

Seasonal malacological investigations on the willow forest fauna (Csigáserdő) on the active flood plain of the Fekete-Körös River near Dénesmajor.

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Abstract

The occurrence of *Chilostoma banatica* (ROSSMÄSSLER 1838) in the regions with an annual precipitation of 540-640 mm on the Great Hungarian Plains can be explained by the fluvial transport of the Körös Rivers. Former and present seasonal distribution of the species were investigated in the willow forests of the active flood plain at Dénesmajor between 1996-1999.

Zusammenfassung

Das Vorkommen von *Chilostoma banatica* (ROSSMÄSSLER 1838) in Gebieten mit einem jährlichen Niederschlag von 540 bis 640 mm in der Großen Ungarischen Tiefebene kann mit dem Transport durch die Flüsse Fekete-Körös und Sebes-Körös erklärt werden. Die frühere und jetzige saisonale Verteilung der Art in den Weidenwäldern der Überschwemmungsgebiete bei Dénesmajor wurden in den Jahren 1996 bis 1999 untersucht.

Introduction

As a result of fluvial transport of the rivers draining into the area of the Great Hungarian Plains more and more localities could be found in the marginal parts of the Great Plains, where the zoo- geographically dazic-podolic (9.5) *Chilostoma* species appeared. These places have relatively high average annual precipitation (BÁBA 1970, 1979 a und b, 1980 a und b, 1983, DOMOKOS 1987). Besides *Chilostoma* an additional 47 species of floodtransported origin could be found on the active flood plains of Hungarian rivers (BÁBA 1982, 1992), primarily Carpathian elements (9.1 Carpathian, 9.2 Carpatho-Sudetic, 9.3 Carpatho-Baltic, 9.4 Alpine-Carpathian). Seasonal distributions of the species along with possible causes in the changes of these were examined in detail.

Material and methods

Collections were made in the willow forests (*Salicetum albae fragilis*) on the active flood plain of the Fekete-Körös River near Dénesmajor between 1996 and 1999 by the classical square sampling technique (10x25x25 cm). In the years of 1997-1998 an annual three, while in 1999 an annual two and in 1996 an annual one sampling were carried out (Table 1). Faunal elements were classified on the basis of LOZEK's (1965) habitat types (Fig. 1.), FRÖMMING's (1954) feeding types (Fig. 2) and BÁBA's (1982) zoogeographical faunal distribution types (distribution of continental and sub Atlantic faunas Fig. 3 and distribution of certain faunas Fig. 4).

Furthermore, the number of *Chilostoma* individuals and constant percent distributions were also investigated (Fig. 5). Based on data collected by the Körös-Vidéki Vízügyi Igazgatóság (Körös Area Hydrological Survey) under the technical leadership of Mr. ATTILA KISS the number of individuals was compared to rates of monthly and annual rainfall and temperatures for the years between 1997 and 1999 (Fig. 6).

Monthly data of certain years were investigated by multivariate analysis (PCO) utilizing the program Princoor (PCOA) (PODANI 1988).

Former known occurrences of the species *Chilostoma*.

According to SOÓS (1943) the general areas of occurrence for this species are the southern, southwestern parts of Transylvania extending from the county of Maramures to Mehadia, widely distributed in the Eastern Carpathians. Some parts of this latter area extend towards the lowlands to Oradea and Arad as well. KORMOS collected specimens of the species in Vocarica, Slavonia. GROSSU (1955) mentions it from the Bucegi Mts., Retezat, and the surroundings of Arad and the Apuseni Mts. In 1983 he added the area of the Tibles Mts. in Northern Transylvania to the places of occurrence of this species placing the geographical center of distribution into the region of the Banat. BÁBA & KOVÁCS (1975) mentioned that the species generally occurs in the Eastern Carpathians as well. BÁBA (1980) found specimens of the species at Királyhágó (Bucea) and the Valley of Vodu Crisului. Further specimens were found by BÁBA (1980) in the forests of Arad-Csála, by BÁBA & KONDOROSI (1995) in the forests of Csála and Pécska near the Mures River. DOMOKOS (1987) mentioned 9 localities of the species from Romania along the banks of the Fekete-Körös and Sebes-Körös Rivers (Menyháza-Mones, Biharkristyár-Christior de Jos, Felsőgirda-Girda de Sus, Csordavár-Padis, Mézged-Valea Meziad, Biharfüred- Valea Ladulni, Nagyvárad-Püspökfürdő- Baile 1 Mai, Lankás-Valea Vida, Felsőbánya-Baia Sprie: Magosa). BÁBA & SÁRKÁNY-KISS (1999) found 9 new occurrences along the Somes River: Gilan Mountain: Bazerul Somesului (Somesul Cold): Alnetum incanae-Petisetetum albae, Somesul Mic (Cley.): Salicetum albae fragilis. Further localities are the surroundings of Talita Creek, Tibles Mts. and the banks of the left affluent creek of Somes River, the Agrij Creek in the Salicetum albae fragilis. DOMOKOS (1987) mentions it from the Southern Carpathians as well.

