

Pliocene and Early Pleistocene arvicolids (Rodentia, Mammalia) of the Dacic Basin, Romania.

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Abstract. Excavations carried out in Pliocene and Early Pleistocene deposits outcropping in the valleys of the Jiu and Olt Rivers (Dacic Basin, Romania) yielded rich micromammalian associations with arvicolid rodents, spanning a time interval of about 2.5 million years. Dental morphological analyses allowed the recognition of two arvicolid lineages of "mimomyian" aspect (*Mimomys rhabonensis* and *M. moldavicus*) which gave rise during the Early and Middle Pliocene to the genera *Dolomys* and *Propliomys* respectively. The transitional forms leading to *Propliomys* are discussed and illustrated. A third phyletic line started at the end of the Middle Pliocene with *Mimomys* ex gr. *stehlini* minor. This stock is presumed to lead to *M. coelodus* of the Early Pleistocene. A fourth lineage, Early Pleistocene in age, was constituted of *M. ostramosensis* ssp., followed by *Kislangia rex*.

Key words: Arvicolidae, Rodentia, Mammalia, Pliocene, Early Pleistocene, Dacic Basin, Romania, evolution, phyletic lines.

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I. INTRODUCTION

Arvicolids are a group of rodents that provides the necessary information for a more refined Pliocene and Pleistocene biostratigraphy of the Dacic Basin than has been available in the past. Study of dental remains collected during the last two decades from sequences of deposits located in this area has shown that arvicolids may prove helpful in establishing a more detailed time scale based on micromammals.

The investigations concerning the Plio-Pleistocene small mammals of the Dacic Basin, undertaken since 1978, led to the discovery of new and rich associations, which span a time interval of about 2.5 million years (My). The mammal bearing deposits also yielded abundant molluscan shells, which allowed a correlation to be made between the biostratigraphic subdivisions of the Dacic Basin based on molluscan faunas (NSM, QM) (ANDREESCU 1983) and the biozonation of the Mediterranean Neogene (MN zones) (MEIN 1990) and Quaternary (GUÉRIN 1982) based on mammals. Determinations of magnetic polarity were also undertaken (ANDREESCU et al. 1981, 1986).

II. BIOCHRONOLOGY

The micromammalian sequences to be discussed in this paper are from southern Moldavia (northeastern extremity of the Dacic Basin) and Oltenia (western portion of the Dacic Basin). Excavations were conducted with microstratigraphical techniques. The succession of fossil localities investigated by us is as follows:

Early Pliocene

Southern Moldavia

Malusteni (code Ml). First appearance of a very primitive representative of the genus *Mimomys* MAJOR, 1902 (*M. moldavicus* KORMOS, 1932, type locality). Earliest Romanian or Dacian/Romanian boundary. MN 15a (RADULESCU & SAMSON 1989).

Oltenia (Motru Valley)

Lupoia/VIII (code Lp/8) (clay at the base of coal layer VIII in the coal Quarry at Lupoia): *Mimomys rhabonensis* RADULESCU, SAMSON & STIUCA, 1989 (type locality) (RADULESCU et al. 1989).

Oltenia (Jiu Valley)

The sequence of deposits at Dranic includes four superimposed fossiliferous levels containing remains of micromammals.

Dranic-0 (code Dr-0): *M. rhabonensis*, *M. moldavicus* group, Early Romanian (Siensian, NSM 10a), MN 15a, normal polarity (Cochiti event).

Dranic-1 (code Dr-1): *M. rhabonensis/Dolomys* (mimomyian and dolomyian features associated) (stage 1), *M. moldavicus/Propliomys* (presence of propliomyian tendencies) (stage 1). Early Romanian (Siensian, NSM 10a), MN 15a, reversed polarity (Late Gilbert subchron).

Dranic-2 (code Dr-2): *M. rhabonensis/Dolomys* transitional forms (stage 2), *M. moldavicus/Propliomys* transitional forms (stage 2). Early Romanian (Siensian NSM 10b), MN 15b, reversed polarity (Late Gilbert subchron).

