WHEN DID THE DANUBES BECOME THE DANUBE?

ION ANDREESCU

This paper is dedicated to Professor PETRE COTEŢ,
an outstanding Romanian Geomorphologist.

Abstract. *In the Middle Dacian (Parscovian) – Early Romanian (Pelendavian) time span at least three major migrational phases of the fresh-water molluscs, coming from the southern Pannonian Basin "Paludinian Beds," have been recorded in the Dacian Basin. In these conditions a direct, even intermittent, fluvial connection between the two realms, is to be supposed. According to the available data, since at that time the Paleo-Danube did not reach yet the central Pannonian Basin, such a connection could possibly be accomplished by the Paleo-Timok River (a southwestern Dacian Basin tributary) through the Serbian Paleo-Morava tectonic corridor. The Upper Valahian (=Uppermost Romanian) morphogenetic movements led, inter alia, to the fluvial connection breaking off through the Timok-Morava corridor. But, meantime, the Paleo-Danube already reached the southern Pannonian Basin area. Consequently one may say the Paleo-Danube became the Danube when it reached the Dacian Basin through the Iron Gates piercing, an event that could take place some 2.0-1.8 Ma ago, i.e. during the Uppermost Romanian (Upper Valahian) – Early Pleistocene.*

Keywords: *Danube, Dacian Basin, Pannonian Basin, Paludinian Beds, Paleo-Timok.*

Rezumat. Când au devenit Dunările Dunăre? *Deoarece în intervalul Dacian mediu (Parscovian)-Romanian inferior (Pelendavian) în Bazinul Dacic se înregistrează cel puţin trei faze importante de migraţie a faunelor de moluşte dulcicole, provenite din "Stratele cu Paludine"sud-pannonice, este de presupus o legătură fluvială, posibil intermitentă, între cele două bazine. Conform datelor de care dispunem, în lipsa Paleo-Dunării, care în acest interval nu avansase încă în sectorul central al Bazinului Pannonic, Paleo-Timokul pare să fi realizat o astfel de legătură prin intermediul culoarului tectonic drenat de Paleo-Morava. Mişcările morfogenetice valahiene au determinat întreruperea pasajului Timok-Morava dar, între timp, Paleo-Dunărea ajunsese în zona sudică a Bazinului Pannonic. În consecinţă este de presupus că pătrunderea Palo-Dunării în Bazinul Dacic a avut loc cel mai probabil în urmă cu cca. 2,0-1,8 Ma, adică în partea terminală a Romanianului (Valahian) - începutul Pleistocenului (în actuala accepţiune a acestuia).*

Cuvinte cheie: *Dunărea, Bazinul Dacic, Bazinul Pannonic, «Stratele cu Paludine», Paleo-Timok.*

The present Danube valley, as a whole, is made of four major segments:

a) from the source to the entrance in the Pannonian Basin;
b) the Pannonian segment;
c) the Iron Gates gorges;
d) the Valahian - Pontic segment.

The Danube River course can be structured according to other criteria also, as for example, by tacking into account the six gorges it passes through.

Admitting the Danube course is made by several elements, then the questions are when and how these segments put together, resulted in the present course?

In time, a lot of more or less realistic hypotheses regarding these questions have been proposed. The present contribution does not intend a particularly analysis of those hypothesis. However, it is worth mentioning that till recently, most of them were mainly focused on the genesis of the Iron Gates gorges, considered with good reason, the clue in the Danube's evolution course.

Four of those hypotheses, although lasting since the 19th century, could be still considered as topical:

1. the gorges installed as a result of *tectonic displacements* that took place in the southwesternmost part of the Southern Carpathians (PETERS, 1876);

2. the *drainage capture* (PETERS, 1876) assumes the western side rivers of the Almaşu Mountains have been captured by the eastern side ones. This hypothesis, adopted by de MARTONNE, 1902; MURGOCI, 1908; VÂLSAN, 1918 etc., has been subsequently developed by FICHEUX & TRICOM (1948, apud COTEŢ, 1954); POSEA et al., 1963, 1969) becoming the "successive capture" hypothesis.

3. the *antecedence* hypothesis (PENCK, 1895, apud COTEŢ, 1954) implies that the Danube's valley through the Iron Gates gorges existed already in Pontian, as a heritage of a Miocene or pre-Miocene valley.

CVIJIC, 1908, adopted this opinion conceiving the gorges as a former marine narrow. In other words, this hypothesis claims the fluvial connection between the Dacian and Pannonian basins has practically been permanent since the Pontian time. Besides most of the Serbian authors, this model is supported by COTEŢ, 1954; 1957; BADEA, 1970; PAULIUC et al., 1988; LEEVER, 2007, as well;

4. the *overflow* of the Pannonian Lake in the Dacian Basin (TOULA, 1896, apud COTEŢ, 1954) has in view the similitude of the mollusc assemblages in the "Paludinian Beds", from the southern Pannonian Basin, with the freshwater mollusc assemblages from Pliocene deposits in the Dacian Basin.

Except the first hypothesis, the others are implicitly, or explicitly, referring to the time span when in the Iron Gates area, or in its upstream or downstream proximities, there took place the events that led to the present Danube configuration.

