ZANCLEAN GILBERT-TYPE FAN DELTAS IN THE TURNU SEVERIN AREA (DACIAN BASIN, ROMANIA). A CRITICAL ANALYSIS

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Abstract. The critical analysis of the Gura Văii – Turnu Severin – Izvoru Bârzii Gilbert-type deltas concentrated on the deltaic architecture and the age of the deltaic deposits, referring especially to the conglomeratic sediments considered the proximal foreset unit of the Gilbert-type fan deltas. It reveals the lack of evidences necessary to demonstrate the existence of the three units (foreset, bottomset and topset beds) which define a Gilbert-type delta. Although there are convincing data for its tectonic origin, the homoclinal structure of these deltaic deposits was considered, with no argumentation, as a primary structure generated through the deltaic progradation. The age of the rudaceous deposits in the area Gura Văii – Turnu Severin – Izvoru Bârzii, representing the core of the two outlined Gilbert deltas, was considered Zanclean (Bosphorian) by Clauzon *et al.* (2005) and Suc *et al.* (2011), rejecting the Badenian – Sarmatian (*s.l.*) age formerly attributed (Marinescu, 1978 and the references herein). The critical examination of these two concepts pointed out the paleontological and stratigraphic proofs which substantiate the Badenian-Sarmatian (*s.l.*) age, in contrast with the lack of evidences in favor of the Zanclean age. The Gilbert-type fan deltas figured by Clauzon *et al.* (2005) and Suc *et al.* (2011) in the area of the present-day Danube River course (area Gura Văii – Turnu Severin – Izvoru Bârzii), closely downstream of the Iron Gates, represents one of the main arguments of these authors for the action of the Messinian crisis in the Dacian Basin. Taking into consideration the importance of this concept for the understanding of the Dacian Basin evolution, this paper undertakes a critical analysis of the factual data which generated the concept of the Gilbert-type fan deltas in the Turnu Severin area.

Key words: Gilbert-type fan delta, Messinian crisis, Dacian Basin, Eastern Paratethys

1. INTRODUCTION

During the last decade, the interest for the areal extension of the Messinian salinity crisis, an event which affected an important part of the Earth, focused on the Paratethys Domain. Even since 1998, Clauzon and Suc* were interested on the Messinian crisis effects in the Dacian Basin, southern Romania. The Dacian Basin sediments have been intensely studied from this viewpoint: Clauzon *et al.* (2005), Vasiliev *et al.* (2005), Leever (2007), Stoica *et al.* (2007), Andreescu (2009), Leever *et al.* (2010), Krijgsman *et al.* (2010), Suc *et al.* (2011).

Relying on the Hsü and Giovanoli (1979) hypothesis about the Messinian crisis consequences in the Black Sea, Clauzon *et al.* (2005, p.439) were convinced that "similar impacts must also exist in the Turnu Severin area and on the Northwestern Mediterranean region". The Drobeta-Turnu Severin zone (on the Danube River left bank, just downstream of the Iron Gates) (Fig.1) have been selected as the Dacian Basin study area, because "Danube River … is expected to have offered the same response as the other large rivers (Rhône, Nile)" and also because "Danube River has cut a gorge through the Carpathians, the context of which is physiographically similar to Zanclean Gilbert-type fan delta constructions evidenced in the northwestern Mediterranean region" (Clauzon *et al.*, 2005, p.441). According to their conception the Messinian crisis induced changes not only inside the Dacian Basin, but also on the relationships with the neighboring Paratethyan basins. One of the most significant Messinian crisis effect in the Dacian Basin was the Danube River construction of a large Gilbert-type fan delta in the Turnu Severin area (Fig. 1).

In the scientific community this model met with approval (Leever, 2007; Leever *et al.*, 2010) but also with rejection (Andreescu, 2009; Krijgsman *et al.*, 2010).

* Clauzon, G. and Suc, J.-P. (1998) Peut-on appliquer au couple Mer Noire – Danube le modèle d'évolution du bassin de Méditerranée occidentale - Rhône lors de la crise de salinité messinienne? Rapport TOTAL - Conventions TEP/DEG-1546-1551, 62pp.

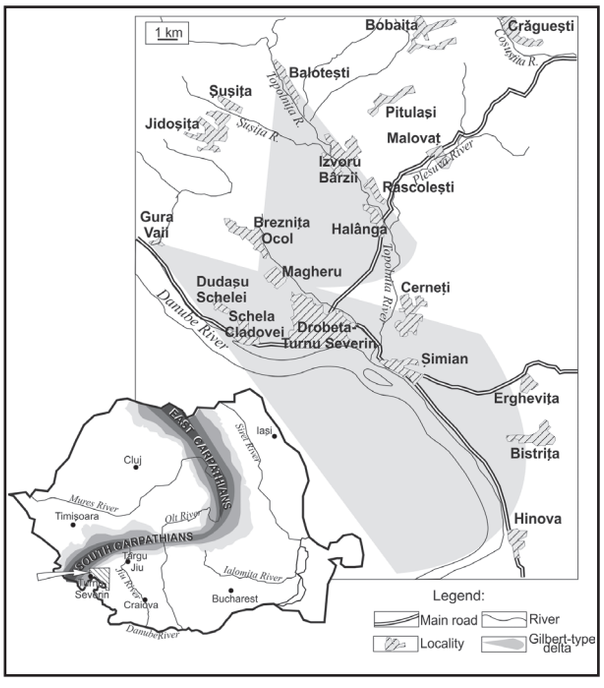


Fig. 1. Study area map. The outline of the Gilbert-type deltas after Clauzon *et al.* (2005; lower deltaic body) and Suc *et al.* (2011; upper deltaic body). Lower-left index map: location of the study area in Romania.

2. OBJECTIVE AND METHODOLOGY

Authors ponder important for the general knowledge of the Dacian Basin evolution, the throughout analysis of the characteristics of the Gilbert-type deltas as defined by Clauzon *et al.* (2005) and Suc *et al.* (2011). The present paper thus focuses on the conglomeratic deposits cropping out in the area between Gura Văii – Drobeta Turnu Severin – Izvoru Bârzii- Baloteşti (Fig. 1), which would represent the core of the Gilbert-deltas.

This paper intends to use the critical analysis approach, an academic practice, which will include confronting the support or rebut arguments.