Early Middle and Middle Pliocene

Dranic-3 (code Dr-3): *M. rhabonensis/Dolomys nehringi* KRETZOI, 1959 (stage 3), *M. moldavicus/Propliomys* (hypothetical stage 3 poorly documented). Early Middle Pliocene, beginning of the Middle Romanian (Pelendavian, NSM 11a), MN 15b, boundary of the Gilbert/Gauss paleomagnetic epochs.

Podari (code Pd): *Dolomys nehringi*, *Propliomys hungaricus* KRETZOI, 1959, *Pliomys* sp. It must be emphasized that representatives of the genus *Mimomys* are completely absent. Middle Pliocene, Middle Romanian (Pelendavian, NSM 11c), MN 16a, normal polarity (Middle Gauss subchron).

Late Middle and Late Pliocene

Oltenia (Olt Valley)

The small mammal remains at Slatina come from three successive levels, the oldest one overlying the fossil site at Milcovu din Vale.

Milcovu din Vale-1 (code MV-1): *Dolomys milleri* NEHRING, 1898, *Mimomys* ex gr. *stehlini* KORMOS, 1931/*minor* FEJFAR, 1961 (an immigrant form). Late Middle Pliocene. Beginning of the Late Romanian according to the biostratigraphy based on molluscan faunas (Valachian, NSM 12a), MN 16b, normal polarity (end of the Gauss epoch).

Slatina-1 (code Sl-1): *D. milleri* (dominant form), *M. minor*. Late Pliocene, Late Romanian (Valachian, NSM 12c), MN 16b, reversed polarity (Early Matuyama subchron).

Slatina-2 (code SI-2): diversification of arvicolid species including *Dolomys ferui* RADULESCU & SAMSON, 1987, *Mimomys* cf. *livenzovicus* ALEXANDROVA, 1976, *Borsodia* sp. Late Romanian (Valachian, NSM 12d), MN 17, reversed polarity (Matuyama epoch prior to the Olduvai event).

Cherlestii-Mosteni (code CM): *D. ferui* (type-locality), *Mimomys* ex gr. *pliocenicus* MAJOR, 1902 (earliest record in the Dacic Basin), *M. cf. livenzovicus*, *Borsodia* sp. Late Romanian (Valachian, NSM 12d), MN 17.

Slatina-3 (code SI-3): *Mimomys* sp. (medium-sized form belonging to the *M. minor/coelodus* KRETZOI, 1954 lineage). Late Pliocene/Early Pleistocene transition. Unionids of boreal type (QM 1). MN 17/18, normal polarity (Olduvai event).

E a r l y P l e i s t o c e n e

Draganesti-Olt (code DO): *Clethrionomys kretzoi* (KOWALSKI, 1958), *Mimomys ostramosensis* ssp., *M. coelodus alutae* RADULESCU & SAMSON, 1983, *M. reidi* HINTON, 1910, *Borsodia* cf. *lagurodontoides* (SHEVCHENKO, 1965). First part of zone 18 of GUERIN (1982), Eburonian of the biostratigraphic scheme of northern Europe (ZAGWIJN 1985).

Izvoru-2 (code Iz-2): *Clethrionomys kretzoi*, *Kislangia rex* (KORMOS, 1934), *Mimomys coelodus* cf. *coelodus*, *M. pitymyoides* JANOSSY & VAN DER MEULEN, 1975, *M. reidi*, *Borsodia* sp. (arhizodont arvicolid species still absent). QM 2, zone 18, temperature phase within the Eburonian.

III. PHYLETIC LINES

In the sequences of deposits containing superimposed micromammal-bearing levels, four phyletic successions (denoted A to D) of arvicolid taxa were tentatively identified.

