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**GEOLOGY AND PALAEOBIOLOGY OF THE CENTRAL AND  
SOUTHERN NAMIB**

**VOLUME 2:  
PALAEOONTOLOGY OF THE ORANGE RIVER VALLEY,  
NAMIBIA**

by

**Martin Pickford and Brigitte Senut**



*Orangemeryx hendeyi*

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## Insectivora from Arrisdrift, a basal Middle Miocene locality in southern Namibia

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Considering the energetic depositional environment of the Proto-Orange deposits, it is somewhat surprising that remains as fragile and small as those of insectivores are preserved at Arrisdrift. Three species have been discovered, a chrysochlorid, an erinaceid and a tenrecid, all of which are similar in overall aspect to material from the Early Miocene of Kenya and Uganda. The taxa recovered confirm an Early to basal Middle Miocene age for the deposits.

### Resume français

A Arrisdrift, les dépôts du paléofleuve Orange sont visiblement à haute énergie. Il est surprenant que des restes aussi petits et fragiles que ceux d'insectivores puissent être préservés. Cependant, trois espèces de ce groupe ont été découvertes dans le gisement: une taupe dorée, un hérisson et un tenrec. Ces espèces sont semblables à celles rencontrées dans le Miocène inférieur au Kenya et en Ouganda. La présence de ces taxons plaide en faveur d'un âge Miocène inférieur où légèrement plus récent pour cette faune.

### Introduction

Arrisdrift is a fluvial deposit in the Proto-Orange terrace, 35 km upstream from Oranjemund. Insectivore remains recovered from the site are rare, being represented by 10 specimens out of well over 10,000 fossil vertebrates excavated at the site. Apart from an isolated upper molar, the remains found are all mandibular, in strong contrast to the East African sites that have yielded Insectivora, where skulls are more common than mandibles (Butler & Hopwood, 1957; Butler, 1984).

The aim of this paper is to describe and interpret these few fossils and to make comparisons with the much more abundant material from Early Miocene localities in tropical Africa and elsewhere.

### Systematic descriptions

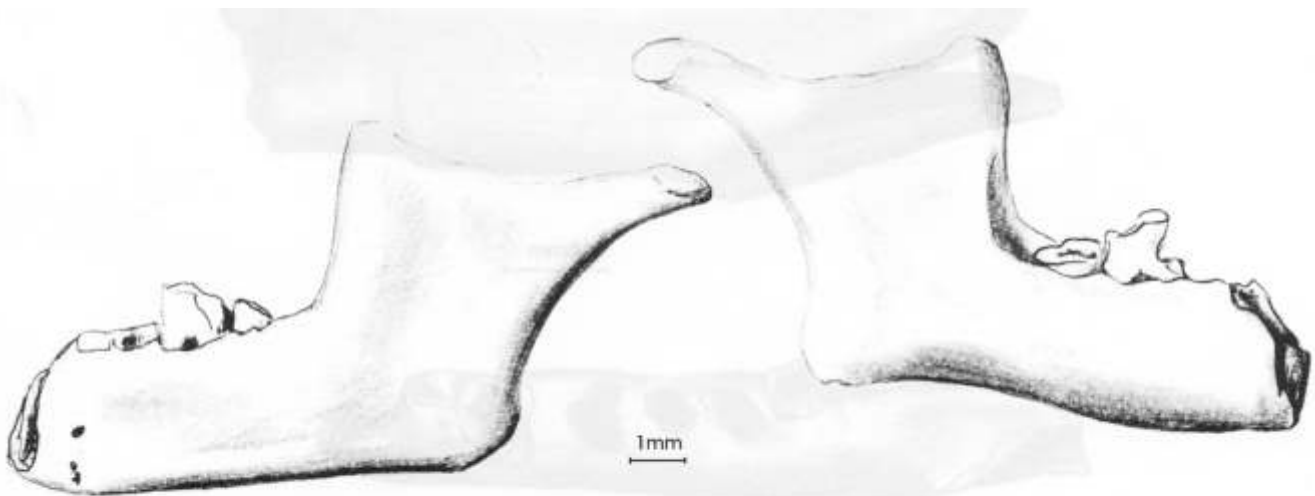
**Order Insectivora Bowdich, 1821**  
**Family Chrysochloridae Gray, 1825**  
**Genus *Prochrysochloris* Butler & Hopwood, 1957**