The Turnu Severin Gilbert-type deltas, as defined by Clauzon *et al.* (2005), have not been outlined through a facies and paleoenvironmental sedimentogenetic investigation yet. The analysis we are undertaking will use this full range of investigations and shall deliberate on the architecture of the deltaic bodies and on the geological age of the units making up these deltaic deposits.

3. CRITICAL ANALYSIS OF THE GILBERT-TYPE DELTAS FROM THE GURA VĂII – TURNU SEVERIN – IZVORU BÂRZEI ZONE

One of the main conclusions of the Clauzon *et al.* (2005) paper was that the conglomerates cropping out on the Danube River left bank between Gura Văii and Drobeta-Turnu Severin (Fig. 1) represent the foreset beds of a large Gilbert-type fan delta. This delta extends southeastward to Hinova locality. The Gura Văii – Turnu Severin – Hinova deltaic body is described by Clauzon *et al.* (2005) through the three component of a Gilbert-type delta: bottomsets, foresets and topsets (Fig. 2).

In a recently published paper Suc *et al.* (2011) reveal the existence of a second Gilbert-type deltaic body. The sediments of this delta have been accumulated in the Baloteşti – Izvoru Bârzii area (Fig. 1), less than 10 km north-east from the present course of the Danube River.

An important assertion of Clauzon *et al.* (2005), endorsed by Suc *et al.* (2011), refers to the age of the foreset conglomerates in Gura Văii – Turnu Severin area. The authors reject the Badenian-Sarmatian (s.l.) age previously granted to these deposits (Marinescu, 1978 and the herein references).

3.1. The sedimentary architecture of the Gilbert-type deltas

As originally described by Gilbert (1890), one of the characteristic features of the Gilbert-type fan deltas is their tripartite structure, consisting of foreset beds which uncomfortably overlay bottomset beds and underlay top sets.

Showing the threefold distinct structure, the sedimentary architecture of the Gilbert delta from Gura Văii – Turnu Severin – Hinova is impressive, in the graphical image (Fig. 2) shown in Clauzon *et al.* (2005, Fig. 10). In reality, this is a synthetic image, built up with data from three distinct areas (Fig. 3).

The gravelly-sandy *foreset* beds are visible only in area A, that is, between Gura Văii and Turnu Severin. From area B (Hinova), 22 km away from the foresets of area A, derive the data concerning the *bottomset* clay, the foreset beds (a finer-grained sandy facies) and the basal part of the topset beds deposits (Figs 3,4). Most of the information on the *topset* strata come from area C, a large surface including the coal quarries Lupoaia (north-east from Motru town) and Husnicioara (Fig.3). The Husnicioara Quarry is 17 km away from Hinova and, till the Lupoaia Quarry, there are about 35 km from Hinova and over 30 km from Drobeta – Turnu Severin.

The most significant component of the analyzed Gilbert-type fan deltas is the conglomeratic foreset unit, because important conceptual connotations implicate these deposits. But on what grounds the conglomerates from Gura Văii – Turnu Severin – Izvoru Bârzii have been granted the quality of foreset beds?

Clauzon *et al.* (2005) as well as Suc *et al.* (2011) produced no argument to demonstrate the foreset bed structure of the discussed conglomerates. Nowhere is visible a situation showing sedimentary relationships between the inclined Gura Văii – Turnu Severin – Izvoru Bârzii conglomerates and the horizontal (or less inclined) underlying or overlaying deposits, as graphically displayed by Clauzon *et al.* (2005, Fig. 10) or claimed by Suc *et al.* (2011).

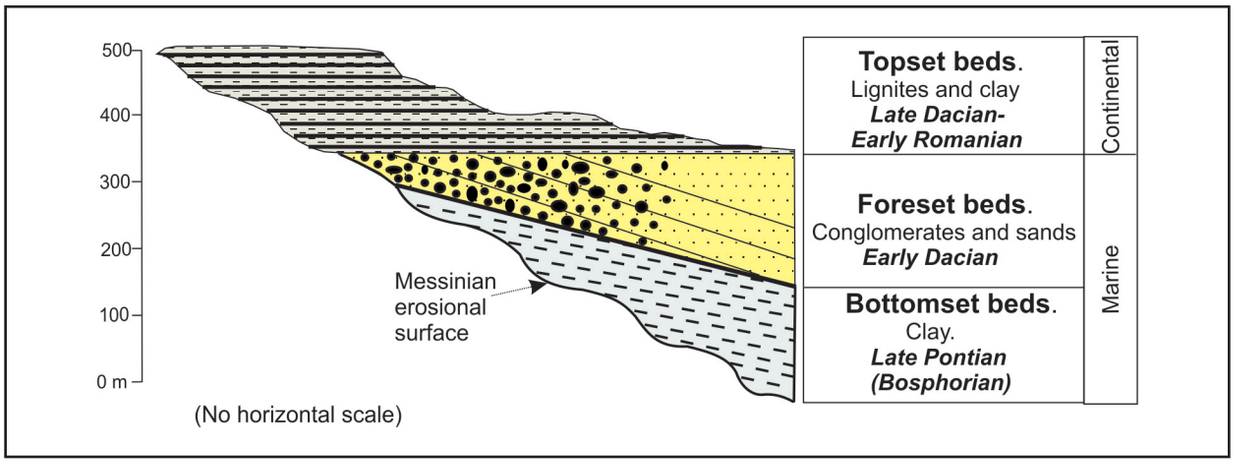


Fig. 2. Sedimentary architecture of the Gilbert-type fan delta from the Gura Văii - Turnu Severin - Hinova. Modified, after Clauzon *et al.* (2005, Fig. 10)