The first phyletic succession (A) includes large-sized specimens. It begins with *Mimomys rhabonensis* and ends with *Dolomys nehringi*. It is worth remembering that *M. rhabonensis* is distinguished, besides other features, by the presence of a fifth lingual reentrant angle (LRA 5) and a very low, primitive *linea sinuosa*. The dental material from the four successive levels at Dranic indicates a progressive accentuation of the *Dolomys* patterns (e. g., M/1 with buccal islet reentrant becoming isolated at various depths, but tending to remain open to the base of the crown; M3/ with anteroexternal reentrant open and posterointernal reentrant displaying the insulation pattern at various levels, but with a visible tendency to remain open, especially at Dr-3). At the same time, there is an increase in hypsodonty and the dentine tracts become higher. Some morphological features showing the transition from *M. rhabonensis* (*Mimomys*-like aspect) to *Dolomys nehringi* (possessing typical morphology at Podari) were illustrated in a separate paper (RADULESCU et al. 1995).

The second phyletic line (B) consists of a succession of forms starting with *M. moldavicus*. At Dr-O, this medium-sized species includes both mimomyian (M/1 with BRA3 isolating an enamel pit) (Fig. 1.1.) and pliomyian (M/1 with BRA3 open almost to the base of the crown) (Fig. 1.2.) morphotypes, connected by intermediate forms. The prism fold and *Mimomys* ridge are always present, although sometimes not very distinct. Juvenile specimens are frequently distinguished by a pliomyian aspect, whereas the old ones possess a *Mimomys*-like morphology. The various morphological steps in the succession (Figs 1, 2) were designated 'stages'. At Podari, *Propliomyys hungaricus* can be recognized as a completely realized independent morphological entity (Fig. 2.5-2.6).

The last upper molar (M3/) is characterized by the insulation of the anteroexternal reentrant (BRA1) (Figs 1.3, 1.6, 2.3-2.4). The insulation of the posterointernal reentrant (LRA2) is realized at various levels. The distal insulation is accompanied by the formation of a vertical, well-marked residual groove on the posterointernal wall of the crown in *Propliomyys hungaricus* (Fig. 2.6) (this groove is less conspicuous or absent in true *Mimomys* forms).

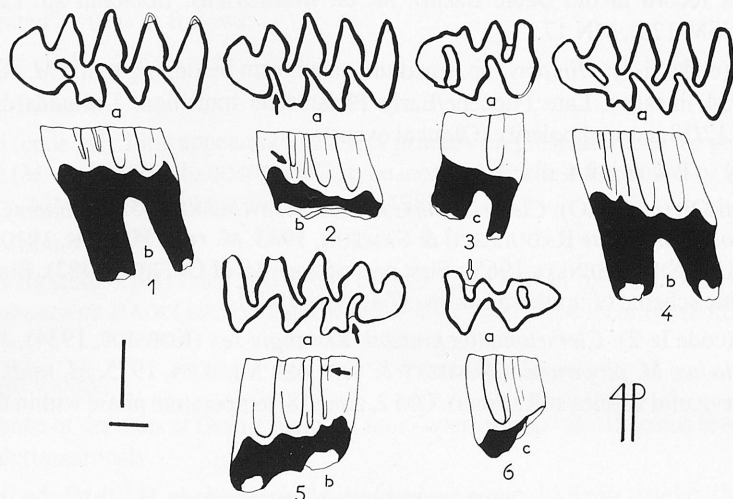


Fig. 1. *Mimomys moldavicus*/*Propliomys*. 1 – LM/1 (Dr-0.S/0.01). 2 – LM/1 (Dr-0.S/0.02). 3 – RM3/ (Dr-0.S/0.03). 4 – LM/1 (Dr-1.S/0.01). 5 – RM/1 (Dr-1.S/0.03). 6 – LM3/ (Dr-1.S/0.02). Occlusal (a), external (b) and internal (c) views. Scales equal 1 mm. Solid arrow indicates the isolation of an enamel islet in M/1; open arrow indicates the isolation of an anterior islet in M3/.

