



## A new heterosoricid shrew from the lowermost Oligocene of Europe

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The earliest Oligocene faunas of Europe are characterised by a large number of Asian immigrants. One of the classical sites that shows the faunal change after this so-called “Grande Coupure” is Hoogbutsel in Belgium (MP 21). Recently a new locality from the lowermost Oligocene was discovered in Belgium, Boutersem TGV. Here, we describe a new heterosoricid (Mammalia, Soricomorpha), *Belgicasorex ramboeri* gen. et sp. nov., from these lowermost Oligocene localities. We assume that, like the erinaceid *Tetracus nanus* Aymard, 1846 and the nyctitheriid *Oligonyctia hoffmani* Smith, 2004, *Belgicasorex ramboeri* was one of the Asian immigrants that entered Europe after the “Grande Coupure”.

### Introduction

During the HST railway construction in 1999 a temporary exposure of the lowermost Oligocene yielded a new locality called Boutersem TGV. The vertebrate beds occur at the base of a fluvio-lacustrine complex, known as the Boutersem Member, which belongs to the Borgloon Formation (Tongeren Group, previously known and mapped as upper “continental” Tongrian Tg2). The faunas of these levels are correlated with the reference-level MP 21 of the mammalian biochronological scale for the European Paleogene (Aguilar et al. 1997) defined on the fauna of Soumailles (Quercy, France). Amongst the insectivores discovered at the new locality, one M1 was identified as an unknown genus of Heterosoricinae Viret and Zapfe, 1951 (Smith 2004). The study of Geert Ramboer’s collection from the famous Belgian locality of Hoogbutsel (Glibert and de Heinzelin de Braucourt 1952) of the same age as Boutersem TGV, and collected in 1977, yielded nice additional material of the same genus showing the upper dentition (P4–M3). This material is here described as a new genus and species.

The taxonomic status of the heterosoricids has been a cause of debate. Originally, they were grouped as a subfamily of the Soricidae by Viret and Zapfe (1951). Reumer (1987) raised them to family level, assuming a separate origin of the Heterosoricidae and the Soricidae from a nyctitheriid stock. Since then, the group has been considered either a family (e.g., Ziegler 1989; Van den Hoek Ostende 1995; Reumer 1998), or was retained as a subfamily (e.g., McKenna and Bell 1997; Ziegler 1998; Storch and Qiu 2004).

### Materials and methods

The fossils figured in this paper are housed at the Royal Belgian Institute of Natural Sciences (IRSNB). The other specimens recorded from Hoogbutsel and Boutersem TGV are in the collections of G. Ramboer (GR) and R. Smith (RS). The terminology used for dental crests and cusps is based on that defined by Van Valen (1966).

### Systematic palaeontology

Order Soricomorpha Gregory, 1910

Family Heterosoricidae Viret and Zapfe, 1951

Genus *Belgicasorex* nov.

Figs. 2, 3.

*Type species: Belgicasorex ramboeri* sp. nov.

*Derivation of the name:* Sorex = shrew, Belgica = from Belgium.

*Diagnosis.*—The same as for the species.

### *Belgicasorex ramboeri* sp. nov.

*Holotype:* IRSNB-M-1903, fragmentary right maxilla with P4, M1, M2.

*Paratype:* IRSNB-M-1904, right M3.

*Derivation of the name:* After Geert Ramboer, who found the holotype and some other specimens from Hoogbutsel.

*Type locality and horizon:* Hoogbutsel near Boutersem, Flemish Brabant, Belgium (Glibert and de Heinzelin 1952; Smith 2003), lowermost Oligocene, Boutersem Member, Borgloon Formation, Early Rupelian, reference level MP 21 (see Aguilar et al. 1997).

*Other locality:* Boutersem TGV (see Smith 2003, 2004).

*Differential diagnosis.*—*Belgicasorex ramboeri* gen. nov. sp. nov. differs from all the members of the Heterosoricidae by having a M2 with quadrangular outline, anterior and posterior sides of equal length. *Belgicasorex* differs from *Wilsonosorex* Martin, 1978 and *Lusorex* Storch and Qiu, 2004 by the absence of distinct paraconules and metaconules on M1–M2. It differs from *Dominina* Cope, 1873 in not having an individualised hypocone and by a much wider posterior basin on the M1 and M2. *Belgicasorex* differs from *Heterosorex* Gaillard, 1915 by having a quadrangular outline of P4 rather than triangular, a wider than long M3 with a postprotocrista ending in the trigon basin, and better developed lingual cusps on M1 and M2. The latter character also sets *Belgicasorex* apart from *Quercysorex* Engesser, 1975.

