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COMMENT ON A FOSSIL CIVET SKULL FROM THE LOWER OLIGOCENE OF THE WEISSELSTER BASIN (SAXONIA, GERMANY)

[Sobre un cráneo de civeta del Oligoceno inferior de la cuenca de Weisselster (Sajonia, Alemania)]

Hans-Volker KARL (*)
Elke GRÖNING (**)
Carsten BRAUCKMANN (**)

(*): Geoscience Centre of the University of Göttingen. Department Geobiology. Goldschmidtstrasse 3. D-37077 Göttingen. Correo-e: hkarl@uni-goettingen.de or hvkarl@web.de
(**): Institute of Geology and Palaeontology. Clausthal University of Technology. Leibnizstrasse 10. D-38678 Clausthal-Zellerfeld. Correo-e: Elke.Groening@tu-clausthal.de, Carsten.Brauckmann@tu-clausthal.de

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RESUMEN: Se redescribe un cráneo fósil casi completo de una civeta de los sedimentos marinos de edad Oligoceno inferior en la cuenca de Weisselster (Sajonia, Alemania) y se compara con especies afines de la misma edad.

Palabras clave: Feliformia, Stenoplesictidae, *Stenoplesictis* Filhol, 1880, *Palaeoprionodon* Filhol, 1880, Oligoceno inferior, Rupeliense, cuenca de Weisselster, Sajonia, Alemania.

ABSTRACT: A nearly complete fossil skull of a civet from the marine deposits of Early Oligocene age in the Weisselster Basin (Saxonia, Germany) is redescribed and compared with related species of the same age.

Key words: Feliformia, Stenoplesictidae, *Stenoplesictis* Filhol, 1880, *Palaeoprionodon* Filhol, 1880, Early Oligocene, Rupelian, Weisselster Basin, Saxonia, Germany.

INTRODUCTION

According to Colbert & Morales (1991), the most primitive of modern Carnivora are some civets of the Old World, mainly those slightly modified descendants of the progressive miacids. They may be regarded as rather important Carnivora which lasted from the Late Eocene until today.

The genus *Genetta* (genet), now inhabiting the Mediterranean region, is very close to the central stem group from which all other civets have evolved. It is a small carnivore which lives in forests, with a long body and a very long tail. The limbs are rather short and the feet are provided with claws which can be withdrawn to some extent, similar to the retractile claws of a cat. The skull is elongated and rather flat and narrow, the carnassial teeth are sharp, forming efficient shearing blades, and the molars retain the primitive tribosphenic pattern. The modem genet has a spotted fur which most probably represents a primitive colour pattern that has been retained up to now. It has specialized scent-glands for marking the territory and for defence, a characteristic adaptation in the modern civets (Viverridae).

One branch includes the various African and Oriental palm civets and binturong or bearcat of Asia. The latter is one of the largest civets. An extreme offshoot from this stem group is *Eupleres goudoti*, the falanouc (or small-toothed mongoose) of Madagascar, in which the teeth are reduced to relatively simple pivot teeth, caused by its insectivorous nutrition (in particular ants).

Another evolutionary branch is represented by *Cryptoprocta ferox*, the fossa of Madagascar, with a distinct cat-like appearance. The systematic position of this species (whether a cat-like civet or a civet-like cat) has therefore been disputed for a long time. Very probably the fossa arose from a primitive civet, close to the origin of the Felidae; this might be the reason for the combination of cat-like and civet-like characters.

Finally, a large branch of the civets are the Herpestinae (mongooses), small active Carnivora which are known as predators on snakes and various small mammals.

The most ancient civets occur in sediments of Late Eocene and Early Oligocene age. They are represented by such genera as for example *Stenoplesictis* and *Palaeoprionodon*. Less is known about the Neogene fossil record of the Viverridae and Stenoplesictinae. This is probably caused by their preferred habit in tropical forests with less appropriate conditions for fossilisation. The few genera known from Miocene and Pliocene sediments in Eurasia indicate that the Viverridae and Stenoplesictidae continued as very primitive carnivores during the Neogene. See the distributional map in figure 1.

Thus the fossil record from *Palaeoprionodon* via Late Paleogene to Neogene genera as for example the Mongolian *Tungurictis* to the Recent viverrids indicates only minor changes within the evolutionary progress.

