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NEW AND LITTLE-KNOWN MAMMALS FROM THE MIOCENE OF AFRICA¹

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The remains described in the following pages were collected by Mr. Herbert Lang in the Namib, south of Lüderitz Bay, South West Africa, with the assistance of Dr. Beetz, the original discoverer of this fossil field. For the privilege of examining them I am indebted to the kindness of my friends Professor Henry Fairfield Osborn and Dr. George Gaylord Simpson. To both these gentlemen I here tender my heartiest thanks. The drawings were made by John Germann.

The specimens are very fragmentary and some are worn and eroded by wind-driven dust and sand. They are supplementary to the collections made by Professor Kaiser and Dr. Beetz in the same area, described by Stromer,² and, like them, are most probably of Lower Miocene age.

The Lower Miocene mammals of the Namib, so far as known, are listed below.

CREODONTA

Metapterodon kaiseri Stromer.
Gen. et sp. indet. (Auct. Stromer).

RODENTIA DUPLICIDENTATA

Austrolagomys inexpectatus Stromer.
Austrolagomys simpsoni Hopwood.

RODENTIA SIMPLICIDENTATA

Parapedetes namaquensis Stromer.
Bathyergoides neotertiarius Stromer.
Neosciuromys africanus Stromer.
Phiomysoides humilis Stromer.
Apodecter stromeri Hopwood.
Phthinylla fracta Hopwood.
cf. *Phiomys andrewsi* Schlosser. (Auct. Stromer).
Diamantomys luederitzi Stromer.
Pomonomys dubius Stromer.

PERISSODACTYLA

Rhinocerotid indet. (Auct. Stromer).

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²Stromer, E. 1926. Reste land- und süßwasser-bewohnender Wirbeltiere a. d. Diamantenfeldern Deutsch-südwestafrikas. In Kaiser, E., "Die Diamantenwüste Südwestafrikas," II, pp. 107-153. Berlin, 1926.

ARTIODACTYLA

- Diamantohyus africanus* Stromer.
 ?*Propalæochærus* sp. (Auct. Stromer).
Tragulid indet. cf. *Dorcatherium*. (Auct. Hopwood).
Tragulid indet. cf. *Bachitherium*. (Auct. Hopwood).
 cf. *Strogulognathus* sp. (Auct. Stromer).
Propalæoryx austroafricanus Stromer.

HYRACOIDEA

- Prohyrax tertiarius* Stromer.
Myohyrax oswaldi Andrews. (Auct. Stromer).
Myohyrax doederleini Stromer.
Myohyrax osborni Hopwood.
Protypotheroides beetzi Stromer.

RODENTIA DUPLICIDENTATA

Ochotonidæ

Austrolagomys simpsoni, new species

TYPE.—Amer. Mus. No. 22528a, broken mandibular ramus with P₃–M₃.

PARATYPE.—Amer. Mus. No. 22528b, part of right ramus with P₃₋₄.

HORIZON AND LOCALITY.—Lower Miocene, south of Lüderitz Bay, South West Africa.

DIAGNOSIS.—An *Austrolagomys* in which P₃ has a deep external fold, and P₄–M₂ show a marked angulation, or rib, in the enamel of the hinder surface of the anterior pillar. M₃ square in cross section, placed obliquely to the other teeth.

This species is slightly smaller than *A. inexpectatus* Stromer, from which it differs in having a deeper fold on P₃, an angulation in the enamel of the hinder surface of the anterior pillars of P₄–M₂, and in the outline of M₃, which is square rather than oval in cross-section.

The trivial name is given in honor of my friend Dr. G. G. Simpson.

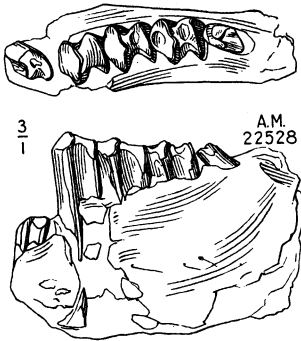


Fig. 1. *Austrolagomys simpsoni*, new species. Left lower jaw with P₃–M₃. Type. Crown and external views. Three times natural size.

DIMENSIONS

	P ₃	P ₄	M ₁	M ₂	M ₃	P ₄ –M ₃
Type { Length	1.4	1.6	1.9	1.8	0.7	6.1
{ Breadth	1.3	1.7	1.9	1.9	0.7	—
Paratype { Length	1.5	1.8	—	—	—	—
{ Breadth	1.2	1.7	—	—	—	—

RODENTIA SIMPLICIDENTATA

Apodecter, new genus

DIAGNOSIS.—Simplicidentate rodents with quadricuspidate lower molars. Teeth brachyodont, one outer and two inner valleys; a slight anteroexternal cingulum on M_1 and M_2 , external valley directed backward, internal valleys directed forward. Hinder half of M_3 reduced.

TYPE.—*A. stromeri*, new species.

This genus differs from *Phiomyoides* in the proportions of the teeth, in the presence of an anteroexternal cingulum, and in the presence of a hypoloph. It differs from *Paraphiomys* in the absence of accessory tubercles in the inner valleys, in its smaller size, and in the proportions of the teeth.