J. WAGNER found specimens of the species in 1941 in the Gutin Mts. Further specimens were collected by BÁBA in 1997 on Rozsály Hill. DELI & al. (1985) mention it from the Avas Mts. in the Eastern Carpathians and at Huszt (in the Ukraine).

Among the Hungarian localities the first mentioned in literature (BÁBA 1969) was Bagisziget near Vásárosnamény. Newer specimens were found on the Szatmár-Bereg Lowlands in the Szabó willows near Tiszabecs by FINTHA & al. (1993) and DELI & al. (1994, 1996). Due to active deforestation in the area this species became extinct there. Further specimens were collected from the alluvium near Szeged by CZÓGLER (1935) and CZÓGLER & ROTARIDES (1938). Living specimens were collected at the inlet of the Maros River to the Tisza at Szeged by ANDOR HORVÁTH and KÁROLY BÁBA in the 1970s and 1980s. BÁBA found additional specimens in 1986 in the alluvial forests of Makó and the gallery forests of Makó-Landor. Annual investigations of these latter localities were made in cooperation with TAMÁS DOMOKOS (BÁBA & DOMOKOS 1992). Based on proposals by K. BÁBA and B. GASKÓ the area of the Landor forest is highly protected now. BÁBA made proposals for the protection of this species in 1979. Full protection of the species was established in 1990 (RAKONCZAY 1990, RED BOOK AND MAGYAR KÖZLÖNY 1993). DOMOKOS made investigations with regards to climate preference and size distribution of the species in the areas of Bagisziget and Landor in 1987 and 1992. Size distributional parameters were investigated in the area of Szabó Willows near Tiszabecs by FINTHA & al. in 1993 as well. DOMOKOS collected specimens of the species from two localities in the Békés county: Gyulavár-Mályvád: Sitkaierdő (Sitkai forest) and Csigáserdő (Csigás forest) near Gyulavár. Both localities were proposed for protection however only the latter was placed under it only in 1994 as the former has been cut down.

In 1972 Béla Gaskó collected specimens of the species from soil traps placed into the old willow forests bordering the village of Deszk near the Maros River. This forest has been cut down as well. Further specimens were found in soil traps at Vetyehát (Bába-Gaskó) in Salicetum albae fragilis-Populus canescens flora, in the meadow protecting the mixed forest

belt of Magyarcsanád and Nagylak, in the mixed deciduous forests and the Cynodonti-Poetum flora of the dam of Ferencszállás, from *Salicetum albae fragilis* and *Popeletum albae* flora at Klárafalva. An additional four localities with *Salicetum albae fragilis* are mentioned near Kiszombor between the national border and the village of Ferencszállás (GASKÓ 1999).

Fossil occurrences of this species were analysed by DOMOKOS (1986,1987) for the area of the Békés County along the Körös Rivers in the Great Plains. Intensive river control activities and the creation of agricultural areas and ploughlands in the deforested areas resulted in the disappearance of the species from several localities.

Distributional conditions

According to investigations of Bagisziget specimens (DOMOKOS 1987) there is a gradual decrease in shell heights and shell widths as a result of increasing continentality of the climate.