During the Miocene one evolutionary branch split off from the stem group which is characterized by the tendency to increase in size and to develop a heavy skull and very robust teeth: the Hyaenidae (hyenas). Together with the Ursidae, the Hyaenidae are the youngest family among the Carnivora. Thus they are very large and heavy descendants of the civets in which the legs were elongated for running and in which the teeth and jaws were usually enlarged for cracking bones. In particular, the proximal two cone-shaped premolars are distinctly enlarged; they are used for breaking the bones of large carcasses, the main food of the hyenas. This led also to extremely strong jaws and jaw muscles. The carnassials are highly specialized as shearing blades in the hyenas, and the molars behind the carnassials are reduced to mere remnants (Colbert & Morales, 1991).

The first terrestrial Mammalia from the marine Early Oligocene of the Weisselster Basin were mentioned by Fischer (1982). Later, the same author (1983) described the skull of a "viverrid carnivore" as *Stenoplesictis cayluxi* Filhol, 1880. According to Lange-Bagré & Böhme (2005), the mammalian fauna of this fossil site is various and includes: *Apterodon intermedius*,

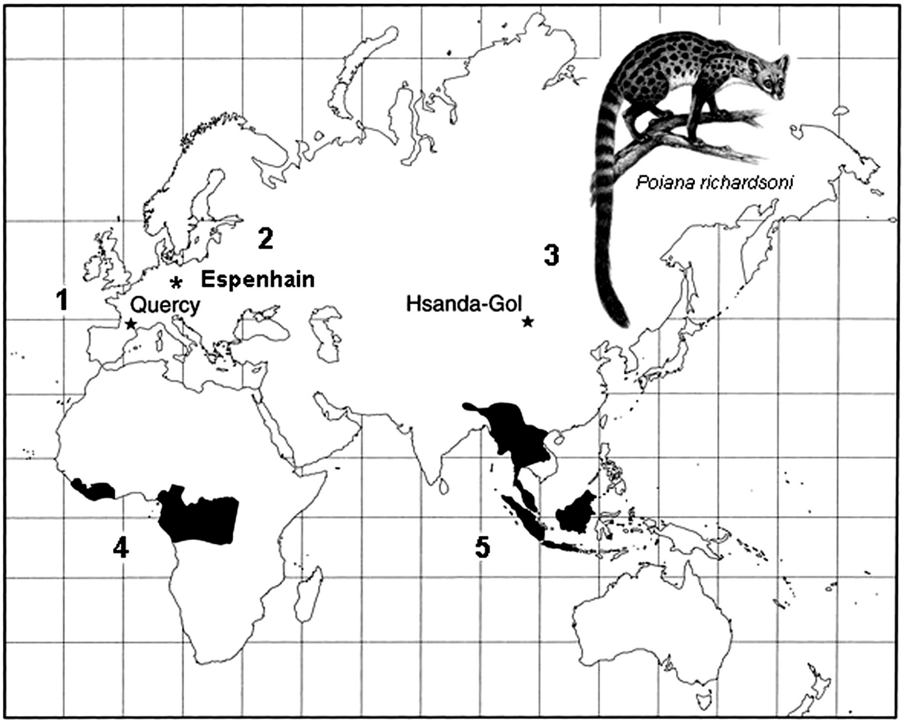

Figure 1. Geographic distribution of the living Asian linsangs (Prionodon pardicolor, P. linsang) *and the African linsang* (Poiana richardsoni), *and the Eurasian localities which yielded fossil remains of the Oligocene aeluroid* Palaeoprionodon. *1* = Palaeoprionodon lamandini, *Quercy fissures, France; 2 = (Aeluroidea / Stenoplesictidae: Gen. et spec. indet.), Espenhain, Germany; 3 = Hsanda Gol, Mongolia* (?Palaeoprionodon)*; 4* = Poiana richardsoni leightoni *(western area),* P. r. richardsoni *(eastern area); 5* = Prionodon pardicolor *(northern area),* Prionodon linsang *(southern area); modified from Hunt (2001).*

Entelodon deguilhermi, *Anthracotherium ex gr. illirycum/magnum/valdense*, *Ronzotherium filholi*, *Eggysodon* cf. *osborni*, *Protapirus bavaricus* and *Stenoplesictis cayluxi*. The whole faunal assemblage fits well with the Paleogene reference mammal level MP22 (Early Oligocene). The presence of the Rupelian horizon MP22 within the Böhlen Formation is in particular confirmed by *Entelodon deguilhemi* from the abandoned mine Espenhain near Leipzig where the single hitherto known specimen of a viverrid (described by Fischer, 1983 as *Stenoplesictis cayluxi*) from the Weisselster Basin was found, too. This rather completely preserved skull is redescribed here.

Abbreviations: MMA- Museum Mauritianum Altenburg, MNHN- Muséum national d'Histoire naturelle France.

