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SPECIES DIVERSITY OF THE CADDISFLIES (*TRICHOPTERA*) IN THE LEFT-BANK RIVER BUG VALLEY

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Summary. The River Bug, the largest non-regulated Polish river, as well as varied types of aquatic habitats situated in its valley, have not been the subject of trichopterological research. In the years 2001-2003 the research on caddisflies of this area (209 km of the river course between Gołębie and Włodawa) was conducted. 47 species were found to occur of which three are redlisted and 9 are new to the Lublin province. Species composition, habitat distribution and two-way migrations between the waters of the river and the remaining aquatic habitats (in case of imagines – also terrestrial ones) confirm the idea of the ecological corridor of the River Bug valley – the area which is regarded as the route for species migrations and the mainstay for faunal biodiversity.

Key words: the River Bug valley, caddisflies, *Trichoptera*

INTRODUCTION

Many trichopterological studies were carried out in the streams and rivers of Poland but mainly in submountain or mountain areas. Only a few papers present caddisfly aspect of lowland riverine habitats [Mejbaum 1955, Wielgosz 1979, Kopytek and Majecki 1986, Czachorowski 1988, Czachorowski *et al.* 1993, Raczyńska *et al.* 2000] but none refers to the largest Polish rivers like Bug, Wisła or Odra. The only data concerning caddisflies of the rivers Wisła and Odra, among other invertebrates, come from two summary papers but it is of quite a fragmentary character [Kownacki 1999, Schöll 2003].

The River Bug valley represents a unique and rare type of European biotope: natural, meandering river with minor changes of its valley [Dombrowski *et al.* 2002]. Consequently, the whole valley with varied aquatic and terrestrial habitats within, plays an important role in biota preservation. Such an important area has been protected by much legal protection or declaration. Seven „functional areas", e.g. The Bug River Euroregion or Pan-European Ecological Corridor have been established up to date in order to help manage the natural resources of this exclusive habitat [Dombrowski *et al.* 2002]. At the same time only a few groups of plants and animals have been studied within this region so far. The aim of this paper is to present the first list of caddisflies for the River Bug valley with some preliminary notes on the relationships between species inhabiting the

main watercourse and other water bodies within the valley. Detailed ecological characteristics and longitudinal distribution of caddisfly larvae of this area will be published in a separate paper.

STUDY SITE, MATERIAL AND METHODS

The trichopterological studies of the River Bug valley were conducted in the years 2002-2003, sporadically in 2001. The examined non-regulated trans-boundary reach of 209 km (together with the valley) ranges from Gołębie to Włodawa – that is 185-394 km of the whole course of the river. In geographical division this part of the reach flows through the Wołyń Upland and then through Polesie Wołyńskie [Kondracki 2002]. The river valley is of 1.74 km width, flood terrace – 3 km [Michalczyk and Wilgat 1998]. Lots of aged oxbows, flooded terraces used as hay-growing meadows and high flood stages of the river in spring are typical of the examined reach and influence the development of caddisflies.

45 study sites representing 8 following aquatic habitats were researched in the described area: the River Bug (12 localities), its tributaries (3), streams (6), canals and ditches (4), a peat bog water body (1), oxbows (9), a gravel pit (1) and astatic waters (9). They were located in the following places (starting from 185 km of the river): Gołębie, Kryłów, Ślipcze, Gródek, Husynne near Hrubieszów, Strzyżów, Skryhiczyn, Dubienka, Husynne near Dorohusk, Dorohusk, Świerże, Hniszów, Wola Uhruska, Stulno Stare, Zbereże, Wołczyny, Żłobek and Włodawa. Caddisfly larvae were collected with a hydrobiological scoop as well as by hand from submerged plants, stones, branches etc. Imagines were caught with an entomological net and took out from under the protruding bark of old trees growing near the riverbanks.

Dominance classes in estimating the structure of dominance were given after Biesiadka [1980] and PIE Index (species diversity) were calculated according to Hurlbert's formula [Lampert and Sommer 1996].

