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MOLLUSC THANATOCENOSES IN THE LOWER COURSE OF THE OSAM RIVER (NORTHERN BULGARIA)

STEFAN WITOLD ALEXANDROWICZ

Chair of Stratigraphy and Regional Geology, Academy of Mining and Metallurgy, Mickiewicza 30, 30-059 Kraków, Poland

ABSTRACT: A shell-abounding thanatocenosis was found on the valley floor of the Osam River near Muselievo. It is composed of 42 taxa of land snails and aquatic molluscs. Six species of rheophile water snails, *Lithoglyphus naticoides* (C. Pfeiffer) being the dominant, are the main components of the assemblage, together constituting 57%. Land snails are represented mainly by open-country species, including the most numerous shells of *Helicopsis striata* (O. F. Müller). All the taxa of the thanatocenosis are known from the recent fauna of Bulgaria and adjacent countries. The percentage of particular components corresponds to thanatocenoses deposited in the lower course of the river. The shell material was displaced by the flood flow over a relatively short distance and deposited close to environments inhabited by molluscs. Differences in abundance of some species between the thanatocenosis and the malacocenosis can be explained by differences in the hillwash intensity controlled by local conditions.

KEY WORDS: molluscs, thanatocenosis, fluviatile sediments, Bulgaria

INTRODUCTION

Thanatocenoses composed mainly of empty shells of molluscs and plant remains accumulate within fluviatile sediments during floods. They are deposited on valley floors of streams and rivers, along their beds and on alluvial plains. Snail and bivalve thanatocenoses are usually very rich, composed of many species and abounding in specimens. Such assemblages have been sampled and described for over a hundred years (KOTULA 1882, CLESSIN 1908, 1911, GEYER 1908, CZOGLER & ROTARIDES 1938, ZEISSLER 1963). They provide valuable information on the occurrence and distribution range of particular species, thus supplementing regional faunistic data (KLEMM 1973, KÖRNIG 1987). On the other hand, thanatocenoses are and should be a subject to detailed actualistic studies which are crucial to palaeoenvironmental interpretation of subfossil mollusc assemblages according to methods described by WASMUND (1926) and ALEXANDROWICZ (1987, 1999). Similar studies concerning seeds and fruits collected in recent fluviatile sediments were initiated by PELC (1983) and CABAJ (1993).

The thanatocenosis described here was found in the lowermost course of the Osam River, close to its outlet to the Danube. The river is 314 km long and drains northern slopes of the Stara Planina Mountains in their central part (Fig. 1). The catchment area exceeds 2,800 km^2, enclosing the mountain (21%), upland (37%) and lowland (42%) parts. The slope of the whole valley is 6.9‰, but within the lowland it decreases to 1.8‰; the sinuosity of the river is about 20%. The afforestation of the catchment area is low (25%) and unequal, reaching 55% (mainly beech forest) in the upper course, but only 18% and 7% in the mid and lower course, respectively (mainly oak forest). The mean annual temperature of the surrounding area is +12°C, the total annual rainfall being 500 mm. Cultivated areas and xerothermic habitats are widespread on the upland and the lowland (Fig. 2).

