Tenrecoid mandible from Elisabethfeld (Early Miocene) Namibia

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Abstract: In 2011, a relatively complete mandibular ramus of a tenrecid was found at Elisabethfeld, Sperrgebiet, Namibia. The specimen retains the three molars, four antemolar teeth and the broken alveoli for the two posterior incisors. The anteriormost preserved tooth is bicuspid but has a single root and is interpreted to be a canine. A new genus and species is erected for this tenrecid to accomodate the jaw.

Key Words: Neogene; Namibia; Tenrecidae; Mammalia; Mandible; Dentition.

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Introduction

Tenrecoids are rare in the fossil record and most of the available specimens are fragmentary mandibles and maxillae (Asher 1999, 2003, 2010; Butler & Hopwood 1957; Butler 1969, 1984; Mein & Pickford 2003, 2008a). In 2011, the Namibia Palaeontology Expedition found an almost complete mandible of a tenrecoid at Elisabethfeld, Namibia, which contains three molars and four antemolar teeth, and as such is the most complete mandible known of a Miocene tenrecoid. A new genus and species is erected on the basis of the mandible, and other material from the same site is ascribed to it.

Geological context

Figure 1. Early Miocene red and green silts at Elisabethfeld, Sperrgebiet, Namibia. GSN EF 30’11 was collected from the red silts underlying the green beds.

The geology of Elisabethfeld has been published on several occasions (Corbett 1989, Pickford & Senut 1999). The sediments infill a palaeovalley incised during the Oligocene low sea stand, which backfilled during the Burdigalian marine transgression. The Elisabethfeld deposits are freshwater silts of red and green colours, with intercalations of conglomerate. All the fossils found are of terrestrial affinities, being dominated by land tortoises, but with a high diversity of other vertebrates including ostriches (Mourer-Chauviré 1996a, 1996b), rodents (Mein & Pickford 2008b), insectivorans (Mein & Pickford 2008a) creodonts and carnivores (Morales *et al*. 2008a) ruminants (Morales *et al*. 2008b) and others. The tenrecid fossil described herein was collected from the red limey silts (Fig. 1) near an abandoned and rusted water point in the bottom of the deflation basin.

The red and green silts are unconformably overlain by Plio-Pleistocene aeolian Fiskus Sandstone which has been pervasively calcified by onyx travertine which forms an extensive plateau to the north of the deflation basin.

Age of Elisabethfeld

The red and green silts at Elisabethfeld are of Early Miocene age (Stromer 1926; Mein & Pickford 2003, 2008a, 2008b). The deposits have yielded many species of rodents such as *Diamantomys luederitzi*, *Apodecter stromeri*, *Bathyergoides neotertiarius* and *Parapedetes namaquensis* among others, the macroscelidid *Miohyrax oswaldi* and a diversity of other mammals listed in Pickford (2008) which as an assemblage indicate an Early Miocene age, probably ca 21 Ma (Mein & Pickford 2008b).

Material and Methods

The descriptions and interpretations of the teeth of tenrecs follow the work of MacPhee (1987) who showed that there has often been confusion between deciduous and permanent teeth. Measurements of the teeth were by taken by P. Mein using a stereo microscope fitted with dial calipers. Images were obtained using a Sony digital camera and a scanner (J. Morales).

Systematic Palaeontology

Order Soricomorpha Gregory 1910

Family Tenrecidae Gray 1821

Genus *Promicrogale* nov.

Genus diagnosis: Tenrecoid with shallow mandible, long retromolar space, inferred lower permanent dental formula 3/1/3/3, mental foramina in lower third of jaw beneath p/3 and m/1, symphysis unfused, extending as far as the rear of p/3, talonids of molars relatively short, short gap between p/2 and p/3, no gap between c/1 and p/2, lower canine biscuspid.

