

A revision of the late Miocene mustelid carnivoran *Eomellivora*

Mieczysław WOLSAN and Yuriy A. SEMENOV

Accepted for publication: 15 Nov., 1995

WOLSAN M., SEMENOV Yu. A. 1996. A revision of the late Miocene mustelid carnivoran *Eomellivora*. Acta zool. cracov., **39**(1): 593-604.

Abstract. A taxonomic revision of the mustelid carnivoran genus *Eomellivora* ZDANSKY, 1924 (= *Perunium* ORLOV, 1947) is carried out. The genus is removed to the subfamily Mustelinae FISCHER VON WALDHEIM, 1817 (= Peruniinae ORLOV, 1947). It consists of the single lineage or species *Eomellivora wimani* ZDANSKY, 1924 that evolved during the Late Miocene in Eurasia and North America. The characteristic feature in the evolution of this species was a progressive anteroposterior shortening and buccolingual broadening of the upper canines and the upper and lower premolars, as well as an increase in the massiveness of the lower canines, associated with a gradual augmentation in the number and size of the secondary cusps on the premolars. The species comprised the primitive Vallesian (early Late Miocene) chronosubspecies *Eomellivora wimani piveteaui* OZANSOY, 1965 known from Europe and the derived Turolian, Baodean, and Hemphillian (late Late Miocene) chronosubspecies *Eomellivora wimani wimani* ZDANSKY, 1924 occurring in Europe, Asia, and North America. The synonymy of *Eomellivora wimani piveteaui* includes *Eomellivora liguritor* CRUSAFONT PAIRÓ & GINSBURG, 1973, whereas that of *Eomellivora wimani wimani* contains *Eomellivora californica* KRETZOI, 1942, *Eomellivora hungarica hungarica* KRETZOI, 1942, *Eomellivora hungarica altera* KRETZOI, 1942, *Perunium ursogulo* ORLOV, 1947, *Eomellivora rumana* ORLOV, 1947, and *Eomellivora orlovi* KRETZOI, 1965. The species '*Eomellivora*' *necrophila* PILGRIM, 1932 and '*Eomellivora*' *tenebrarum* PILGRIM, 1932 are excluded from the genus *Eomellivora*. Key words: systematics, Mustelinae, Peruniinae, *Eomellivora*, *Perunium*, Miocene, Europe, Asia, North America.

Mieczysław WOLSAN, Institute of Palaeobiology, Polish Academy of Sciences, Żwirki i Wigury 93, 02-089 Warszawa, Poland; Yuriy A. SEMENOV, Palaeontological Museum, Central Museum of Natural History, National Academy of Sciences of Ukraine, Bogdana Khmel'nitskogo 15, 252601 Kiev MSP-30, Ukraine.

I. INTRODUCTION

The genus *Eomellivora* was erected by ZDANSKY (1924) for his new species *Eomellivora wimani* from the Upper Miocene of China. Since that time, ten new species-group taxa assigned to *Eomellivora* have been described from European, Asian, and North American sites of late Tertiary age. All these taxa, including ZDANSKY's *Eomellivora wimani*, were based on small samples of one to three or exceptionally seven specimens, which have until quite recently constituted almost the whole of the available material attributed to *Eomellivora*.

A rich accumulation of more than a hundred remains of *Eomellivora*, which have recently been collected from about 3 m³ of upper Miocene deposits in a limestone quarry near Gritsev in western

Ukraine, has for the first time enabled a thorough study of the range of individual variation in a population of that genus and induced us to make an attempt at revising it taxonomically and reconstructing its pattern of evolution.

The geochronologic unit Late Miocene as used in this paper corresponds to the Vallesian and Turolian European Land Mammal Ages (DE BRUIJN et al. 1992) and the Bahean and Baodean East Asian Land Mammal Ages (LI et al. 1984), and the Clarendonian and Hemphillian North American Land Mammal Ages (TEDFORD et al. 1987). The Vallesian Age contains the Mammal Neogene (MN) units 9 and 10 while the Turolian Age comprises MN 11, 12, and 13 (DE BRUIJN et al. 1992).

A b b r e v i a t i o n s f o r c o l l e c t i o n s: **IPS**, The M. Crusafont Institute of Palaeontology, Sabadell, Spain; **LACM-CIT**, California Institute of Technology Collection, Natural History Museum of Los Angeles County, Los Angeles, USA; **PIN**, Palaeontological Institute, Russian Academy of Sciences, Moscow, Russia; **PMK**, Palaeontological Museum, Central Museum of Natural History, National Academy of Sciences of Ukraine, Kiev, Ukraine; **PMU**, Palaeontological Museum, University of Uppsala, Uppsala, Sweden.

A c k n o w l e d g m e n t s. Our sincere thanks go to L. WERDELIN (Stockholm) for his valuable suggestions. We also thank A. V. LAVROV (PIN), S. MOYÁ SOLÁ (IPS), and S. STUENES (PMU) for access to specimens in their care, as well as D. P. WHISTLER (LACM) for providing casts of specimens of *Eomellivora californica*. Yu. A. SEMENOV acknowledges financial support from the State Committee for Scientific Research (Poland).

II. SYSTEMATICS

Class Mammalia LINNAEUS, 1758

Order Carnivora BOWDICH, 1821

Suborder Caniformia KRETZOI, 1943

Infraorder Arctoidea FLOWER, 1869

Parvorder Arctomorpha WOLSAN, 1993

Superfamily Musteloidea FISCHER VON WALDHEIM, 1817

Family Mustelidae FISCHER VON WALDHEIM, 1817

Subfamily Mustelinae FISCHER VON WALDHEIM, 1817

A d d i t i o n a l s y n o n y m: Peruniinae ORLOV, 1947a: pp. 947, 949, 950. Type genus: *Perunium* ORLOV, 1947a. Synonymized with Mustelinae also by THENIUS & HOFER (1960: p. 164) through the synonymizing of the type genus with *Plesiogulo* ZDANSKY, 1924 and referral of the latter to the Mustelinae, by GROMOVA et al. (1962: pp. 206, 208; 1968: pp. 274, 277), DE MUIZON (1982: p. 268), and THENIUS (1989: p. 254) through the placement of the type genus within the Mustelinae, and by WOLSAN & SEMENOV (1994: pp. 83, 84) through the inclusion of the type species of *Perunium* in *Eomellivora* and ascription of the latter genus to Mustelinae. Synonymized with Mellivorinae GRAY, 1865 by OZANSOY (1965: pp. 16, 23-25) through the synonymizing of the type genus with *Eomellivora* and assignment of the latter to Mellivorinae, by WEBB (1969: pp. 67, 68) through the attribution of the type genus to Mellivorinae, and by LUNGU (1978: pp. 41, 45, 46, tables 2, 3) through the inclusion of the type species of *Perunium* in *Eomellivora* and referral of the latter genus to Mellivorinae. Synonymized with Guloninae GRAY, 1825 by BARYSHNIKOV (1988: pp. 56, 57) through the assignment of the type genus to Guloninae.