However, the timing of those supposed events is rather out-of-date, whether one take into account that the meaning of some chronostratigrafic units used that time is quite different by comparison with the actual Neogene chronostratigrafic units. As for example, what did the Miocene or the Pontian mean to CVIJIC, 1908?

Did he use the Pontian in the sense accepted that time by the greatest part of the Austro-Hungarian authors, in TEISSEYRE's, 1907; 1909, sense or in ANDRUSOV's, 1897; 1906 one?

But, beyond those features related to some temporal inaccuracy and inconsistence of several ideas, there is no reason, in any way, to consider those opinions as imputable to our ancestors.

During the last two decades a recrudescence of the items regarding the Paleo-Danube evolution in the Pannonian Basin is to be noted, in contrast with a somewhat slowness concerning the same subject, but in the Dacian Basin realm.

Most authors tried to integrate the various Danube's elements evolution in the tectono-sedimentary regime of the Pannonian and/or the Dacian Basin.

Several authors intending to integrate the paleogeographic evolution of the two basins in the frame of the Upper Miocene circum-Mediterranean events consider that the so-called "Messinian Salinity Crisis" has decisively influenced the Paleo-Danube evolution, either in the Pannonian Basin, or in the Dacian one.

In this respect, a peculiar note concerns the papers of CLAUZON et al., 2005; 2008, in which the authors claim the Paleo - Danube built a Zancleean delta in the Gura Văii - Drobeta Turnu Severin outlet.

The bottom set beds of that so-called Gilbert-type delta would be represented by the Upper Pontian (Bosphorian) silty-sandy clays from Hinova (= Sandy Clays of Valea Boereasca, in MARINESCU, 1978), while the foreset beds would be represented by the Gura Văii Conglomerates and Pebbles (= Gura Văii Formation, ANDREESCU, in ANDREESCU et al., 1992a), thought BY CLAUZON et al., 2005, to be Bosphorian too.

In CLAUZON's et al., 2005 acceptance, those pebbles and conglomerates, exposing a normal bedding, have erroneously been considered to belong to the Badenian Stage by the Romanian authors.

LEEVER, 2007, ENCIU, 2007 etc., adopted without any comment CLAUZON's et al. (2005) opinion.

Our investigations concerning the stratigraphy of the Neogene deposits from Oltenia prove the edifice of CLAUZON et al., 2005, is nothing else but an artifact.

The careful inspection of Fig. 1, in which the relationships among the Neogene deposits from Gura Văii-Drobeta-Turnu Severin area are depicted, is conclusive.

It is enough to see that the Gura Văii Conglomerates and Pebbles are channelized by huge Sarmatian alluvial fans (= Izvoru Bârzii Pebbles, MARINESCU, in MARINESCU et al., 1972; MARINESCU, 1978) which, in their turn, are transgressively invaded by the Lower Pontian deposits of the Ilovăț Formation (ANDREESCU, in ANDREESCU et al., 1992a, 1992b).

Thus, the cross-section (Fig. 1) shows the inconsistence of CLAUZON's et al., 2005, idea as concerns the presumably Upper Pontian age of the Gura Văii Formation and, consequently, the existence of a Bosphorian Gilbert-type delta in the Drobeta-Turnu Severin area as well.

The paleogeographic considerations of CLAUZON et al., 2005; 2008, regarding the Danube evolution follow a strange scenario according to which, during the Pontian, the Danube flowed on a similar course to its modern one, while the Pontian aquatorium of the Dacian Basin remained as a "perched" lake somewhere to the north.

In JIPA, 2008 and JIPA'S et al., 2008 opinions, the hypothesis of CLAUZON et al., 2005, regarding the Messinian - Zancleean origin of the Danube in the Dacian Basin seem to be unlikely and in conflict with the stratigraphic data.

The first Proto-Danube delta had been built immediately after entering the Vienna Basin, in the low-stand interval subsequent to the Neo-Paratethys depletion, corresponding to Zone B (PAPP, 1951), of the basal Pannonian (HARZHAUSER et al., 2003, 2007), or to the Upper Bessarabian from the Oriental Paratethys.

That initial delta has been destroyed after about 1.1-1.3 Ma by the transgresive phase, coincident with Zone C (PAPP, 1951) of the Early Pannonian (HARZHAUSER et al., 2003; MAGYAR & SZTANO, 2007; CZICZER et al., 2008).

In the Dacian Basin this transgressive phase took place in the Lowermost Meotian, in a time interval corresponding to *NSM_{5a} - Congeria neumayri - Teissereomya subatava Subzone* (ANDREESCU, 1981; 1983 etc.), paleomagnetically dated at 8.75 - 8.9 Ma (ANDREESCU, 2008, revised).

Against the strong transgression background, the connections between the Pannonian and Dacian basins could be easily re-established through the Cerna - Timis and/ or Iron Gates - Baziaş corridors, already extant in the Early Sarmatian.

The so-called "*Dosinia Level"* (= *NSM_{5b} - Dosinia maeotica Subzone*) represents the high-stand of the Lower Meotian transgression.