M. moldavicus from Dr-0 and *Propliomys hungaricus* from Pd, as judged by the successive intermediate stages of Dr-1 and Dr-2 (Figs 1, 2), represent a single lineage leading, through segregation of existing variation, from a polymorphous *Mimomys*-like species to a *Propliomys* form. A similar phenomenon of splitting and phyletic evolution was described by KOWALSKI (1960a, b) on the basis of the presence at Weže of *Dolomys hungaricus* (*Propliomys* in our interpretation) and *Mimomys stehlini* (very probably a species of the *M. moldavicus* group), as well as a morphologically intermediate group of specimens. The beginning of this division was described on the basis of the dental material from Sète (France), assigned to *M. occitanus*, a species including "dolomyian" (propliomyian in our terminology) (subordinate) and mimomyian (dominant) morphotypes (THALER 1966, MICHAUX 1971).

The succession of morphological stages identified in the superimposed fossiliferous levels of the Jiu Valley (Dr, Pd) appears to offer supplementary and more precise evidence for the lineage wherein *P. hungaricus* descends from a *Mimomys*-like ancestry. *P. hungaricus* is unknown in the Dacic Basin after the Podari faunal level.

A third phyletic line (C), documented in fossil sites of the Olt Valley, is represented by *Mimomys* ex gr. *stehlini*/minor, followed by *M. cf. livenzovicus* and *M. coelodus*. The latter species was subdivided into an earlier form (*M. coelodus alutae*) and an advanced one corresponding to the nominate subspecies (*M. coelodus coelodus*) (RADULESCU & SAMSON 1983). *M. coelodus* is considered (taking into account its dental morphology and size) to be the ancestral taxon which gave rise to *M. intermedius* (NEWTON, 1882). The primitive *Arvicola* forms (possessing a *Mimo*-

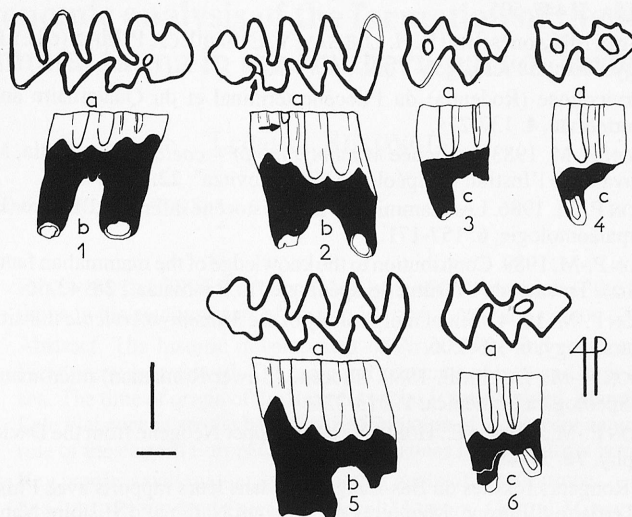


Fig. 2. *Mimomys moldavicus/Propliomys*. 1 – RM/1 (Dr-2.N/0.11). 2 – LM/1 (Dr-2a.S/0.01). 3 – LM3/ (Dr-2a.S/0.02). 4 – LM3/ (Dr-2.N/0.06). *Propliomys hungaricus*. 5 – LM/1 (Pd/0.24). 6 – LM3/ (Pd/0.26). Occlusal (a), external (b) and internal (c) views. Scales equal 1 mm. Solid arrow indicates the isolation of an enamel islet in M/1.

mys-like enamel pattern) very probably evolved from a *M. intermedius*-like ancestor during the transition from the Matuyama to the Brunhes paleomagnetic epoch (RADULESCU & SAMSON 1994).

In addition, a fourth phyletic line (D), less well documented, appears to be represented in the Dacic Basin by *M. ostramosensis* ssp. from DO (less advanced in comparison with specimens at Osztramos-3, the type-locality for *M. ostramosensis* JANOSSY & VAN DER MEULEN, 1975), followed by *Kislangia rex* from Iz-2 (the transition between the two forms consists of an increase in hypsodonty, greater dimensions and the disappearance of *Mimomys* structures in M/1 of *Kislangia*, although the *Mimomys* islet may be present; the more conservative M3/ is distinguished at Iz-2 by the presence of a posterior islet) (RADULESCU & SAMSON 1986).

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