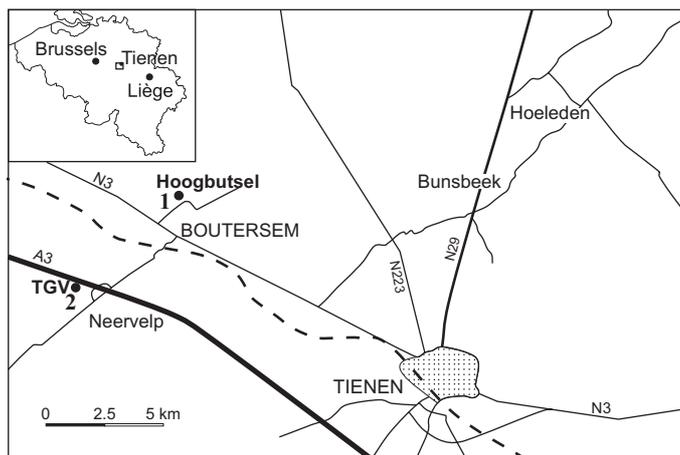


Fig. 1. Location of the localities of Hoogbutsel (1) and Boutersem TGV (2).

*Belgicasorex* differs principally from *Dinosorex* Engesser, 1972 by the absence of reduction in size from M1 to M3 resulting from a square outline of the M2.

## Description

The infraorbital canal is well preserved on the maxilla fragment. The canal is short in length but large in cross section. The infraorbital foramen is oval. It lies above the middle of P4 to the middle of M1. The lacrimal foramen is a small circular foramen above the anterior root of M2. Behind the lacrimal foramen a fragment of the jugal is present.

P4 is sub-trapezoidal in occlusal view. The labial side, much longer than the lingual one, is rectilinear except at the base of the paracone which curves convexly. The lingual side is slightly curved convexly. The posterior side is much wider than the anterior one. A well-developed cingulum runs around the tooth. The paracone is high. There is no metacone. The postparacrista is long (about half of the labial side) and curves obliquely from the top of the paracone to the metastyle. The latter is indistinctly separable from the postparacrista. The preparacrista is short and connects the distinct parastyle to the paracone. The parastyle is not really in the anterolabial corner of the teeth but somewhat distant from the labial side. The protocone is low and small. A very small hypocone is situated postero-lingual from the protocone. The posterior basin is pyriform in occlusal view, wide in the lingual part and deep.

M1 has the largest occlusal surface of all the cheek teeth. It is sub-quadrate in occlusal view. The anterior side is slightly curved. The paracone and metacone are high and antero-posteriorly compressed. The sharp ridges of the paracrista, the centrocrista and the metacrista form a wide W-shape. The paracrista is shorter than the metacrista. The paracone is more labially situated than the metacone. The mesostyle is undivided from the centrocrista. The preprotocrista is connected to the base of the paracone and the postprotocrista is connected to the base of the metacone. The lingual cusps are well defined. The hypocone is weaker and somewhat more lingually situated than the proto-

cone. The prehypocrista is connected to the end of the post-protocrista at the base of the metacone, dividing the anterior and posterior basins of the teeth. A posterior ridge runs from the hypocone along a wide and deep basin to the metastyle. The ridge is first convex then somewhat concave. There are neither a paraconule nor a metaconule.

M2 is a little shorter than M1. The outline is more quadrangular. The posterior width is equal to the anterior width. The W-shape is symmetrical because the paracrista is subequal to the metacrista. The paracone and the metacone are equidistant from the labial side. The preprotocrista is shorter than in M1.

M3 is much smaller than M1 and M2. The labial side is strongly oblique. The paracone is well developed. The metacone is reduced. The W pattern is incomplete due to the absence of a postmetacrista. The protocone is small and placed close to the anterior side. The preprotocrista is short and ends at the base of the paracone, separated from it by a notch. The postprotocrista is not clearly defined and ends in the trigon basin. This basin is lingually wide open. The lingual side is semi-circular. There is no hypocone.