Differential diagnosis: *Promicrogale* differs from *Microgale* Thomas 1882, by the longer retromolar space in the mandible, the larger posterior mental foramen and the taller posterior cusplet in the lower canine. It differs from *Micropotamogale* Balsac 1954, by its much larger lower canine relative to the other cheek teeth, and the bicuspid morphology of the lower canine (simple in *Micropotamogale* – Butler 1984, fig. 18). It differs from *Protenrec* Butler & Hopwood 1957 by the presence of bicuspid lower canines.

Type species: *Promicrogale namibiensis* nov.

Derivatio nominis: Greek : *Pro* – before, *micro* – tiny, *gale* – weasel-like mammal.

Species *Promicrogale namibiensis* nov.

Diagnosis: as for the genus.

Type Locality: Elisabethfeld, Namibia.

Age: Early Miocene, Faunal Set P0, ca 21 Ma.

Derivatio nominis: *namibiensis*, Latin : meaning "from Namibia".

Material: GSN EF 30'11, left mandible (holotype); GSN EF 32'98, lower i/2; provisionally attibuted specimen GSN EF 17'03, anterior part of snout with incisors.

Description and comments

The mandible is shallow and buccally there are two prominent mental foramina, one beneath the centre of the m/1, the other beneath the centre of the p/3 (Fig. 2, 3). Both of these foramina are positioned in the lower third of the mandible. The symphysis extends back as far as the rear of the p/3, and is unfused. There is a long retromolar space, equal in length to the m/2. The masseteric fossa terminates anteriorly well behind the level of the m/3.

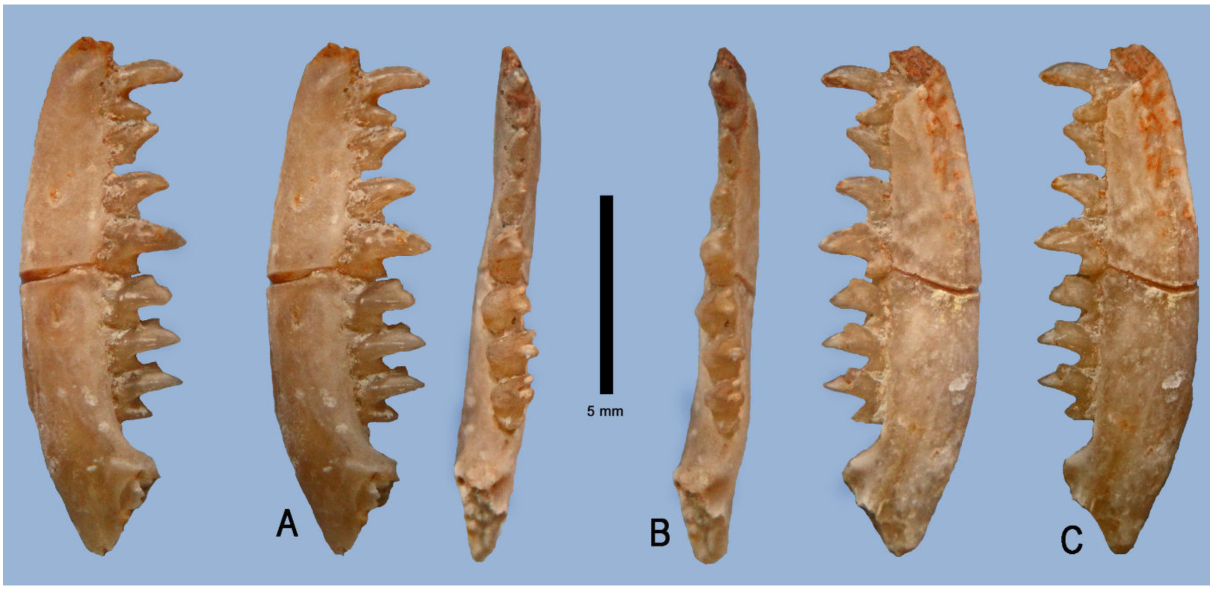

Figure 2. Stereo images of holotype left mandible of *Promicrogale namibiensis*, gen et sp. nov. from Elisabethfeld, Namibia, GSN EF 30'11. A) buccal, B) occlusal, C) lingual views (scale : 5 mm).

