

QUATERNARY MALACOFaUNA OF TOPOLOVNIK AND GOLUBAC (NORTH-EASTERN SERBIA)

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Abstract: The paper offers a survey of geological profiles of Quaternary sediments in the neighbourhood of Topolovnik and Golubac. The profiles are composed of loess, loessoid sands, and quicksand. In the area of Topolovnik, Quaternary sediments overlying Pliocene sediments contain terrestrial fauna of molluscs (gastropods). These layers are more than 10 m thick. The neighbourhood of Golubac and the town itself lies partly on Badenian and partly on Quaternary formations. The appearance and composition of these sediments can best be seen on the road cuts near the Danube banks and on the profiles in the wider area of the town. The Quaternary overlies transgressively the marine Upper Badenian. It is most manifest and best preserved north-west of the stadium. In the lower part it contains sands 2 m thick with the fauna of fluvial and terrestrial origin. Overlying them are loess sediments more than 10 m thick, containing terrestrial fauna.

Key words: Golubac, Topolovnik, Žuto Brdo, Quaternary, Mollusca, taphonomical, paleoecological.

Introduction

Quaternary sediments and malacofauna of the neighbourhood of Topolovnik and Golubac have not been investigated in detail so far. The studies have been based mostly on a survey of distribution of different types of Quaternary formations and shorter lists of identified fossil material. These sediments are chiefly described as deposits of loess, eolian loessoid sands, and quicksand (Marković-Marjanović 1951; Pavlović 1922; Rakić 1980; and Stevanović 1949).

The profiles described lie in north-eastern Serbia (Fig. 1), west of Veliko Gradište (the village of Topolovnik) and west of Golubac (Žuto Brdo). During 1986/87 and 1997/98, a markedly numerous and diverse mollusc fauna indicating Pleistocene age was collected from these sediments. The material is kept in the collections of the Natural History Museum in Belgrade.

Investigation methods

The fossil material has been collected from several sites of the aforementioned area. Both complete, well-preserved shells and damaged (mechanically, after fossilization) have been collected. The fauna is on the whole well preserved, which has rendered possible an identification of the species as well as an assessment of the sediment age. Stratigraphic, paleontological and micro-paleontological methods have been employed for that purpose. Determination of fossil material and paleoecological analyses have been performed by means of widely accepted methods as defined by Ložek (1964) and Kerney (1983).

In the course of preparation, material was treated mechanically by tools and sifted through mineralogical sieves. Certain gastropod specimens had very tender and fragile shells and had to be protected by a thin layer of lacquer prior to treatment. The paleoecological (actualistic) method has been used to establish the living conditions under which paleoflora thrived. Paleoecological characteristics of fauna have been shown in histogrammes.

Quaternary malacofauna of Topolovnik

Quaternary sediments overlying Pliocene sediments are widespread on the territory of Topolovnik near Veliko Gradište. The best exposed profiles are those in the road-cuts, gullies, and streams (the Veliki Izvor and Došor).

South of the Topolovnik village, at the foot of Kalugara, on the road to the source of the Veliki Izvor, a gravel series around 0.50 cm in thickness (Spajić 1967) is overlain by Quaternary sediments (more than 10 m thick) abounding in fossil gastropods and Carbonate concretions (loess dolls). Two levels can be sharply distinguished (Fig. 2). The lower level (Fig. 2/1) is represented by sandy silts with rich mac-

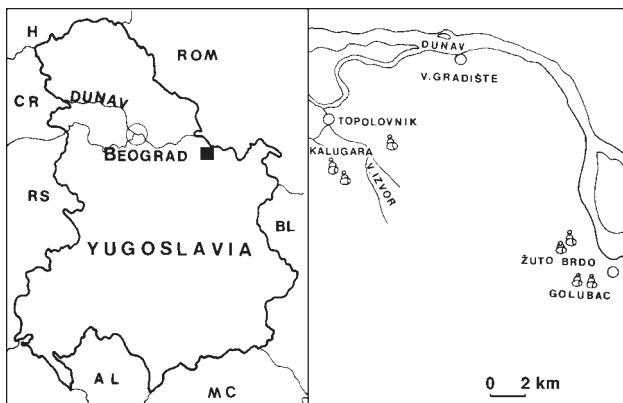


Fig. 1. Geographical position of sites with fossil macrofauna.