Based on climate regional classifications of Kakas among the minor landscape units of the Great Hungarian Plains known localities of the gastropod species *Chilostoma* are restricted to areas having higher annual rates of rainfall such as: Upper Tisza area (602-640 mm), Körös area (540-578mm), Körös-Maros Interfluve (558-580mm) (BÁBA 1996.). Settling and survival of the species reaching the area of the Great Plains by the way of fluvial transport is highly restricted or even made impossible in these areas by certain forestational activities (type preferential cutting, young protectional cutting and total deforestation) (BÁBA 1998.).

Relative humidity is 20% higher in the investigated forests analysed by GASKÓ (1999) than in the barren meadows. These values are always above 60% for the forests even in days of the most drastic droughts.

Collected species

During the cooperative investigations between 1996 and 1999 21 species were collected from the forest areas. At that time we could collect only dead specimens of the species *Laciniaria plicata* (DRAP.1801) formerly found alive in the area by DOMOKOS (1996) in 1995. The species *Chilostoma* can be considered as a constant element of the fauna from the hygrophilous forest dwelling species (HF). Further species include *Vitrea crystallina*, *Bradybaena*, *Limax cinereoniger* and *Limax flavus* collected in 09.1997 and 08.1998 (Table 1). The species *Chilostoma*, *Vitrea* and the two *Limaces* reached the area by way of fluviotransport of the Fekete-Körös River. Dead specimens of *Cepaea* and *Helix lutescens* have been collected. Living specimens of the latter species are restricted to the new plantational areas of the forest. The steppe-dwellers (St) *Monacha* and *Vertigo pygmea* sporadically appear in the forests.

There is an increase in the number of individuals for the years of 1998-99, when the average annual rainfall had the highest values as well (Table 2). Diversity values fluctuate between 2.30 and 3.0 with an increasing tendency for 1998-1999 (Table 1).

Distribution of species groups

Habitat types are characterized by the low percentage of steppe dwellers (St). There was an increase in the percentage of the bush forest dwellers (B) in the year of 1998 and the riparian ubiquists (RU) for the year of 1999. These latter two are in complementary condition displaying complementary changes in the faunal distributions. The 1999 water coverage of the II-III active flood plain for the RU group might have had a role in it as well.

Regarding feeding habitat types the complementary relations of the omnivores (O) and saprophagous species (Sp) should be emphasized. There is a decrease in the saprophagous group with a parallel increase in the omnivores between 1997 and 08.1998. Both groups show an opposite trend in the following years with regard to the previous trends. Only in 07.1999 could a slight increase be traced in the low values of the herbivore (H) group.

There is a similar complementary trend in the cumulative values of the fauna circles as well (Fig.3), with a gradual increase of the continental group. The distribution of dominant species in the certain faunal circles display the following characteristics: among the Sub Atlantic fauna domains there is a gradual decrease in the Adriatic-Mediterranean elements from 1997 following really low values. From the Continental fauna circles the Holarctic (1.4) and East-Siberian (1.1) groups are in a complementary relation. The species *Carychium* and *Bradybaena* belong to the latter one. There is an increase in the percentage of Dacian-Podolian (9.5) elements from 1999 with the species *Chilostoma* as a member of the group.

Correlations of the seasonal distribution values

In a search for the possible causes of differences in the number of individuals, the cumulative averages of precipitation for the mating periods (IV-X months) were compared to the total number of individuals collected in 05.1997, 07.1997, 09.1997, 05. 1998, 08.1998, 10. 1998 and 07-10.1999 paying special attention to values of the species *Chilostoma* for these months (Fig.5). There is a positive correlation between the increasing number of individuals for *Chilostoma* and the increasing rate of precipitation for the examined three years (Fig.5). Correlations between the number and constancy of individuals for *Chilostoma* and monthly cumulative values of rainfall for the years 1997-1999 point to a very decisive role of precipitation (Fig.6) in affecting species numbers and distribution. Clear differences between the distribution of data points on the PCA scatter plot for the year of 1999 with the highest rainfall values and the year 1996 (Table 2) with the lowest rainfall values along with the data points of the years 1997 and 1998 also bearing high rates of precipitation also underlie these previous remarks.