There are two alveoli preserved anterior to the canine, interpreted to be for the i/3 (small) and the i/2 (larger). Damage to the anterior part of the symphysis has obliterated the alveolus of the i/1.

The isolated i/2 (GSN EF 32'98) attributed to the species (illustrated by Mein & Pickford 2008a, fig. 7a as (?)*Prochrysochloris*) is regularly curved from root to crown with a tall main cusp anteriorly, and a sharp but low cusp posteriorly. The latter cusp is about a quarter of the height of the main cusp and its posterior profile is vertical, while the valley separating it from the main cusp is v-shaped and quite narrow. The crown and root measure 4.82 mm in height, the crown is 2.08 mm tall and the mesio-distal length of the tooth is 1.21 mm.

The lower canine in the holotype mandible is bicuspid with a single root. The anterior cusp is tall and in lateral view has a convex anterior profile. The posterior cusplet is about half the height of the main cusp and is separated from it by a relatively broad u-shaped valley.

The p/2 is close up behind the canine and leans anteriorly, the main cusp being only slightly taller than the distal cusp of the canine.

It has two roots, and the posterior cuspid is low and centrally positioned.

The p/3 is a larger version of the p/2 but with a more convex mesial profile and a small cusplet (paraconid) at the lingual base of the main cusp. The distal cusp is low.

The p/4 is sub-molariform with a low, but distinct paraconid on the mesio-lingual corner of the tooth. Behind the paraconid there is a tall metaconid lingually and an even taller protoconid buccally. The mesio-buccal cingulum is weakly expressed but the talonid cusp is prominent with a lingually positioned cristid running from its apex anteriorly towards the base of the metaconid.

The three molars resemble each other, differing mainly in dimensions (m/1 is slightly smaller than m/2 which is somewhat shorter but broader than m/3) and in the development of the talonid (mesio-distally compressed in m/1 and m/2, and more elongated and narrower in m/3). All three molars have low-relief paraconid and metaconid apices posed on a tall basal part and separated from each other by a low valley. The protoconid is taller and more voluminous than the paraconid and metaconid. In the m/1 and m/2 the hypoconulid cristid is slightly oblique, extending from the disto-buccal apex of the cusp towards the midline of the trigonid base. In the m/3 in contrast, the cristid is more oblique and terminates beneath the base of the metaconid (Fig. 3). Measurements of the teeth are provided in Table 1.