MATERIAL

"Espenhain skull", Museum Mauritianum Altenburg (MMA), ex. coll. Arnold Müller, N.º P 2004. Material for comparison: *Palaeoprionodon lamandini* (Teilhard de Chardin, 1915), Oligocene, Quercy fissures, France (MNHN Qu 9370) figured by Hunt (2001).

SYSTEMATIC PALEONTOLOGY

Class Mammalia

Order Carnivora

Division Aeluroidea Flower, 1869

Infraorder Feliformia Kretzoi, 1945

Superfamily Feloidea Fischer von Waldheim, 1817 [fide Benton (1993)]

NOMENCLATURAL NOTE

The authorship of the superfamily Feloidea is often indicated incorrectly. According to the "International Code of Zoological Nomenclature", Article 36.1, "A name established for a taxon at any rank in the family group is deemed to be simultaneously (latent) established with the same author and date for taxa based upon the same name-bearing type (type genus) at other ranks in the family group, with appropriate mandatory change of suffix". These "other ranks in the family group" are, as defined by Article 35.1 as: "superfamily, family, subfamily, tribe, subtribe and any other rank below superfamily and above genus that may be desired". This clearly means that –if the family name Felidae was established by Fischer von Waldheim, 1817 as often cited– the author of the Superfamily must be Fischer von Waldheim, 1817, too, even though it was first used by Hay (1930) as cited by Peigne & de Bonis (1999).

Stenoplesictidae sensu Morales *et al.*, 2000 [syn. Viverridae Gray, 1821 (fide Benton 1993, in part.)]

Subfamily Stenoplesictinae Schlosser, 1923

Stenoplesictis Filhol, 1880

DESCRIBED SPECIES PREVIOUSLY ASSIGNED TO *STENOPLESICTIS* AND THEIR DISTRIBUTION

* *Stenoplesictis cayluxi* Filhol, 1880 (type species) [syn. *Stenoplesictis minor* Filhol, 1882] (Oligocene; Quercy, France);

* *Stenoplesictis crocheti* Peigne & de Bonis, 1999 (Oligocene; Quercy, France);

* *Stenoplesictis elegans* Matthew & Granger, 1924 (Early Oligocene / Ergilin Dzo Formation / Ergilin Member; Ergil Obo, eastern Gobi Desert) [removed from *Stenoplesictis* by Peigne & de Bonis, 1999];

* *Stenoplesictis indigenus* Dashzeveg 1996 (late Eocene, Alag Tsab, eastern Gobi Desert) [removed from *Stenoplesictis* by Peigne & de Bonis, 1999];

* *Stenoplesictis muhoronii* Schmidt-Kittler, 1987 (Early Miocene; East Africa) [removed from *Stenoplesictis* by Peigne & de Bonis, 1999];

* *Stenoplesictis simplex* Dashzeveg 1996 (Early Oligocene / Ergilin Dzo Formation / Ergilin Member; Ergil Dzo, Ergil Obo, eastern Gobi Desert) [removed from *Stenoplesictis* by Peigne & de Bonis, 1999].

Stenoplesictis simplex is slightly larger than *Stenoplesictis cayluxi* and considerably larger (about 45-50%) than the junior synonym of it *Stenoplesictis "minor"*. Furthermore, *St. simplex* differs from the western European species by its more developed metaconids on M^1 and by a more elongated M^2. From the other Mongolian species, *St. elegans* and *St. indigenus*, it differs by its distinctly larger size (about 40% longer) and in its more massive talonid on M^1.

On the other hand, *St. indigenus* differs from the European *St. cayluxi* (syn. *St. "minor"*) by a more obtuse angle between the protoconid and paraconid on m1; from the Asian species *St. elegans* it differs by its slightly smaller size and by a larger talonoid on m1 (Dashzeveg, 1996).