C o m m e n t s. The subfamily Mustelinae has recently been rediagnosed by WOLSAN (1993: p. 378) as characterized by the following derived features: the sagittal crest of the skull present in adults so that the dorsal cranial crests are Y-shaped, the posterior border of the caudal-entotympanic bone of the auditory bulla situated behind the posterior margin of the fossa leading to the posterior lacerate foramen, the suprameatal fossa of the middle-ear cavity partially or completely closed by the posterior wall of the external auditory meatal tube anteriorly, the postlateral sulcus of the brain present, the carnassial notch of P^4 absent, M^1 smaller than P^4 , the lingual half of the M^1 crown equal in anteroposterior length to or longer than the buccal one, the lingual and buccal halves of the M^1 crown separated from each other by an anteroposterior constriction, M^2 absent, the trigonid of M_1 more than three times as long as the talonid, the metaconid of M_1 distinctly lower than the paraconid or absent, and M_2 single-rooted. The genus *Eomellivora* is included in the Mustelinae because it shows all the diagnostic characters of the subfamily, with the exception of the bulla condition, which is, however, regarded here as a secondary development. Since *Perunium*, which is the type genus of the subfamily Peruniinae, appears to be a synonym of *Eomellivora* (see below), the name Peruniinae ORLOV, 1947a is therefore synonymized with Mustelinae FISCHER VON WALDHEIM, 1817.

Genus *Eomellivora* ZDANSKY, 1924

A b b r e v i a t e d s y n o n y m y: *Eomellivora* ZDANSKY, 1924: pp. 61, 65-67, 151, captions to pls XI, XII.

Pliogulo KROKOS in VOZNESENSKY, 1937: p. 60. Nomen nudum.

Perunium ORLOV, 1947a: pp. 947-950. Type species, by monotypy, *Perunium ursogulo* ORLOV, 1947a. Synonymized with *Eomellivora* also by OZANSOY (1957: p. 43; 1965: pp. 16, 24, 25) explicitly, as well as by LUNGU (1978: pp. 45, 46, tables 2, 3) and WOLSAN & SEMENOV (1994: pp. 83, 84) through the inclusion of the type species in *Eomellivora*. Synonymized with *Plesiogulo* ZDANSKY, 1924 by THENIUS & HOFER (1960: p. 164), ROMER (1966: p. 384), and HERÁŇ (1982: p. 35).

Pliogulo KROKOS in KRETZOI, 1965: pp. 131, 132. Nomen nudum.

E m e n d e d d i a g n o s i s. Musteline mustelids of very large size, distinguished morphologically by a combination of the following features: auditory bulla relatively small, with a rugose ventral surface; posterior carotid and posterior lacerate foramina closely adjacent to each other; premolar teeth crowded; P^1 single-rooted; P^3 with cingulum continuous or nearly continuous around the base of its crown, and with one or two secondary cusps on the posterior slope of its principal cusp; P^4 with cingulum almost continuous around its crown base, with a bulged buccal base of its crown at the level between the paracone and metacone, with a subconical protocone, and with the paracone-protocone and paracone-parastyle crests; M^1 with cingulum conspicuously swollen buccally and lingually, with a vestigial metacone, with an arched, ridge-shaped protocone continued into the anterior protocone crest (or anterocrista), and with its talon being about equally expanded anteriorly and posteriorly; P_1 single-rooted; P_4 with a secondary cusp on the posterior slope of the principal cusp; M_1 with cingula anterobuccally, posterobuccally, and lingually at the level of the carnassial notch, without any differentiated metaconid but with a well-marked crest passing across the lingual surface of the protoconid from the tip of this cusp through the bulged basal portion of the crown at the posterolingual corner of the trigonid to continue into the lingual talonid crest that lingually encloses a vestigial talonid basin, as well as with a single but strong talonid cusp, the hypoconid, being nearly centrally positioned on the talonid; M_2 elongated anteroposteriorly, with a low crown surrounded by a cingulum and with a very small, almost centrally placed, single cusp, the protoconid, being linked with the cingulum by crests anteriorly, posteriorly, and lingually.

Type and only species. By monotypy, *Eomellivora wimani* ZDANSKY, 1924.

Excluded species: '*Eomellivora*' *necrophila* PILGRIM, 1932, designated as the type species of the genus *Sivamellivora* KRETZOI, 1942 by KRETZOI (1942: pp. 320, 322), and '*Eomellivora*' *tenebrarum* PILGRIM, 1932, transferred to the genus *Sivamellivora* by KRETZOI (1942: p. 322) and to the subgenus *Hoplictis* GINSBURG, 1961 of the genus *Ischyriactis* HELBING, 1930 by SCHMIDT-KITTLER (1976: pp. 36, 38).

Occurrence. The early and late Late Miocene of Europe and the late Late Miocene of Asia and North America.

Comments. The name *Perunium* ORLOV, 1947a is synonymized with *Eomellivora* ZDANSKY, 1924 because the type species of these genera, *Perunium ursogulo* and *Eomellivora wimani*, constitute synonyms as evidenced below.

Eomellivora wimani ZDANSKY, 1924

Synonymy. See synonymy lists of the included chronosubspecies.

Emended diagnosis. Same as for the genus.

Lectotype. Designated by KRETZOI (1965: p. 132), a facial-palatal portion of skull (PMU M3692) associated with partial right and left dentaries (PMU M3693), preserving all teeth except the right M₂, figured by ZDANSKY (1924: pl. XI, fig. 6; pl. XII, fig. 2).

Type locality and age: Shangyingou (Shang-Yin-Kou, Locality 12), China; Baodean (LI et al. 1984).

Included chronosubspecies: *Eomellivora wimani wimani* ZDANSKY, 1924 and *Eomellivora wimani piveteaui* OZANSOY, 1965.

Comments. When the finds of *Eomellivora* are arranged according to stratigraphic sequence, a progressive trend towards greater number and size of secondary premolar cusps through time can be observed (Table I, WOLSAN & SEMENOV 1994). The increase in number and size of the secondary cusps is associated with anteroposterior contraction and buccolingual extension of the premolars and the upper canines and with an augmentation in the massiveness of the lower canines (Fig. 1). Apart from the characters involved in this trend, no others could be scored to distinguish the Vallesian population of *Eomellivora* from the Turolian, Baodean, or Hemphillian one. This plainly justifies the conclusion that all the populations are simply parts of the single lineage or species *Eomellivora wimani* that evolved during the Late Miocene in Eurasia and North America. For purposes of practical application to biostratigraphy, we subdivide this species into the two chronosubspecies: the primitive Vallesian *Eomellivora wimani piveteaui* OZANSOY, 1965 and the derived Turolian, Baodean, and Hemphillian *Eomellivora wimani wimani* ZDANSKY, 1924.

Eomellivora wimani wimani ZDANSKY, 1924

Abbreviated synonymy: *Eomellivora Wimani* ZDANSKY, 1924: pp. 61, 151, pl. XI, figs 5, 6, pl. XII, figs 1, 2.

Eomellivora aff. *hungarica* KRETZOI in KADIĆ & KRETZOI, 1930: p. 48. Nomen nudum.

Pliogulo gigas KROKOS in VOZNESENSKY, 1937: p. 60. Nomen nudum.

Eomellivora californica KRETZOI, 1942: pp. 319, 322. Lectotype, designated herein, LACM-CIT 50/1210, associated partial right and left maxillae with right and left P³-M¹, figured by STOCK & HALL (1933: pl. 4, figs A, B). Type locality and age: Kern River Formation site 1, California, USA; early Hemphillian.