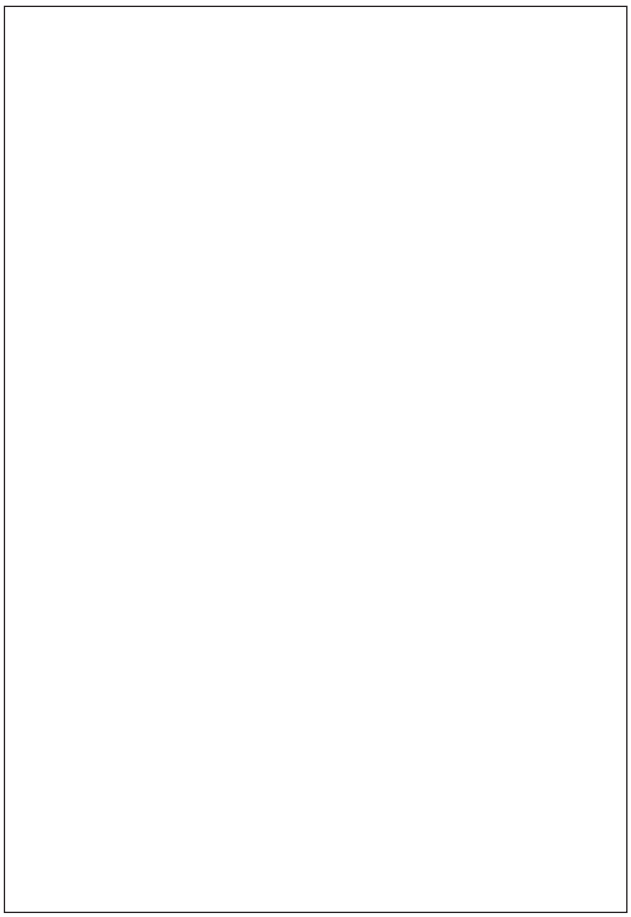

Fig. 1. The catchment area of the Osam River (location map). Ms – Muselievo – the site of the described thanatocenosis, main towns: Lk – Lewskij, Lv – Lovetch, Tr – Trojan; parts of the river course: M – mountains (upper course), U – Upland (mid course), L – lowland (lower course).

Fig. 2. Afforestation of the Osam River catchment area. W – woodland, O – open habitats, A_O – mean afforestation of the catchment area, A_B – mean afforestation of Bulgaria; for further lettering see Fig. 1.

MATERIAL AND METHODS

A sample of flood sediment of ca. 5 kg was collected on the valley floor of the Osam River in Muselievo (Fig. 1). It was composed of plant remains, fragments of wood and branches, empty mollusc shells and anthropogenic components with an admixture of sand and gravel. The thanatocenosis was deposited by a late spring flood flow on the point bar, as a meander scroll ridge at the outer part of a small meander, 30 cm above the mean water level. The material was cleansed by washing, dried up and sieved to select all shells and their identifiable fragments. The collection, comprising over 2,000 specimens (42 taxa) was analysed using standard methods described by LOŽEK (1964) and ALEXANDROWICZ (1987, 1999):

* the number of specimens representing each taxon is presented on a logarithmic scale;

* the malacospectrum of species and specimens includes five ecological groups distinguished according to the scheme defined by ALEXANDROWICZ (1992, 1999);

* the TDA index, the SHANNON-WEAVER index (SWI) and the equitability index of PIELOU (EVI) were used to characterize the diversity of the assemblage.

The thanatocoenosis in question has been compared with the fauna found by PETRBOK (1948) in flood sediments of the River Osam close to its mouth, as well as with the land malacocenosis living on slopes and the valley bottom in the vicinity of Muselievo, and collected by the author.

RESULTS

All the mollusc species forming the thanatocenosis are known from the recent fauna of Bulgaria, Rumania and adjacent countries (DAMIANOV & LIKHAREV 1975, RICHNOVSZKY & PINTÉR 1979, GROSSU 1981–1987, FRANK et al. 1990). The subspecies *Alinda biplicata euptychia* was first described by URBAŃSKI (1960) from the Rila Mountains.

Aquatic molluscs and open-country snails are two main components of the described thanatocenosis (Fig. 3). The former group constitutes 38% species

and 66% specimens, the latter – 33% and 25%, respectively. Shells of *Lithoglyphus naticoides* are the most numerous (21%), and shells of *Amphimelania holandri*, two species of *Fagotia* and two species of *Theodoxus* together form 36%. *Helicopsis striata* is the dominant land snail (15%); it is accompanied by fairly numerous specimens of *Cepaea vindobonensis*, *Chondrula tridens*, *Vallonia pulchella*, *Lindholmiola corcyrensis* and *Monacha cartusiana*. Snails associated with shady and humid habitats are accessory components, except for *Bradybaena fruticum* (Table 1). The assemblage in question is fairly differentiated, characterised by the following values of indices of diversity and equability: TDA – 0.734, SWI – 3.455, EVI – 0.641.