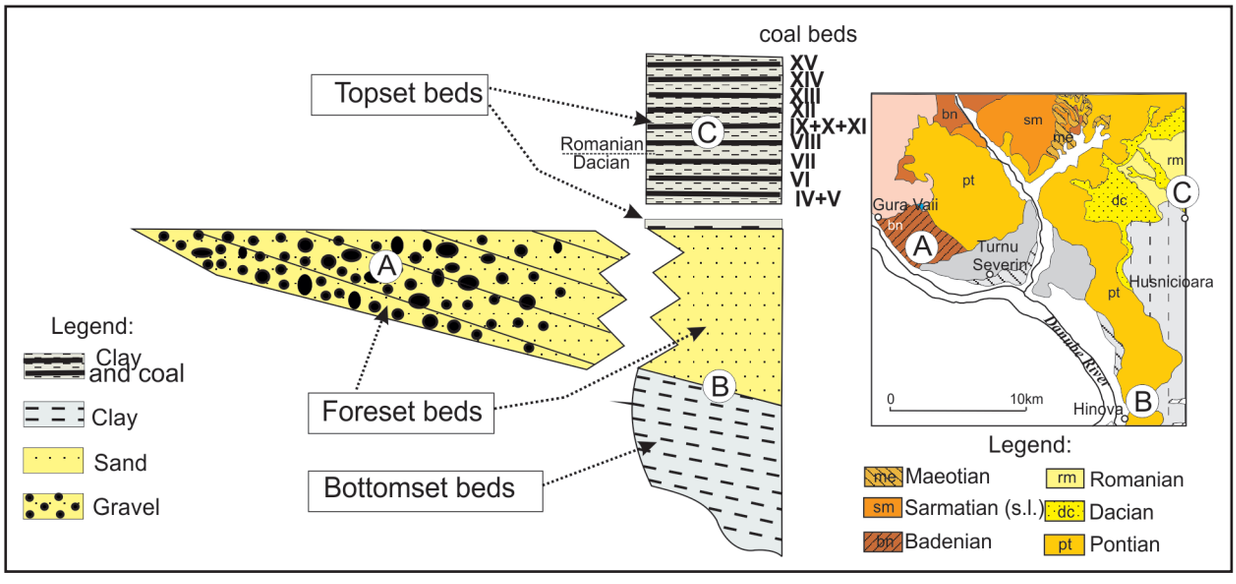


Fig. 3. Cropping out areas of the three units of the Clauzon *et al.* (2005) Gilbert-type delta. As revealed in this figure the conglomeratic foreset beds from area A are not associated with the bottomset and top set deposits described from area B. The topset beds from area C are cropping out in an area different from area B, but the topset strata from the two areas are consanguineous. Geological sketch map in the right side of the figure is simplified after the geological map of Romania scale 1:200.000, sheets Turnu Severin and Baia de Aramă (coordinated by Savu and Ghenea, 1967 and Năstăseanu and Bercia, 1968).

The threefold Gilbert-type deltaic structure is also not evident on Hinova section. In this case, the sand unit occurs between two dominantly clayey units. However, the large scale inclined bedding of the sand body, proper for a foreset unit, is drawn in the graphical model (Clauzon *et al.*, 2005, Fig. 10), but cannot be recognized in the outcrop. Moreover this sand unit is not a restricted/confined sedimentary body, as the outlined Gilbert delta (Suc *et al.*, 2011) would require. This sandy lithostratigraphic unit, named Cocorova Sand Fm. (Late Bosphorian; Early Zanclean) by Marinescu (1978), extends 35-40 km northeast from Hinova as shown on the Marinescu (1978) geological map. Similarly, the clay formation from Hinova, bottomset beds according to Clauzon *et al.* (2005), is known as Valea Boereasca Beds (Early Bosphorian; Marinescu, 1978) and shows the same regional extent.

3.2. Tectonic homocline versus Gilbert delta foreset dip

Another important sedimentary-architectural aspect is the sedimentary nature of the dip displayed by the conglomeratic deposits considered foreset beds.

The deltaic structure of the Gura Văii – Turnu Severin – Hinova deposits, as well as the Baloteşti – Izvoru Bârzii deposits rely on the implicit assumption that their eastward dip is of primary nature.

With the exception of an area at the Carpathian bend, the homocline structure is present in all the Upper Neogene deposits cropping out in the internal, sub-Carpathian part of the Dacian Basin. The homoclinal structure affects the entire

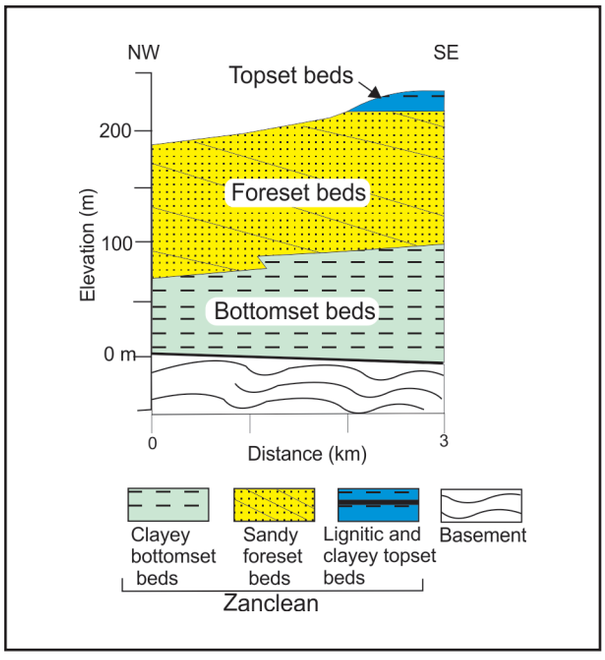


Fig. 4. The three units at Hinova sedimentary succession considered the structural components of a Gilbert-type fan delta. After Clauzon *et al.* (2005, Fig. 6 c) with modifications.

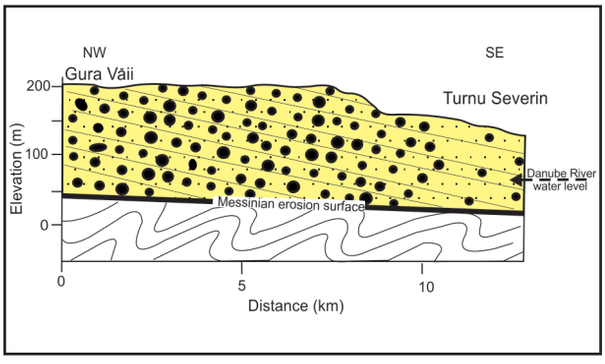


Fig. 5. Geological section through the dominantly conglomeratic deposits cropping out on the Danube River left bank, between Gura Văii and Drobeta-Turnu Severin localities. These deposits are considered the foreset strata of a Zanclean Gilbert-type fan delta. After Clauzon *et al.* (2005, Fig. 5 c) with modifications.