Table I

Occurrence and size of secondary cusps on premolar teeth in *Eomellivora wimani piveteaui* and *Eomellivora wimani wimani*. Sources: *Eomellivora wimani piveteaui*, OZANSOY (1965: p. 23, pl. II, figs 1, 5), LUNGU (1978: pp. 42, 45, 46, text-figs 8, 10, pl. I, figs 1, 2, 5, 6), GINSBURG et al. (1981: pl. II, fig. 6), and this paper (PMK Ca 1, 15-19, 39-62, 64, 66, 82-88, 90-102, 112-121, 208); *Eomellivora wimani wimani*, SIMIONESCU (1938b: text-figs 23, 24, pl. II, figs 2, 3), KRETZOI (1942: p. 320, pl. XXII, figs 1, 2, 5, 7; 1965: p. 130, pl., figs 4-7), and this paper (cast of LACM-CIT 50/1210; PIN 655-1, 655-2, 655-3; PMU M3692, M3693, M3847)

Character	<i>Eomellivora wimani piveteaui</i>	<i>Eomellivora wimani wimani</i>
P ¹ anterior secondary cusp	absent	absent
P ¹ posterior secondary cusp	absent	absent
P ² anterior secondary cusp	absent	absent
P ² posterior secondary cusp	absent	absent to very small
P ³ anterior secondary cusp	absent	very small to small
P ³ posterior secondary cusp	absent to very small	small
P ⁴ anterior secondary cusp	absent	absent to very small
P ₁ anterior secondary cusp	absent	absent
P ₁ posterior secondary cusp	absent	absent
P ₂ anterior secondary cusp	absent	absent to very small
P ₂ posterior secondary cusp	absent	absent to very small
P ₃ anterior secondary cusp	absent	absent to small
P ₃ posterior secondary cusp	absent to small	very small to small
P ₄ anterior secondary cusp	absent to small	small to very large
P ₄ posterior secondary cusp	very small to large	large

Eomellivora hungarica KRETZOI, 1942: pp. 319-322, pl. XXII, figs 1-3, 6. Holotype, by original designation, a partial left dentary with C₁, P₂, P₄, and M₁, figured by KORMOS (1914: text-fig. 17) and KRETZOI (1942: pl. XXII, figs 1, 2). Type locality and age: Polgárdi 2, Hungary; Turolian, MN 13.

Eomellivora hungarica altera KRETZOI, 1942: pp. 321, 322, pl. XXII, figs 4, 5, 7-10. Holotype, by original designation, a left P⁴, figured by KRETZOI (1942: pl. XXII, fig. 5). Type locality and age: Csákvár, Hungary; Turolian, MN 11.

Perunium ursogulo ORLOV, 1947a: p. 947, text-figs 1-4. Holotype, by monotypy, a nearly complete skull preserving all teeth except the right P¹ (PIN 655-1), associated with partial right and left dentaries bearing the right I₃-M₂ and left M₁ and M₂ (PIN 655-2), figured by ORLOV (1947a: text-figs 1-4; 1947b: text-figs 1, 2; 1947c: text-figs 1, 2, 3A, 4, 5A-C, 6, 7A, 8-12; 1948: text-figs 1, 2, 3a, 4, 5a-c, 6, 7a, 8-12), PIVETEAU (1961: text-figs 133, 200), GROMOVA et al. (1962: text-fig. 222; 1968: text-fig. 222), THENIUS (1969a: text-figs 390, 391a; 1969b: text-figs 390, 391a), and MÜLLER (1970: text-fig. 177; 1989: text-fig. 204). Type locality and age: Grebeniki, Ukraine; Turolian, MN 11.

Eomellivora rumana ORLOV, 1947c: pp. 26, 56, tables 2, 6 [not *Lutra rumana* SIMIONESCU, 1922, not *Pannonictis rumana* (SIMIONESCU, 1922)]. Holotype, by monotypy, a partial left maxilla with C¹ and P⁴, figured by SIMIONESCU (1938b: text-figs 23, 24, 25/6, pl. II, figs 2, 3). Type locality and age: Cimislia, Moldova; Turolian, MN 12.

