

THE PLEISTOCENE NANO-MOLLUSCS FAUNA BETWEEN CĂCIULĂTEȘTI AND SADOVA (DOLJ COUNTY, SW OF ROMANIA)

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Abstract. Between Căciulătești and Sadova (Dolj County, SW of Romania), on the slope of the lower terrace belonging to the Upper Pliocene, we have identified a nanofauna, especially with gastropods and two species of *Corbula*. The identified taxa have been described and represented in two drawings comprising 54 figures in total.

Keywords: nano-molluscs, *Corbula*, Upper Pliocene.

Rezumat. Fauna de nanomoluște pleistocene dintre Căciulătești și Sadova (județul Dolj, sud-vestul României). Între localitățile Căciulătești și Sadova (județul Dolj, România), pe taluzul terasei inferioare de vârstă Pliocen superior am identificat o nanofaună cu gastropode în special și două specii de *Corbula*. Taxonii identificați au fost descriși și figurați în două planșe cuprinzând în total 54 de figuri.

Cuvinte cheie: nanomoluște, *Corbula*, Pliocen superior.

INTRODUCTION

The Jiu river terraces in the Sadova sector have been studied by both geologists and geographers. We mention here the detailed works, based also on the results of some drillings: COTEȚ (1957), BADEA (1970), LITEANU (1957), BANDRABUR et al. (1963), BANDRABUR (1971). The last and most extensive work (BANDRABUR, 1971) was used for the geological considerations in the present paleontological study.

A drilling located about 3 km north of Bechet, entered the deposits of the lower terrace of the Jiu, which showed the following lithology:

- 0-6.30 m deep, dune sands
- 6.30-7.60 m reddish-brown sandy-clayey powders
- 7.60-8.00 m yellowish-whitish dusty sands

Further east, in the Grojdibod area, loessoid deposits with a thickness of 15 m and a yellowish, dusty-sandy character with calcareous concretions and a buried fossil soil appear.

At Piscul Sadovei, on the slope of the lower terrace (BANDRABUR, 1971), about 6 m of fine and medium yellowish dune sands with ferruginous lenses were found, lying on weakly cemented sands, with *Planorbis* sp., *Limneus* sp., *Succinea* sp. Regarding the age of the deposits in the lower Jiu River terrace, most of the mentioned researchers consider it to be Upper Pleistocene. Apart from the mollusk fauna of Piscul Sadovei, LITEANU & BANDRABUR (1957) mention a rich gastropod fauna in the Teslui valley with: *Pisidium amnicum* Müller, *Succinea oblonga* Draparnaud and *Clausilia* sp.

Among the mammals, BANDRABUR (1971) mentions a skull of *Mammuthus primigenius* Blum. found by PROTOPOESCU-PACHE (1911) in the "basement of the upper terrace" at Dobrești. PATTE (1936) considered that this skull would belong to the more evolved species *Elephas peimigenius* var. *sibiricus*, and COTEȚ (1957) reported a molar of *Mammuthus primigenius* in the lower part of the loessoid deposits of the lower terrace.

Most of the aforementioned authors attribute the dune sands to the Holocene, as they cover all the Jiu, Olt and Danube terraces in this sector, including part of the High Field.

Based on the above considerations, we consider that Carciulătești - Sadova outcrop studied by us belong to the low terrace of the Jiu river, of the upper Pleistocene.

MATERIAL AND METHODS

Situated on the left bank of the Jiu River, close to the confluence with the Danube, Sadova is situated on the lower terrace of this river, at 12-14 m relative altitude (BANDRABUR et al., 1963; BANDRABUR, 1971).

The bridge of the lower terrace is covered with aeolian sands under which reddish-brown loessoid sands lie. The front of the terrace is affected by several ravines. Most of the collected material comes from the right side of such a ravine located at the entrance to Sadova from Căciulătești (Fig. 1).

Subsequently, in another small incipient ravine located further north of the described outcrop, at the exit from Căciulătești (Fig. 3), where the road makes a concave curve, we collected from a greyish-whitish sandy clay, in addition to many nanogastropods of the family Clausiiloidae, also specimens of *Corbicula*.



Figure 1. Ravine from Sadova (Photo A. Popescu)



Figure 2. Profile of the Sadova nanogastropod collection site (Photo A. Popescu).

