: *Mystacides longicornis*, *M. nigra* and *Triaenodes bicolor*; in 2003 – *M. longicornis* and *Limnephilus decipiens*; in 2004 – *M. longicornis* and *T. bicolor*. These are typical lacustrine species, associated with vegetation zones or muddy substratum. Dominants were present only in 2002: *Agrypnia pagetana* and *Limnephilus decipiens*. In 2002 the subdominants included – *Limnephilus politus*, *Oecetis furva* and *O. lacustris*; in 2003 – *L. subcentralis*, *T. bicolor*; in 2004 – *O. furva* only. The remaining species belonged to recedents.

Wns Index reached the highest value in 2002 and clearly decreased in the two following years. The values of Wni Index were high and rather stable. PIE changed significantly and it ranged from 0.8 to 0.47.

DISCUSSION

In several European countries ponds are regarded as very precious habitats supporting the greatest number of invertebrate species [7]. The results presented in the paper indicate that caddisfly fauna of ponds can be a sensitive indicator of changes of the environment caused, in this case, by hydrotechnical works. Briers and Biggs [2] suggest that caddisfly families *Limnephilidae*, *Leptoceridae* and *Polycentropodidae* are good indicators of the conservation of ponds. In the studied area the two first families were represented abundantly. However, the number of species recorded during the three-year studies within "Echo" ponds was not very high but it was comparable to the fauna of similar ponds situated in Roztocze

(author's unpublished data). The value of Hurlbert`s Index recorded in the first year of studies was the highest, when the share of small water body species and lacustrine ones was almost balanced. The decrease in the index value was due to the fusion of two ponds. In 2004 the index value was still low because a half of the species occurred as single specimen which can be connected with the beginning of the creation of a new lacustrine caddisfly assemblage.

The reconstruction of the complex may have different influences on caddisflies: on the one hand there was a negative loss of small water body species, inhabiting shallow shores with warm water and different type of vegetation. The main cause of such state was the destruction of helophytes – the place of feeding and building larval cases of caddisflies. Typical lacustrine species are rather associated with elodeid and nympheid zones which are more resistant to hydrological works. The decreasing values of Wns and Wni Indices reflect this phenomenon, nevertheless, the present situation of the fauna should be treated as an initial stage.

On the other hand, "Echo" ponds have just started to support lacustrine fauna according to the aim of the reconstruction and it can be evaluated in two ways: quasi-lake complex may play an important role in Roztocze – the region which is naturally lake-free. From this point of view the populations of lacustrine species should be treated with proper care and all hydrotechnical works should be seriously well-thought-out. The species belonging to eudominants represent lacustrine elements; some of them can be also found on the shores of small stagnant water bodies in dense vegetation. All of them are common and typical of Polish lakes [3].

CONCLUSION

The caddisfly fauna of "Echo" ponds has been changing its character after the hydrological works – small water body species are replaced by lacustrine ones, the number of species has been fluctuating significantly, and the process of recolonization has been also observed. Despite the decrease in calculated indices reflecting lower species diversity and fauna naturalness, the conservation value of the complex still remains high, especially for the Roztocze region.

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WPŁYW ZABIEGÓW HYDROTECHNICZNYCH NA CHRUŚCIKI (*TRICHOPTERA*) NA PRZYKŁADZIE STAWÓW „ECHO" W ROZTOCZAŃSKIM PARKU NARODOWYM

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S t r e s z c z e n i e. Badania chruścików stawów „Echo" w latach 2002-2004 pozwoliły na prześledzenie wpływu zabiegów hydrotechnicznych na skład gatunkowy i liczebność tej grupy owadów. Wskaźniki naturalności biocenoz oraz Hurlberta były punktem wyjściowym do analizy stanu fauny przed i po przebudowie kompleksu. Gatunki drobnozbiornikowe zostały wyparte przez typowo jeziorne, różnorodność gatunkowa spadła, podobnie jak wskaźniki naturalności biocenoz, co było spowodowane przez przekształcenia misy stawowej oraz zniszczenie dużej części roślinności wodnej przybrzeżnej. Mimo to, fauna badanych stawów jest cenna ze względu na naturalny brak jezior na terenie Roztocza.

S ł o w a k l u c z o w e: chruściki, Trichoptera, stawy „Echo", zabiegi hydrotechniczne, park narodowy