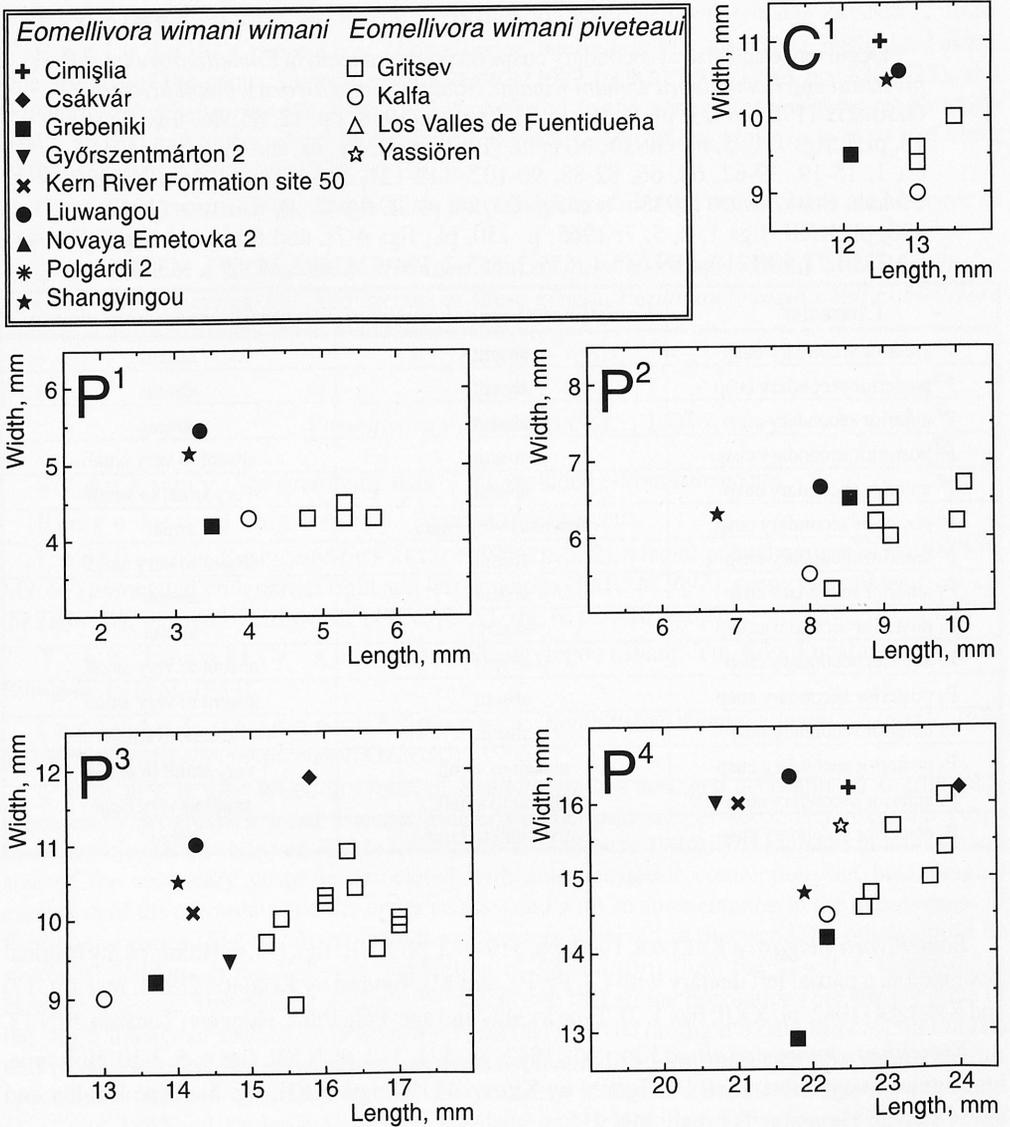
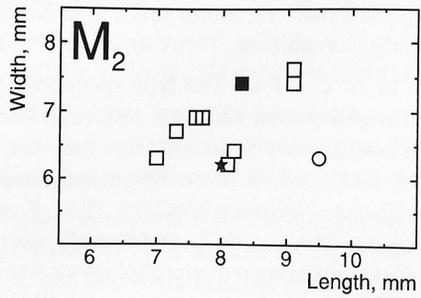
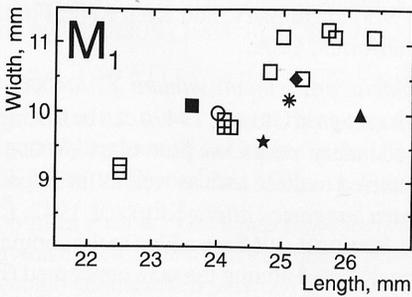
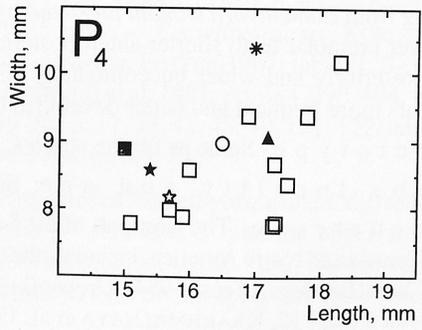
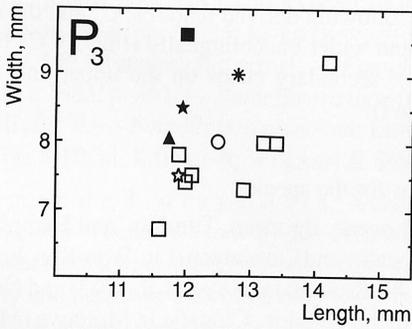
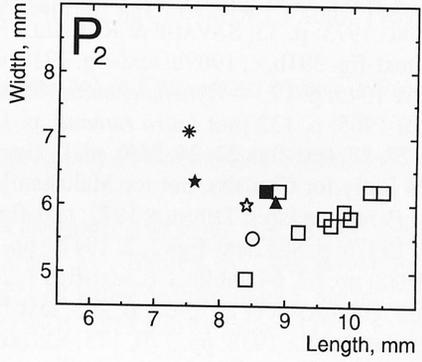
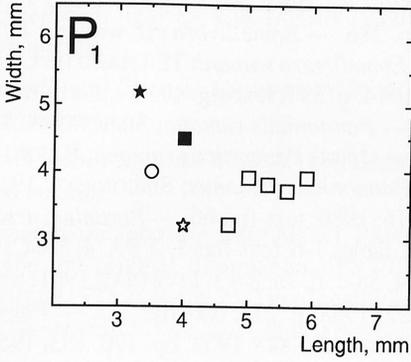
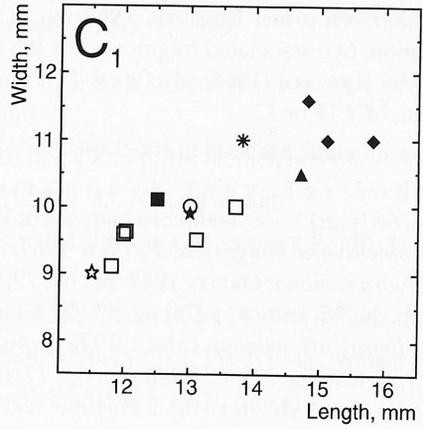
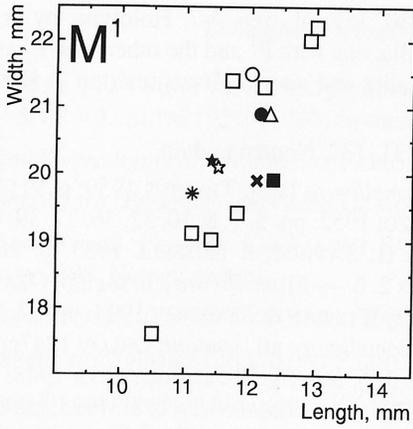


Fig. 1. Relationships between lengths and widths of teeth in *Eomellivora wimani wimani* and *Eomellivora wimani piveteaui* from various localities. Sources: Cimişlia (C¹ width), SIMIONESCU (1938b: p. 28); Cimişlia (C¹ length), this paper, an estimation based on fig. 2 of pl. II in SIMIONESCU (1938b), instead of the obviously erroneous original data published on pp. 27 and 28 in SIMIONESCU (1938b); Cimişlia (P⁴), KRETZOI (1965: p. 132); Csákvár, KRETZOI (1942: p. 321); Grebeniki, this paper, PIN 655-1 and 655-2 (for P⁴ the dimensions of the right and left teeth are presented separately because of their significant discrepancy); Gritsev, this paper, PMK Ca 1, 3, 5, 15, 17-27, 30-32, 37-50, 52-62, 64-68, 70, 71, 82-87, 89-103, 105-109, 112-121, 202-208; Győrszentmárton 2, KRETZOI (1965: p. 130); Kalfa (except M¹), LUNGU (1978: tables 2, 3); Kalfa (M¹), this paper, estimations based on text-fig. 9 in LUNGU (1978), instead of the apparently mistaken original data given in table 2 in LUNGU (1978); Kern River Formation site 1, STOCK & HALL (1933: p. 65); Liuwangou, this paper, PMU M3847; Los Valles de Fuentidueña, this paper, IPS 2057; Novaya Emetovka 2, this paper, PIN 655-3; Polgárdi 2, KRETZOI (1942: p. 320); Shangyingou, this paper, PMU M3692, M3693; Yassiören (P⁴ and M¹), this paper, estimations based on fig. 5 of pl. II in OZANSOY (1965), instead of the evidently confused original data provided on p. 23 in OZANSOY (1965); Yassiören (C¹-P⁴), OZANSOY (1965: p. 23).



Eomellivora orlovi KRETZOI, 1965: pp. 128, 130, 132, pl., figs 4-7. Holotype, by original designation, two associated fragments of a left maxilla, one with P¹ and the other with P³ and P⁴, figured by KRETZOI (1965: pl., figs 4-7). Type locality and age: Győrszentmárton 2, Hungary; Turolian, MN 11 or 12.

Pliogulo gigas KROKOS in KRETZOI, 1965: pp. 131, 132. Nomen nudum.