Soon, in the 8.6-8.1 Ma time span (=*NSM_{5c} - Eolymnium moldavicum -Sinzovinaia prahovensis* Subzone), the aquatorium of the Dacian Basin recorded a sudden level fall, leading to the completely freshening, strong erosion and developing of deltaic or even alluvial fan delta environments, as a result of breaking off the connections with the Euxinic and Pannonian basins (ANDREESCU, in ANDREESCU et al., 1992a; 1992b).

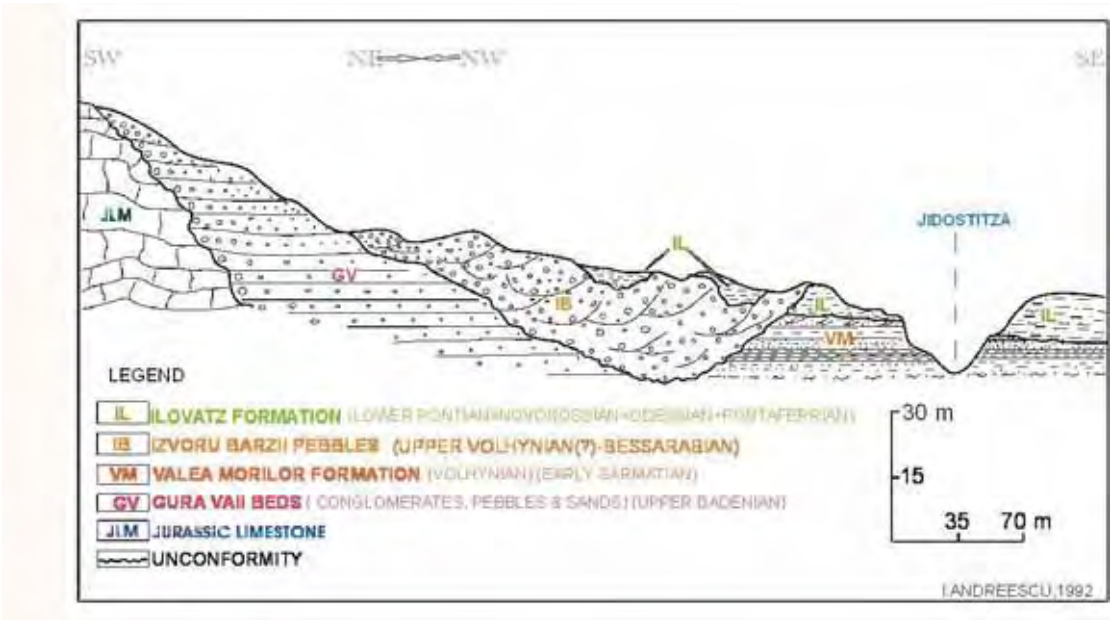


Figure1. Cross-section in the Jidoştiţa valley area, NW to Drobeta-Turnu Severin.
Figura 1. Secţiune în zona văii Jidoştiţa, nord-vest de Drobeta-Turnu Severin.

This low-stand interval (about 0.5 Ma), inducing a real "salinity crisis" in the Dacian Basin, has been experienced by the Pannonian Basin as well, being illustrated by a substantial progradation of the Paleo-Danube and Paleo-Tisa deltaic environments (HARZHAUSER et al., 2003, 2007; MAGYAR & SZTANO, 2007; CSATO et al., 2007 etc.) at a stratigraphic level corresponding to Zone D (PAPP,1951).

This interval seemingly is coincident with the "Lower Messinian Evaporites" from the marginal Mediterranean basins.

The Upper Meotian transgression in the Dacian Basin (~8.1 Ma), had been less evident in the Pannonian Basin. However, according to MARINESCU, 1978, several facts suggesting some restrictive connections between the two basins through the above-mentioned corridors, could took place.

At the level of ~7.7-7.5 Ma, the connections between the Dacian Basin and the Pannonian Basin were completely restored and, as a result, Lower Pontian retrogradational delta environments, which gain a wide expansion reaching the western Vienna Basin, have destroyed the Pannonian deltas of the Paleo-Danube and Paleo-Tisa.

According to STEININGER & WESSELY, 2000, the Paleo-Danube entered again the Vienna Basin not earlier than about 3.0 Ma ago, i.e. during the Pelendavian.

The second half of Portaferrian Substage (~7.0-6.75 Ma) is affected by a strong regressive tendency of the Paratethys realm. Finally, that regression led to a new and final depletion of the Paratethys.

On this background, the extinction processes of the Pontian brackish water molluscs are severely experienced in the Pannonian Basin. From now on, to the almost complete basin fill in Pleistocene, the Pannonian Basin is biostratigraphically characterized by the exclusive development of the freshwater molluscs of the "Paludinian Beds".

Concomitantly, a series of quite interesting faunal events took place: tens and tens of freshwater bivalves and gastropods taxa, peculiar for the "Paludinian Beds" are to be found in the Upper Dacian and Romanian deposits from the Dacian Basin, a fact revealed by a lot of authors: BRUSINA, 1874; 1902; NEUMAYR & PAUL, 1875; PORUMBARU, 1881; PENECKE, 1883; FONTANNES, 1886; COBĂLCESCU, 1883; SABBA STEFĂNESCU, 1896; TEISSEYRE, 1907; IONESCU-ARGETOAIA, 1918, 1923; KREJCI-GRAF, 1932; JEKELIUS, 1935, 1943; WENZ, 1942; LUBENESCU, 2008 etc.

