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SHORT NOTE - NOTA BREVE

VIVERRA HOWELLI N. SP., A NEW VIVERRID (CARNIVORA, MAMMALIA) FROM THE BACCINELLO-CINIGIANO BASIN (LATEST MIOCENE, ITALY)

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Abstract. We describe a new viverrid species (*Viverra howelli* n. sp.). *Viverra howelli* n. sp. is identified in Late Miocene (Messinian) localities in the circum Mediterranean area (Italy and Libya) and in East Africa (Kenya). Morphologically, the new species is characterized by a relatively small size and a lower carnassial with short talonid.

Riassunto. Viene descritta una nuova specie di viverride (*Viverra howelli* n. sp.). *Viverra howelli* n. sp. è presente in località del Miocene terminale (Messiniano) con una distribuzione nell'area circum-Mediterranea (Italia, Libia) ed in Est Africa (Kenya). Morfologicamente si caratterizza per avere una taglia relativamente piccola e per un dente ferino inferiore con un tallonide ridotto.

Introduction

Viverrids are scantily represented in the Mio-Pliocene European fossil record. The earliest known European representatives of the sub-family Viverrinae date to the beginning of the Miocene, when made its first appearance *Semigenetta* (Helbing 1927, 1928; Engesser 1972), a genus that survived until the Vallesian (Petter 1976; Montoya et al. 2001). The earliest representatives of the genus *Viverra* occur in the deposits of Vieux Collonges (France; unit MN 4 in the European mammal biochronology) where are described as *Viverra modica vetusta* (Viret 1951; De Beaumont 1973). This species is also present at another French site, at La Grive (MN 7/8), with a different subspecies, namely *Viverra modica modica* (Viret 1951; de Beaumont 1973). During Turolian viverrid are very elusive in Europe. A viverrid mandible has been described from the Italian assemblage Baccinello V3 (Latest Miocene; MN 13) as *Viverra* sp. by Rook et al. (1991). These authors, although recognize this form as a possible new species, preferred not to erect a new name for it. Material attributed to a unnamed new *Viverra* species has been recovered from another latest Miocene (Messinian) locality in the circum-Mediterranean area, the locality P28A of Sahabi, in Libya (*Viverra* n. sp. "A" in Howell 1987). A larger species of *Viverra* is found in the Lower Pliocene (Ruscinian) of southern France, at Montpellier and Roussillon (MN 14 and MN 15 respectively), where *Viverra pepratxi* is present (Deperet 1890). The same species is also recorded at "Fornace RDB quarry" (Italy; Early Villafranchian, MN 16a) (Azzaroli et al. 1988). During Early Pliocene another related genus is known to be distributed in Europe: *Megaviverra* (Kretzoi & Fejfar 1982). This genus has been erected on the basis of material from Ivanovce-1 (Slovakia; MN 15) attributed to the species *Megaviverra carpatorum*. The genus is also recorded in the Early Villafranchian of Italy (Triversa, MN 16a), with a different species, *Megaviverra apenninica* (Kretzoi & Fejfar 1982).

The Baccinello-Cinigiano basin (southern Tuscany, Italy) is known for its Late Miocene vertebrate record (Benvenuti et al. 2001). Late Miocene (MN 13) mammal remains are found in several sites, from outcrops of the upper part of the fluvio-lacustrine sedimentary succession of the basin. This mammal assem-

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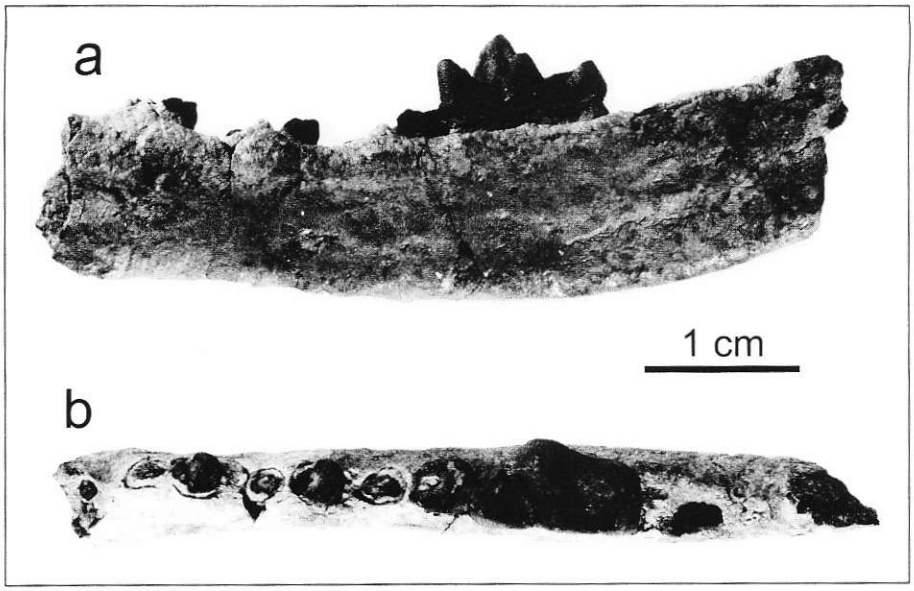