**Type species:** *Prochrysochloris miocaenicus* Butler & Hopwood, 1957

**Species *Prochrysochloris cf miocaenicus* Butler & Hopwood, 1957**

**Material:** PQAD 2638, left mandible with broken m/2-m/3 but with an almost complete ascending ramus (Fig. 1a, b).

**Description:** The partial mandible PQAD 2638 possesses parts of the m/2-m/3. The ascending ramus is well preserved and shows a masseteric *fossa* as opposed to a pterygoidean *fossa*. The ascending ramus is long and relatively low (see measurements) with a shallow saddle between the coronoid process and the mandibular condyle which projects strongly to the rear. This morphology differs markedly from *Microgale* and *Potamogale* in which there is a deep concavity between the coronoid process and the condyle, and indicates that the specimen is not a tenrecid. In contrast, the shape of the ascending ramus recalls that of chrysochlorids. The lower edge of the mandible is not recurved upwards, and in internal view the mandibular foramen is seen to be located slightly above the alveolar mar-



**Figure 1:** PQAD 2638, *Prochrysochloris cf miocaenicus* left mandible with broken m/2-m/3 but with an almost complete ascending ramus, a) buccal view; b) lingual view.

gin and is not far removed from the m/3, in contrast to its low and well retired position-in *Protenrec*.

The m/2 and m/3 are broken, but the length of m/2 and the breadth of m/3 can be measured.

**Table 1:** Measurements of the teeth and mandible (in mm) of *Prochrysochloris cf miocaenicus* from Arrisdrift, Namibia.

| Specimen                              | length | breadth |
|---------------------------------------|--------|---------|
| PQAD 2638, m/2                        | 1.34   | --      |
| PQAD 2638, m/3                        | --     | 0.95    |
| PQAD 2638, mandible depth below m/1   | 3.00   |         |
| PQAD 2638, length coronoid to condyle | 6.57   |         |
| PQAD 2638, height of ascending ramus  | 6.35   |         |
| PQAD 2638, length m/1-m/3             | 4.00e  |         |

**Discussion:** The specimen here identified as *Prochrysochloris cf miocaenicus* is slightly larger than material assigned to *Protenrec butleri* from which it differs by the shape of the ascending ramus, the positions of the mental foramina and the mandibular foramen. It is close in size to specimens of *Prochrysochloris miocaenicus* from Legetet, Chamtwara and Songhor and the position of the mandibular foramen is similar to that of the Kenyan fossils. Thus, even though the Arrisdrift sample is poor, it reveals several similarities with *Prochrysochloris miocaenicus* from East Africa, and major differences from the genera *Protenrec* and *Parageogale*.

**Family Erinaceidae Fischer von Waldheim, 1817**  
**Genus *Amphechinus* Aymard, 1850**

**Type species:** *Erinaceus arvernensis* de Blainville, 1839

**Species *Amphechinus rusingensis* Butler, 1956**

**Material:** AD 420'99, right mandible with p/4 and m/3 (Fig. 2); AD 343'95, left mandible with fragment of p/4 (or dp/4),

complete m/1-m/3 and alveoli of anterior dentition; AD 581'94, left M3/ (Fig. 3).

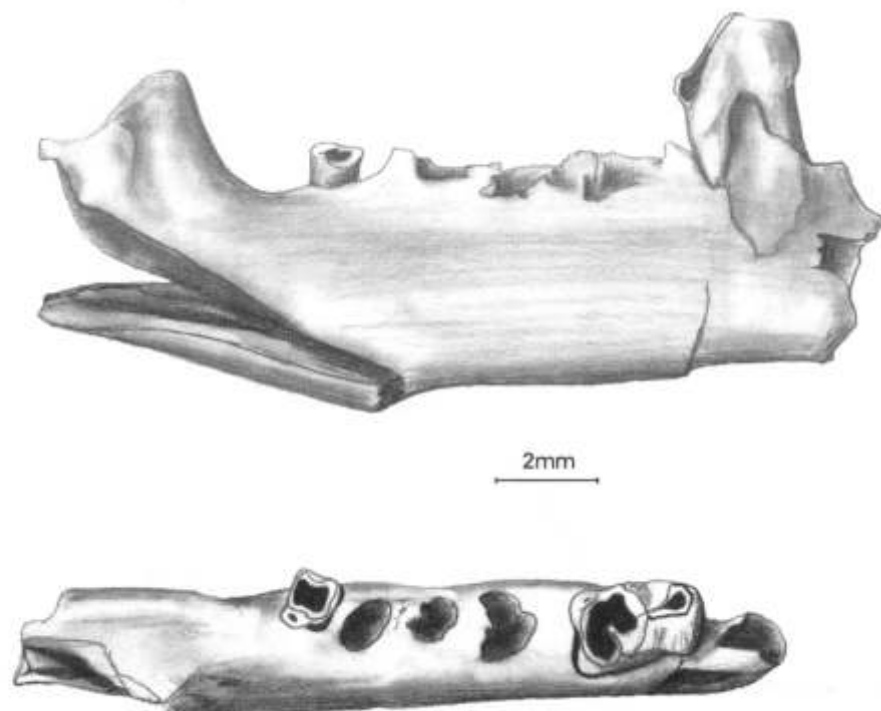
**Description:** Butler (1984) refers to the tooth in front of the p/4 as the p/2, but we consider that this tooth is in fact the p/3 (Niethammer & Krapp, 1990), but unlike the latter authors, we consider the two incisors of erinaceids to be i/2 and i/3, rather than i/1-i/2. In AD 343'95, the p/3 has two roots, unlike European species which have single rooted p/3s (Butler, 1956).