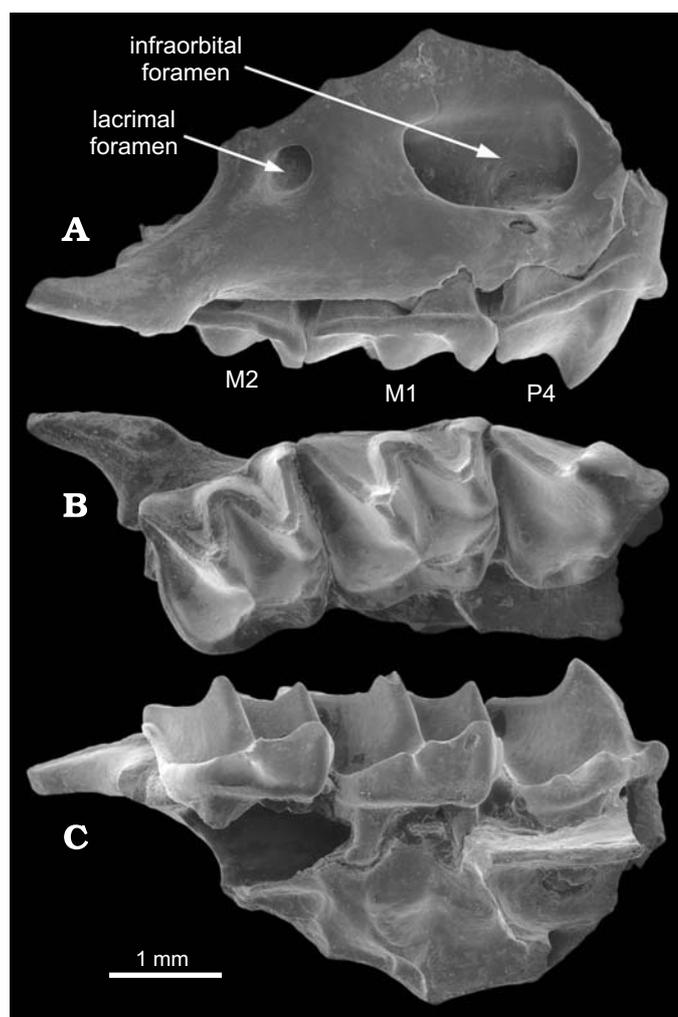


Fig. 2. *Belgicasorex ramboeri*, Lower Oligocene, Hoogbutsel, Belgium, IRSNB-M-1903 (holotype). Right maxillary with P4–M2, in labial (A), occlusal (B), and lingual (C) views.

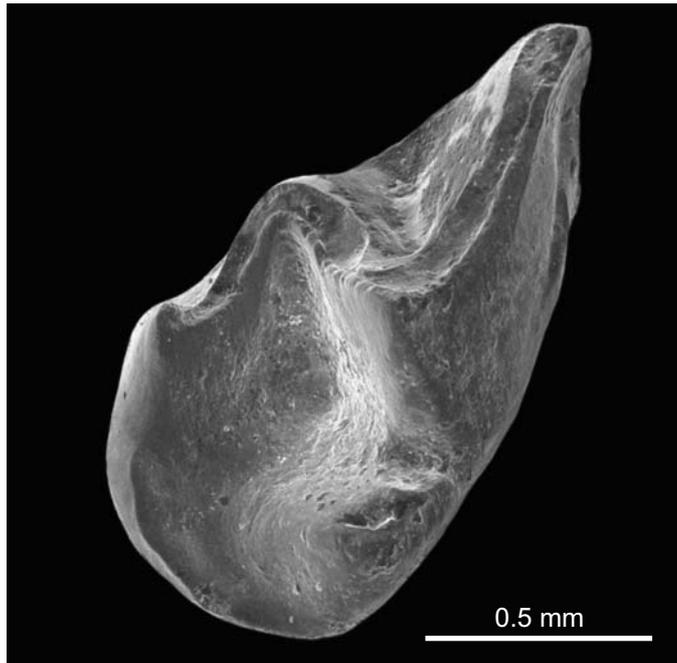


Fig. 3. *Belgicasorex ramboeri*, Lower Oligocene, Hoogbutsel, Belgium, IRSNB-M-1904, right M3 in occlusal view.

## Discussion

The presence of *Belgicasorex ramboeri* in the Belgian localities Hoogbutsel and Boutersem TGV attests that the family Heterosoricidae was already present in Europe at the earliest Oligocene (MP 21). At that time, endemic insectivores were in competition with new immigrants (Smith 2004). In all probability, *Belgicasorex ramboeri* must be considered with the erinaceid *Tetracus nanus* and the nyctitheriid *Oligonyctia hoffmani* as new immigrants to Europe.