Fig. 1 - *Viverra howelli* n. sp., holotype IGF 2890v. a) right mandibular ramus in lingual view; b) right mandibular ramus in occlusal view. Bar scale represents 1 cm.

blage was named V3 (after Lorenz 1968) to distinguish it from older mammal faunas (known as V0, Vl, and V2) that are present in the sedimentary sequence of the basin. These older faunas, which date to the late Miocene (Turolian Mammal Age), are made up by endemic fossil taxa (including the fossil ape *Oreopithecus bambolii*), suggesting that the Tusco-Sardinian region was an insular domain characterised by a faunal province distinct from the provinces of the surrounding continental masses. This isolation of the Tusco-Sardinian paleobioprovince came to an end with the Messinian, when the region was reached by forms typical of the European faunal bioprovince (Hurzeler & Engesser 1976; Rook 1991; Bernor et al. 2001). The Baccinello - Cinigiano succession was studied in detail by Lorenz (1968) and, more recently, by Benvenuti et al. (1995, 2001) and Rook et al. (2000).

The fossiliferous site of Caprarecce was first discovered by Mr. Malpassi, and a certain number of specimens were collected either by Mr. Malpassi and by researchers of the Earth Sciences Dept. of the University of Florence. Some of these samples have been already described (Rook et al. 1991; Rook & Rustioni 1991; Rook & Torre 1995; Abbazzi 2001) and the following taxa have been at present recognized in the assemblage for this locality:

Tapirus cf. *arvernensis* Croizet & Jobert 1828, *Procapreolus* cf. *lóczyi* Pohlig 1911, Cervidae indet., *Korhynochoerus paleochoerus* (Kaup 1833), *Viverra* sp., *Celadensia grossetana* Rook & Torre 1995, *Alilepus* sp., *Castor* cf. *praefiber* Déperet 1890.

The viverrid mandible from this site has been described as *Viverra* sp. by Rook et al. (1991). The specimen was recognized as belonging to a hitherto undescribed species, but the decision was taken not to erect a new species on it until wider comparisons would had been made. In this note the Baccinello specimen, as well as the contemporary viverrid from Sahabi (*Viverra* n. sp. "A" in Howell 1987) and from Lothagam (Viverrinae sp. indet.; Werdelin 2003) are re-described and attributed to a new species.

Systematic Paleontology

Order **Carnivora** Bowdich, 1821
Suborder Ailuroidea Flower, 1869
Family Viverridae Gray, 1821
Subfamily Viverrinae Gill, 1872
Genus *Viverra* Linné, 1758

Viverra howelli n. sp.

Fig. 1

1987 - *Viverra* n. sp. "A", Howell, Fig. 2a
1991 - *Viverra* n. sp., Rook et al., Pl. 1, figs. 2-3
2003 - Viverrinae sp. indet., Werdelin, fig. 7.13

Holotype. IGF 2890v (Fig. 1), right mandibular ramus bearing lower canine (isolated), roots of P_1, P_2, P_3 and P_4 (fourth premolar still preserving a small talonid portion), complete first lower molar (carnassial), and the alveolus of M_2.

Repository. Natural History Museum, The University of Florence, Italy. The specimen is kept in the collections of the "Geology and Paleontology Section" with inventory number "IGF 2890v".

Type locality. Caprarecce, 400 m SO of "Poggio Vannini", Baccinello-Cinigiano basin (Grosseto, southern Tuscany, Italy).

Chronological distribution. Messinian, late Turolian, MN 13 unit in the European mammal biochronology.

Diagnosis. Mandibular ramus fairly sturdy with lower profile slightly arched. Lower carnassial stoutly built. Trigonid makes up about two thirds of the tooth. Metaconid well developed, almost of the same height as the paraconid. The stout protoconid is large and produces an extremely pronounced swelling of the labial side. Talonid is squarish in shape, and with a wide occlusal basin ringed by three cusps, an hypoconid, a small hypoconulid, and a stouter entoconid.