Empty shells of molluscs were collected by PETRBOK (1948) in two sites in the lowermost part of the Osam River valley. One fauna (Table 1, P–1) was deposited by flood, the other was obtained from a deposit accumulated close to the river mouth (Table 1, P–2). Each includes 15 taxa, and both are relatively poor in relation to the thanatocenosis from Muselievo. In P–1 fauna particular taxa are represented only by 1–6 specimens (the total number of shells is 40) while in P–2 fauna only one species (*Chondrula microtraga*) is represented by more than hundred specimens, and two species by 20–24 specimens (the total number of shells is 176). Land snails dominate in both faunas. Differences between assemblages found by PETRBOK (1948) and the described thanatocenosis result probably from the sampling methods. PETRBOK'S specimens were hand-collected during fieldwork, while the present specimens were picked from a big sample of flood deposits enriched with shells of molluscs.

Slopes surrounding the valley in Muselievo are developed on Upper Cretaceous marls and limestones, covered partly with loess (MADEYSKA 1977), while terraces extending on the valley bottom are formed of silts and sandy silts rich in calcium carbonate. The mollusc fauna collected by the author is dominated by three species: *Chondrula microtraga* and *Helicopsis striata*, inhabiting xerothermic habitats on slopes, and *Helicella obvia*, living among poor vegetation of the main Holocene terrace. Other species are subordinate components of the malacocoenosis (Table 1, Mlc). Subfossil mollusc assemblages, composed mainly of *Succinea oblonga*, *Pupilla muscorum* and *Helicopsis striata* were found in loess.

Fig. 3. Malacospectrum of the thanatocenosis from Muselievo. 1 – spectrum of species (MSS), 2 – spectrum of specimens (MSI), 3 – percentage of main components, F – woodland snails, O – open–country snails, M – mesophile species, H – higrophile snails, W – water molluscs, Hs – *Helicopsis striata*, Cv – *Cepaea vindobonensis*, Ln – *Lithoglyphus naticoides*, Fa – *Fagotia*, Ah – *Amphimelania holandri*, Td – *Theodoxus*, Ot – others

INTERPRETATION

The thanatocenosis from Muselievo is related to the present-day environments spread along the Osam River valley and to sedimentary conditions controlling the deposition of material transported by the flood flow. The fauna of water molluscs characterizes both the river and the stagnant water bodies existing within the valley floor, while the land snail assemblage is associated with a variety of habitats developed on the surrounding slopes and river terraces elevated above the flood plain. Both components should be interpreted separately.

The high proportion of aquatic molluscs, exceeding 50% of the fauna, is typical of thanatocenoses accumulated in the lower course of rivers flowing across lowlands, contrary to thanatocenoses deposited in stream valleys and in the upper course of rivers crossing mountains and uplands. The latter assemblages are clearly dominated by land snails (ALEXANDROWICZ 1987, 1998).

Six species of water snails (*Lithoglyphus naticoides, Fagotia acicularis, F. esperi, Amphimelania holandri, Theodoxus danubialis, Th. transversalis*) are the dominant components of the mentioned assemblage. All of them are rheophile species, typical of fast-flowing water. Molluscs associated with slow-flowing rivers and permanent or temporary water bodies developed within flood plains, occur only as an admixture, like snails typical of swamps and marshes. The described fauna reflects the various habitats distributed along the valley floor of the Osam River. It was occasionally

Table 1. Assemblage of molluscs forming thanatocenoses of the Osam River. Tntc – thanatocenosis from Muselievo, P–1, P–2 – thanatocenoses described by PETRBOK (1948); asterisk denotes species recorded under another name, Mlc – land malacocenosis of surrounding areas; E – ecological groups of molluscs: F – shade-loving snails, O – open-country snails, M – mesophile snails, H – higrophile snails, W – water molluscs. Number of specimens: I – 1–3, II – 4–9, III – 10–31, IV – 32–99, V – 100–316, VI – 317–999 (ALEXANDROWICZ 1987).