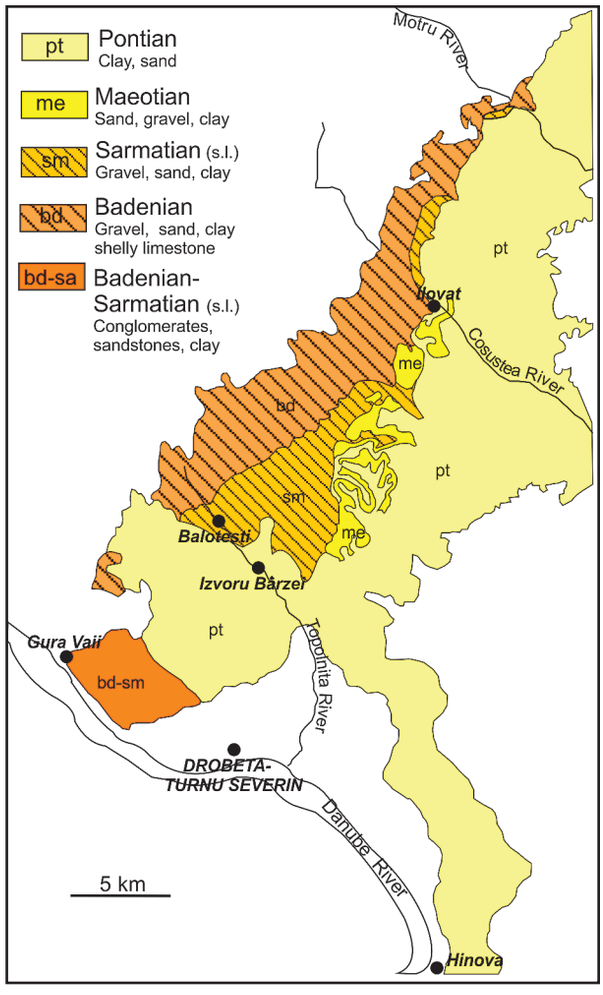


Fig. 6. Geological sketch of the Badenian to Pontian deposits in the area between Danube River and Motru River. The transgressive Pontian deposits cover Maeotian, Sarmatian and Badenian deposits. Simplified from the geological map of Romania scale 1: 200.000, sheets Turnu Severin and Baia de Arama (coordinated by Savu and Ghenea, 1967 and Năstăseanu and Bercia, 1968).

sedimentary succession, from the Upper Sarmatian (*s.l.*) to the Romanian deposits. The dip values decrease southward and eastward, away from the Carpathians. In the Focşani area (northern Dacian Basin), Necea *et al.* (2005) and Necea (2010) have been able to prove that the homocline structure occurred as a result of the Carpathians uplift. Therefore, there are good reasons to regard the dip of the Gura Văii - Turnu Severin deposits as a secondary, tectonic feature, not a primary sedimentary structure originated through deltaic progradation.

3.3. The geological age of the deposits making up the Gilbert-type deltas of the Gura Văii-Turnu Severin- Izvoru Bârzii area

The most important new general idea promoted by Clauzon *et al.* (2005) and Suc *et al.* (2011) in the process of outlining the Gilbert-type deltas, is the coining up a Zanclean age of the conglomerates in the Gura Văii-Turnu Severin – Izvoru Bârzii area. Assigning this new age, the authors invalidate the previous bio- and lithostratigraphic work results, which regard these deposits as Badenian – Sarmatian (*s.l.*) in age. Let us examine the arguments of the two concepts.

3.3.1. The Badenian-Sarmaţian (s.l.) age of the conglomeratic deposits from Gura Văii – Turnu Severin – Izvoru Bârzei

The westernmost part of the Dacian Basin is singled out by the massive participation of the conglomeratic deposits of Badenian-Sarmatian-Maeotian age. They extend from the Danube River to the Motru River (Fig. 6). The biostratigraphic researches on these deposits began at the end of the 19th century and reached the most important stage with the book signed by Marinescu (1978). During this large time interval, albeit fossils scarcity, the progressively accumulated paleontology, but also, stratigraphy and cartography data lead to a mature concept regarding the time and space position of the coarse-grained sediments on the western Dacian Basin rim.

The chronostratigraphic scale of the Dacian Basin and its correlation with the international stratigraphic scale is displayed in figure 7.

Paleontological arguments. Several fossiliferous points have been found and described (Marinescu, 1978, and references herein) in the dominantly rudaceous deposits cropping out in the Danube River to Motru River area. We will present only the faunistic data coming from the area between Danube River and Topolniţa River, where the Turnu Severin – Gura Văii and Baloteşti – Izvorul Bârzii Gilbert-type deltas have been outlined by Clauzon *et al.* (2005) and Suc *et al.* (2011).

The Sarmatian (*s.l.*) age of the upper part of the conglomerates in the area at the north and north-east from Drobeta-Turnu Severin is documented by the fauna from the Cocuţa Creek (left side tributary of the Topolniţa River, at the northern limit of Izvoru Bârzii locality (Fig. 8). On this creek, at about 1500 m upstream from the Baloteşti – Izvoru Bârzii road, Marinescu (1972) collected from the sandy matrix numerous specimens of *Congeria*, *Mactra*, *Cardium*, *Cerithium* and others (Table 1), which attest the Late Bessarabian age of the gravels.

Table 1. List of Sarmatian (Late Bessarabian) fauna from Cocuţa Valley fossiliferous point (NW Izvoru Bârzii, Topolniţa Valley) (Marinescu, 1972. Marinescu, 1978, pg. 44-45)

Congeria neumayri neumayri Andrusov	*Gibula pictiformis* (Andrusov) var.	
Congeria neumayri carpatica Macarovici	*Gibula (Colliculus) angulata spirocarinata* Papp	*Brothia (Tinnieana) escheri subotici* Brusina
Congeria neumayri poenensis Jeanrenaud	*Gibula (Robur) stavropoliana* (Kudriavtzew)	*Brothia (Tinnieana) escheri rotundata* Sandberger
Congeria neumayri savuli Jeanrenaud	*Gibula (Rolandiana?) pseudorolandiana* (Kolesnicov	*Melanopsis* cf. *M. bouei affinis* Handmann
Congeria politioanei Jekelius		
Congeria zoisi Brusina		*Theodoxus* sp.
Congeria aff. C. grshici Brusina	*Calliostroma af. C. marginata* (Eichwald)	*Pirenella disjuncta* (Sowerby)
Congeria tacutai Jeanrenaud	*Calliostroma tuleganela* nom. nov. (=*Trochus*	
Congeria birladensis Jeanrenaud	*elegantus* Sinzov)	*Terebralia bidenta lignitarum* (Eichwald)
Congeria cf. *C. zujovici* Brusina	*Calliostroma papilla* (Eichwald) var. *Calliostroma*	
Congeria ornithopsis Brusina	*curvilineata* (Sinzov)	*Cerithium comperei* d'Orbigny
		Pithocerithium rubiginosum (Eichwald)
Cardium ingratum perfida Kolesnikov	*Turbo (Barbotella) omaliusii* d'Orbigny	*Cerithium moldavicum* Simionescu et Barbu
Cardium ingratum ingratum Kolesnikov	*Turbo (Barbotella) hoernesi* Barbot	*Cerithium banaticum* Jekelius
Cardium plicatofittoni Sinzov	*Turbo (Barbotella) neumayri* Cobălcescu	*Dorsanum* cf. *D. duplicatum* (Sowerby
Cardium fittoni d'Orbigni	*Turbo (Barbotella) intermedia* Radovanović et	
Mactra vitaliana vitaliana d'Orbigni	Pavlović)	
Mactra cf. *M. vitaliana fabreana* d'Orbigny	*Tapes gregarius dissitus* (Eichwald)	
Mactra mingirensis Macarovici		
Mactra cf. *M. naviculata* Baily		
Mactra tapesoides Sinzov		

