

## REVIEW OF THE VILLAFRANCHIAN S.S. FAUNAS OF ROMANIA\*

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RIASSUNTO - Breve rassegna delle faune del Villafranchiano s.s. in Romania - Il Quaternario Italian Journal of Quaternary Sciences, 8(2), 1995, 377-382 - Ricerche paleontologiche condotte nel bacino della Dacia e nella Depressione di Braşov hanno mostrato che il Villafranchiano s.s. (corrispondente al Villafranchiano inferiore degli Autori italiani, zona MN-16, Pliocene medio) viene distinto per la comparsa successiva di nuove specie di animali. Basandosi sulle polarità magnetiche, sono stati distinti 4 eventi faunistici: (1) comparsa di *Dicerorhinus elatus* fra la fauna di Covrigi (Bacino della Dacia), a Araci-Fântâna Fagului and Iarăş-2 (Depressione di Braşov) (circa 3.2 Ma) (2) comparsa del *Dicerorhinus etruscus* tra la fauna di Mătăsari/Brădetu (Bacino della Dacia) e a Iarăş Cariera Veche (Depressione di Braşov) (circa 3.1 Ma); (3) comparsa di un elefante molto primitivo, il *Mammuthus rumanus*, tra le faune di Cernăteşti and Tuluceşti (Bacino della Dacia) (circa 3.0 - 2.9 Ma); (4) comparsa del gruppo del *Mimomys stehlini minor* nel Bacino della Dacia, immediatamente prima del limite Gauss-Matuyama). L'insieme di micromammiferi di Podari (Bacino della Dacia) (di età circa 3.0 Ma) che include specie dei generi *Dolomys*, *Propliomys* e *Pliomys*, ma è privo di forme del genere *Mimomys*, rappresenta l'equivalente della fauna di Cernăteşti.

ABSTRACT - Review of the Villafranchian s.s. faunas of Romania - Il Quaternario Italian Journal of Quaternary Sciences, 8(2), 1995, 377-382 - Paleontological investigations carried out in the Dacic Basin and the Braşov Depression indicate that the Villafranchian s.s. (Early Villafranchian of Italian authors, MN-16 zone, Middle Pliocene) is distinguishable for the appearance of a serie of new types of animals. Four faunal events can be distinguished on the basis of the magnetic polarity sequence: (1) appearance of *Dicerorhinus elatus* among the Covrigi fauna (Dacic Basin), at Araci-Fântâna Fagului and Iarăş-2 (Braşov Depression) (approx. 3.2 Ma); (2) appearance of *Dicerorhinus etruscus* among the Mătăsari/Brădetu fauna (Dacic Basin) and at Iarăş Cariera Veche (Braşov Depression) (approx. 3.1 Ma); (3) appearance of a very primitive elephant, *Mammuthus rumanus* among the Cernăteşti and Tuluceşti faunas (Dacic Basin) (approx. 3.0 - 2.9 Ma); (4) appearance of the *Mimomys stehlini minor* group in the Dacic Basin (just before the Gauss-Matuyama boundary). The micromammalian assemblage of Podari (Dacic Basin) (dated to about 3.0 Ma) which includes species of the genera *Dolomys*, *Propliomys* and *Pliomys*, but lacks *Mimomys* forms, represents an equivalent of the Cernăteşti fauna.

Key words: Mammals, Villafranchian s.s. (Early Villafranchian), MN-16 zone, biostratigraphy, Dacic Basin, Braşov Depression, Romania  
Parole chiave: Mammiferi, Villafranchiano s.s. (Villafranchiano inferiore), zona MN-16, biostratigrafia, Bacino della Dacia, Depressione di Braşov, Romania

### 1. INTRODUCTION

Systematic investigations undertaken since 1960 on the fluvio-lacustrine deposits of the Dacic Basin and the Braşov Depression have allowed the recognition of a succession of four faunal units in the evolution of mammals of Villafranchian s.s. age of Romania (Villafranchian s.s. being equivalente to the early Villafranchian of Italian authors, MN-16 zone, Middle Pliocene).