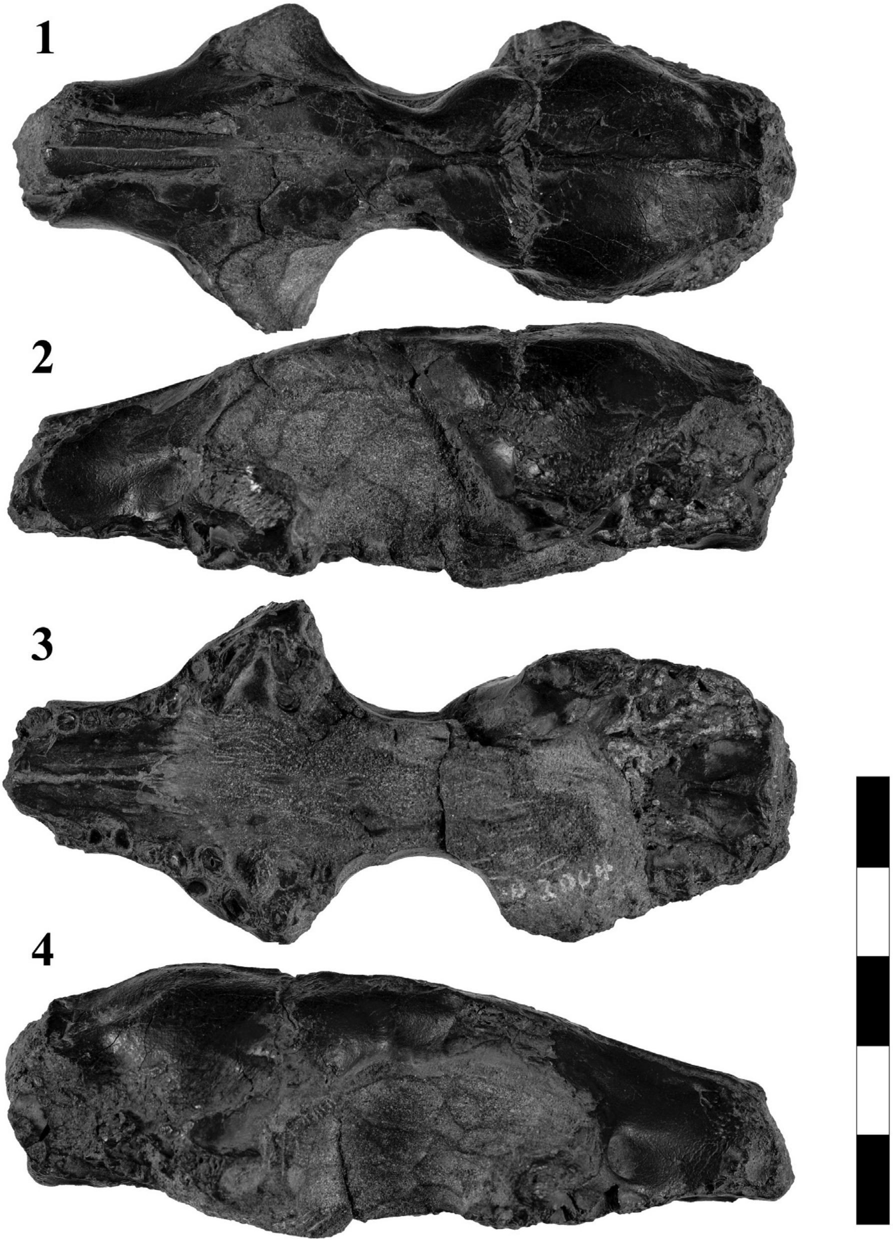

Plate 1. Aeluroidea / Stenoplesictidae: Gen. et spec. indet., MMA ex. coll. Arnold Müller, N.º P 2004; fig. 1 = dorsal view, fig. 2 = left lateral view, fig. 3 = palatal view, fig. 4 = right lateral view. Scale bar = 5 cm.

Subfamily Prionodontinae Pocock, 1933

Palaeoprionodon Filhol, 1880

DESCRIBED SPECIES PREVIOUSLY ASSIGNED TO *PALAEOPRIONODON* AND THEIR DISTRIBUTION

- * *Palaeoprionodon mutabilis* Filhol, 1880 Oligocene, 32 m.a., Caylus, Tarn-et-Garonne, France;
- * *Palaeoprionodon lamandini* (Teilhard de Chardin, 1915) from the Oligocene of the Quercy fissures, France and
- * *Palaeoprionodon* sp. from the Oligocene of Hsanda Gol, Mongolia.

Aeluroidea / Stenoplesictidae: Gen. et spec. indet.

MATERIAL FROM THE WEISSELSTER BASIN

Nearly complete skull, deposited in the Museum Mauritianum Altenburg (MMA), ex. coll. Arnold Müller, N.º P 2004 (Fischer 1982, 1983; Müller 1983).

Plate 2. Aeluroidea / Stenoplesictidae: Gen. et spec. indet., MMA ex. coll. Arnold Müller, N.º P 2004; fig. 1 = frontodorsal view, fig. 2 = frontal view, fig. 3 = occipital view. Scale bar = 5 cm.