Those similarities of the freshwater mollusc assemblages imply a fluvial connection, even intermittent, between the two basins.

As it was already specified, this is the strongest proof of the hypothesis of antecedence of the Danube course through the present Iron Gates area.

The proof is irrefutable indeed, but, in the same time, it is quite insufficient, by itself, to prove the validity of the antecedence hypothesis.

Firstly, it is noteworthy to point out that, during the slice time following the beginning of the Upper Portaferrian regression, the Paleo-Danube was trapped in the Vienna Basin (STEININGER & WESSELY, 2000), or somewhere in the northwestern Pannonian Basin (HARZHAUSER et al., 2003, 2007 etc.).

The amazing capacity of the Pannonian Basin to accommodate huge masses of Upper Neogene sediments, as an effect of a thermal subsidence, led to a relatively slowness in the progradation of the northern tributaries Paleo-Danube and Paleo-Tisa (CSATO et al., 2007 etc.).

Then an essential fact must be kept in mind, namely that those very numerous taxa of the "Paludinian Beds" recorded in the Pliocene deposits of the Dacian Basin, represent the vicariant faunas of the Croatian, Slovenian and south-westernmost Serbian realms, and not of the central or northern Pannonian Basin ones.

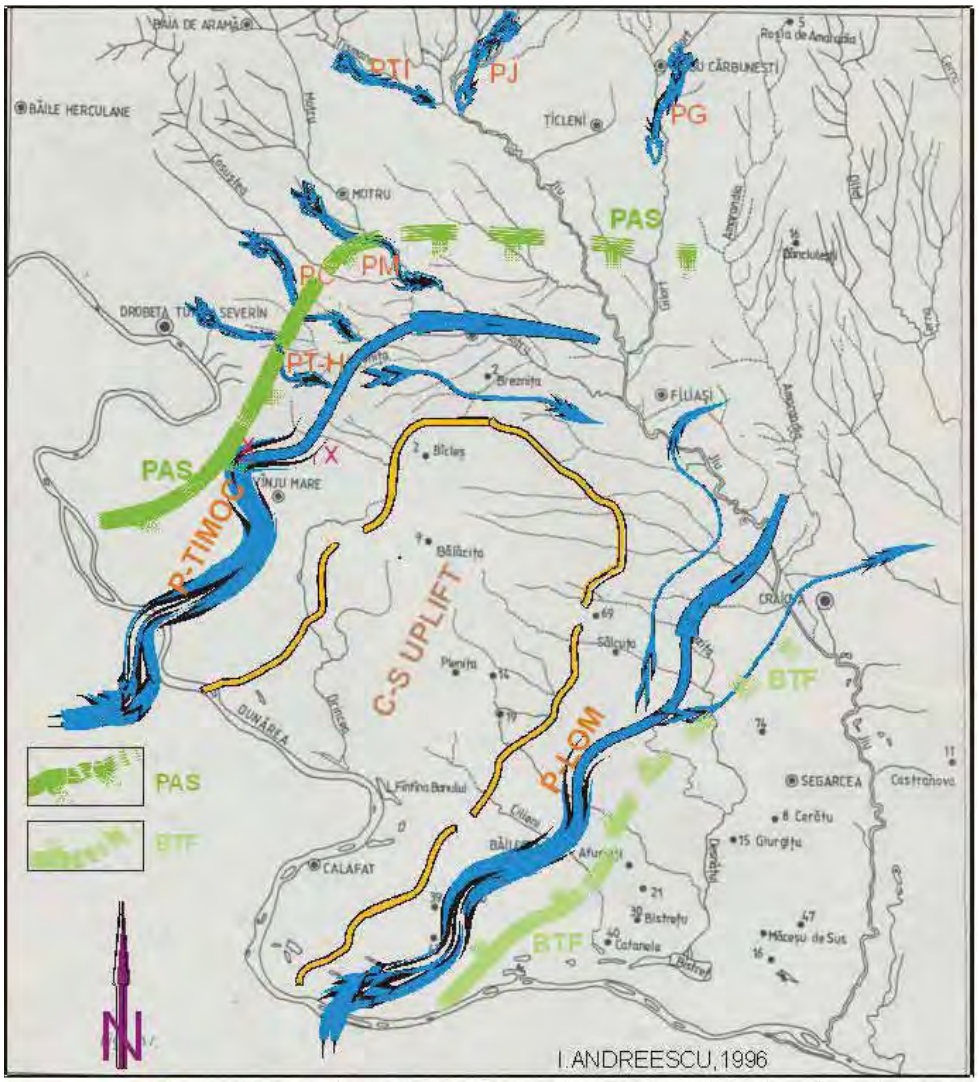
Once admitted these evidences, then the natural question is: how could those freshwater molluscs reach and disseminate, starting with the Upper Parscovian, the Dacian Basin?

Partially, the answer is rendered out in the attached charts (Figs. 2-5).