Other relevant synonyms: *Eomellivora* [sp.]; THENIUS 1959: p. 91; WEBB 1969: p. 66 [part]. — *Eomellivora hungarica*; KRETZOI 1952: pp. 3, 7, 8, 10, 32, 36, 37, 39, 40. — [not] *Eomellivora hungarica*; PETTER 1967: table II; SAVAGE & RUSSELL 1983: p. 261. — *Eomellivora rumana*; ORLOV 1948: pp. 63, 79, tables 2, 6. — *E[omellivora]. ursogulo*; OZANSOY, 1965: pp. 24, 25; LUNGU 1978: pp. 45, 46, tables 2, 3; WOLSAN & SEMENOV 1994: pp. 83, 84. — *E[omellivora]. aff. wimani*; LUNGU 1978: p. 46. — *Eomellivora aff. wimani*; ORLOV 1947c: p. 56, tables 3, 6, text-fig. 7B, C; 1948: pp. 63, 77, tables 3, 6, text-fig. 7b, c; BELYAEVA 1948: p. 56; GROMOVA et al. 1962: text-fig. 225; 1968: text-fig. 225; KRAKHMALNAYA et al. 1993: table 2. — *Eomellivora aff. wimani*; ORLOV 1947c: p. 23 [typographic error]. — *Eomellivora cf. wimani*; STOCK & HALL 1933: pp. 63, 65, pl. 4, figs A-E; KRETZOI 1965: p. 132; CRUSAFONT PAIRÓ & GINSBURG 1973: p. 33; SAVAGE & RUSSELL 1983: p. 286. — *Eomellivora cfr. wimani*; THENIUS 1969a: text-fig. 391b, c; 1969b: text-fig. 391b, c. — *Eomellivora wimani*; TEILHARD DE CHARDIN & LEROY 1945: p. 19. — *Hyaena eximia*; KORMOS 1914: p. 591, text-fig. 17. — „*Lutra rumana*”; KRETZOI 1965: p. 132 [not *Lutra rumana*, p. 131]. — *Pannonictis rumana*; SIMIONESCU 1938b: pp. 14, 27, 28, text-figs 23, 24, 25/6, pl. II, figs 2, 3. — [part] *Pannonictis rumana*; BARBU 1959: table 24 [only for Cimisia, not for Malusteni]. — *Pannonictis rumanus*; SIMIONESCU 1938a: p. 576. — *Perunium* [sp.]; THENIUS 1972: text-fig. 69/16; 1980: text-fig. 66. — *Perunium ursogulo*; ORLOV 1947b: p. 883, text-figs 1, 2; 1947c: pp. 5, 56, tables 1-6, text-figs 1, 2, 3A, 4, 5A-C, 6, 7A, 8-13; 1948: pp. 63, 64, tables 1-6, text-figs 1, 2, 3a, 4, 5a-c, 6, 7a, 8-13; PIVETEAU 1961: text-figs 133, 200; GROMOVA et al. 1962: p. 208, text-fig. 222; 1968: p. 277, text-fig. 222. — *Plesiogulo* [sp.]; PIDOPLICHKA 1938: pp. 170, 175; KROKOS in VOZNESENSKY 1939: pp. 190, 193, 195, 196.

E m e n d e d d i a g n o s i s. The nominotypical chronosubspecies of *Eomellivora wimani* differing from *Eomellivora wimani piveteaui* by the following derived features: C¹ and the upper and lower premolar teeth shorter anteroposteriorly and wider buccolingually (Fig. 1); C₁ longer anteroposteriorly and wider buccolingually (Fig. 1); secondary cusps on the upper and lower premolars more frequent and better developed (Table I).

L e c t o t y p e. Same as for the species.

T y p e l o c a l i t y a n d a g e: Same as for the species.

O c c u r r e n c e. The later part of the Late Miocene, Baodean, Turolian, and Hemphillian Ages, Eurasia and North America, including the type locality and Liuwangou (Liu-Wan-Kou, Locality 31) in China (Baodean, Li et al. 1984); Grebeniki (MN 11, KRAKHMALNAYA et al. 1993) and Novaya Emetovka 2 (MN 12, KRAKHMALNAYA et al. 1993) in the Ukraine; Cimisia in Moldova (MN 12, MEIN 1990); Csákvár (MN 11, MEIN 1990), Győrszentmárton 2 (MN 11 or 12, KRETZOI 1982), and Polgárdi 2 (MN 13, FREUDENTHAL & KORDOS 1989) in Hungary; and Kern River Formation site 1 (early Hemphillian, TEDFORD et al. 1987) in California, USA.

C o m m e n t s. The type specimens of *Eomellivora wimani wimani* ZDANSKY, 1924, *Eomellivora hungarica* KRETZOI, 1942, and *Perunium ursogulo* ORLOV, 1947a can be distinguished from one another by occurrence and size of secondary cusps on premolars (WOLSAN & SEMENOV 1994). When, however, other specimens referred to these taxa as well as the hypodigms of *Eomellivora californica* KRETZOI, 1942, *Eomellivora hungarica altera* KRETZOI, 1942, *Eomellivora rumana* ORLOV, 1947c, and *Eomellivora orlovi* KRETZOI, 1965 are added to the comparison, no significant difference in morphology or size can be detected among the taxa concerned (Fig. 1, Table I). For this reason, we synonymize all these names with one another.

Eomellivora wimani piveteaui OZANSOY, 1965

Abbreviated synonymy: *Eomellivora liguritor* CRUSAFONT PAIRÓ in CRUSAFONT PAIRÓ & DE VILLALTA, 1951: p. 148. Nomen nudum.

Eomellivora liguritor CRUSAFONT PAIRÓ in TOBIEN, 1955: p. 19. Nomen nudum.

Eomellivora (Perunium) piveteaui OZANSOY, 1957: p. 43. Nomen nudum.

E[omellivora]. liguritor CRUSAFONT PAIRÓ & GINSBURG in CRUSAFONT PAIRÓ & GOLPE, 1962a: p. 2808. Nomen nudum.

E[omellivora]. liguritor CRUSAFONT PAIRÓ & GOLPE, 1962b: p. 14. Nomen nudum.

Eomellivora liguritor CRUSAFONT PAIRÓ & GINSBURG in PETTER, 1963: p. 41. Nomen nudum.

Eomellivora piveteaui OZANSOY, 1965: pp. 16, 23-25, table 5, pl. II, figs 1, 5.

E[omellivora]. liguritor CRUSAFONT PAIRÓ in OZANSOY, 1965: p. 24. Nomen nudum.

Eomellivora liguritor CRUSAFONT PAIRÓ & GINSBURG in CRUSAFONT PAIRÓ, 1969: p. 55. Nomen nudum.

Eomellivora liguritor CRUSAFONT PAIRÓ & GINSBURG in CRUSAFONT PAIRÓ, 1971: p. 155. Nomen nudum.

Eomellivora liguritor CRUSAFONT PAIRÓ & GINSBURG in CRUSAFONT PAIRÓ, 1973: p. 64. Nomen nudum.

Eomellivora liguritor CRUSAFONT PAIRÓ & GINSBURG, 1973: pp. 32, 33, 43, text-fig. 2. Holotype, by original designation, IPS 2057, a right M^1 , figured by CRUSAFONT PAIRÓ & GINSBURG (1973: text-fig. 2). Type locality and age: Los Valles de Fuentidueña, Spain; Vallesian, MN 9. Synonymized with *Eomellivora piveteaui* OZANSOY, 1965 also by LUNGU (1978: pp. 41, 46).

Other relevant synonyms: *Eomellivora nova* sp.; CRUSAFONT PAIRÓ 1958: p. 21. — *Eomellivora* [sp.]; CRUSAFONT PAIRÓ 1958: p. 25; THENIUS 1959: p. 66. — *Eomellivora* sp.; LUNGU 1968: pp. 31, 35; KOROTKEVICH et al. 1985: p. 82. — *Eomellivora* sp.; KOROTKEVICH 1988: p. 109 [?typographic error]. — *Eomellivora hungarica*; PETTER 1967: table II; SAVAGE & RUSSELL 1983: p. 261. — *Eomellivora liguritor*; GINSBURG et al. 1981: pp. 384, 390, 404, text-fig. 8, pl. II, fig. 6. — *Eomellivora piveteaui*; LUNGU 1978: pp. 17, 33, 41, 48, 49, 121, 122, tables 1-3, text-figs 8-10, pl. I, figs 1-6; WOLSAN & SEMENOV 1994: pp. 83, 84.