A profile through that outcrop includes (Fig. 2):
 0,40 m - Greyish topsoil
 1,10 m - Reddish-brown macroporous loess sand with yellowish-white sand lenses, containing a fossiliferous level
 0,50 m - Reddish brown loess sand
 0,35 m - Gray- greyish buried soil, sometimes blackish.
 0,50 m - Reddish brown loess sand
 Fine yellowish- whitish sand



Figure 3. The fossiliferous site south of Căciulătești. A - General view; B - Detail (Photo A. Popescu).

From the gully located at the entrance to Sadova from Căciulătești, we collected a rich fauna of nanogastropods, and from the site at the exit of Căciulătești only a few taxa. The material, sorted and classified, was mostly examined and photographed under the microscope and compared with similar forms described and shown in catalogues or specialist articles. Some of these species have been identified in sites belonging to the Romanian (Table 1).

Table 1. Molluscs species identified in the Sadova and Căciulătești sites.

Species	Romanian	Pleistocene	Holocene	Current
<i>Anisus (Spirulina) vortex</i> Wenz	+	+	+	+
<i>Succinea oblonga</i> Draparnaud		+	+	+
<i>Alinda biplicata</i> (Montagu)		+	+	+
<i>Valonia excentrica</i> Sterk	+	+		
<i>Vertigo angustior</i> Jefefreys	+	+	+	+
<i>Pupilla muscorum</i> (Linè)	+	+	+	+
<i>Pomatias costulatum</i> Rossm		+	+	+
<i>Lacrinaria plicata</i> (Drapanaud)	+	+	+	
<i>Corbicula fluminalis</i> (Müller)		+	+	+
<i>Corbicula fluminea</i> (Müller)		+	+	+

The Căciulătești outcrop, located on a sandy-clay material, seemed to be a site with present-day nanomolluscs, but the fact that all the forms collected are devoid of traces of the body of the animal that lived in the shells that is an essential condition for relating the species to present-day forms, and especially the fact that these forms were found under the flora that includes mainly needle grass, green foxtail and Johnsongrass, and not living on these types of

plants, are arguments that make us affirm that the nanofauna at Căciulătești is also fossil. In addition to these arguments, this soil resembles the fossil soil found at Sadova.

RESULTS AND DISCUSSIONS

The results of the research are presented below, with the species shown in two plates.

GASTROPODS

Planorbidae Family

Anisus (Spirulina) vortex (Wenz) 1942

Pl. I, Figs. 1-4.

1942 *Anisus (Spirulina) vortex* WENZ, p. 72, Pl. 27, Figs. 408-410.

1955 *Anisus (Spirulina) vortex* GROSSU, p. 133-134, Fig. 44.

2019 *Anisus confusus* HARZHAUSER et al., p. 166, Pl. 3, Figs. 1-4.

The circular, flat, spiral shell is 6-8 mm in diameter, consisting of 4-6 turns of spiral with very slow growth, smooth, with both sides evenly crowned. The aperture is circular. The umbilicus is depressed. The present form is found in Romania only in the still waters of the Tisza valley.

Romanian superior – Holocene – present.

Succineidae Family

Succinea oblonga Draparnaud 1801

Pl. I, Figs. 5-9.

1955 *Succinea (Succinella) oblonga elongata*, GROSSU, p. 258, Fig. 136.

1927 *Succinea oblonga* SIMIONESCU, p. 371, Fig. 409 (right).

1967 *Succinea oblonga* SAULEA, p. 245, Pl. LXVI, Fig. 18.

1972 *Succinea oblonga* MACAROVICI & TURCULEȚ p. 245, Pl. LXXXIV, Fig. 12.

Elongated oval shell has a pointed tip. It is 7-8 mm high and 3-4 mm wide. It has 3 to 3½ turns of strongly arched spiral, which are separated by a deep suture. The last turn of the spiral is very crowned, longish, the height of the diaphragm occupying about 2/3 of the total height. The shell is dextral and has relatively thick, opaque walls with a matte surface.

The shell closely resembles that of *Catinella arenaria* (Potiez & Michaud). These two species are separated by anatomical differences. It differs from *Succinea putris* (Liné) by its larger size and regular growth bands. They are very widespread in loessoid deposits in our country

Pleistocene – Holocene – present.

Clausilioidea Family

Alinda biplicata (Montagu) 1803.

Pl. I, Figs. 10-19.

1955 *Lucinaria (Alinda) biplicata* GROSSU, p. 258, Fig. 135.

1974 *Lucinaria (Stigillecula?)* sp. MARINESCU p. 31, Pl. II, Fig. 2.

2012 *Alinda biplicata* MALTZ & SULIKOWSKA-DROZD ANNA, 45. 2. p. 469-480, Figs. 1A, 3A.