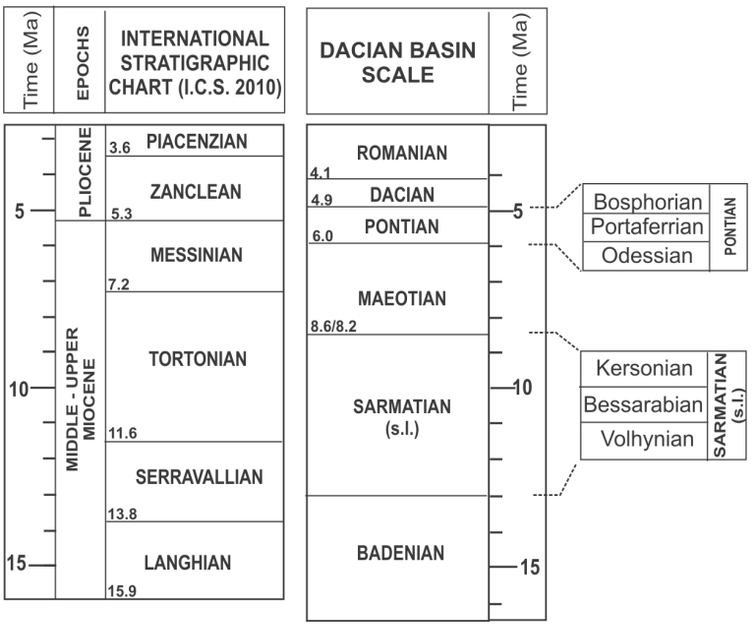


Fig. 7. Dacian Basin geological time scale compared with the international stratigraphic scale. Dacian Basin chronology (4.1 - 8.6 Ma) after Vasiliev et al. (2004) and Krijgsman et al. (2010). The international stratigraphic chart after the International Commission on Stratigraphy (2010).

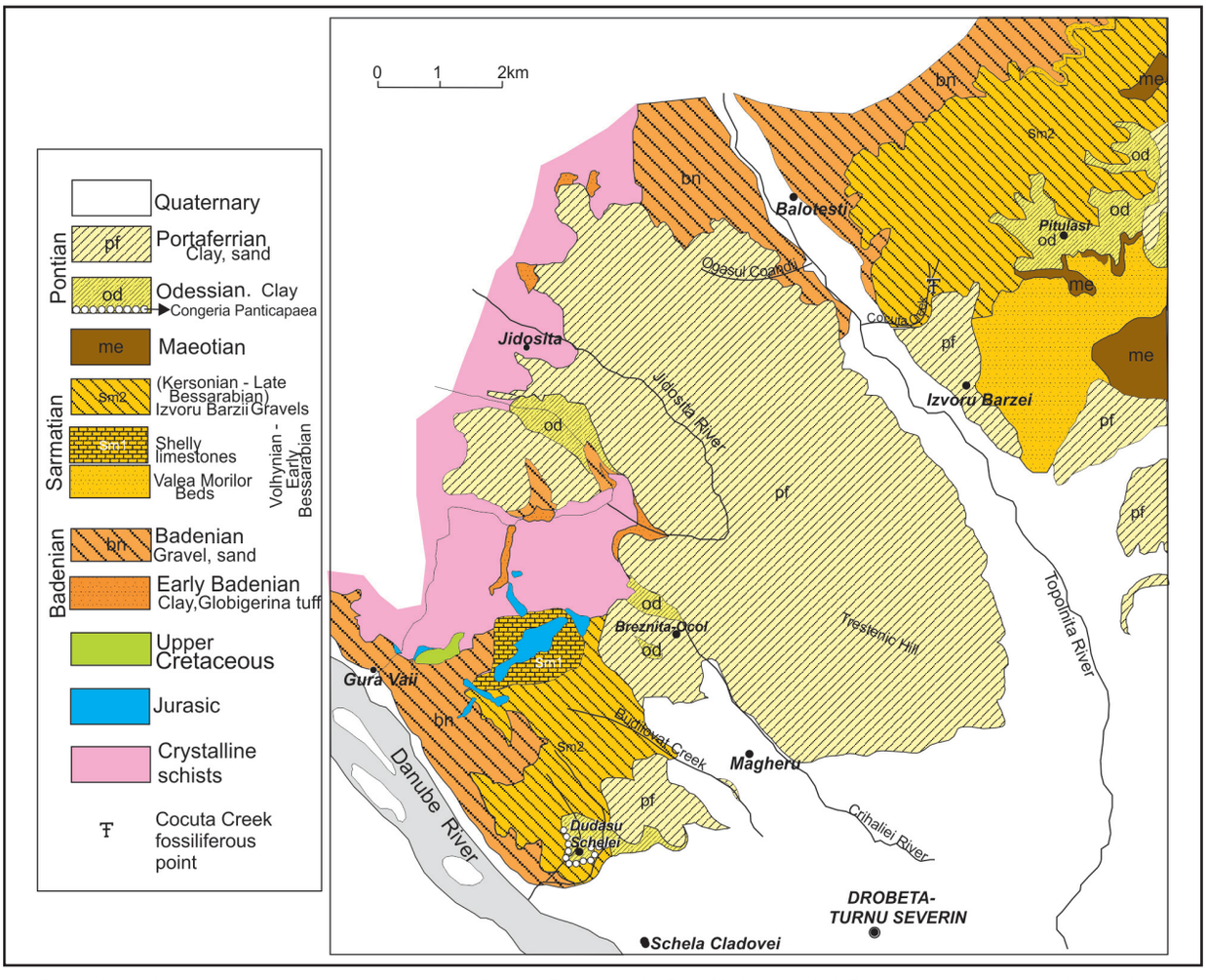


Fig. 8. Geological map of the area located northwest of Drobeta-Turnu Severin. From Marinescu, 1978. The age of the conglomeratic deposits is well constrained through the mapped stratigraphic relationships. The Lower Pontian (Odessian) and the Middle Pontian (Portaferrian) deposits lay over the Sarmatian conglomerates at Dudaşu Schelei and west of Breznița-Ocol. The Badenian conglomerates south of Jidoşita are laying under the Lower and Middle Pontian deposits and over the Early Badenian Globigerina tuff.