Emended diagnosis. A chronosubspecies of *Eomellivora wimani* differing from *Eomellivora wimani wimani* by the following primitive features: C^1 and the upper and lower premolar teeth longer anteroposteriorly and narrower buccolingually (Fig. 1); C_1 shorter anteroposteriorly and narrower buccolingually (Fig. 1); secondary cusps on the upper and lower premolars less frequent and less well developed (Table I).

Lectotype. Designated herein, a partial right dentary with I_2 - P_4 and the M_1 trigonid, figured by OZANSOY (1965: pl. II, fig. 1).

Type locality and age: Yassiören, Turkey; Vallesian, MN 9 (DE BRUIJN et al. 1992).

Occurrence. The earlier part of the Late Miocene, Vallesian Age, Europe, including the type locality, as well as Gritsev in the Ukraine (MN 9, KOROTKEVICH 1988), Kalfa in Moldova (MN 9, MEIN 1990), and Los Valles de Fuentidueña in Spain (MN 9, DE BRUIJN et al. 1992).

Comments. The name *Eomellivora liguritor* CRUSAFONT PAIRÓ & GINSBURG, 1973 is synonymized with *Eomellivora wimani piveteaui* OZANSOY, 1965 because no significant differences could be discerned between the morphological and size characteristics of the hypodigms of these taxa (Fig. 1, Table I).

REFERENCES

- BARBU V. 1959. Contributii la cunoasterea genului *Hipparion*. Biblioteca de Geologie si Paleontologie, Editura Academiei Republicii Populare Romîne, Bucharest, 5: 1-85. (In Roumanian).
- BARYSHNIKOV G. F. 1988. The taxonomic place of *Mellivora* species of the USSR fauna. Byulleten' Moskovskogo Obschestva Ispytatelei Prirody, Otdel Biologicheskii, 93(5): 50-58. (In Russian with English summary).
- BELYAeva E. I. 1948. Katalog mestonakhozhdenii tretichnykh nazemnykh mlekopitayushchikh na territorii SSSR. [In:] A. A. BORISYAK, E. I. BELYAeva – Mestonakhozhdeniya tretichnykh nazemnykh mlekopitayushchikh na territorii SSSR. Trudy Paleontologicheskogo Instituta, 15(3): 36-114. (In Russian).
- BOWDICH T. E. 1821. An analysis of the natural classifications of Mammalia, for the use of students and travellers. J. Smith, Paris.
- BRUIJN H. DE, DAAMS R., DAXNER-HÖCK G., FAHLBUSCH V., GINSBURG L., MEIN P., MORALES J. 1992. Report of the RCMNS working group on fossil mammals, Reisenburg 1990. Newsletters on Stratigraphy, 26: 65-118.
- CRUSAFONT PAIRÓ M. 1958. Endemism and paneuropeism in Spanish fossil mammalian faunas, with special regard to the Miocene. Commentationes Biologicae, 18(1): 1-31.
- CRUSAFONT PAIRÓ M. 1969. Història de la paleontologia a Sabadell. Ed. Sallent, Sabadell. (In Catalan).
- CRUSAFONT PAIRÓ M. 1971. Estado actual de los estudios paleomastológicos en España. Memorias de la Real Academia de Ciencias y Artes de Barcelona, Tercera Época, 15: 139-159.
- CRUSAFONT PAIRÓ M. 1973. Mammalia tertiaria Hispaniae. [In:] F. WESTPHAL (ed.) – Fossilium catalogus. I: Animalia. W. Junk b. v., The Hague, 121: I-IV + 1-198.
- CRUSAFONT PAIRÓ M., GINSBURG L. 1973. Les Carnassiers fossiles de Los Vallès de Fuentidueña (Ségovie, Espagne). Bulletin du Muséum National d'Histoire Naturelle, Série 3, 131: 29-45.
- CRUSAFONT PAIRÓ M., GOLPE J. M. 1962a. Présence, dans le Miocène d'Espagne, de Mustélidés connus, à l'Est, sur les bords de la Téthys. Comptes Rendus des Séances de l'Académie des Sciences, 254: 2807-2809.
- CRUSAFONT PAIRÓ M., GOLPE J. M. 1962b. Nuevos hallazgos de Lútridos aonicoides (*Sivaonyx*, *Enhydriodon*) en el Plioceno español (Cuenca de Teruel). Notas y Comunicaciones del Instituto Geológico y Minero de España, 67: 5-15.
- CRUSAFONT PAIRÓ M., DE VILLALTA J. F. 1951. Los nuevos mamíferos del Neogeno de España. Notas y Comunicaciones del Instituto Geológico y Minero de España, 22: 129-151.
- FISCHER [VON WALDHEIM] G. 1817. Adversaria zoologica. Mémoires de la Société Impériale des Naturalistes de Moscou, 5: 357-472.
- FLOWER W. H. 1869. On the value of the characters of the base of the cranium in the classification of the order Carnivora, and on the systematic position of *Bassaris* and other disputed forms. Proceedings of the Scientific Meetings of the Zoological Society of London, 1869: 4-37.
- FREUDENTHAL M., KORDOS L. 1989. *Cricetus polgardiensis* sp. nov. and *Cricetus kormosi* SCHAUB, 1930 from the Late Miocene Polgárdi localities (Hungary). Scripta Geologica, 89: 71-100.
- GINSBURG L. 1961. La faune des Carnivores miocènes de Sansan (Gers). Mémoires du Muséum National d'Histoire Naturelle, Nouvelle Série, Série C, 9: 1-190.
- GINSBURG L., MORALES J., SORIA D. 1981. Nuevos datos sobre los Carnívoros de Los Valles de Fuentidueña (Segovia). Estudios Geológicos, 37: 383-415.
- GRAY J. E. 1825. An outline of an attempt at the disposition of Mammalia into tribes and families, with a list of the genera apparently appertaining to each tribe. The Annals of Philosophy, New Series, 10: 337-344.
- GRAY J. E. 1865. Revision of the genera and species of Mustelidae contained in the British Museum. Proceedings of the Scientific Meetings of the Zoological Society of London, 1865: 100-154.
- GROMOVA V. I., DUBROVO I. A., YANOVSKAYA N. M. 1962. Otryad Carnivora. Khishchnye. [In:] V. I. GROMOVA (ed.) – Osnovy paleontologii. Spravochnik dlya paleontologov i geologov SSSR. Mlekopitayushchie. Gosudarstvennoe Nauchno-Tekhnicheskoe Izdatel'stvo Literatury po Geologii i Okhrane Nedr, Moscow. Pp. 182-230. (In Russian).
- GROMOVA V. I., DUBROVO I. A., YANOVSKAYA N. M. 1968. Order Carnivora. [In:] V. I. GROMOVA (ed.) – Fundamentals of paleontology (Osnovy paleontologii). A manual for paleontologists and geologists of the USSR, 13: 241-310. Israel Program for Scientific Translations, Jerusalem.
- HELBING H. 1930. Zur Kenntnis der miocänen „*Mustela*” *zibethoides* BLAINVILLE. Eclogae Geologicae Helvetiae, 23: 637-644.