The shell is slender, turreted, 12-13 mm high, slightly dilated in the middle where it reaches a maximum thickness of 3-5 mm. It has 9-11 turns of spiral, with continuous increase in thickness. Like all species in this family, it has a closing clausilium. The shell has equal width of nervures which are perpendicular to the spiral (Pl. I, Fig. 10). Aperture is toothless, with weakly reshaped lip, elements which distinguish it from *Lacrinaria plicata* (Draparnaud). This gastropod is present in the current terrestrial fauna, but has also been reported in the last Würm glacial period of the Pleistocene in the Carpathian Basin (MALTZ & SULIKOWSKA-DROZD. 2012). Aperture is without folds between parietal and columellar (pl.I, Figs. 11, 18-19). Near London, the present species is also known as a fossil from the Lower Holocene and in recent sedimentary deposits in the Baraolt Basin (MARINESCU, 1975).

Upper Pleistocene - Holocene – present.

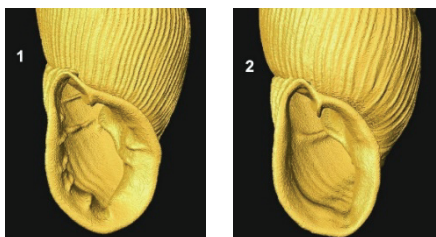
Lacrinaria plicata (Draparnaud) 1801

Pl. II, Figs. 25-28.

2002 *Lacrinaria plicata*, HLAVÁK & HORSÁK, p. 98, Fig. 5.

2018 *Lacrinaria plicata*, SULIKOWSKA-DROZD et al., p. 150, Fig. 1.

Turriculated shape shell, slightly smaller than that of *Alinda biplicata* (Draparnaud) and cylindrical towards the aperture. It has folds (teeth) on the labium and a prominent tooth on the labrum which clearly distinguish it from *Alinda biplicata* (Draparnaud).



1. Aperture of *Lacrinaria plicata*
 2. Aperture of *Alinda biplicata*
 (in accordance with SULIKOWSKA-DROZD
 et al., 2018. Micro-computed tomography).
 Dimensions 15-18 x 3,3-3,6 mm.
 Romanian – Pleistocene – Holocene.

Valloniidae Family

Valloniinae Subfamily

Vallonia excentrica Sterki 1893

Pl. I, Figs. 20-25.

1893 *Vallonia excentrica* STERKI p. 249, Pl. 32, Figs. 6-9.

1942 *Vallonia excentrica* WENZ p. 75-76, Pl. 27, Figs. 6-9.

The shell is very small, flattened, with oval-rounded outline, with slightly increasing spiral in diameter. It has 3-3.5 turns of the spiral which grow quite rapidly. The shell is slightly crowned, with apical angle 95-96°, glossy, with extremely fine growing stripes, the final turn of the spiral wider, ending with circular aperture. It has thickened edges.

Dimensions: Height = 1,1 mm, Diameter = 1,87 – 3,2 mm.

Upper Romanian – Pleistocene.

Vertiginidae Family

Vertigininae Subfamily

Vertigo angustior Jeffreys 1830

Pl. I, Figs. 26-28, Pl. II, Figs. 1b-c, 2-5.

1942 *Vertigo (Vertilla) angustior* WENZ, p. 74, Pl. 267, Fig. 420.

Very small, curled up shell that measures 1.6 to 2.0 mm (average: 1.8 mm) in height and 0.9-1.05 mm (average: 1 mm) in width. It is elongated and ovoid with 4.5 to 5.5 spiral turns (average 5 turns). The edge of the diaphragm is bent and slightly thickened, slightly notched continuing outwards as a spiral groove (Figs. 3, 5). The aperture is circular, relatively elongated at the bottom.

It differs from *Vertigo pusilla* Müller which also possesses a similar shell twisted from right to left, but in which the aperture has 6-9 teeth and less obvious growth striations.

It is currently reported in Western Europe.

Romanian – Pleistocene – present.

Pupillidae Family

Pupilla muscorum (Linné) 1758

Pl. I, Figs. 26-29, Pl. II, Figs. 2-10

1927 *Pupa muscorum* SIMIONESCU, p. 371, Fig. 409.

1945 *Pupilla (Pupilla) muscorum* WENZ, p. 74-75, Pl. 27, Fig. 431.

1955 *Pupilla (Pupilla) muscorum* GROSSU, p. 186-187, Fig. 83.

1967 *Pupilla muscorum* SAULEA, Pl. LXVI, Fig. 17.