RESULTS

1629 specimens representing 47 species were found to occur (Tab. 1). It constitutes 17% of Polish caddisfly fauna. In the collected material the eudominants were represented by: *Limnephilus flavicornis*, *Ironoquia dubia*, *Triaenodes bicolor*, dominants – *Anabolia* sp. (*furcata/laevis*), *Hydropsyche bulgaromanorum*, *Athripsodes aterrimus*, subdominants – *Hydropsyche contubernalis*, *Neureclipsis bimaculata*, *Oligostomis reticulata* and *Orthotrichia costalis*. The remaining species were recedents. *Limnephilus flavicornis* and *Anabolia* sp. (*furcata/laevis*) were characterized by the widest habitual spectrum. The numbers of specimens caught in particular habitats are presented in the Table as well as the values of PIE index, which ranged from 0.4-0.84.

The most frequently caught species at 12 study sites marked out in the River Bug were the following: *Anabolia* sp. (*furcata/laevis*) (7 localities), *Neureclipsis bimaculata* (6), *Hydropsyche bulgaromanorum* (5), *Halesus digitatus*, *Brachycentrus subnubilus* and *Limnephilus flavicornis* (4). Except for the last species all of them represent riverine element, while *L. flavicornis* usually inhabits summer dry pools situated in flood terraces

but in the springtime its larvae can be washed down to the river. The remaining species found in the River Bug were present at less than three study sites and they were typical of riverine habitat, temporary pools and – the rarest ones – permanent water bodies (oxbows). In general those species occurred in low numbers.

Hydropsyche bulgaromanorum, *H. modesta* – collected in the River Bug and *Limnephilus fuscinervis* – caught in a peat-bog water body represent species from the Red List of Polish caddisflies [Szczęsny 2002]. 9 species (Tab. 1) are new to the Lublin province.

DISCUSSION

The number of species found in the River Bug valley is fairly large in comparison with other studies of the lowland rivers in Poland [Wielgosz 1979, Kopytek and Majecki 1986]. However, 23 species collected in the river itself is not very high probably due to habitual homogeneity of the examined course (potamal zone). Worth mentioning is the fact of the occurrence of 5 species of the genera *Hydropsyche* with *H. bulgaromanorum* and *H. modesta* regarded as rare in our country. A similar composition of hydropsychids was observed in the River Odra in its lower reaches [Schöll 2003]. Entire species composition of the river is typical of large lowland rivers [Botosaneanu and Malicky 1978]. The most similar river fauna in Poland was found in the lower courses of the River Wisła [Kownacki 1999] and the River Widawka [Kopytek and Majecki 1986].

The most important factors influencing the occurrence of attached organisms like caddisflies in running waters are substrate, flow rate, erosion and deposition, light, temperature and oxygen [Chapman 1996]. In case of large rivers the most important thing for caddisfly larvae seems to be the character of the riverbank and the presence of solid substratum on the bottom like stones, gravel, roots, plants, dead woods and also some artificial structures, e.g. concrete walls. In naturally meandering rivers the bottom material is highly diversified [Żelazko and Popek 2002], therefore different species can be found in varied microhabitats. The conducted research showed that the number of species and specimens were higher at study sites with the bottom of stones or gravel with emerged branches and dead woods (study sites in Gródek, Ślipcze, Gołębie), while the bottom of sand only was inhabited by just a few species (Hniszów, Strzyżów) or even none (Husynne, Dorohusk, Wola Uhruska). This relationship was also observed by Oglęcki *et al.* in the River Wkra [2002] and Czachorowski in the River Pasłęka [1988]. A additional observation in the river showed that even high stands of water can be tolerated by most species if they have available substrates – in those cases emergent dead plants where caddisfly nets and cases were attached.