- HERÁŇ I. 1982. Kunovité šelmy. Zvířata Celého Světa, Státní Zemědělské Nakladatelství, Prague, **9**: 1-205. (In Czech).
- KADIĆ O., KRETZOI M. 1930. Ergebnisse der weiteren Grabungen in der Esterházyhöhle (Csákvárer Höhlung). Mitteilungen über Höhlen- und Karstforschung, **1930**: 45-49.
- KORMOS T. 1914. Über die Resultate meiner Ausgrabungen im Jahr 1913. Jahresbericht der Königlichen Ungarischen Geologischen Reichsanstalt, **1913**: 559-604.
- KOROTKEVICH E. L. 1988. Istoriya formirovaniya gipparionovoï fauny vostochnoi Evropy. Naukova Dumka, Kiev. (In Russian).
- KOROTKEVICH E. L., KUSHNIRUK V. N., SEMENOV Yu. A., CHEPALYGA A. L. 1985. Novoe mestonakhozhdenie srednesarmatskikh pozvonochnykh na Ukraine. Vestnik Zoologii, **1985**(3): 81-82. (In Russian).
- KRAKHMALNAYA T. V., SVETLITSKAYA T. V., CHEPALYGA A. L. 1993. New data on stratigraphy, magnetostratigraphy and mammal faunas of the late Miocene locality of Novaya Emetovka (Ukraine). Newsletters on Stratigraphy, **29**: 77-89.
- KRETZOI M. 1942. *Eomellivora* von Polgárdi und Csákvár. Földtani Közlöny, **72**: 318-323.
- KRETZOI M. 1943. *Kochictis centennii* n. g. n. sp., ein altertümlicher Creodonte aus dem Oberoligozän Siebenbürgens. Földtani Közlöny, **73**: 180-195.
- KRETZOI M. 1952. Die Raubtiere der *Hipparion*-Fauna von Polgárdi. A Magyar Állami Földtani Intézet Évkönyve, **40** (3): 1-42.
- KRETZOI M. 1965. Die *Hipparion*-Fauna von Györszentmárton in NW-Ungarn. Annales Historico-Naturales Musei Nationalis Hungarici, **57**: 127-143.
- KRETZOI M. 1982. Fontosabb szórványleletek a MÁFI gerinces-gyűjteményében (7. közlemény). A Magyar Állami Földtani Intézet Évi Jelentése, **1980**: 385-394. (In Hungarian).
- LI C., WU W., QIU Z. 1984. Chinese Neogene: subdivision and correlation. Vertebrata Palasiatica, **22**: 163-178. (In Chinese with English summary).
- LINNAEUS C. 1758. Systema naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis, **1** [10th edn]. Laurentius Salvius, Stockholm.
- LUNGU A. N. 1968. Usloviya obitaniya i osobennosti sistematicheskogo sostava gipparionovoï fauny srednego sarmata Moldavii. Izvestiya Akademii Nauk Moldavskoi SSR, Seriya Biologicheskikh i Khimicheskikh Nauk, **1968**(3): 30-36. (In Russian).
- LUNGU A. N. 1978. Gipparionovaya fauna srednego sarmata Moldavii (khishchnye mlekopitayushchie). Izdatel'stvo Shtiintsa, Kishinev. (In Russian).
- MEIN P. 1990. Updating of MN zones. [In:] E. H. LINDSAY, V. FAHLBUSCH, P. MEIN (eds) – European Neogene mammal chronology. NATO ASI Series, Series A, Plenum Press, New York, **180**: 73-90.
- MUIZON C. DE 1982. Les relations phylogénétiques des Lutrinae (Mustelidae, Mammalia). Geobios, Mémoire Spécial **6**: 259-277.
- MÜLLER A. H. 1970. Lehrbuch der Paläozoologie. VEB Gustav Fischer Verlag, Jena, **3**(3): I-XVI + 1-855.
- MÜLLER A. H. 1989. Lehrbuch der Paläozoologie. VEB Gustav Fischer Verlag, Jena, **3**(3): 1-809 [2nd edn].
- ORLOV Yu. A. 1947a. Novye iskopaemye kunitsy iz verkhnnetretichnykh otlozhenii Ukrainskoi SSR. Doklady Akademii Nauk SSSR, Novaya Seriya, **57**: 947-950 [issued 21 September 1947]. (In Russian).
- ORLOV Yu. A. 1947b. Nekotorye dannye o golovnom mozge *Perunium ursogulo* ORLOV. Doklady Akademii Nauk SSSR, **58**: 883-886 [issued 11 November 1947]. (In Russian).
- ORLOV Yu. A. 1947c. Peruniinae, novoe podsemeïstvo kunits iz neogena Evrazii (k filogenii kunits). Trudy Paleontologicheskogo Instituta, **10** (3): 1-56 [issued in 1947]. (In Russian).
- ORLOV Yu. A. 1948. *Perunium ursogulo* ORLOV, a new gigantic extinct mustelid (a contribution to the morphology of the skull and brain and to the phylogeny of Mustelidae). Acta Zoologica, **29**: 63-105.
- OZANSOY F. 1957. Faunes de Mammifères du Tertiaire de Turquie et leurs révisions stratigraphiques. Bulletin of the Mineral Research and Exploration Institute of Turkey, **49**: 29-48.
- OZANSOY F. 1965. Étude des gisements continentaux et des Mammifères du Cénozoïque de Turquie. Mémoires de la Société Géologique de France, Nouvelle Série, **44**(102): 1-92.
- PETTER G. 1963. Contribution à l'étude des Mustélidés des bassins néogènes du Vallès-Pénéès et de Calatayud-Teruel (Espagne orientale). Mémoires de la Société Géologique de France, Nouvelle Série, **42**(97): 1-44.
- PETTER G. 1967. Mustélidés nouveaux du Vallésien de Catalogne. Annales de Paléontologie, Vertébrés, **53**: 91-117.