Those charts are based on a series of multidisciplinary investigations: litho-biostratigraphic, morphostructural, magnetostatigraphic, carbogenetic etc.), carried out during 1975-1998 in Oltenia (PANĂ et al., 1981; PAULIUC et al., 1981; ANDREESCU et al., 1984; ANDREESCU et al., 1985; ANDREESCU, 1986; ANDREESCU et al., 1986; ANDREESCU et al., 1992a; 1992b; 1993; 1994; 1995; 1996; 1997; 1998).

From the corroboration of the processed data, regarding mainly the coal bearing sediments in Oltenia, the following observations can be pointed out:

- in the Getian - Pelendavian interval, the Pannonian Paleo-Danube did not reach the Dacian Basin;
- in the Uppermost Bosphorian, lithologically represented by the Cocorova Sands and Vânju Mare Sands, and in the Lowermost Getian Substage, represented by the Lazu Sands, in the south-westernmost Dacian Basin flowed at least 5 important rivers: the Paleo-Motru, the Paleo-Coşuştea and the Paleo-Huşnița-Topolnița, in the north area, as well as the Paleo-Timok and the Paleo-Lom in the south (Fig. 2);
- both Balkan rivers representing major drainage axes, followed the structural dip along the depression corridors of Pătulele-Izvoru Aneştilor-Samarineşti (PAS) and Băileşti-Terpezița-Filiaşi (BTF) (Fig. 2);



PAS= NORTHERN BOUNDARY OF DEPRESIONARY AREA PATULELE-IZVORU ANESTILOR-SAMARINESTI
P-TIMOC=PALEOTIMOC; P-LOM=PALEOLOM; PT-H=PALEOTOPOLNITA-HUSNITA;
PC =PALEOCOSUSTEA; PM =PALEOMOTRU; PTI =PALEOTISMANA; PJ =PALEOJIU;
PG=PALEOGILORT; C-S UPLIFT=CALAFAT-STREHAIA UPLIFT; X-X = CROSS SECTION
BTF=SOUTHEASTERN BOUNDARY OF THE BAILESTI-TERPEZITA-FILIASI CORRIDOR

Figure 2. Main drainage axes in the Lower Dacian (Getian) from Western Oltenia.
Figura 2. Principalele axe de drenaj în Dacianul inferior (Getian) din Oltenia occidentală.

- the lithofacial cross-section, drawn out in the southernmost Livezile sector (=„X – X" in Fig. 2; Fig. 3) reveals an important channel, flowing from south to north, as suggested by the data processed in a number of about 800 wells in the Western Husnicioara, Eastern Husnicioara and Western Prunişor - Izvoru Aneştilor - Livezile sectors;

- the same sediment supplying trend is documented by the Lower Getian sands containing heavy minerals and the bipiramidate and/or hexagonal quartz, originated from the Belogradcik - Boljevac eruptive zones and/or in the eruptive and metamorphic rocks from the south-Danubian areas south of Maidanpek (HADNAGY, in ANDREESCU et al., 1992a; 1992b);

- that channel, which deposited Uppermost Bosphorian - Lower Getian extensive sand sheets and accretionary sand bodies, reaching up to 100-150 m thickness in the corridor Pătulele - Izvorul Aneştilor - Samarineşti, represents the Paleo-Timok River (Figs. 2; 3) (ANDREESCU, in ANDREESCU et al., 1992a; 1992b);