No.	E	Taxon	Tntc	P–1	P–2	Mlc
1	F	*Orcula doliolum* (Bruguiére, 1792)	I		I*	
2	F	*Alinda biplicata euptychia* Urbański, 1960	I			
3	F	*Bradybaena fruticum* (O. F. Müller, 1774)	III		I	II
4	F	*Helix pomatia* Linnaeus, 1758	II	I		II
5	O	*Cochlicopa lubricella* (Porro, 1838)	I			
6	O	*Pupilla muscorum* (Linnaeus, 1758)	I	I	III	III
7	O	*Vallonia pulchella* (O. F. Müller, 1774)	III		II	II
8	O	*Vallonia costata* (O. F. Müller, 1774)	I		I	I
9	O	*Imparietula seductilis* (Rossmässler, 1837)	I	I	I	
10	O	*Chondrula tridens* (O. F. Müller, 1774)	III	II*		II
11	O	*Chondrula microtraga* (Rossmässler, 1839)	I	I	V	VI
12	O	*Zebrina detrita* (O. F. Müller, 1774)	I		I	III
13	O	*Cecilioides acicula* (O. F. Müller, 1774)	I			
14	O	*Helicella obvia* (Hartmann, 1840)	II		I	V
15	O	*Helicopsis striata* (O. F. Müller, 1774)	V			V
16	O	*Monacha cartusiana* (O. F. Müller, 1774)	III	I*	II*	II
17	O	*Euomphalia strigella* (Draparnaud, 1801)	II		I	I
18	O	*Cepaea vindobonensis* (Férussac, 1821)	IV			II
19	M	*Pomatias riviculare* (Eichwald, 1829)	II	II*		I
20	M	*Succinea oblonga* Draparnaud, 1801	II	I*		
21	M	*Cochlicopa lubrica* (O. F. Müller, 1774)	I	I		I
22	M	*Nesovitrea hammonis* (Ström, 1765)	I		I*	
23	M	*Euconulus fulvus* (O. F. Müller, 1774)	I		I*	
24	M	*Laciniaria plicata* (Draparnaud, 1801)	II			
25	M	*Lindholmiola corcyrensis* (Deshayes, 1839)	III	II*	III*	II
26	H	*Succinea putris* (Linnaeus, 1758)	I			
27	H	*Zonitioides nitidus* (O. F. Müller, 1774)	I		I	
28	W	*Theodoxus transversalis* (C. Pfeiffer, 1828)	IV			
29	W	*Theodoxus danubialis* (C. Pfeiffer, 1828)	V			
30	W	*Lithoglyphus naticoides* (C. Pfeiffer, 1828)	VI	II		
31	W	*Bithynia tentaculata* (Linnaeus, 1758)	I	I		
32	W	*Fagotia acicularis* (Férussac)	V			
33	W	*Fagotia esperi* (Férussac, 1823)	IV			
34	W	*Amphimelania holandri* (Férussac, 1829)	V			
35	W	*Physa acuta* Draparnaud, 1805	II			
36	W	*Lymnaea truncatula* (O. F. Müller, 1774)	I	I		
37	W	*Lymnaea peregra* (O. F. Müller, 1774)	II			
38	W	*Planorbarius corneus* (Linnaeus, 1758)	III	I*		
39	W	*Planorbis planorbis* (Linnaues, 1758)	III			
40	W	*Segmentina nitida* (O. F. Müller, 1774)	I			
41	W	*Unio crassus* Philipsson, 1788	II			
42	W	*Pisidium* sp.	I	I		

redeposited by flood flows, with only a limited change of proportions of particular components. It might be locally enriched with relatively thick-walled shells of rheophile snails.

Open-country species predominate among the land snails (86%), while the percentage of shade-loving species is only 6%. Such a proportion corresponds directly to the low afforestation of the lowland surrounding the lower course of the Osam River (8%). This indicates, that shells of land snails are displaced by the flood flow over relatively short distances, only within the lower course of the river, without an admixture of specimens coming from the mid and upper course; the material forming the mentioned thanatocenosis derives from the area situated close to the place of their deposition, inhabited by the malacocenosis of the vicinity of Muselievo. Differences between the number of specimens of some species in both assemblages are noteworthy. The living fauna abounds in *Chondrula microtraga* and *Helicella obvia*, but in the thanatocenosis they are represented only by a few specimens (Table 1). Such differences depend mainly of the intensity of the hillwash controlled by local conditions (relief, vegetation density, mode of cultivation). Similar relations have been noted in rivers crossing the Polish Carpathians and the Małopolska Upland (ALEXANDROWICZ 1997, 1998).

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