Summary

Collections were made in the willow forests (*Salicetum albae fragilis*) on the active flood plain of river Fekete-Körös near Dénesmajor between 1996 and 1999 using the classical square sampling technique (10x25x25 cm). 21 species were identified with classical montane species such as *Vitrea crystallina*, *Limax flavus*, *Limax cinereoniger* and *Chilostoma banaticum* reaching this area by way of fluvial transport. In the years 1997-1998 an annual three, in 1999 an annual two and in 1996 an annual one seasonal analysis were carried out in the area. There is an increase in the percentage of the bush forest dwellers (B) in the year of 1998 and the riparian ubiquists (RU) for the year 1999 in the investigated area. Regarding feeding habit types the complementary relations of the omnivores (O) and saprophagous species (Sp) should be emphasized. The Continental elements are regarded as dominant species with regard to zoogeography in the location. From the Continental fauna circles the Holarctic (1.4) and East-Siberian (1.1) groups are in a complementary relation.

Similar to previously gained results (DOMOKOS 1987, BÁBA 1996, GASKÓ 1999) the increasing rates of rainfall between 1997 and 1999 induced an increase in the number and constancy of individuals for *Chilostoma* along with the values of total individual numbers. Furthermore seasonal variations in precipitation rates correlate well with seasonal changes marked by the results of seasonal analysis on the PCA scatter plots.

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16	HF	O	1.1	Bradybaena fruticum (O. F. Müller 1774)	13/9	60	24/ 18	90	17/ 15	70	13/11	60	16/ 15	40	10/8	70	24/ 22	80	7	50	44/ 31	80
17	St	H	8	Monacha cartusiana (O. F. Müller 1774)	1/1	10	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	RU	H	1.1	Perforatella rubiginosa (A. Schmidt 1853)	1	10	-	-	-	-	-	-	4/2	40	-	-	-	-	-	-	5	40
19	HF	H	9.5	Chilostoma banaticum (Rossmässler 1838)	5/4	40	7/3	40	11/6	70	9/3	50	13/ 12	70	8/5	60	10/8	60	33	100	10/3	60
20	B	H	3	Cepaea vindobonensis (Ferussac 1821)	+	-	-	-	-	-	+	-	+	100	-	-	-	-	+	-	+	-
21	B	H	5.3	Helix lutescens (Rossmässler 1837)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	-
				number of species	13		10		8		8		10+1		10+1		9		11		14	
				number of individuals	103/ 45		171/ 86		152/ 76		162/ 85		341/ 158		96/ 46		241/ 136		178		793	
				species ticket	5,4		5,0		4,5		4,7		6,2		4,8		5,6		5,1		7,3	
				juvenile in %	44,5		47,7		50,0		52,4		46,3		47,9		56,4				17,4	
				mortality	41,2		34,0		28,9		29,5		26,9		71,0		53,2				56,7	
				bottom plant close in %.	42		62,0		-		31,5		85		78		10		75		68	
				foliage close in %	70		53,0		-		58		63		58		50		78		62	
				relative humidity in %	34,3				38,1		25,4		63,3		66,1		58,1		-		-	
				pH	7,39				7,08		7,06		6,95		7,3		6,71		-		-	
				organic material in %	6,38				5,63		5,06		6,41		6,96		5,82		-		-	
				hygroscopic	2,88				4,05		3,98								-		-	
				CaCO ₃	-				0,2		0,2		1,28		1,07		0,11		-		-	
				diversity	3,00		2,30		2,31		2,41		2,57		2,64		2,48		2,93		2,89	