The geological sections containing fossil mammalian remains are generally made up of long sequences of deposits from 40 m to >100 m in thickness; in many cases, however, the fossiliferous levels are contained in sediments superposed to the main sequence. Calibration of stratigraphical sequences is based on paleomagnetic determinations, biostratigraphic correlations being established on the basis of molluscan associations and

of mammalian taxa themselves. Sections with a long sequence of magnetic polarity reversals — e.g. the section of the Lupoiaia Coal Quarry in the Jiu-Motru interfluvie, the Slatina section in the Olt valley (Dacic Basin) and the Iarăş-New Quarry section (Braşov Depression) — which appear to be essential for accurate correlations, were used as reference.

The term Villafranchian (subdivided into early, middle and late) was extensively used in Romania to distinguish various local mammalian assemblages covering a time period of about 2.5 million years (4±1.6 Ma) (Samson & Radulescu 1963; 1965).

After these first studies, a great progress was made and a better knowledge of Villafranchian faunas has been achieved. On the basis of a new collection coming from fluvio-lacustrine deposits of the type locality Villafranca d'Asti, Hurzeler (1967) said that the mammals remains from this locality did not include either elephant remains or *Equus*.

As a consequence, the term "early Villafranchian" — or Villafranchian s.s. — was taken as equivalent of the Middle Pliocene and used to distinguish several faunal assemblages of Romania of an age between the Ruscinian (Early Pliocene) and middle Villafranchian (Late Pliocene) (Samson & Radulescu 1973).

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## 2. STRATIGRAPHY

### 2.1 Dacic Basin

The Dacic Basin is a large sedimentary area belonging to the Central Paratethys region. It is situated between the Carpathians to the north and west, the Balkan to the south and the Danube to the east.

The mammal-bearing sediments outcrop especially in the western portion of the basin along the valleys of the rivers Jiu and Olt, where the sequence of Pliocene and Early Pleistocene deposits consists of three lithostratigraphic units (Andreescu *et al.*, 1985) including many (up to 22) coal layers. The following lithostratigraphic units are distinguished: i) the Berbești Formation (mainly psammitic, with coal layers A-D and I-IV); ii) the Jiu-Motru Formation (a psammitic-humitic pelite with coal layers V-XII); and iii) Căndești Formation (psammitic-psephitic deposit with coal layers XIII-XVIII). Early Villafranchian mammalian remains were collected from the upper part of the Jiu-Motru Formation and the lower part of the Căndești Formation. The bulk of the fauna comes from sandy deposits between coal layers XII and XV (Feru *et al.*, 1965; 1983). The type section of the Jiu-Motru Formation is represented by the Lupoia Coal Quarry section containing the coal layers V to XIV in a thickness of about 100 m. The magnetic polarity of this succession of strata shows that the Gilbert-Gauss boundary is between coal layers XI and XII. At this level molluscs showing the transition from the early (Siensian) to the middle (Pelendavian) Romanian have been found (Andreescu *et al.*, 1986). Mammal remains which had been collected beneath this limit in the neighbouring area are indicative of a Ruscinian fauna (for instance, at Horăști the clay layer underlying coal layer X yielded skeletal remains of a very large *Dicerorhinus leptorhinus* (Cuvier) (= *megarhinus* de Christol). The Dacic Basin biostratigraphic scheme contains four subsequent faunal units which may be considered as of early Villafranchian (Middle Pliocene) age.

#### 2.1.1 Covrigi fauna

In the Covrigi area (Jiu-Motru interfluvium), the sandy deposits above coal layer XII yielded a mammalian assemblage which includes, if compared to the Ruscinian fauna, a different type of rhinoceros identified as *Dicerorhinus elatus* (Croizet & Jobert) (= *astensis* Sacco = *jeanvireti* Guérin) together with *Mammot borsoni* (Hays), *Anancus arvernensis* (Croizet & Jobert), *Metacervocerus pardinensis* (Croizet & Jobert) and *Cervus perrieri* Croizet & Jobert (Feru *et al.*, 1965; 1983) (MN-I 6 zone).

The Covrigi fauna is similar to that of the Triversa faunal unit of Italy (Azzaroli, 1983). On the basis of paleomagnetic determinations, the fossil-bearing sediments are normally polarized (Andreescu *et al.*, 1986).