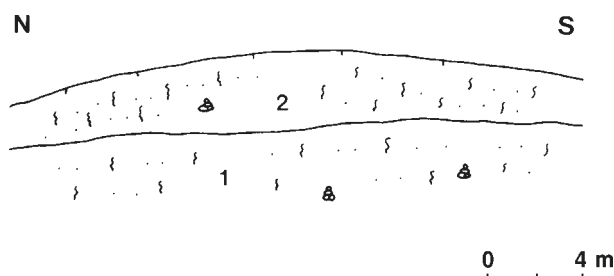
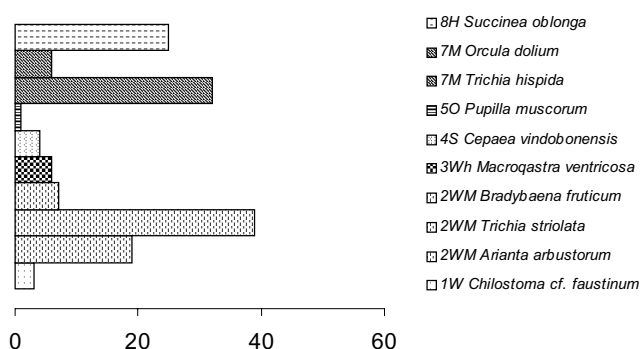


Fig. 2. Profile of Topolovnik. *Legend:* Layer 1. Sandy silts with abundant macrofauna; Layer 2. Gray-yellow sandy silts with sparse fossil remains.

rofauna and larger Carbonate concretions: *Succinea oblonga* Draparnaud, *Euconolus* cf. *fulvus* (Müller), *Orcula dolium* (Draparnaud), *Trichia hispida* Linné, *T. plebeia* (Draparnaud), *Pupilla muscorum* (Linné), *Helicella obvia* (Hartmann), *Cepaea vindobonensis* (Ferussac), *Chondrula tridens* (Müller), *Macrogastra ventricosa* (Draparnaud), *Perforatella bidentata* (Gmelin), *Bradybaena fruticum* (Müller), *Vitrea crystallina* (Müller), *Trichia striolata* (Pfeiffer), *T. cf. unidentata* (Draparnaud), *Cochlodina transsylvanica* (Bielz), *C. laminata* (Montagu), *Aegopinella nitens* (Michaud), *Chilostoma* cf. *faustinum* (Rossmässler), *Pupilla* sp. (tip of the whorl), *Clausilia* sp. (tip of the whorl), *Orcula* sp. (part of the whorl), *Aegopinella* sp. (part of the whorl). The layer 2 is composed of gray-yellow sandy silts with sparse fossil remains: *Helix pomatia* Linné and *Arianta arbustorum* (Linné).

The histogram (Fig. 3) shows that the dominating species are those related to woodland areas, cold to temperately cold forms preserved in loess (*Trichia striolata* (Pfeiffer) etc.) and mesophilous species of wide ecological valence also found in



LEGEND

- 1W Forest associated species
- 2WM Forest biotope (mesophilic forms)
- 3Wh Humid to wet forest biotope
- 4S Open areas (steppe) in forest biotope
- 5O Open places (from humid meadows to steppes)
- 7M Mesophilic species
- 8H Humidity - requiring, cold resistant sp.

Fig. 3. Histogram of species frequency according to ecological valence of Topolovnik.

loess (*Trichia hispida* Linné etc.). The representatives of the subspecies *Succinea oblonga* Draparnaud indicating the conditions of a humid biotope are seen to be numerous.

Quaternary malacofauna of Žuto Brdo near Golubac

Quaternary sediments of Žuto Brdo (Golubac) overlying transgressively Badenian sediments have been discovered in the wider area of the town in cuts of local roads and the banks of the stream flowing beneath the town church. The most instructive profiles lie near the Danube shore north-east of Golubac where a contact with Badenian sediments can be seen (Fig. 4). Overlying Badenian conglomerates are loessoid sedi-

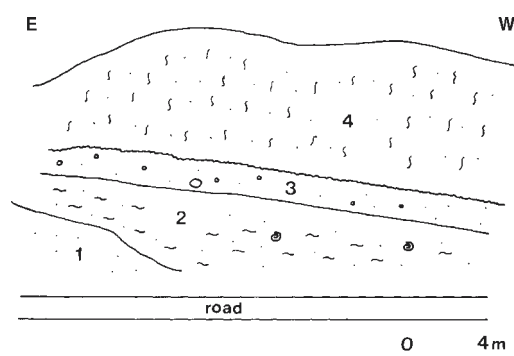
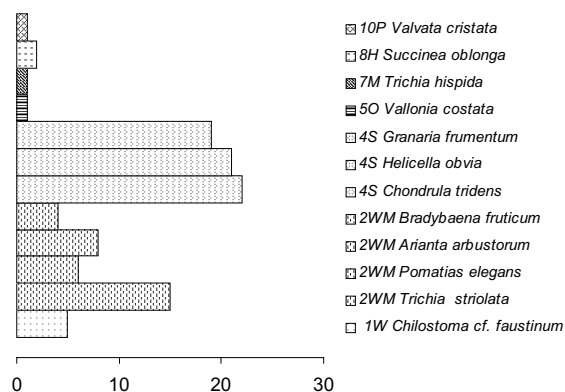


Fig. 4. Profile of Badenian and Quaternary sediments of Žuto Brdo-Golubac. *Legend:* Layer 1. Gravely sands; Layer 2. Fine-grained sands, clayey, with mollusc fauna; 3. Loose gravels; 4. Loessoid sediments.