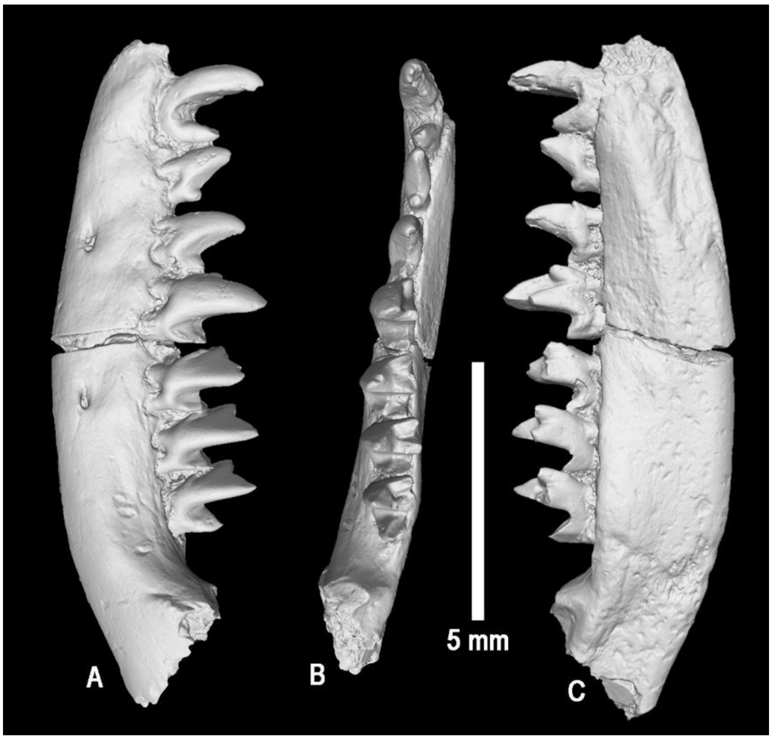

Figure 3. Scanned images of the holotype left mandible of *Promicrogale namibiensis* gen. et sp. nov. from Elisabethfeld, Namibia, GSN EF 30’11. A) buccal, B) occlusal, C) lingual views (Scans courtesy of Jorge Morales, Madrid) (scale : 5 mm).

Table 1. Measurements (in mm) of the teeth in the holotype left mandible of *Promicrogale namibiensis* GSN EF 30’11 (measurements courtesy of P. Mein).

Tooth	Mesio-distal length	Bucco-lingual breadth
c/1	1.49	0.78
p/2	1.11	0.51
p/3	1.12	0.66
p/4	1.42	0.95
m/1	0.80	1.10
m/2	1.15	1.30
m/3	1.32	1.05

Discussion

GSN EF 32'98, a single-rooted bicuspid tooth, was included in (?) *Prochrysochloris* by Mein & Pickford (2008a) but it is more likely to be a lower tooth of *Promicrogale namibiensis*.

A snout from Elisabethfeld previously attributed to *Protenrec butleri* Mein & Pickford (2003) GSN EF 17'03, is more likely to represent *Promicrogale namibiensis* on account of the presence in the I2/ of small mesial and lingual cusps in addition to the main cusp, as in several species of extant *Microgale* (MacPhee 1987). However, pending the recovery of associated maxillae and mandibles, for the time being we prefer to leave the attribution of this specimen open.

Among the Tenrecoidea, the holotype mandible of *Promicrogale namibiensis* is closest in overall morphology to jaws of *Microgale*, the extant shrew otter of Madagascar, of which there are several species (MacPhee 1987). It shares some features with *Micropotamogale* Balsac (1954) but differs from this genus by possessing a bicuspid lower canine (single small cusp in *Micropotamogale* (Butler 1984) and it even shares some features with *Potamogale* Du Chaillu (1860) although the latter genus is appreciably larger, and has simple lower canines without a posterior cusp.

The new genus and species differs from other Neogene fossil African Tenrecidae, *Protenrec* Butler & Hopwood (1957), *Erythrozootes* Butler & Hopwood 1957, and *Parageogale* (Butler 1984) in possessing a two-cusped lower canine and more mesio-distally compressed talonids in the two anterior molars.

The families Tenrecidae and Potamogalidae have a long history in Namibia, the earliest known members having been described from the Late Eocene of Eocliff (Pickford 2015).

Conclusions

A relatively complete left mandibular ramus from Elisabethfeld, an Early Miocene sedimentary deposit in the Sperrgebiet, Namibia, differs from other fossil and extant African tenrecoids, but resembles extant *Microgale* from Madagascar in a number of features. It is here attributed to a new genus and new species, *Promicrogale namibiensis*, thereby adding to the list of described Neogene African fossil tenrecids, previously represented by four species, *Protenrec tricuspis* Butler & Hopwood (1957), *Protenrec butleri* (Mein & Pickford (2003), *Erythrozootes chamerpes* Butler & Hopwood (1957) and *Parageogale aletris* (Butler & Hopwood 1957).

The discovery of *Promicrogale* in Namibia highlights the biogeographic relationships with Madagascar already evoked by Butler & Hopwood (1957) and Butler (1984).

Acknowledgements

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