#### 2.1.2 Mătășari Brădetu fauna

This faunal level overlies the coal layer XIII and contains a macrofauna which, although very similar to that from the Covrigi horizon because of the presence of same mastodons and cervid species, is distinguished for the first appearance of a smaller rhinoceros — *Dicerorhinus etruscus* (Falconer). Paleomagnetic data indicate a normal polarity in the Mătășari Brădetu faunal deposit suggesting an age of about 3.1 Ma (Early Gauss subchron). If faunal evolution in Italy is taken into account, *D. etruscus* would have appeared somewhat earlier in southeastern Europe.

#### 2.1.3 Cernătești fauna

This type of fauna is characteristic of the gravelly sandy deposits between coal layers XII and XV. On the basis of faunal remains collected at Cernătești (Central Oltenia), Cernătești fauna is characterized by the first appearance of a very primitive elephant *Mammuthus rumanus* (Ștefănescu). The species has been identified on the basis of an upper molar (M/3), 293 mm in length and 131 mm (max) in height, which is characterized by a low laminar formula (1/2-8-x), laminar frequency 3.07, index of hypsodonty 1.18 and thickness of enamel 4.25. This *Mammuthus* was found in association with *M. borsoni*, *A. arvernensis*, *Dicerorhinus elatus*, *D. etruscus* and *Metacervocerus pardinensis*.

An equivalent of the Cernătești faunal level is represented by the Tulucești fauna in the northeastern extremity of the Dacic Basin. At Tulucești — which is the type locality of *M. rumanus* — the mammalian assemblage composed of *M. borsoni*, *A. arvernensis*, *Mammulhus rumanus*, *Plesippus euxinicus* Samson, *Paracamelus cf. bessarabiensis* (Khomenko) and *Cervus perrieri* (Samson, 1976) was found.

Paleomagnetic determinations carried out at Podari (to the south of Craiova), where a sequence of sandy layers is the equivalent of the deposits with *M. rumanus*, indicate the normal polarity of sandy accumulations and the reversed polarity of underlying clays. A rich fauna of micromammals, recovered from the upper part of the sandy deposits, contains the following species: *Desmaninae* indet. (very large), *Galemys kormosi* Schreuder, *Desmanella sp.*, *Sorex ex gr. minutus* Linnaeus, *Petenyiella gracilis* (Petényi), *Beremendia fissidens* Kormos, *Blarinoidea mariae* Sulimski, *Talpa sp.*, *Trogotherium cf. minus* Newton, *Dromomys eliomyoides* Kretzoi, *Pliospalax ex gr. macoveii* (Simionescu), *Apodemus dominans* Kretzoi, *Orientalomys cf. similis* (Argyropulo & Topachevsky), *Micromys praeminutus* Kretzoi, *Dolomys nehringi* Kretzoi, *Propliomys hungaricus* (Kormos), *Pliomys sp.*, *Ochotonoides sp.* (Radulescu *et al.* 1993).

The absence of *Mimomys* species, the association being dominated by representatives of the genera *Dolomys*, *Propliomys* and *Pliomys*, is to be noted. As a whole,

the micromammals from Podari present affinities with Csarnóta-2 (Hungary) faunas (including, however, more primitive taxa of the same phyletic lineages) and with Tourkobounia-1 (Greece) faunas. The southeastern Mediterranean influence on the Podari small mammal fauna is indicative of a rather warm climate at about 3 Ma BP (Middle Gauss subchron).

The molluscan faunas of this time interval belong to the NSM<sub>11</sub>-*Rugunio lentkularis* zone (Andreescu 1982).

#### 2.1.4 Milcovu fauna

Remains of small mammals were collected at "Milcovu din Vale" — a part of the Slatina section, which comprises a sequence of deposits ranging from the Late Gauss through most of the Matuyama epoch until some time after the Olduvai event. Mammals were contained in sandy silty layers of an age attributed to the end of the Gauss epoch (Andreescu *et al.*, 1981). The fauna is distinguished by the appearance of *Mimomys* ex gr. *stehlini* Kormos/minor Fejfar, *Dolomys milleri* Nehring and *Trogontherium minus*.

The Milcovu fauna can be assigned to the MN-16b subzone. The associated molluscs belong to the NSM<sub>12a</sub>-*Ebersiniaia milcovensis* subzone (Andreescu 1982).