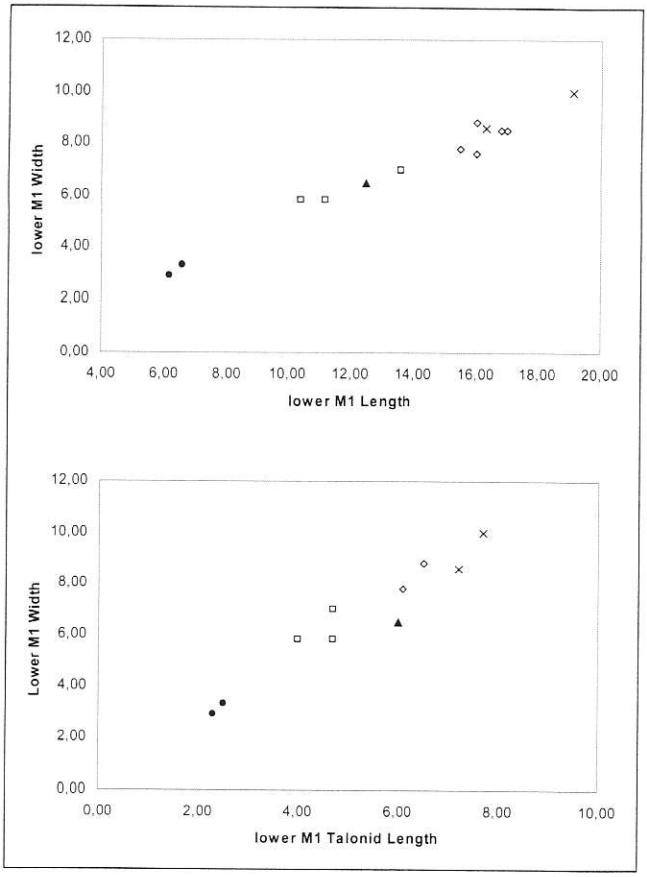

Fig 2 - Bivariate plot diagram of M_1 Length versus M_1 Width (above) and M_1 Talonid Length versus M_1 Width (below). Legend: *Viverra modica*, solid circles; *Viverra howelli* n. sp., open squares; *Viverra pepratxi*, solid triangle; *Viverra leakey*, open diamonds; *Megaviverra* spp., crosses.

Etymology. The species is named after prof. Clark F. Howell, for his contribution in the study of Mio-Pliocene carnivores and for his reference in authors' professional carrier.

Measurements. See Table 1.

Description and comparisons. *Viverra howelli* n. sp. is morphologically characterized by a quite robust lower canine, with a root and crown circular in section. The lower canine crown has well developed longitudinal furrows, both on the external and the internal sides. The premolars are represented only by their roots in the alveoli and small crown fragments (P_2, P_3 and P_4). The first lower premolar is very small in size and its alveolus is located just behind the posterior margin of the canine alveolus (with no diastema). A small diastema occurs between P_1 and the anterior alveolus of the double rooted second lower premolar. As far as can be seen, second and third lower premolars are narrow and slender. The small talonid fragment preserved seems to indicate that the fourth lower premolars was enlarged posteriorly, although the occurrence of accessory cusps cannot be determined. The first lower molar (the carnassial) has a paraconid intermediate in height between protoconid and metaconid. The M_1 talonid is relatively short, and characterized by the occurrence of accessory cusplets, either on the buccal or on the lingual side. The second lower molar is not preserved but its alveolus indicates the occurrence of an elongated tooth. The mandibular ramus is slender; the posterior margin of mandibular symphysis is observable on the lingual side of the ramus, reaching the level of P_2 alveoli. The masseteric fossa is also observable in its end, at the level of the second lower molar alveolus (Fig. 1).

Viverra howelli n. sp. is clearly distinguished from the genus *Megaviverra* by its smaller dimensions (Fig. 2) and by its stout trigonid morphology. In terms of size, *Viverra howelli* n. sp. falls between *Viverra modica* ssp. and *Viverra pepratxi* Deperet 1890 (Table 1; Fig. 2). The small viverrid from Sahabi (Libya; late Turolian), represented by a right M_1 and described as *Viverra* n. sp. "A" by Howell (1987), is fully comparable by size (Fig. 2) with *Viverra howelli* n. sp.. In addition, also the fragmentary mandible from the Lower Nawata Fmt. (Lothagam) recently described as Viverrinae sp. indet. (Werdelin 2003) is morphologically comparable with *Viverra howelli* n. sp.. The Lothagam viverrinae sp. indet. is just larger in carnassial length in respect to the Baccinello V3 type specimen and Sahabi M_1 but shows the same proportions in talonid reduction (Fig. 2) . As a matter of fact, in addition to the very similar size, it is noticeable to note that these three Messinian specimens have a relatively short M_1 talonid in respect to *V. pepratxi* and to the later (and larger) European *Megaviverra*. (Fig. 2). The Baccinello V3 specimen shows instead a shorter trigonid like the larger *Viverra leakey* Hendey 1974 from South Africa (Langebaanweg) and Ethiopia (Omo), as does Sahabi and Lothagam M_1s (Fig. 2).