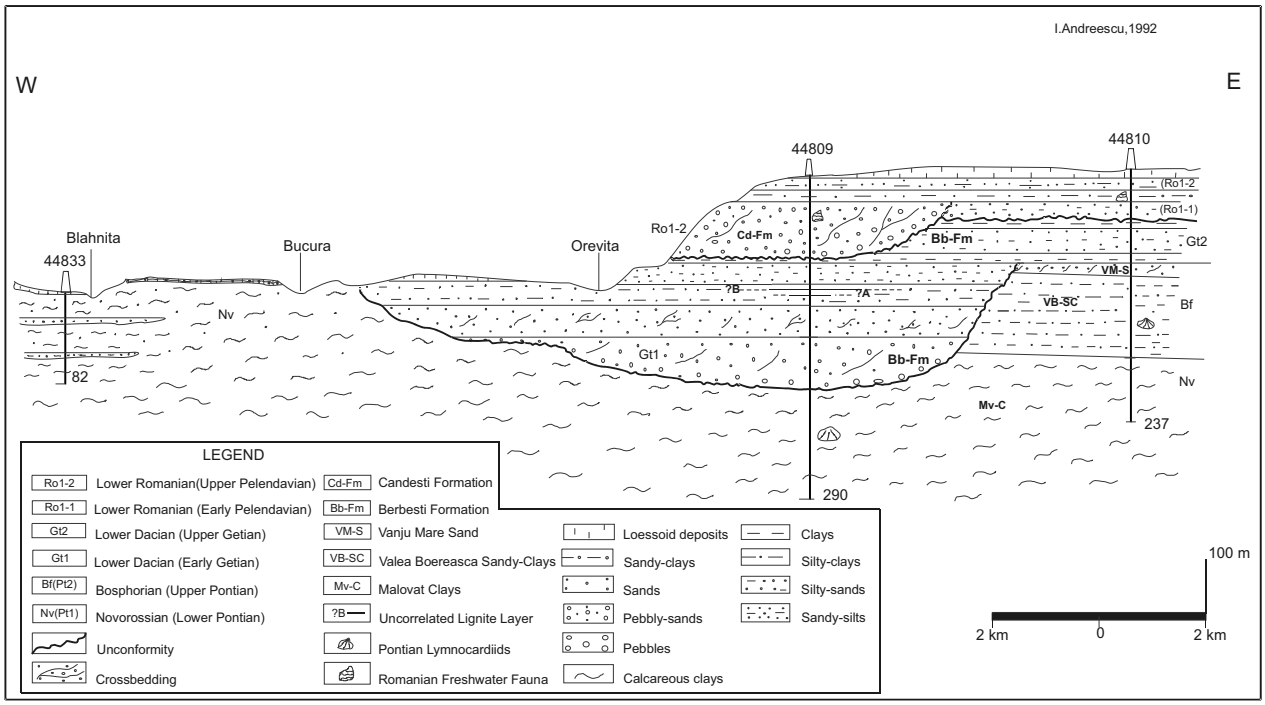


Figure 3. Lithofacial cross-section in southernmost Livezile perimeter.
Figura 3. Secţiune litofacială în extremitatea sudică a perimetrului Livezile.

- the greatest part of the extended "sandy platform" (Cocorova and Lazu Sands), without which the initiation of the peat generating environments leading to the "Viseni Valley Coaly Complex", could not be possible, has mainly to be put in the account of the Paleo-Timok River (ANDREESCU, TICLEANU, in ANDREESCU et al. 1985).

- in the second part of the Getian, the sediment supply of the Paleo-Timok suffered a dramatic shortage, which favoured the development of peat generating environments (coal beds I to IV) in the medial-distal fan-delta lobes;

- in contrast to the Paleo-Timok regime, a cyclic, impetuous activation of the Carpathian rivers, the Paleo-Motru, the Paleo-Coşuştea and the Paleo-Huşniţa-Topolniţa, which formed extended fan deltas, is to be noted.

- frequently, the alluvial channels cannibalized their own deposits accumulated either during the former cycles, or in the same cycle, and eroded even the thick (12-21 m) peat sheets, corresponding to the 4th lignite bed (4-7 m) (Fig. 4).

- basinward the medial to distal alluvial fans of the Carpathian rivers (the Paleo-Huşniţa-Topolniţa etc.) and the Paleo-Timok, built joined, more or less, shared-fan deltas, in the area of Prunişor - Izvoru Aneştilor (Fig. 5).

- no freshwater molluscs ascending in the "Paludinian Beds" have been recorded in the Getian deposits from this sector of the Dacian Basin.

The heralds of the "Lower Paludinian Beds" [*Bittneriella bittneri* (BRUS.), *Sibinunio pannonicus* (NEUM.), *S. sibinensis* (PEN.), *Viviparus spurius* (BRUS.), *V. eburneus* (NEUM.), *V. sadleri* (PARTSCH), *Melanopsis decollata* STOL., *Valvata sibinensis* NEUM., *Bulimus croaticus* PILAR, *B.pilari* NEUM., *Pyrgula eugeniae* NEUM., *Prososthenia radmanesti* (FUCHS), *Hydrobia syrmica* NEUM., *Theodoxus slavonicus* (BRUS.) etc.], occured in Parscovian (*NSM$_{9b}$-Prosodacnomya sturi - Bittneriella bittneri Subzone*) (ANDREESCU, 1981), whose lower limit is paleomagneticaly dated at ~ 4.7 Ma (ANDREESCU, 2008, revised).

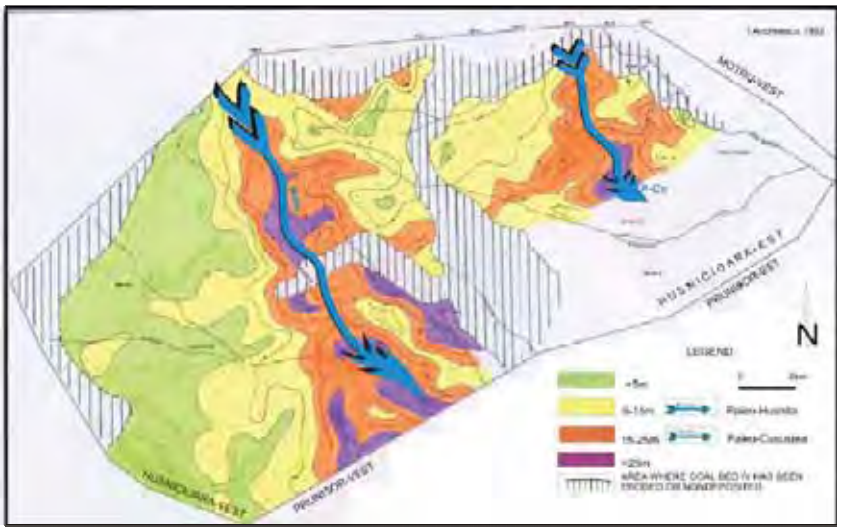


Figure 4. Sands isopach between the 3rd and the 4th coal beds in Husnicioara perimeters.
Figura 4. Izopahitele nisipurilor dintre stratele de lignit III-IV în perimetrele Husnicioara.