According to Marinescu (1978, p. 42) the Bessarabian age is also indicated by the faunal content of the shelly limestone from the Vărănic Hill, located at the west of the Brezniţa Ocol locality (Fig. 8). However, the relationships between the shelly limestone and the conglomerates are not clear yet.

The Early Sarmatian age of the gravels is also suggested by the faunal content of an olistolith resedimented in Pontian sediments, described by Marinescu (1978, p. 35) from the Budilovăţ Creek (between Magheru and Brezniţa Ocol localities, north-west of Drobeta-Turnu Severin).

The Kersonian stratigraphic level is also present in the Sarmatian gravels, as indicated by faunal data coming from the Coşuştea River area (Marinescu, 1978).

Stratigraphic arguments. Based on Marinescu (1978), the stratigraphic concept of the Middle and Upper Neogene sedimentary accumulation from the western Dacian Basin, presented in a brief and sketchy manner, is the following:

1. The lower part of the Badenian begins with the *clay and tuffs with Globigerina*. The succession continues with conglomerates (undivided Badenian). The Badenian time interval ends with the *clay with Spiratella* (Late Badenian);
2. The Early Sarmatian is represented by the *clay with Ervilia*, named by Marinescu (1878) the *Valea Morilor Beds* (Volhynian – Early Bessarabian). The thick rudaceous formation which follows in the stratigraphic scale (*Izvoru Bârzii Gravels,* after Marinescu, 1978) belongs to the Late Bessarabian – Kersonian time interval;
3. Maeotian (undivided), consisting of sand and clay;
4. The Pontian, dominantly clayey but also sandy in the uppermost part, was divided into three parts: Early Pontian (Odessian), Middle Pontian (Portaferrian) and Late Pontian (Bosphorian).

This stratigraphic series is complicated by unconformity relationships and proximal to distal facies variations.

In the above described stratigraphic succession, the two conglomeratic intervals (the undivided Badenian and Late Bessarabian – Kersonian formations), distinguished by the scarcity of the fossil remains, are positioned between fossiliferous deposits. Their general stratigraphic connotation is rather well constrained in this way.

Recent investigations. Intrigued by the complete age reversal proposed by Clauzon *et al.* (2005), we undertook field surveys to check-up the age and the stratigraphic position of the Gura Văii – Turnu Severin – Izvoru Bârzii conglomerates.

A paleontological study carried out (M.S) at the basal part of the conglomerates was rewarding for our objectives. Very rich and well-preserved foraminifera fauna was provided by fine-grained sediments intercalated in the conglomerates that crop out on the left bank of Danube River, close to Gura Vaii locality (Fig. 9). This fauna (Fig. 10) is represented by agglutinated foraminifera: *Karrerotextularia inopinata*