1972 *Pupilla (Pupilla) muscorum* MACAROVICI, TURCULEȚ, p. 245, Pl. LXXXIV, Fig. 11.

The shell is slightly striated or almost smooth. It has 5-6.5 turns of weakly convex spiral and the suture is not very deep. Aperture is deep, circular, with cut upper side, with developed lip, strongly developed cervical callus.

Pupilla muscorum differs from *Pupilla pratensis*, with which it lives together, by its thicker and smaller shell. The shell height is 3.0-4.0 mm. The width is 1.6-1.8 mm.

Lives in dry grasslands, sand dunes and loess deposits in open, sunny habitats.

Romanian superior – Pleistocene – Holocene – present

Pomatiidae Family

Pomatias cf. costulanum (Rossmässler) 1836

Pl. II, Figs. 11, 14.

1909 *Cyclostoma costulatum* SEVASTOS, Pl. IV, Figs. 35-36.

1942 *Pomatias cf. costulatum* WENZ, p. 43, Pl. 11, Figs. 139-143.

1972 *Pomatias costulatum* MACAROVICI & TURCULEȚ, p. 245, Pl. LXXXIV, Fig. 3.

1981 *Pomatias costulatum*, PANĂ IOANA et al., p. 107, Pl. 11, Figs. 130-142.

Conical, semi-globose turban shell that has a pointed apex, with broad umbilicus. It presents 4-5 rounded spiral turns separated by deep sutures. The aperture is subcircular. The height is 5-6 mm.

Romanian - Upper Pleistocene – Holocene.

LAMELLIBRANCHIATA**Ordo Veneroida****Corbiculidae Family***Corbicula fluminalis* (Müller) 1774

Pl. II, Figs. 12, 13, 15, 17, 21, 23.

1896 *Corbicula fluminalis* ȘTEFĂNESCU p. 79, Pl. 7, Figs. 35-39.1942 *Corbicula fluminalis* WENZ, p. 110-111, Pl. 55, Figs. 577-578.1987 *Corbicula fluminalis* GROSSU, p. 215, Figs. 109-110.1993 *Corbicula fluminalis* QRAUJO, MORENO, RAMOS, Fig. 3A.2009 *Corbicula fluminalis* CIUTTI FRANCESCA, CAPPELLETTI CRISTINA, Fig. 1a.

The shell usually has a 10-12 mm diameter, but can reach diameters of 50-60 mm. The outline of the shell is circular. The umbo is located centrally from the valve margins, whereas in *Corbicula fluminea* the umbo is usually elevated and eccentric, moved slightly towards the anterior edge of the left valve. The right valve has 3 cardinal teeth, the middle and back ones being larger and 2 lamellar teeth on the anterior and posterior edges of the valve (Pl. I Figs. 21,23). The left valve has 3 middle cardinal teeth and a lateral front and posterior tooth that are notched on both sides. The anterior and posterior muscle impressions are almost equally large. The paleal impression is complete. The earliest appearance is in the Termian Pliocene, with the advance quite far eastward occurring in the basal Pleistocene. The Romanian appearances that took place in Upper Romanian approximately coincide with the western boundary of today's distribution

Upper Romanian - Pleistocene - Holocene – present

Corbicula fluminea (Müller) 1774

Pl. II, Figs. 16, 18-20, 22, 24.

1987 *Corbicula fluminea* GROSSU, p. 217-218, Fig. 111.1942 *Corbicula fluminalis* WENZ, p. 110-111, Pl. 55, Figs. 56, 560, 579.1972 *Corbicula fluminalis* MACAROVICI & TURCULEȚ, p. 243, Pl. LXXXIII, Figs. 4a-d.1993 *Corbicula fluminea* ARAUJO et al., Fig. 3C.2009 *Corbicula fluminea* CIUTTI FRANCESCA & CAPPELLETTI CRISTINA, Fig. 1b.2013 *Corbicula fluminea* CORENBLIT et. al., Fig. 1A.

The shell is small, circular-oval, 12-16 mm in diameter. The anterior edge of the valve is circular and the posterior edge is visibly ellipsoidal. The umbo is slightly elevated. These characteristics distinguish *Corbicula fluminea* (Müller) from *C. fluminalis* (Müller).

The two species are most easily distinguished by the density of ribs on the valve; *C. fluminea* has 7 to 14 ribs per cm and *C. fluminalis* has 13 to 28. Integripaleal.

Romanian – Pleistocene – Holocene – present.