LEGEND

- 1W Forest associated species
- 2WM Forest biotope (mesophilic forms)
- 4S Open areas (steppe) in forest biotope
- 5O Open places (from humid meadows to steppes)
- 7M Mesophilic species
- 8H Humidity - requiring, cold resistant sp.
- 10P Shallow water

Fig. 5. Histogram of species frequency according to ecological characteristics of Žuto Brdo-Golubac.

ments which contain a diverse and numerous fauna of terrestrial molluscs: *Chilostoma* cf. *faustinum* (Rossmässler), *Cochlodina laminata* (Montagu), *Trichia striolata* (Pfeiffer), *Pomatias elegans* (Müller), *Arianta arbustorum* (Linné), *Bradybaena fruticum* (Müller), *Vitrea crystallina* (Müller), *Helix pomatia* Linné, *Cochlodina transsylvanica* (Bielz), *Chondrula tridens* (Müller), *Helicella obvia* (Hartmann), *Granaria frumentum* (Draparnaud), *Cepaea vindobonensis* (Ferussac), *Vallonia costata* (Müller), *Trichia hispida* Linné, *Succinea oblonga* Draparnaud, and *Valvata cristata* Müller. The histogram (Fig. 5) shows a presence of species related to woodland areas — mesophilous species (*Trichia striolata* etc.). Inferring from the number of specimens, the most dominant are the representatives of open areas — steppes (*Granaria frumentum*, *Chondrula tridens*, and *Helicella obvia*).

Quaternary malacofauna of the “Golubac” stadium at Golubac

Near the Danube, at a distance of 300 m from the stadium “Golubac”, there lies a profile (Fig. 6) of Quaternary sediments composed of two layers. The first level (Fig. 6/1) is represented by fine-grained clayey sands, 2 m thick, with fluvial fauna: *Pomatias elegans* (Müller), *Bradybaena fruticum*

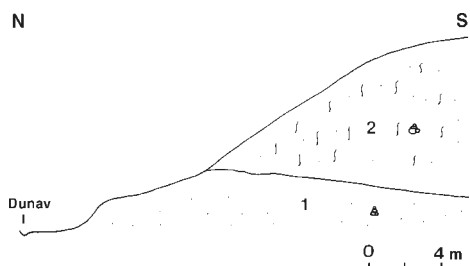


Fig. 6. Profile of Quaternary sediments in Golubac. Legend: Layer 1. Layer of sands with *Unio* sp.; Layer 2. Loose with terrestrial malacofauna.

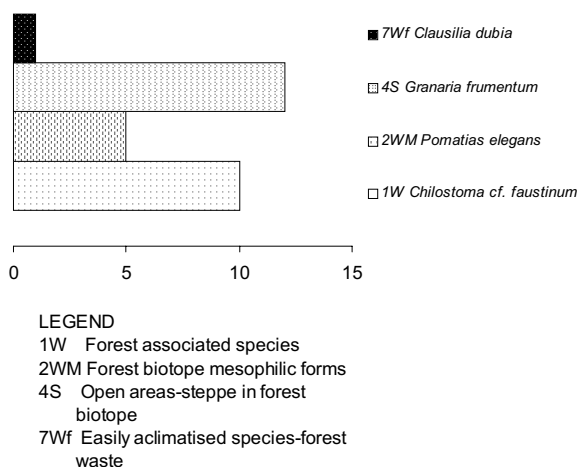


Fig. 7. Histogram of species frequency according to ecological characteristics of fauna from Golubac.

(Müller), *Helicopsis striata* (Müller), *Cepaea vindobonensis* (Ferussac), *Chondrula tridens* (Müller), *Vallonia costata* (Müller), *Succinea oblonga* Draparnaud, *Unio* sp. This layer was formed by the shifting of the Danube shore-line which caused fluvial and terrestrial fauna of allochthonous origin to be mixed together. The upper level (Fig. 6/2) is built of loess sediments more than 10 m thick, containing terrestrial fauna: *Clausilia dubia* Draparnaud, *Bradybaena fruticum* (Müller), *Helicella obvia* (Hartmann), *Chilostoma* cf. *faustinum* (Rossmässler), *Granaria frumentum* (Draparnaud), *Chondrula tridens* (Müller), and *Pomatias elegans* (Müller). Most significant is the presence of the steppic species *Granaria frumentum* and *Chondrula tridens* indicating a warm climate (Fig. 7).