## 2.2 Braşov Depression

The Braşov Depression — of tectonic origin — is an intermontane depression of the inner bend zone of the Eastern Carpathians. The depression is divided into several smaller basins, which can be seen as gulfs penetrating into the orogen along drained valleys. The thickness of the deposits filling these basins ranges between 150 and more than 500 m. Several lithostratigraphic complexes, pliocenic in age, have been identified. These are (from bottom to top): a) the Coal Complex (which, at Căpeni and Vârghiş, yielded a Late Ruscinian faunal assemblage); b) the Marly Complex, and c) the Iarăş Sands Formation (which is a littoral equivalent of the upper part of the Marly Complex; (Alimen *et al.*, 1969).

### 2.2.1 Iarăş Sands Formation

In the Iarăş area (Baraolt Basin), the Marly Complex (reversely polarized; Late Gilbert subchron) underlies the Iarăş Sands Formation, which was studied at the Iarăş New Quarry. The deposits stratigraphic sequence includes ferruginous sands at the base, followed by predominantly white sands underlying upper marly deposits.

#### Iarăş 1

The lower ferruginous sands (normally polarized; beginning of the Gauss magnetic epoch) yielded a Late

Ruscinian fauna: *M. borsoni*, *A. arvernensis*, *Tapirus arvernensis* Croizet & Jobert, *Dicerorhinus* cf. *leptorhinus*, *Hipparion* cf. *malustenense* Radulescu & Samson and "Parabos" *athanasiui* (Simionescu).

#### Iarăş 2

The white sands (normally polarized; Early Gauss subchron) (= layer 6 in Alimen *et al.*, 1969) contain remains of *Dicerorhinus elatus*. In the nearby "Cariera Veche" Quarry, remains of *Dicerorhinus etruscus* and *Cervus perrieri/arvernensis* were recovered (Radulescu *et al.*, 1965).

It is worth noting that frost phenomena (ice wedge, plications) suggestive of severely worsened climatic conditions were observed at the base of the white sands (Alimen *et al.*, 1969). This lowering of temperature seems to have had some bearing on the marked change in composition of mammal assemblages.

#### Iarăş 3

The upper marly layers (displaying a reversed magnetization and regarded as Mammoth or Kaena event) yielded only some molars of *A. arvernensis*.

A tentative correlation shows that the Iarăş 1 fauna has not an exact equivalent in the Dacic Basin, whereas it is highly probable that Iarăş 2 and Iarăş-Cariera Vache are equivalent to the Mătăşari Brădeţu fauna.

### 2.2.2 Other fossil localities

#### Araci - Fântâna Fagului (Baraolt Basin)

In this quarry, a basal level consisting of white sands (normally polarized; Early Gauss) yielded an early Villafranchian fauna containing *M. borsoni*, *A. arvernensis*, *Dicerorhinus elatus* (a cranium with the nasal septum) and *Metacervoceros pardinensis*. This association, including only one species of Rhinocerotidae (*D. elatus*) might be located between the Iarăş 1 and Iarăş 2 associations.

#### Iieni Basin

Coal layers in the small isolated basin of Iieni yielded the following mammals: *A. arvernensis*, *Tapirus arvernensis*, *Dicerorhinus* cf. *elatus*, *Cervus* sp., *Gazella* sp., *Ursus minimus* (Devèze & Bouillet), *Hystrix* cf. *refossa* Gervais, *Castor praefiber* Depéret. This level is characterized by the first appearance of *Ursus minimus*. It is worth mentioning that the Late Ruscinian fauna of the Braşov Depression contains only the primitive Ursid species *Protarctos boeckhi* (Schlosser).

#### Cernatu (Târgu - Secuiesc Basin)

In this locality, the Robert Sand Quarry supplied the following mammals: *Dicerorhinus elatus*, *Canid* indet.,

*Arvernoceros ardei*, *Trogontherium minus*, *Miomomys* sp.

The chronological position of these two latter localities has not exactly been identified, even if it falls in the early Villafranchian in a broad sense.

### 3. CONCLUDING REMARKS

Figure 1 shows the superposition of a number of selected fossil sites of the Dacic Basin and the Braşov Depression of Villafranchian *s.l.* age (Samson & Radulesco 1963; 1965). Within this important period of time we distinguish: a Ruscinian faunal complex (approx. 4+3.2 Ma) followed by an early Villafranchian (Villafranchian *s.s.*) faunal succession (approx. 3.2+2.4 Ma); and a late Villafranchian mammalian sequence, which is richly documented. The middle Villafranchian faunas (Saint Vallier type) are practically unknown in Romania.