For the similarity in size and proportions, "*Viverra* n. sp. A" from Sahabi P28A site (Howell, 1987) and the Viverrinae sp. indet. from Lothagam (Werdelin 2003) are here considered conspecific with *Viverra howelli* n. sp.

Discussion. As already pointed out, the fossil record of the genus *Viverra* is discontinuous in Europe, since its first occurrence in the early Miocene. *Viverra howelli* n. sp. represent a latest Miocene (Messinian) small sized viverrid with a geographic distribution from circum-mediterranean area and Eastern Africa, identified at Baccinello V3 (Italy), Sahabi (Libya) and Lothagam (Kenya).

During latest Miocene in Africa the genus *Viverra* was present, in addition to Sahabi and Lothagam, with a larger species (*Viverra leakey*) at Langebaanweg (Messinian or early Pliocene; South Africa; Hendey 1974, 1981). *Viverra leakey* has a longer chronological distribution, being documented until the early Pleistocene of the Omo valley, in the Tanganika area (Petter 1963; Howell 1987).

The first Asian representative of this subfamily appeared during the Astaracian (middle Miocene) in Mongolia (Tung Gur Fm.). Its extremely primitive characteristics result in its assignment to a separate genus, *Tunguractis* (Colbert, 1939). The Siwaliks Hills have produced

Species	Length	Width	Talonid Length	Locality
Viverra modica vetusta	6,20	2,90	2,30	Vieux Collonges
Viverra modica modica	6,60	3,30	2,50	La Grive
Viverra howelli	10,40	5,80	4,00	Baccinello V3 (Caprarecce)
Viverra howelli	11,20	5,80	4,70	Sahabi (P28A)
Viverra cf. howelli	13,60	7,0	4,70	Lothagam
Viverra pepratxi	12,50	6,50	6,00	Roussillon
Viverra leakey	15,50	7,80	~6,10	Langebaanweg
Viverra leakey	16,00	7,60		Langebaanweg
Viverra leakey	17,00	8,50		Langebaanweg
Viverra leakey	~18,00			Langebaanweg
Viverra leakey	16,00	8,80	6,50	Omo valley
Viverra leakey	16,80	8,50		Omo valley
Megaviverra carpatorum	19,10	10,00	7,70	Ivanovce-1
Megaviverra apenninica	16,30	8,60	7,20	Triversa

Tab. 1 - Measurements (in mm) of M_1 in some Viverrinae species. Data from de Beaumont (1973), Howell (1987), Kretzoi & Fejfar (1982), Werdelin (2003).

two small-sized viverrids, one (*Viverra chinjiensis*) from the Chinji Fmt. (middle Miocene), and other (*Vishnuictis salmontanus*) in the Dhok Patan Fmt. (late Miocene to early Pliocene). Two large-sized forms (*Viverra bakeri* and *Vishnuictis durandi*) were also recognized in this region, where they were found in the Pinjor Fmt. (late Pliocene) (Pilgrim, 1932). The genus *Vishnuictis* was defined by Pilgrim (1932) on the basis of the extreme height and narrowness of the skull, characteristics he feels entirely preclude its assignment to any existing viverrid. Pilgrim (1932) also described a fragmentary right mandibular branch bearing P_4-M_1 (labelled GSI D135) as "Lutrinae gen et sp. nov. *hasnoti*". The specimen was collected from deposits correlated with the Dhok Patan Fm. According to Pilbeam et al. (1979) and Howell (1987) this fossil is better attributable to a viverrid and probably represents a new large-sized genus.

Viverra pei was erected on the basis of material from "Cap" Travertine at Zoukoudian by Qiu (1980), and seems to be a form close to the genus *Megaviverra*.

Conclusive remarks

The newly described viverrine species *Viverra howelli* had a latest Miocene distribution from circum-Mediterranean area (Baccinello V3 in Italy and Sahabi in Libya) and Eastern Africa (Lothagam in Kenya). *Viverra howelli* n. sp. has general size close to *Viverra pepratxi* (Early Pliocene of Europe). General proportions and morphology of lower carnassial however suggest an higher affinity degree with larger sized Late Miocene and Pleistocene species from Africa (*Viverra leakey* from Langeebanweg and Omo Valley) than Europe (*Viverra pepratxi* and *Megaviverra*).

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