Conclusion

Quaternary sediments of the neighbourhood of Topolovnik are represented only by eolian deposits, while at Golubac two types have been distinguished, determined by sedimentation process:

- 1) sediments of fluvial origin (on the basis of the preserved remains of fossil bivalves *Unio* sp. in association with terrestrial fauna);
- 2) eolian sediments (terrestrial fauna).

Table 1: Survey of Quaternary malacofauna of the Danube area near Požarevac from the collections of Natural History Museum.

Paleocological characteristics	Faunistic records	T	Ž	G
1 W	<i>Chilostoma</i> cf. <i>faustinum</i> (Rossmässler)	1	4	10
	<i>Aegopinella nitens</i> (Michaud)	3		
	<i>Cochlodina laminata</i> (Montagu)	1	1	
	<i>Cochlodina transsylvanica</i> (Bielz)	2	1	
	<i>Trichia</i> cf. <i>unidentata</i> (Draparnaud)	1		
2 WM	<i>Arianta arbustorum</i> (Linné)	19	7	
	<i>Trichia striolata</i> (Pfeiffer)	39	15	
	<i>Vitrea crystallina</i> (Müller)	1	2	
	<i>Bradybaena fruticum</i> (Müller)	7	4	2
	<i>Helix pomatia</i> Linné	3	1	
	<i>Helix pomatia</i> Linné juv.	1		
	<i>Pomatias elegans</i> (Müller)		6	5
3 W(h)	<i>Macrogastra ventricosa</i> (Draparnaud)	6		
	<i>Perforatella bidentata</i> (Gmelin)	1		
4 S	<i>Granaria frumentum</i> (Draparnaud)		16	12
	<i>Chondrula tridens</i> (Müller)	2	22	3
	<i>Helicella obvia</i> (Hartmann)	3	13	1
	<i>Cepaea vindobonensis</i> (Ferussac)	4	5	2
5 O	<i>Pupilla muscorum</i> (Linné) juv.	1		
	<i>Vallonia costata</i> (Müller)	1	1	1
	<i>Trichia hispida</i> Linné	32	1	
7 M	<i>Trichia plebeia</i> (Draparnaud)	4		
	<i>Euconulus</i> cf. <i>fulvus</i> (Müller)	1		
	<i>Abida secale</i> (Draparnaud)	5	2	
	<i>Orcula dolium</i> (Draparnaud)	6		
	<i>Vertigo alpestris</i> Alder	6		
	<i>Clausilia dubia</i> Draparnaud			1
7 Wf	<i>Clausilia dubia</i> Draparnaud			1
8 H	<i>Succinea oblonga</i> Draparnaud	25	2	2
10 P	<i>Valvata cristata</i> Müller		1	1

T — Topolovnik
Ž — Zuto Brdo (Golubac)
G — Stadium at Golubac

Legend: 1W — Forest associated species; 2WM — Forest biotope (mesophilic forms); 3Wh — Humid to wet forest biotope; 4S — Open areas (steppe) in forest biotope; 5O — Open areas (from humid meadows to steppes); 7M — Mesophilic species; 7Wf — Easily acclimatized species-forest waste; 8H — Humidity-requiring, cold resistant species; 10P — Shallow water.

Around 200 specimens have been collected from the fossiliferous sediments of Topolovnik and Golubac and a total of 29 species belonging to six genera has been identified (Table 1). From a comparison of taxa shown in the histograms of molluscs for the sites cited (Topolovnik, Žuto Brdo-Golubac, and stadium "Golubac" at Golubac) it may be inferred that the dominant forms in the Topolovnik area are those related to woodland areas — mesophilous species (*Trichia hispida* etc.), while an increased presence of steppic species (*Chondrula tridens* etc.) is characteristic of Golubac. Also numerous is the species *Succinea oblonga* from the site of Babina Stena-Kasumbača (near Golubac) indicating a moist climate (Pavlović 1922). Tender and very fragile though they are, the shells of fossil organisms are remarkably well preserved. Very few specimens were found where only parts of whorl had been preserved. The pattern of the outer surface of the shells is likewise well preserved; in larger forms from the site of Žuto Brdo near Golubac we have observed only cracks in sediment.

In several specimens of the species *Cepaea vindobonensis* (Ferussac) from Topolovnik we have noted damages in the shells, irregular in form, up to 0.5 cm in size suggesting biotic damage inflicted by the predator insect *Carabus* sp. Similar damage on the recent species has been described by Abel (1935). Taphonomical characteristics of the fauna indicate that the oryctocenosis investigated was autochthonous in character.

The paper offers the first results of paleontological investigations of loessal and lessoid sediments of the Danube area near Požarevac. The investigations performed so far suggest that the deposits described may have originated during the latest glaciation.

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