- PIDOPLICHKA I. G. 1938. A survey of paleontological finds 1917 to 1937. [In:] I. G. PIDOPLICHKA – Materials for the study of the fossil fauna of the Ukr. SSR. Vidavnistvo Akademii Nauk URSR, Kiev. Pp. 97-176. (in Ukrainian with English summary).
- PILGRIM G. E. 1932. The fossil Carnivora of India. Memoirs of the Geological Survey of India, New Series, **18**: i-iv + 1-232.
- PIVETEAU J. 1961. Carnivora. [In:] J. PIVETEAU (ed.) – Traité de paléontologie. Masson et C^{ie}, Paris, **6** (1): 641-830.
- ROMER A. S. 1966. Vertebrate paleontology [3rd edn]. University of Chicago Press, Chicago.
- SAVAGE D. E., RUSSELL D. E. 1983: Mammalian paleofaunas of the world. Addison-Wesley Publishing Company, London.
- SCHMIDT-KITTLER N. 1976. Raubtiere aus dem Jungtertiär Kleinasiens. Palaeontographica, Abteilung A, **155**: 1-131.
- SIMIONESCU I. 1922. Über eine pliocäne Wirbeltierfauna aus Rumänien. Centralblatt für Mineralogie, Geologie und Paläontologie, **1922**: 185-186.
- SIMIONESCU I. 1938a. La faune pliocène à *Hipparion* en Roumanie. Volume Jubilaire «Grigore Antipa». Imprimeria Nationala, Bucharest. Pp. 573-580.
- SIMIONESCU I. 1938b. Mamiferele pliocene de la Cimisia. I. Carnivore. Academia Româna, Publicatiunile Fondului Vasile Adamachi, **9** (50): 1-30. (In Roumanian).
- STOCK C., HALL E. R. 1933. The Asiatic genus *Eomellivora* in the Pliocene of California. Journal of Mammalogy, **14**: 63-65.
- TEDFORD R. H., GALUSHA T., SKINNER M. F., TAYLOR B. E., FIELDS R. W., MACDONALD J. R., RENSBERGER J. M., WEBB S. D., WHISTLER D. P. 1987. Faunal succession and biochronology of the Arikareean through Hemphillian interval (late Oligocene through earliest Pliocene epochs) in North America. [In:] M. O. WOODBURNE (ed.) – Cenozoic mammals of North America: geochronology and biostratigraphy. University of California Press, Berkeley. Pp. 153-210.
- TEILHARD DE CHARDIN P., LEROY P. 1945. Les Mustélidés de Chine. Publications de l'Institut de Géobiologie, **12**: i-viii + 1-56.
- THENIUS H. 1959. Wirbeltierfaunen. [In:] F. LOTZE (ed.) – Handbuch der stratigraphischen Geologie. Ferdinand Enke Verlag, Stuttgart, **3**(2): I-XII + 1-328.
- THENIUS H. 1969a. Stammesgeschichte der Säugetiere (einschließlich der Hominiden). [In:] J.-G. HELMCKE, D. STARCK, H. WERMUTH (eds) – Handbuch der Zoologie. Eine Naturgeschichte der Stämme des Tierreiches. Walter de Gruyter & Co., Berlin, **8**(2, 1): I-VIII + 1-722.
- THENIUS H. 1969b. Phylogenie der Mammalia. Stammesgeschichte der Säugetiere (einschließlich der Hominiden). Walter de Gruyter & Co., Berlin.
- THENIUS H. 1972. Grundzüge der Verbreitungsgeschichte der Säugetiere. Eine historische Tiergeographie. Gustav Fischer Verlag, Stuttgart.
- THENIUS H. 1980. Grundzüge der Faunen- und Verbreitungsgeschichte der Säugetiere. Eine historische Tiergeographie [2nd edn]. Gustav Fischer Verlag, Stuttgart.
- THENIUS H. 1989. Zähne und Gebiß der Säugetiere. [In:] J. NIETHAMMER, H. SCHLIEMANN, D. STARCK (eds) – Handbuch der Zoologie. Eine Naturgeschichte der Stämme des Tierreiches. Walter de Gruyter, Berlin, **8**(56): I-XI + 1-513.
- THENIUS E., HOFER H. 1960. Stammesgeschichte der Säugetiere. Eine Übersicht über Tatsachen und Probleme der Evolution der Säugetiere. Springer-Verlag, Berlin.
- TOBIEN H. 1955. Neue und wenig bekannte Carnivoren aus den unterpliozänen Dinotheriensanden Rheinhessens. Notizblatt des Hessischen Landesamtes für Bodenforschung zu Wiesbaden, **83**: 7-31.
- VOZNESENSKY O. N. 1937. Deposition conditions of Meotic fauna in Grebenniki village, Tiraspol District, Moldavian ASSR. Geologichnii Zhurnal, **4**(1): 59-73. (In Ukrainian with English summary).
- VOZNESENSKY O. N. 1939. Deposition conditions of the Meotic vertebrates in the village Novaya Yemetovka, Odessa District, Ukr. SSR. Geologichnii Zhurnal, **6**(1-2): 185-197. (In Ukrainian with English summary).
- WEBB S. D. 1969. The Burge and Minnechaduzha Clarendonian mammalian faunas of north-central Nebraska. University of California Publications in Geological Sciences, **78**: 1-191.
- WOLSAN M. 1993. Phylogeny and classification of early European Mustelida (Mammalia: Carnivora). Acta Theriologica, **38**: 345-384.
- WOLSAN M., SEMENOV Yu. A. 1994. Dental evolution in the Late Miocene genus *Eomellivora* (Carnivora, Mustelidae) and its biostratigraphic implications. Neogene and Quaternary Mammals of the Palaearctic. Conference in honour of Professor Kazimierz KOWALSKI, May 17-21, 1994, Kraków, Poland. Pp. 83-84.
- ZDANSKY O. 1924. Jungtertiäre Carnivoren Chinas. Palaeontologia Sinica, Series C, **2**(1): 1-155.

GUIDE TO AUTHORS

General remarks

Acta zoologica cracoviensia publishes original papers dealing with systematics, biology, faunistics, zoogeography, ecology and paleontology of land and fresh-water animals. All papers are accepted on the understanding that they have not been published or submitted for publication elsewhere. Manuscripts are submitted to referees for evaluation. Their editing may sometimes be extensive, but this will be done in communication with the Author.

Authors will receive the first proof only. Eventual changes of text or illustrations should be kept to a minimum.

50 reprints are supplied free of charge. Additional reprints may be ordered at cost, not later than together with the proof.

Manuscripts

Manuscripts in English should be submitted in two copies, typewritten, double-spaced, with at least 4 cm margin on the left side. All underlining and indentation should be avoided. It is welcomed that Authors submit their material stored as WordPerfect or ASCII files on IBM compatible discs together with one printed copy.

The first page should contain: the title of the paper, full Author's name, abstract, key words, repeated author's name and full address (for every coauthor). In papers dealing with lower taxa, the higher ones should be noted in the title [e.g. Nestling food of *Phylloscopus bonelli* (Passeriformes: Sylviidae)]

Longer papers should be divided into several chapters numbered with Roman numerals. Acknowledgements should be gathered under a single heading (acapit) at the end of introduction.

Tables should be typed on separate sheets and numbered with Roman numerals.

Figures (drawings, maps, diagrams etc.) done in black ink, should be submitted as original and one copy (xero), numbered with Arabic numerals [Fig. 1., Fig. 2. ...]; figures, letters and symbols used on illustrations should be drawn so large that they will be at least 1.5 mm high after reduction in print. Photographs must be sharp and contrast; they will be treated also as figures. Every illustration should bear its own number and Author's name. All captions of illustrations should be gathered on a separate sheet (not incorporated in the figure or photograph itself).

Nomenclature. First used binominal Latin names, according to Intern. Codex of Nomenclature, should be used full i.e. together with not abbreviated names of their authors and dates after coma – be careful using brackets [e.g. *Passer domesticus* (LINNAEUS, 1758) but *Aquila pomarina* BREHM, 1831]. If repeated later on in text the names might be abbreviated [e.g. *P. domesticus*, *A. pomarina*].

Citation in text: VOOUS (1962) or (VOOUS 1962), (DEMENTEV & GLADKOV 1952; BROWN et al. 1988).

References. The list of references must be complete and prepared in the following method:

Journal: MACARTHUR R. H., MACARTHUR J. W. 1961. On the bird species diversity. *Ecology*, **42**: 594-598.

Book: VAURIE C. 1959. The birds of the Palearctic fauna. Passeriformes. Witherby, London.

Chapter: OSBORN J. W. 1978. Morphogenetic gradients: fields versus clones. In: P. M. BUTLER and K. A. JOYSEY (Eds.) – Development, function and evolution of teeth. Academic Press, London-New York-San Francisco. Pp: 171-201.

In the case of papers written in the other than Latin letters, if there is English (or German, or French) title in the summary it may be used:

TOMKOVICH P. S. 1985. Sketch of the Purple Sandpiper (*Calidris maritima*) biology on Franz Josef Land. [In Russian with English summary]. *Ornitologiya*, **20**: 3-17.

If there is not English summary or even title – author's name must be transcribed and title of the paper also transcribed (using anglo-american transcription) or translated into English:

DEMENTEV G. P., GLADKOV N. 1952. Ptitsy Sovetskogo Soyuzu. **2**. or: [The birds of the Soviet Union (in Russian)], **2**.

Manuscripts not conforming to the requirements will be returned for revision.