LOCALITY AND HORIZON

Geographical, geological, biostratigraphical and palaeoecological details were already carefully published by Müller (1983), Frees (1991) and Böhme (2001). The nearly complete skull treated here almost surely originates from the "Horizon of phosphorite nodules" ("Phosphoritknollen-Horizont") which lies immediately at the base of the Early Oligocene "Upper Boehlen Formation" ("Rupel Clay"). This results from fragments of bedrock collected during former brown-coal mining. The age of this Rupelian horizon is approximately 30,3 Ma.

DESCRIPTION

In spite of a preserved condylobasal length of 90,7 mm (intermaxillaria broken off) the sutures of the skull are not completely fused by synosteosis. The median posterior border of the maxillaria extends to the midth of P_2. The posterior border of the nasalia lies above the anterior border of the orbita (as in *Palaeoprionodon lamandini*, MNHN Qu 9370), but in the Espenhain skull they are distinctly slender and equally acute-angled. For additionally described characters see Fischer (1983). Large parts are lacking (rostral region, ear and jugal region) or covered by non-removable sediment layers (intern regions of orbita and palatinum) and therefore not visible. Furthermore, the total condition of preservation does not allow to take exact measurements as tried by Fischer (1983). The whole morphology resembles very much the skulls of *Palaeoprionodon lamandini* (MNHN Qu 9370) as figured by Hunt (2001) as well as of *P. mutabilis.* This applies also to the relatively small dimension of P_2 in comparison with P_3 which was already pointed out as remarkable by Hunt (2001). Additional characteristic similarities with specimen MNHN Qu 9370 are: (1) the completely lacking of M_3, and (2) the position of the remains of the teeth and alveolae of P and M. The only differences are the stronger doming of the anterior calvarium, the probably more rostral position of the choanes, and the moderate vaulting of the basioccipitale towards the foramen magnum.

DISCUSSION

General researches concerning the Feloidea were published by Carroll (1988), Colbert & Morales (1991), McKenna & Bell (1997) and Nowak (1991a, b). Dashzeveg (1996), Gaubert *et al.* (2002), Morales *et al.* (2000), Peigne (1996), Peigne & de Bonis (1999), Schmidt-Kittler (1987) and Wolsan & Morlo (1997) particularly discussed fossil materials compared with *Stenoplesictis*. Recent species were studied in detail by Gregory & Hellman (1939) and Hunt (1998, 2001).

Stenoplesictis is a genus of early civets (Stenoplesictidae) which lived during the Oligocene epoch (approximately 34-23 million years ago). The discovery of new remains assigned to *Stenoplesictis* from the famous phosphorites of the Quercy region (southern France) by PEIGNE & DE BONIS (1999) led to a more detailed study of this genus. The authors synonymized the type species *Stenoplesictis cayluxi* Filhol, 1880 and *Stenoplesictis minor* Filhol, 1882 and established a new species: *Stenoplesictis crocheti* Peigne & de Bonis, 1999 which is documented by remains of mandibles, maxillae, two well preserved skulls and isolated teeth. The basicranial anatomy was studied with special focus on the auditory region.

PEIGNE & DE BONIS (1999) considered *Stenoplesictis* as a plesiomorph member of the Feloidea, "near but slightly more derived than the extant palm civet *Nandinia binotata*". The African and Asian genera differ from the European ones in particular by the morphology of the teeth, and were therefore excluded from *Stenoplesictis*. PEIGNE & DE BONIS (1999) also pointed out that it cannot be concluded that *Stenoplesictis* originated in Asia or that it was even present in Asia.

The preservation of the here re-described Espenhain skull remain does not permit an exact determination on species level. Even the generic grouping can only be treated provisionally. The exact specific determination as supposed by FISCHER (1983; based upon a few linear measurements) cannot be confirmed, since the specimen in question was evidently of non-adult age as indicated by the not completely fused sutures. In particular its relatively larger dimensions in comparison with other known species of *Stenoplesictis* and *Palaeoprionodon* make it difficult to evaluate their interrelationships.

Since both of the comparable genera –*Stenoplesictis* and *Palaeoprionodon*– belong to different subfamilies, the Espenhain skull can only be determined on family level and under open nomenclature.

The relationships between the Espenhain skull and the Proviverridae of the geographically more nearby-situated Geiseltal (Middle Eocene) cannot be clarified due to the poor preservation of its teeth. VAN VALEN (1965) mentioned three species for the Geiseltal: *Proviverra gracilis* (Matthes, 1952), *Prodissopsalis eocaenicus* Matthes, 1952 and *Miacis? macintyri* Van Valen, 1965.

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