The oldest representatives of the Heterosoricidae are known from North America, where the genus *Domnina* Cope, 1873 has been found in the late Eocene of Wyoming (Krishtalka and Setogushi 1977). In Asia, the oldest published find was *Gobisorex kingae* Sulimski, 1970 from the late Early Oligocene of the Hsanda Gol Formation in the Gobi Basin (Reumer 1998). Unfortunately, it is known from the lower dentition only, so that no comparison with *Belgicasorex* can be made. In the meantime,

Table 1. Measurements in mm. of the upper teeth of *Belgicasorex ramboeri*. HO = Hoogbutsel, BOU = Boutersem TGV.

Tooth	Number	Length	Width
P4	HO-21-GR	1.75	1.50
	IRSNB-M-1903	1.75	1.55
M1	IRSNB-M-1903	1.85	1.80
	BOU-696-RS	1.85	1.80
M2	IRSNB-M-1903	1.70	1.80
	HO-338-RS	1.75	1.75
M3	IRSNB-M-1904	1.10	1.50

*Gobisorex* has also been found in lowermost Oligocene strata from the Hsanda Gol Formation (Gerhard Storch, personal communication 2005). *Belgicasorex* in Europe and the early presence of *Gobisorex* in Asia show that by the Early Oligocene the Heterosoricidae had already undergone a diversification and had a wide geographic range. In contrast, the oldest known Soricidae comes from the Lower Oligocene Ergilin-Dzo Svita (Mongolia) (Yanovskaya et al. 1977). Therefore, the stratigraphic distribution, in combination with the anatomical differences underlined by Reumer (1987), seems to indicate that the Heterosoricidae evolved independently from the Soricidae, although both could be derived from the Nyctitheriidae.

The description of a new Oligocene heterosoricid genus in Europe also provides fresh insights into the early history of the family. The previously European Oligocene finds of Heterosoricidae were placed either in *Quercysorex* or in *Dinosorex*. Van den Hoek Ostende (1995) noted the peculiar stratigraphic distribution of *Dinosorex*, which was present in the Oligocene of Europe, but absent during most of the Early Miocene of that continent. During that period it was found in Anatolia. This picture has changed somewhat, as Ziegler (1998) transferred the only species of *Dinosorex* described from the Oligocene, *D. huerzeleri*, to *Quercysorex*. Still, this left two records of *Dinosorex* in the European Oligocene, *Dinosorex* sp. from Cournon-Les Soum eroux (MP 28) (Brunet et al. 1981), and *Dinosorex* sp. from Boudry-Trois-Rods (Mojon et al. 1985). The M2 found at Cournon-Les Soum eroux (Brunet et al. 1981, fig. 11) is only marginally narrower at the posterior side than at the anterior side. In this respect it resembles *Belgicasorex* more than *Dinosorex*. Since we have not seen the original material, we tentatively assign the assemblage from the French locality to *Belgicasorex*, and consider it best classified as cf. *Belgicasorex* sp. Comparison with *Dinosorex* sp. from Boudry-Trois-Rods (Switzerland, Oligocene) is not possible, since the species is represented by a fragmentary mandible only. However, this fragment shows no diagnostic features that allow identification even at the genus level.

Because there is no evidence for the presence of *Dinosorex* in Europe during the Oligocene, the pattern in the distribution of *Dinosorex* observed by Van den Hoek Ostende (1995) may well be artificial. It would be more logic to assume the genus migrated into Europe from Asia at the end of the Early Miocene, *Dinosorex anatolicus* from the Lower Miocene of Turkey being its oldest representative. This scenario is corroborated by the morphology of the P4. Although both *Belgicasorex* and the younger species of *Dinosorex* possess a trapezoid to square P4, this element has a triangular outline in the most primitive *Dinosorex*, *D. anatolicus*. Thus, the square outline of the P4 developed separately in *Belgicasorex* and *Dinosorex*. Assuming this picture is correct, it is noteworthy that both in the Oligocene and Miocene the heterosoricids are represented by a genus with well developed lingual cusps (*Belgicasorex* and *Dinosorex*, respectively) and one in which these cusps are much less developed (*Quercysorex* and *Heterosorex*). Presumably, this represents some trophic adaptation, related to different niches.

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