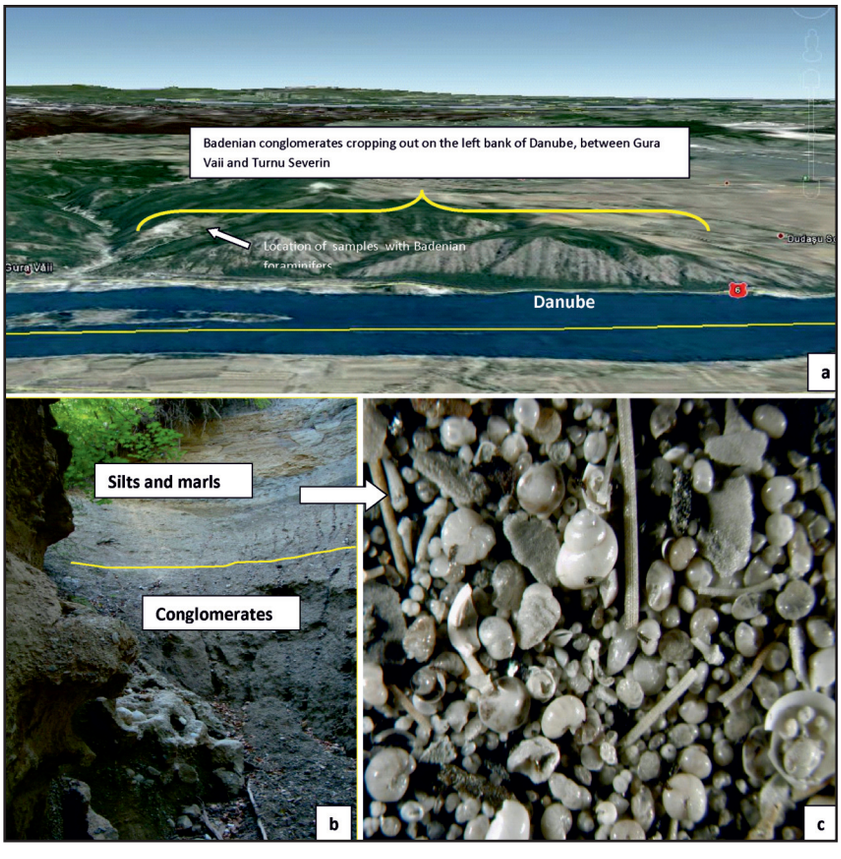
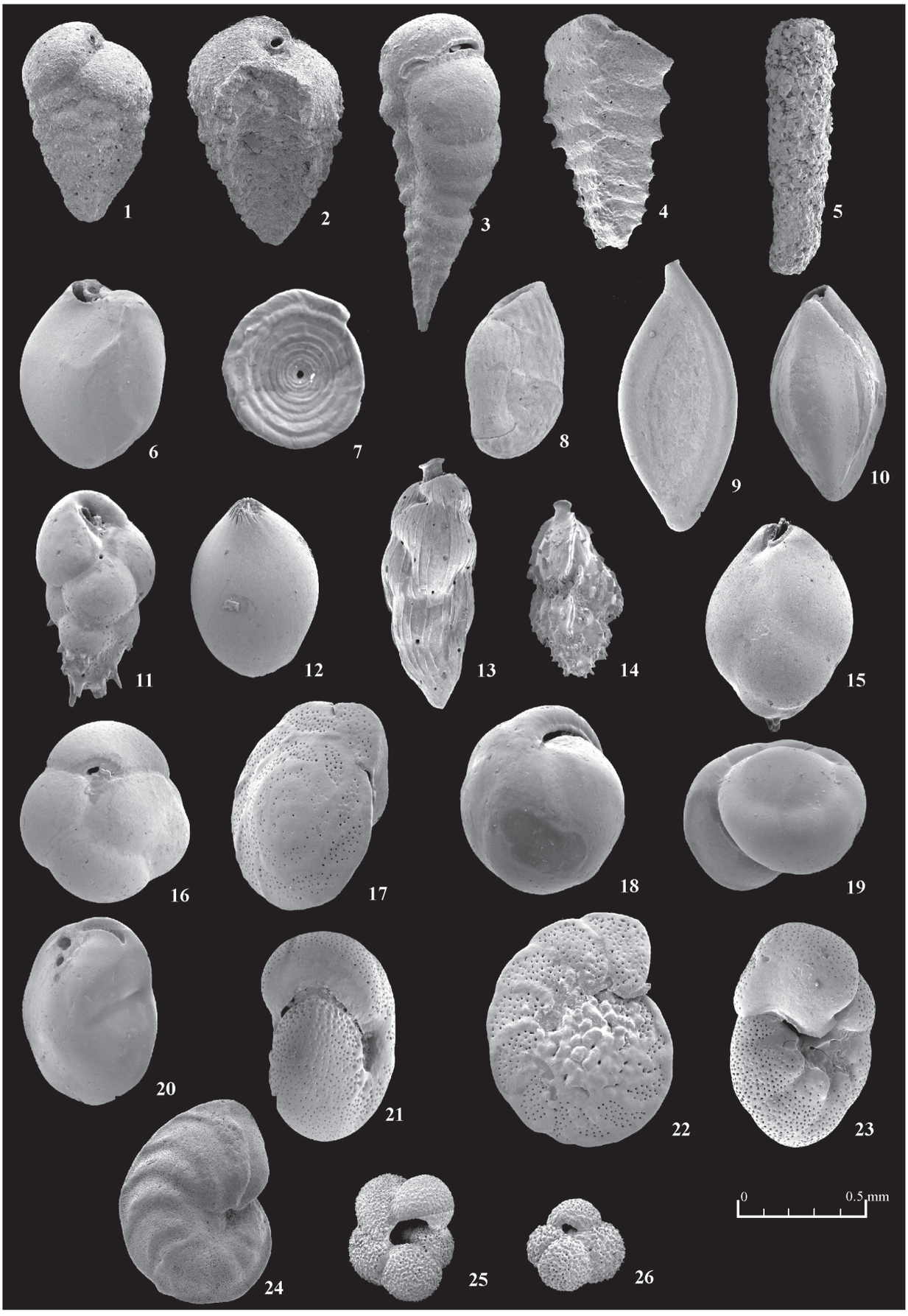


Fig. 9. Fine-grained sediments with Upper Badenian fauna intercalated in the conglomerates cropping out on the left bank of the Danube River, downstream of Gura Văii locality. **a)**The white arrow points out the location of the sampled silty and marly intercalations, where Upper Badenian foraminifers have been identified; Clauzon *et al.*, 2005, Suc *et al.* 2011 considered these conglomerates of Zanclean age (Upper Pontian). **b)** Silts and marls with foraminiferal content interbedded in Badenian conglomerates. **c)** Micropaleontological assemblage dominated by Upper Badenian foraminifera identified in silty and marly intercalations of the conglomerates from Gura Văii.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◂◂ **Fig. 10.** Upper Badenian (Kossovian) foraminifera identified in the fine-grained sediments intercalated in the conglomerates at Gura Vaii (left bank of Danube): 1. *Karrerotextularia inopinata (*Luczkowska); 2. *K. concavata* (Karrer); *3. K. flexua (*Venglinski); 4. *Spirorutilis mariae* (d'Orbigny); 5. *Martinottiella communis* (d'Orbigny); 6. *Miliolinella valvularis* (Reuss); 7. *Cornuspira striata* (Czjek); 8. *Nodobaculariella gibbosula* (d'Orbigny); 9. *Inaequalina jadwigae* (Luczkowska); 10. *Quinqueloculina* sp.; 11. *Baggatella subulata* (Cushman &Parker); 12. *Glandulina laevigata* (d'Orbigny); 13. *Uvigerina brunenesis* Karrer; 14. *Angulogerina alticarinata* Popescu; 15. *Globobulimina pupoides* (d'Orbigny); 16. *Sphaeroidina bulloides* d'Orbigny; 17. *Heterolepa dutemplei* (d'Orbigny); 18 *Pullenia miocenica* Kleinpell; 19. *Gyroidinoides soldanii* (d'Orbigny); 20. *Hoeglundina elegans* (d'Orbigny); 21 *Melonis pompiloides* (Fichtel & Moll); 22. *Cibicidoides ungerianus (*d'Orbigny); 23. *Valvurineria complanata* (d'Orbigny); 24. *Hanzawaia* sp.; 25. *Globigerina concina* Reuss; 26. *Globigerina* sp.