Temporal relations of fossil localities can be interpolated using ages and the paleomagnetic scale.

Paleomagnetic and faunal data from the Dacic Basin and the Braşov Depression indicate that the transition between the Ruscinian and early Villafranchian faunas occurs within the Early Gauss subchron. Not much over the Gilbert-Gauss boundary the mammalian community had still a Ruscinian aspect (Iarăş 1).

The frost phenomena noticed at the Iarăş New Quarry may be correlated with the lowering of temperature occurred in marine sequences 3.3+3.1 Ma.

Faunal evidence indicate that the beginning of the early Villafranchian (Villafranchian *s.s.*) in Romania coincides with the first appearance of *Dicerorhinus elatus* and new types of Cervidae (the so-called Vialette-Etouaires faunal assemblage).

The faunal event marked by the immigration of elephant into southeastern Europe seems to correspond to a shift from cooler to warmer climate about 3.0-2.9 Ma. The first appearance of *Mammuthus* lineage in the Dacic Basin is 0.4 Ma older than the Montopoli faunal unit containing *M. gromovi* (the "elephant - *Equus*" event at the Gauss-Matuyama boundary) (Azzaroli 1983; Azzaroli *et al.*, 1988).

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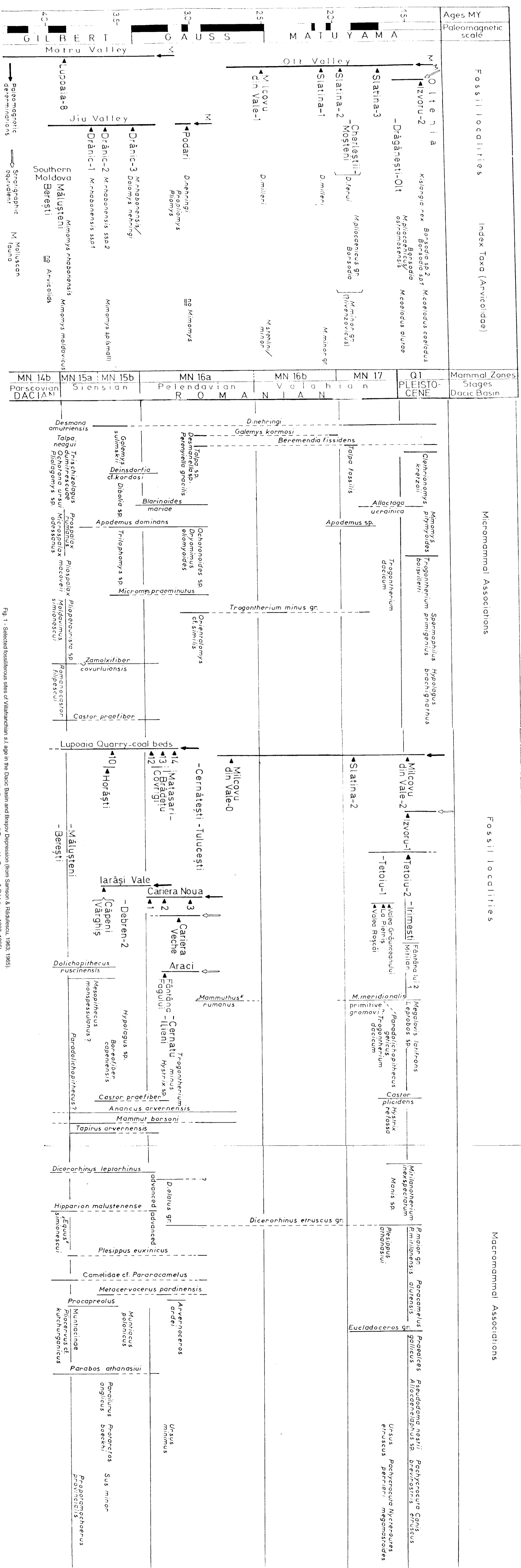


Fig. 1 - Selected fossiliferous sites of Villafraanchian s.l. age in the Dacia Basin and Brasov Depression (from Samson & Rădulescu, 1963, 1965). Localities fossilifere de etia villafraanchiana s.l. nel Bacino della Dacia e nella Depressione di Brasov (da Samson & Rădulescu, 1963, 1965).

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