Table 2: Precipitation, temperature and the flood of the flood area

Precipitation (mm)	Jan.	Febr.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Σmm	April Sept-
1995	42,0	47,0	24,0	56,0	49,0	106,0	67,0	19,0	33,0	3,0	69,0	85,0	500,0	230,
1996	50,7	29,3	17,1	27,1	86,6	42,9	61,2	120,0	109,1	31,6	33,6	54,9	664,1	446,
1997	24,3	14,8	6,3	64,1	46,0	81,2	73,0	46,8	15,6	35,2	14,6	63,3	485,2	326,
1998	31,6	0,2	17,6	65,8	84,3	54,1	90,5	61,6	114,1	60,9	57,1	15,7	653,0	470,
1999	25,9	91,6	19,5	82,4	82,3	127,0	138,8	93,2	33,1	27,6	93,8	107,6	922,8	556,
Mean temperature													Mean temp.	
1995	-1,8	-3,2	5,5	10,3	15,3	18,9	23,0	20,5	15,3	11,2	2,1	0,6	10,18	
1996	-2,4	-2,5	1,0	11,9	19,4	21,7	20,9	20,5	12,4	10,0	6,5	-1,3	9,8	
1997	-2,2	0,7	4,0	6,8	16,6	20,0	20,4	21,0	15,2	7,8	6,0	1,7	9,8	
1998	1,8	3,1	2,1	11,7	16,3	21,8	22,0	20,8	14,9	11,0	2,3	-4,8	10,3	
1999	-0,6	0,0	6,8	11,9	16,4	21,3	22,5	20,3	18,1	11,2	3,1	0,0	10,9	
Flood of the flood area (days)														
1995														
1996														
1997	6-8			23-27			22-23 28-31							
1998											17-19			
1999		12-13, 23-	-12											

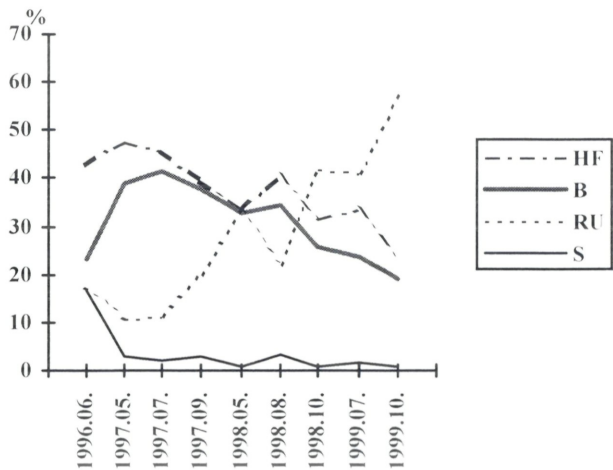


Fig. 1: Distribution of habitat types in the years analysed

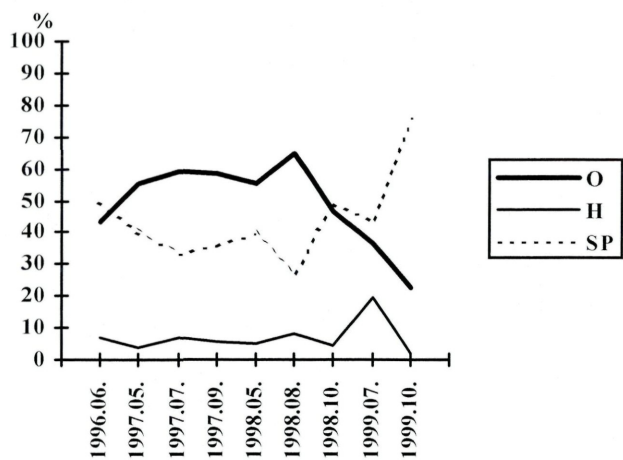


Fig. 2: Distribution of feeding habit types in the years analysed

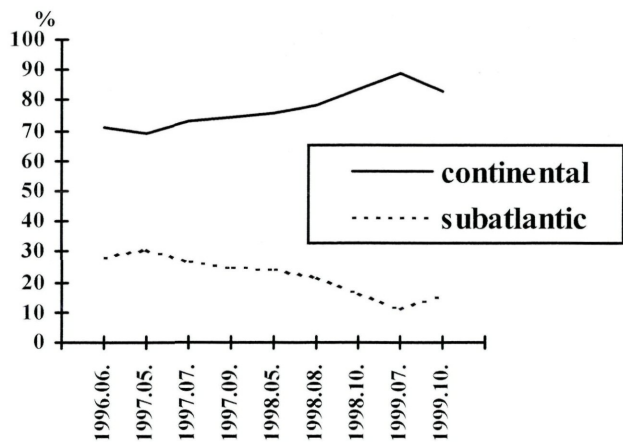


Fig. 3: Cumulative distribution of the Continental and Sub Atlantic faunal domains