Caddisflies, with respect of their biology, that is their dependence on water in larval stages and on terrestrial habitats in imaginal ones (especially species that undergo diapause), perfectly indicate the need of protection of a river valley in the aggregate, e.g. as an ecological corridor. The most important function of such corridors is to maintain the migration of plants and animals within as well as the preservation of biota [Oglęcki *et al.* 2002, Wojciechowski 2002]. In the examined area the migration of caddisfly species between the river and the remaining water habitats (and also in the opposite direction) was observed. Astatic water body species, e.g. very numerous *Limnephilus flavicornis*, can get through to the river in spring when river terraces are flooded. In case

Table. 1. Caddisflies (*Trichoptera*) of the River Bug valley
Tabela. 1. Chruściki (*Trichoptera*) doliny Bugu

No	Taxon/taxon – Gatunek/takson	A	B	C	D	E	F	G	H	I	S
1	*Orthotrichia costalis* (Curt.)#						◘				37
2	*Holocentropus picicornis* (Steph.)					◘	◘				10
3	*Ecnomus tenellus* (Ramb.)						◘				6
4	*Neureclipsis bimaculata* (L.)				◘	◘					59
5	*Lype phaeopa* (Steph.)#				◘						1
6	*Hydropsyche angustipennis* Curt.	◘	◘								18
7	*H. bulgaromanorum* Mal.#	◘					◘				123
8	*H. contubernalis* McL.#	◘						◘			64
9	H. modesta *Nav.*#	◘									3
10	*H. pellucidula* (Curt.)	◘									3
	Hydropsyche sp. juv.	◘					◘				12
11	*Agrypnia obsoleta* (Hag.)					◘					1
12	*A. pagetana* Curt.				◘	◘					11
	Agrypnia sp.								◘		1
13	*Oligostomis reticulata* (L.)			◘				◘			40
14	*Trichostegia minor* (Curt.)			◘					◘		9
15	*Phryganea grandis* L.									◘	1
	Phryganea sp.						◘				6
16	*Brachycentrus subnubilus* Curt.	◘									18
17	*Ironoquia dubia* (Steph.)			◘	◘						230
18	*Anabolia laevis* (Zett.)	◘					◘				2
	Anabolia sp. (*furcata/laevis*)	◘	◘	◘	◘		◘				152
19	*Grammotaulius nigropunctatus* (Retz.) #			◘	◘				◘	◘	7
20	*G. nitidus* (Muell.)#			◘					◘		2
21	*Glyphotaelius pellucidus* (Retz.)			◘	◘		◘	◘			7
22	*Limnephilus bipunctatus* Curt.							◘			1
23	*L. coenosus* Curt.#								◘		23
24	*L. decipiens* (Kol.)					◘					3
25	*L. extricatus* McL.			◘					◘		3
26	*L. flavicornis* (Fabr.)	◘	◘	◘	◘	◘	◘	◘	◘	◘	256
27	*L. fuscicornis* Ramb.	◘									6
28	*L. fuscinervis* (Zett.)					◘					5
29	*L. griseus* (L.)							◘	◘	◘	13
30	*L. ignavus* McL.			◘					◘		2
31	*L. lunatus* Curt.	◘	◘		◘			◘			28
32	*L. nigriceps* (Zett.)					◘	◘		◘		16
33	*L. politus* McL.					◘	◘				2
34	*L. rhombicus* (L.)	◘		◘	◘		◘				8
35	*L. stigma* Curt.					◘			◘		11
36	*L. subcentralis* Brau.					◘	◘				4
	*Limnephilidae**		◘	◘	◘	◘			◘		74
	Limnephilidae non det.	◘	◘		◘	◘	◘		◘		15
38	*Chaetopteryx villosa* (Fabr.)				◘						1
39	*Halesus digitatus* (Schrank)	◘			◘						14

contd tab. 1.