The p/4 in AD 420'99 is heavily worn so it is not possible to see whether the protoconid and metaconid were fused or not. The paraconid is lightly worn. It is positioned lingually and has a slightly oblique crest leading from it to the trigonid. In AD 343'95 there is a small hole on the lingual side of the jaw at gingival level which may represent part of the alveolus of the permanent p/4 which is possibly still in its crypt. If so then the roots above it would belong to the dp/4.

m/2 is smaller relative to m/1 (0.75) than it is in *A. rusingensis* (0.82) (Butler, 1956) and in this respect is close to *A. edwardsi* from Europe (Butler, 1984). The m/1 is broader than any of the East African fossils assigned to this species, but its length falls within the range of variation reported by Butler (1984). The proportions of trigonid length to trigonid breadth and trigonid length to total length of m/1 are similar to specimens from East Africa (Butler, 1984).

The lower m/3 of the Arrisdrift species is not only extremely reduced, but also its protoconid is almost as low as the paralophid and metaconid, and in these features it differs from European species of *Amphechinus*. Furthermore there is no labial cingulum in the Arrisdrift specimen, whereas it is present, even if weak, in *A. edwardsi*.

The upper third molar from Arrisdrift is similar in size to that of *A. rusingensis* from Rusinga (Butler, 1956). The



**Figure 2:** AD 420'99, *Amphechinus rusingensis*, right mandible, a) buccal view; b) occlusal view with p/4 and m/3.

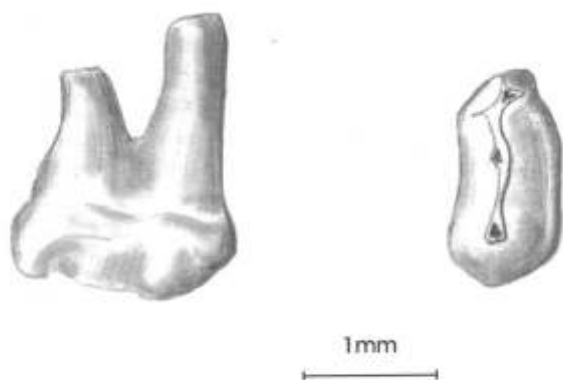


Figure 3: AD 581'94, *Amphechinus rusingensis*, left M3/, a) distal view and b) occlusal view.

crown is wider than long which is typical for erinaceids, and consists of three cusplets at almost the same height, the protocone positioned posterolingually, the median one is equivalent to the paracone and a parastyle in the anterolabial corner. It has cingula running from the parastyle both anteriorly and posteriorly. In distal view (Fig. 3a) the three cusplets are almost the same height, whereas in the European forms the three cusplets are not only well separated from each other, but also the protocone is higher than the paracone, which is in turn higher than the parastyle.