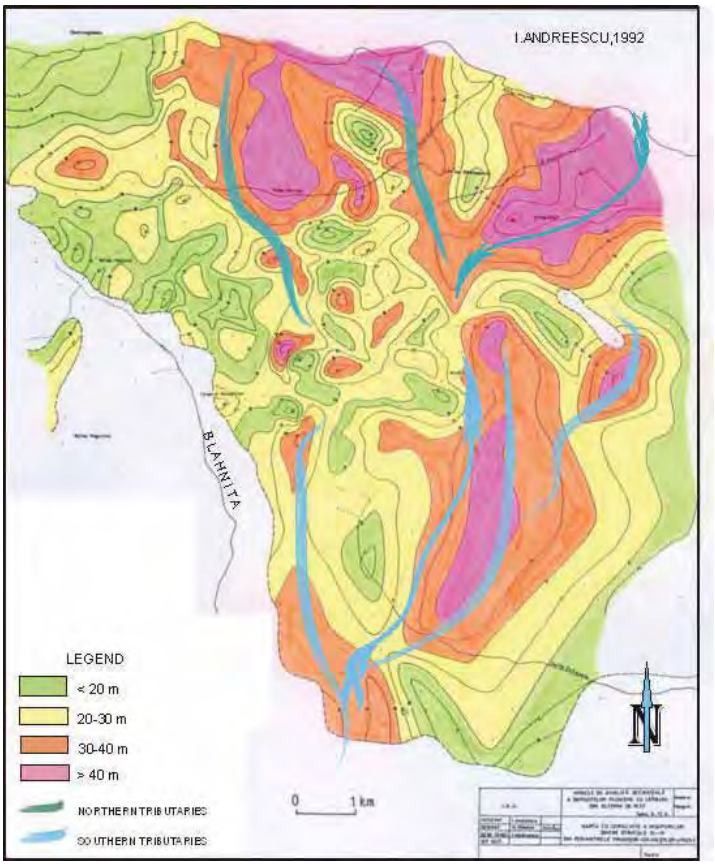


Figure 5. Isopach map of sands between 3rd and the 4th coal beds
in Prunişor-Izvoru Aneştilor-Livezile perimeters.
Figura 5. Harta cu izopahitele nisipurilor dintre stratele de lignit III-IV
în perimetrele Prunişor-Izvoru Aneştilor-Livezile.

Next south-Pannonian freshwater molluscs migration is a true invasion. Among those immigrants, several taxa must be mentioned: *Bittneriella stolitzkai* (NEUM.), *B. sandbergeri* (NEUM.), *Cyclopotomida. zelebori* (HOERN), *Recurvunio hochstetteri* (NEUM), *Unio partschi* PEN., *V. bifarcinatus* (BIELZ), *V. stricturatus* (NEUM.), *V. woodwardi* (BRUS.) etc.

Many other tens of species of the genera *Dreissena, Melanopsis, Lithoglyphus, Bulimus, Valvata, Staja, Hydrobia, Baglivia, Stenothyrella, Prososthenia, Pseudamnicola, Pyrgula, Micromelania, Theodoxus* etc., which concurred to the definition of the *Zone* NSM_{10} *- Malvensinaia psilodonta-Viviparus bifarcinatus* (ANDREESCU, 1981) characterizing the Upper Parscovian and Siensian Substages, could be attached.

Paleomagneticaly calibrated, the *Zone* NSM_{10} extends on ~0.8 Ma (4.5-3.7 Ma) (ANDREESCU, 2008, revised).

The third south-Pannonian migration phase is the most spectacular and it roughly corresponds to the "Middle Paludinian Beds".

That interval is defined by the Pelendavian Substage (3.7-2.7 Ma), characterized by the luxuriant development of the sculpured unionids and viviparids (*Zone* NSM_{11} *- Moldavunio lenticularis-Valahunio iconomianus*).

Temporal and areal distribution of the *NSM11 Zone*, with its 4 subzones: *11a - Rytia brandzai*; *11b - Pristinunio pristinus*; *11c - Pelendunio bielzi*; *11d - V.iconomianus*, are expressively reflected by the paleogeographic configuration and major tectono-sedimentary events of the Dacian, Pannonian and Euxino-Caspian Basins (ANDREESCU, 1981, 1983 etc.).

The south-Pannonian faunal elements are still dominant in the *Subzones* $NSM11_{a\text{-}c}$, while the $NSM11_d$ *- Subzone* witnesses an accused recession of the Pelendavian fauna and the first occurrence of some oriental, Euxino-Caspian, elements: *Cuneopsidea excentrica* (BOG.), *Moldavunio crispisulcatus* (BOG.)*, Valahunio orientalis* ANDR. etc., announcing the last Neogene molluscs zone, *NSM12*.