CONCLUSIONS

The discovery, description and presentation of an Upper Pleistocene nanomollusc fauna from the lower terrace of the Jiu river supplements the palaeontological knowledge of the stratigraphic interval in the terraces Field of Danube in Oltenia. For details on the current existence of the determined taxa, we used in particular the work of GROSSU (1955, 1961, 1987).

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PLATE I

- 1, 4. *Anisus (Spirulina) vortex* (Wenz) x 4 Sadova
- 2-3. *Anisus (Spirulina) vortex* (Wenz) x 5 Sadova
4. *Anisus (Spirulina) vortex* (Wenz) x 4 Sado
- 5-7. *Succinea oblonga* Draparnaud x 1,5 Sadova
8. *Succinea oblonga* Draparnaud x 3 Sadova
10. *Alinda biplicata* (Montagu) x 7 Sadova
- 11-15. *Alinda biplicata* (Montagu) x 4 Sadova
- 16-17. *Alinda biplicata* (Montagu) x 1,5 Sadova
18. *Alinda biplicata* (Montagu) x 1 Sadova
19. *Alinda biplicata* (Montagu) x 5 Căciulătești
- 20-23. *Vallonia excentrica* Sterki x 5 Sadova
- 24-25. *Vallonia excentrica* Sterki x 7,5 Sadova
- 26-28. *Vertigo angustior* Jeffreys x 10 Sadova

PLATE II

- 1 a. *Pupilla muscorum* (Linné) x 9 Sadova
- 1b-c, 2-4. *Vertigo angustior* Jeffreys x 10 Sadova
- 6, 8-9. *Pupilla muscorum* (Linné) x 7 Sadova
- 5, 7, 10. *Pupilla muscorum* (Linné) x 8 Sadova
11. *Pomatia costulatum* (Rossmassler) x 3,7 Sadova
14. *Pomatia costulatum* (Rossmassler) x 2 Sadova
12. *Corbicula fluminalis* (Müller) x 2 Căciulătești
- 13, 15, 17. *Corbicula fluminalis* (Müller) x 2, Căciulătești
- 16, 18, 20. *Corbicula fluminea* (Müller) x 2 Căciulătești
19. *Corbicula fluminea* (Müller) x 2,5 Căciulătești
- 22, 24. *Corbicula fluminea* (Müller) x 1,5 Căciulătești
25. *Alinda biplicata* (Montagu) x 2 Căciulătești
26. *Lacrinaria plicata* (Draparnaud) x 2,2 Căciulătești
27. *Alinda biplicata* (Montagu) x 2 Căciulătești
28. *Lacrinaria plicata* (Draparnaud) x 6,2 Căciulătești
29. *Lacrinaria plicata* (Draparnaud) x1 Sadova

PLATE I



1a



1b



2



3



4



5



6



7



8 a, b



9



10



11a, b



12



13



14



15



16



17



18



19



20



21



22



23



24



25



26

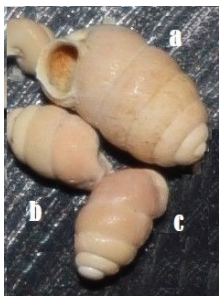


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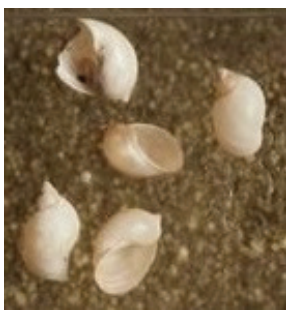
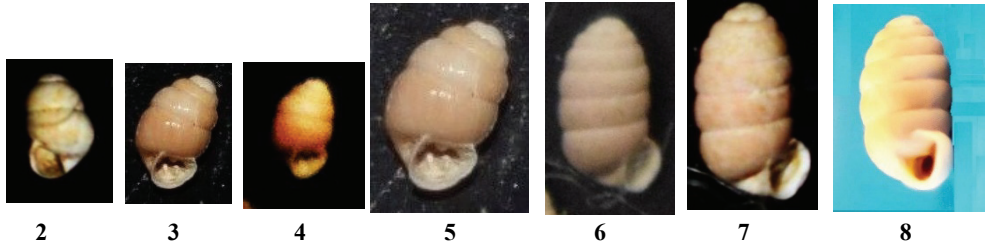


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PLATE II



1a, b, c



14



9



10



11



12



13



15



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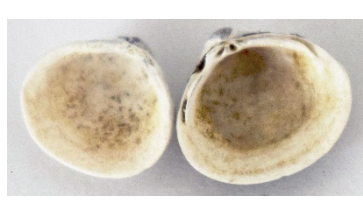
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