Table 2: Measurements of the teeth and mandible (in mm) *Amphechinus rusingensis* from Arrisdrift, Namibia (e= estimated measurement).

| Specimen                         | length | breadth |
|----------------------------------|--------|---------|
| AD 420'99, p/4                   | 2.42   | 1.66    |
| AD 420'99, m/3                   | 0.93   | 0.93    |
| AD 420'99, length p/4-m/3        | 9.60   |         |
| AD 420'99, length m/1-m/3        | 6.75   |         |
| AD 420'99, mandible depth at m/1 | 4.18   |         |
| AD 343'95, m/1                   | 3.50   | 2.23    |
| AD 343'95, m/2                   | 2.62   | 2.00e   |
| AD 343'95, m/3                   | 0.63   | 0.79    |
| AD 343'95, length m/1-m/3        | 6.82   |         |
| AD 343'95, mandible depth at m/1 | 3.40   |         |
| AD 581'94, M3/                   | 0.80   | 1.59    |

**Discussion:** The morphological and metric similarities between the Arrisdrift and East African *Amphechinus* species are manifest, and there can be little doubt that they belong to the same taxon, *A. rusingensis*, despite a few minor differences in proportions and size. The extension of the geographic range of these hedgehogs to southern Africa is not surprising, because the genus was widespread, occurring in Europe (Late Oligocene to Middle Miocene), Asia (in the Late Oligocene) and tropical Africa (20-13 Ma) (Butler, 1984).

**Family Tenrecidae Gray, 1821**  
**Subfamily Geogalinae Trouessart, 1879**  
**Genus *Protenrec* Butler & Hopwood, 1957**

**Type species:** *Protenrec tricuspis* Butler & Hopwood, 1957

**Species *Protenrec butleri* nov.**

**Diagnosis:** A small species of the genus *Protenrec*, approxi-

mately 80% the size of the type species.

**Derivatio nominis:** In honour of Dr Percy Butler for his many contributions to the understanding of fossil and extant insectivorans.

**Material:** Holotype, AD 419'99, right mandible with p/3-m/3 and part of the ascending ramus (Fig. 4).

Hypodigm: PQAD 2000, left mandible with p/4-m/3; AD 274'94, a) right mandible m/1-m/3, b) left p/3; AD 275'94, left mandible with p/4-m/3; AD 187'95, left mandible with dm/4.

**Description:** In AD 275'94, there are three alveoli in front of p/3. The two anterior alveoli slope towards the rear, and are possibly for the incisors. There are two mental foramina, a large one below the p/3 and a smaller one below m/1. The ascending ramus is partly conserved. In AD 274'94, the mandibular foramen is at the same level as, or even slightly below, the alveolar surface of the cheek teeth and is far behind m/3 and the lower border of the ramus is re-curved upwards so that the angular apophysis descends distally and is relatively narrow. In AD 419'99, there is part of the ascending ramus with a pterygoidean *fossa* on the lingual side.

The p/3 is two rooted. The crown has a single main cusp, the protoconid, with a lingual cingulum which rises slightly anteriorly and posteriorly where it forms a tiny median cusp let. The anterior root is long and slightly curved whereas the distal root is larger and straighter. The widest part of the tooth is at the rear.

The p/4 is more molarised than the p/3, with a metaconid more or less fused to the protoconid and which is lower than, and slightly behind it. The talonid consists of a lingual cuspid the entoconid, and a minute labial cuspid, the hypoconid. There is a tiny, low paraconid at the front of the tooth. The widest part of the tooth is across the protoconid-metaconid pair. It is larger than m/1 and m/2.

The m/1 is characterised by a very high trigonid and a low talonid. The paraconid is almost as high as the other two cusps of the trigonid. In contrast to the p/4, the m/1 metaconid is slightly anterior to the protoconid. There is a light basal anterolabial cingulum. The widest part of the crown is at the protoconid. The talonid forms a shallow basin which is situated slightly to the lingual side of the midline.

The m/2 is virtually identical to the m/1, but its talonid is slightly narrower and its height is slightly greater. The posterior root is larger than the anterior one.

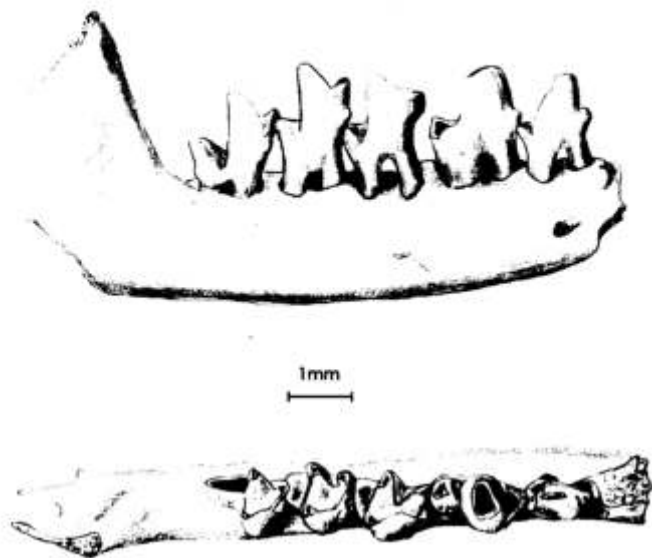
The m/3 is characterised by a long, narrow talonid which rises to a point disto-lingually. This point is higher than it is in the other molars.