Since during the Parscovian-Pelendavian interval the Paleo-Danube was still trapped somewhere in the northern Pannonian Basin (MULLER et al.,1999; HARZHAUSER et al., 2003; RUSZKICZKAY-RUDIGER et al., 2005; etc.) nothing remains to think but to suspect the Paleo-Timoc River of possible fluvial connections with the southern Pannonian Basin (the Alfold Zone). In that case, the tectonic corridor of the Serbian Morava River could act as a passage-way.

This opinion has already been enounced by GILLET, 1961, which considered a connection between the Dacian Basin and the Pannonian Basin, through the Soljig Strait, as plausible.

As a matter of fact, in the present area of the Morava- the Danube junction, several taxa pertaining to NSM_{11} Zone: *Margaritifera flabellatiformis* (DUNK.)*, M. arca* TSCHEP.*, Pristinunio davilai* (PORUMB.) etc., have been recorded (RAKIC & SIMONOVIC, 1997).

The Upper Romanian (Valahian substage) is biochronologically defined by NSM_{12} *- Zone - Ebersininaia milcovensis-Moldavunio crispisulcatus* (2.7-2.0 Ma) and QM_1 *- Zone-Unio apscheronicus* (2.0-1.8 Ma) (ANDREESCU, 1981, 1983, ANDREESCU et al., 1981).

Besides the impoverishment of the molluscs fauna, the essential phenomenon is mass extinction of the related Pannonian fauna, replaced by oriental elements: *Ebersininaia geometrica* (BOG.), *Cuneopsidea neustruevi* (BOG.), *Sulcopotomida sudovskyi* (BOG.), *Bogatschevia tamanenesis* (EBERS.)*, B. bugasica* and by the boreal unionids as well: *Unio kujalnicensis (IATZ.), U. tumidus* etc., suggesting the cessation of the fluvial connection with the Pannonian Basin in the interval 2.4-2.0 Ma, as a result of the Valahian morphogenetic movements and climate deterioration.

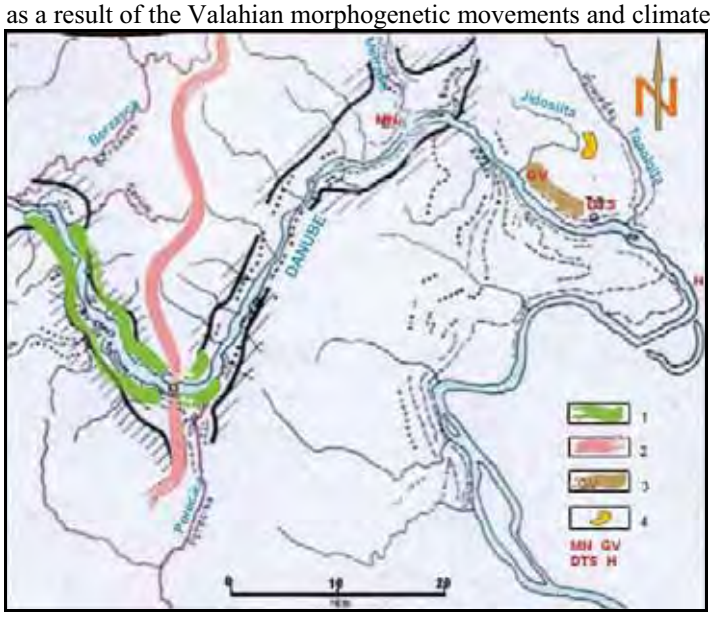


Figure 6. Geomorphologic features of the Danube River in the Iron Gates Area.
1= Area where the eastern "Valahian" River *PORECIKA* captured the western "Pannonian" River *BERZASCA* (Modified, after Coteţ, 1954); 2=The watershed zone in the Almaşu Mountains; 3=Gura Văii Formation outcroping area along the Danube; 4=Area of the Jidoştiţa River capturing; MN=Moldova Noua; GV=Gura Vaii; DTS=Drobeta-Turnu Severin; H=Hinova.

Figura 6. Aspecte geomorfologice ale Dunării în zona Porţile de Fier.
1=Zona unde râul « valah » *PORECIKA* a captat râul vestic « pannonic » *BERZASCA* (Modificat, după Coteţ, 1954) ; 2=Cumpăna apelor în Munţii Almaşu; 3=Zona de aflorare a Formaţiunii de Gura Văii de-a lungul malului stâng al Dunării ; 4=Zona în care s-a produs captarea pârâului Jidoştiţa ; MN=Moldova Nouă ; GV=Gura Văii; DTS=Drobeta-Turnu Severin; H=Hinova.

In these circumstances, we think that the Danubes could become the DANUBE, through the Iron Gates piercing, or capturing (Fig. 6), during the Uppermost Valahian - Lowermost Pleistocene.

The strongest proof consists in the presence of the *nominative species* of the *Zone QM_2 - Bogatschevia sturi*, starting in the Earliest Pleistocene deposits (1.8-1.6 Ma), which has been recorded from Pricaspia, Pricernomorie, eastern-central Dacian Basin to the southern Pannonian Basin.

As it is well known, the life and prochoresis of the reophile unionids are strictly dependent on the fish movements.

Paradoxically, one may state that the "*Danube's problem*" could only be solved by taking into account, simultaneously and/or successively, at least three of the four mentioned hypothesis.

When the Danube reached the Black Sea, this is another intricate question...

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