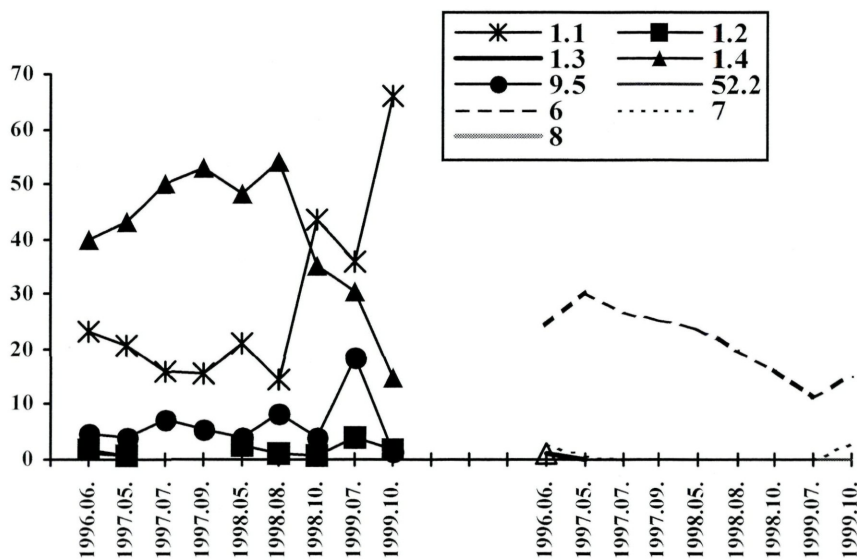


Fig. 4: Separate distribution of the Continental and Sub Atlantic faunal domains

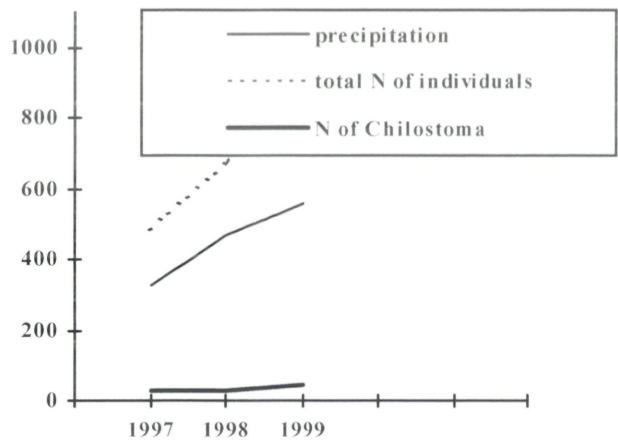


Fig. 5: Variations of the number of individuals and rates of rainfall with regards to seasonal analysis

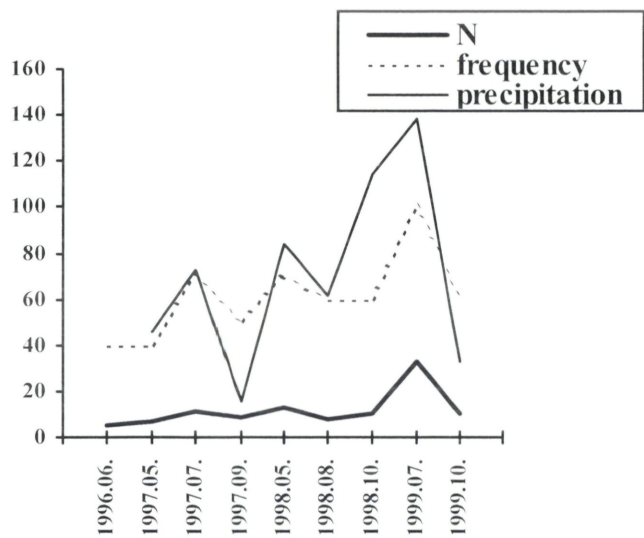


Fig. 6: Correlations between the constancy of individual numbers and variations of monthly precipitation for the species *Chilostoma banaticum*

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Zoologisch-Botanische Datenbank/Zoological-Botanical Database

Digitale Literatur/Digital Literature

Zeitschrift/Journal: [Nachrichtenblatt der Ersten Malakologischen Gesellschaft Vorarlbergs](#)

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