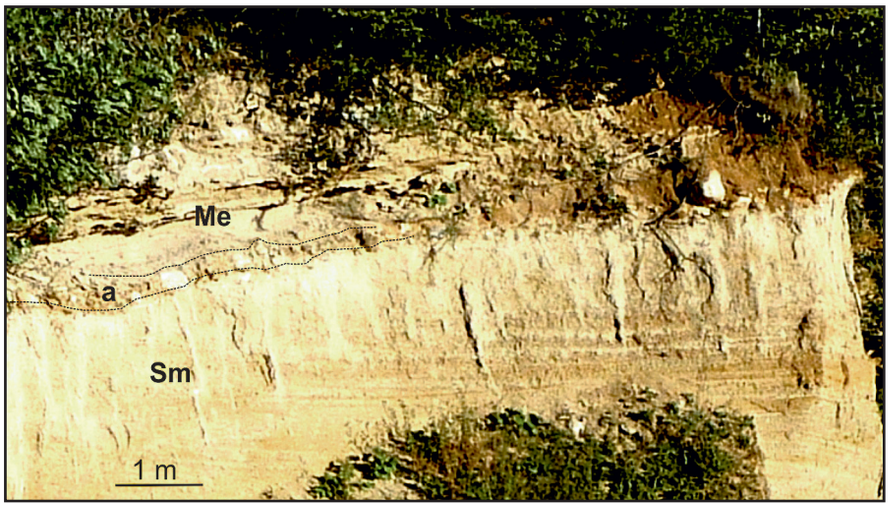

Fig. 11. Sarmatian sandy conglomerates (Sm) underlying sand deposits (Me) with Maeotian ostracods fauna. **a**. Residual coarse-grained gravel accumulated on the erosional surface. Pitulași locality, left slope of the Topolnita River (location in Fig. 8).

*(*Luczkowska), *K. concavata* (Karrer), *K. flexua* (Venglinski), *Spirorutilis mariae* (d'Orbigny) and *Martinottiella communis* (d'Orbigny), as well as calcareous benthic foraminifera: *Miliolinella valvularis* (Reuss), *Cornuspira striata* (Czjek), *Nodobaculariella gibbosula* (d'Orbigny), *Inaequalina jadwigae* Luczkowska, *Baggatella subulata* (Cushman & Parker), *Uvigerina brunenesis* Karrer, *Angulogerina alticarinata* Popescu, *Globobulimina pupoides* (d'Orbigny), *Sphaeroidina bulloides* d'Orbigny, *Heterolepa dutemplei* (d'Orbigny), *Gyroidinoides soldanii* (d'Orbigny), *Hoeglundina elegans* (d'Orbigny), *Melonis pompiloides* (Fichtel & Moll), *Pullenia miocenica* Kleinpell, *Cibicidoides ungerianus (*d'Orbigny), *Cybicides* sp., *Valvulineria complanata* (d'Orbigny), *Hanzawaia* sp. The planctonic foraminifera are represented by *Globigerina concina* Reuss and *Globigerina* sp. The richness and good preservation state of this fauna is an argument for the *in situ* position of the fauna. The faunal content argues for a Late Badenian age of the conglomerates.

Investigations were also conducted at the upper boundary of the conglomeratic formation from Gura Văii – Turnu Severin – Izvoru Bârzii . These works succeeded to point out profiles with sediments bearing Maeotian microfauna directly covering conglomerates in the Izvoru Bârzii area. On Ogaşul Coandii, a small right-bank tributary of the Topolnița River (250 m SSE of the church at the south limit of Baloteşti locality), clayey Pontian deposits directly overly Sarmatian conglomerates. At the Pitulaşi village, sandy Maeotian sediments erosionally cover Sarmatian conglomerates (Fig. 11).These stratigraphic relationships confirm the Marinescu (1978) view that the Upper Bessarabian – Kersonian conglomerates at Izvoru Bârzii are transgressively covered by Pontian and Maeotian deposits.

3.3.2. The Zanclean age of the conglomeratic deposits from Gura Văii – Turnu Severin – Izvoru Bârzii

The radical stratigraphic re-assignment of the Gura Văii – Turnu Severin conglomerates, from Badenian – Sarmatian (*s.l.*) to Zanclean, is introduced by Clauzon *et al.* (2005, p. 442) in one phrase: "At the outlet of the Iron Gates … the Danube River cuts thick conglomerates, …. that have been erroneously considered as Middle-Late Miocene in age … because of their likeness to a detrital tilted formation overlying Badenian clays 25 km northward".

Surprisingly, nowhere further to this statement is presented the second, necessary part of the allegation, to stipulate and support the younger age of these conglomerates. The Zanclean age of the conglomerates is only mentioned in a figure caption: "Foreset beds of the Zanclean Gilbert-type fan delta between Gura Văii and Turnu Severin" (Clauzon *et al.*, 2005, Fig. 5, p. 444).

The analysis of the Clauzon *et al.* (2005) paper points out that the Zanclean age conglomerates affirmed by the authors is not the result of a paleontological and/or stratigraphic analysis or new finding. Suc *et al.* (2011) offer a supplementary explanation mentioning that "the Zanclean age of this Gilbert-type fan delta was deduced from the nannoflora found at Hinova" (area B in Fig. 3).

4. CONCLUSIONS

The critical scrutiny of the concept regarding the Gura Văii – Turnu Severin – Izvoru Bârzii Gilbert-type deltas reveals the lack of evidences necessary to demonstrate the existence of the three units (foreset, bottomset and topset beds) which define a Gilbert-type delta.

Although there are convincing evidences for its tectonic origin, the homoclinal structure of the deposits was cursorily considered as a primary sedimentary structure generated through the deltaic progradation with no further arguments. The age of the rudaceous deposits in the area Gura Văii – Turnu Severin – Izvoru Bârzii, representing the core of the two outlined Gilbert deltas, was considered Zanclean (Bosphorian/late Pontian) by Clauzon *et al.* (2005) and Suc *et al.* (2011), rejecting, without any litho-or biostratigraphic argument the Badenian-Sarmatian (*s.l.*) age formerly attributed (Marinescu, 1978). The critical examination of these two concepts pointed out the paleontological and lithostratigraphic proofs which substantiate the Badenian – Sarmatian (*s.l.*) age, in contrast with the lack of evidences in favor of the Zanclean age.

The Zanclean age of the conglomeratic deposits from Gura Văii – Turnu Severin – Izvoru Bârzii was granted by assigning the same age of the Hinova sand unit, situated 22 km SE, without any rationale.

Altogether, we conclude that it is reasonable to reject the Zanclean age for the conglomerates downstream the Danubian Iron Gates (from Gura Văii – Turnu Severin – Izvoru Bârzii) and that the Badenian – Sarmatian age of the conglomerates is accurate.

The reconfirmation of the Sarmatian – Badenian age by our studies shows the conglomeratic sediments at the Iron Gates area accumulated well before the Messinian Salinity Crisis and have no relation with this event. We also prove the "Zanclean Gilbert-type fan deltas" from Turnu Severin area presented by Clauzon *et al.* (2005) and Suc *et al.* (2011) represents, in fact, tectonically tilted Badenian – Sarmatian (*s.l.*) conglomerates.

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