AD 187'95 has a tooth in the position of the p/4, being followed by the alveoli of three molars. The tooth differs from other p/4s by showing a basin shaped talonid as in the molars, unlike the p/4. We consider that the tooth is a dp/4. If we did not know that there were three molar alveoli behind it, this tooth might have been interpreted as an m/1.

**Discussion:** The specimens assigned to *Protenrec butleri* are appreciably smaller than material identified as *Protenrec tricuspis* by Butler & Hopwood (1957) and Butler (1984). In *P. butleri* m/1-m/3 measures 3.8 to 3.99 as against 4.9 mm in *P.*

**Table 3:** Measurements of the teeth and mandibles (in mm) of *Protenrec butleri* sp. nov. from Arrisdrift, Namibia (e = estimated from alveoli).

| Specimen                            | length | breadth |
|-------------------------------------|--------|---------|
| PQAD 2000, p/4                      | 1.45   | 1.05    |
| PQAD 2000, m/1                      | 1.29   | 1.23    |
| PQAD 2000, m/2                      | 1.20   | 1.22    |
| PQAD 2000, m/3                      | 1.43   | 1.10    |
| PQAD 2000, mandible depth below m/1 | 2.37   |         |
| PQAD 2000, length m/1-m/3           | 3.73   |         |
| AD 274'94, p/3                      | 1.07   | 0.70    |
| AD 274'94, m/1                      | 1.32   | 1.09    |
| AD 274'94, m/2                      | 1.27   | 1.15    |
| AD 274'94, m/3                      | 1.48   | 0.96    |
| AD 275'94, p/4                      | 1.45   | 0.98    |
| AD 275'94, m/1                      | 1.28   | 1.21    |
| AD 275'94, m/2                      | 1.28   | 1.23    |
| AD 275'94, m/3                      | 1.45   | 1.04    |
| AD 275'94, length m/1-m/3           | 3.80   |         |
| AD 275'94, length p/3-m/3           | 5.15e  |         |
| AD 187'95, dp/4                     | 1.34   | 0.97    |
| AD 187'95, mandible depth below m/1 | 1.93   |         |
| AD 187'95, length m/1-m/3           | 3.99e  |         |
| AD 419'99, p/3                      | 1.10   | 0.68    |
| AD 419'99, p/4                      | 1.46   | 0.94    |
| AD 419'99, m/1                      | 1.37   | 1.07    |
| AD 419'99, m/2                      | 1.16   | 1.09    |
| AD 419'99, m/3                      | 1.38   | 0.98    |
| AD 419'99, length m/1-m/3           | 3.80   |         |
| AD 419'99, length p/3-m/3           | 6.34   |         |
| AD 419'99, mandible depth below m/3 | 2.00   |         |



*tricuspis*. The depth of the mandible below m/1 is 2.0 to 2.37 in *P. butleri* as opposed to 2.5 mm in *P. tricuspis*.

The mental foramina are slightly different in the two species. In *P. butleri* the large one is below P/3 whereas in *P. tricuspis* it is below m/1.

### Conclusion

Arrisdrift has yielded three taxa of Insectivora, one each of the families Chrysochloridae (golden moles), Erinaceidae (hedgehogs) and Tenrecidae (tenrecs). Two of the three species (*Prochrysochloris cf. miocaenicus* and *Amphechi- nus rusin-*

*gensis*) are morphologically and metrically close to material from Early Miocene sites in East Africa, whilst the third, *Protenrec butleri* sp. nov., is smaller than Kenyan fossils of the genus. The overall aspect of the Arrisdrift insectivore fossils suggests chronological correlations with East African sites of Early and basal Middle Miocene age, in accordance with inferences based on the large mammals.

Chrysochloridae and Tenrecidae appear to have been confined to Africa (and Madagascar) since the Early Miocene, but Erinaceidae were widespread through Africa and Eurasia, even as early as the Late Oligocene.

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