40	*H. tesselatus* (Ramb.)	◘								◘	7
	Halesus sp.	◘									1
41	*Triaenodes bicolor* (Curt.)					◘	◘				169
42	*Mystacides longicornis* (L.)						◘				1
43	*M. nigra* (L.)	◘					◘				7
	Mystacides sp.						◘				4
44	*Athripsodes aterrimus* (Steph.)				◘		◘				113
45	Ceraclea dissimilis *(Steph)* #	◘									9
	Ceraclea sp.						◘				1
46	*Leptocerus tineiformis* Curt.	◘					◘				13
47	*Oecetis furva* (Ramb.)					◘					1
Sum of specimens – Suma okazów: A – 457, B – 36, C – 270, D – 119, E – 223, F – 325, G – 14, H – 176, I – 9, S – 1629.											
PIE Index: A – 0,82; B – 0,7; C – 0,4; D – 0,84; E – 0,65; F – 0,78; G – 0,7; H – 0,71.											

A – the River Bug, B – tributaries of the River Bug, C – streams, D – canals and ditches, E – the peat bog water body, F – oxbows, G – the gravel pit, H – astatic waters, I – imagines, S – sum of specimens. # – new to the Lublin province, *species of the genera *Limnephilus* (*flavicornis*, *marmoratus*, *politus* or *rhombicus*)

A – Bug, B – dopływy Bugu, C – strumienie, D – kanały i rowy, E – zbiornik torfowiskowy, F – starorzecza, G – żwirownia, H – wody astatyczne, I – imagines, S – suma osobników, # – nowy dla Lubelszczyzny, *gatunki z rodzaju *Limnephilus* (*flavicornis*, *marmoratus*, *politus* lub *rhombicus*)

where the topographic features of the valley exclude the contact between flowing and stagnant waters, the presence of *L. flavicornis* in the river Bug was the result of inhabiting lentic habitats by this species (females lay eggs in such habitats and larvae can undergo the whole life cycle). However, the presence of limnobionts in the river was particularly clear at the study sites where there were some permanent water bodies in open landscape, mainly oxbows. The oxbows of the River Bug are refuge areas for lacustrine caddisfly species in case where there are no lakes in the river valley. The opposite direction of migration was found on the example of two rheophilous species – *Hydropsyche bulgaromanorum* found in the oxbow in Dubienka and *H. contubernalis* found in gravel pit in Gródek. Those migrations confirm an important role of the transitional zone (ecotone) between the river and the land, treated as ecological continuum from the aquatic zone to the flood plain [Chapman 1996]. The values of PIE Index shows that in the examined area all types of habitats (except for streams) are almost equally important for the development of caddisflies and they constitute one integrated system. Degradation or destruction of one of the components of the transitional zone would lead to the impoverishment in the species diversity of caddisflies. The relationship between aquatic and terrestrial zone of the river also plays an important role for *Trichoptera* – the forest communities at the riverbanks give shelter to diapausing species during the summertime. To sum up, for the maintenance of the highest number of species, not only caddisflies, the reasonable management of the River Bug valley must consider all types of natural habitats.

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ZRÓŻNICOWANIE GATUNKOWE CHRUŚCIKÓW (*TRICHOPTERA*) ZASIEDLAJĄCYCH LEWOBRZEŻNĄ DOLINĘ BUGU

Streszczenie. Bug, największa nieuregulowana rzeka na terenie Polski, jak również różnorodne siedliska wodne położone w jej dolinie nie były dotychczas przedmiotem badań trichopterologicznych. W latach 2001-2003 badano chruściki doliny Bugu na 209 km odcinku biegu rzeki między Gołębiami a Włodawą. Stwierdzono występowanie 47 gatunków, z których trzy znajdują się na czerwonej liście chruścików Polski, zaś 9 to gatunki nowe dla Lubelszczyzny. Skład gatunkowy, rozmieszczenie siedliskowe oraz dwukierunkowe migracje *Trichoptera* pomiędzy wodami Bugu a pozostałymi siedliskami wodnymi w jego dolinie (w przypadku imagines także lądowymi) potwierdzają ideę istnienia korytarza ekologicznego doliny Bugu – obszaru stanowiącego trasę migracji gatunkowej i umożliwiającego utrzymanie wysokiej różnorodności biologicznej trichopterofauny.

Słowa kluczowe: rzeka Bug, chruściki, *Trichoptera*