Apodecter stromeri, new species

TYPE.—Amer. Mus. No. 22538, part of a right mandibular ramus with the first two molars slightly worn and the third uncut but fully displayed in the crypt.

HORIZON AND LOCALITY.—Lower Miocene, south of Lüderitz Bay, South West Africa.

DIAGNOSIS.—As for the genus.

The two outer cusps are roundly triangular in section, with the apex of the triangle on the outer side of the tooth, and the shortest side to the front. Each cusp has an antero- and posterointernal ridge. The ridges from the protoconid meet those from the metaconid and entoconid, and the anterior ridge from the hypoconid meets that from the entoconid. The posterior ridge from the hypoconid is confluent from the hypoloph. Ridges pass inward from the metaconid and entoconid at right angles to the anteroposterior axis of the tooth. They meet those from the protoconid and hypoconid in the midline of the crown.

The external fold is broad and directed slightly backwards; the folds on the inner side of the tooth are equally broad and have their ends pointing forwards.

Consisting essentially of two large anterior cusps, the third lower molar has its hinder half considerably reduced. The hypoconid is at the extreme end; a position which gives the tooth a triangular outline. The entoconid is very small. On account of their arrangement, of the nature of the deep anterointernal fold, of the less deep external fold,



Fig. 2. *Apodecter stromeri*, new genus and species. Right lower jaw with M_{1-3} . Type. Crown view. Five times natural size.

and of the small, shallow, posterointernal one, ridges connect metaconid and protoconid, and protoconid and entoconid. The hypoconid is detached, with a minute hypoloph on its inner surface.

The generic name is the Greek ἀποδκτήρ, a tax-collector, and is appropriate to property-devouring vermin. The trivial name is given in honor of Professor Ernst Stromer, who was the first to describe mammalian remains from the Lower Miocene of South West Africa.

DIMENSIONS					
		M ₁	M ₂	M ₃	
Type	{	Length	1.4	1.4	1.1
	}	Breadth	1.4	1.3	1.1

Phthinylla, new genus

DIAGNOSIS.—Simplicidentate rodents with quadricuspidate upper cheek teeth. Teeth moderately hypsodont; with two outer valleys and one inner valley; postero-external valley wide, divided by a strong crest which nearly reaches the labial surface.

TYPE.—*P. fracta*, new species

This genus differs from *Paraphiomys* in being smaller and in having teeth which are relatively more hypsodont. The crest in the posterior valley corresponds with the small projection or crest seen in the antero-internal valley of *Paraphiomys*, but is very much larger and stronger.

Phthinylla fracta, new species

TYPE.—Amer. Mus. No. 22539, part of left maxilla with first two cheek teeth.

HORIZON AND LOCALITY.—Lower Miocene, south of Lüderitz Bay, South West Africa.

DIAGNOSIS.—As for the genus.

Phthinylla, from its close resemblance to *Paraphiomys*, may be placed among the Theriodomyidæ. On the other hand, my colleague Mr. M. A. C. Hinton considers that both *Phthinylla* and *Apodecter* might quite well be considered as primitive murines.

The generic name is the Greek φθίνυλλα, an old hag.

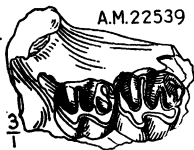


Fig. 3. *Phthinylla fracta*, new genus and species. Left upper jaw with first two cheek teeth. Type. Crown view. Three times natural size.

RODENTIA INCERTÆ SEDIS

In addition to the remains described above there are fragments of at least four indeterminate species in the collection. One specimen,

Amer. Mus. No. 22541, is an almost complete hind foot which is large enough to justify a tentative though doubtful reference to *Parapedetes* Stromer, but the tarsus is fractured and some parts of the bones lost. The other specimens are, in the main, isolated upper and lower incisor teeth.

ARTIODACTYLA

Artiodactyl ungulates are represented by foot bones and fragments of lower jaws. None are identifiable with certainty, but all appear to be ruminants. The teeth belong to tragulids.

Tragulidæ

There are at least two types of tragulids in the collection. The first form is represented by a left mandibular ramus with the broken and worn P_3 - M_3 preserved, Amer. Mus. No. 22527. P_3 is entirely lost except for the posterior root, and only the hinder two-thirds of the lingual surface of P_4 remains. The latter tooth has a deep postero-internal fold which passes obliquely forward, thus distinguishing it from the holotype of *Dorcatherium nauyi* Kaup (Regd. 40632 Brit. Mus. Geol. Dept.), from which it also differs in its slightly greater size. Externally there are basal tubercles on M_2 - 3 , and there was a posteroexternal rib on M_3 .

DIMENSIONS				
	M_1	M_2	M_3	M_{1-3}
Length	11	13.5	21	46 mm.
Breadth	—	9	9	— mm.

A second, smaller tragulid is represented by Amer. Mus. No. 22525, a partial left mandible with the alveoli for P_2 , broken P_{3-4} , and much worn M_{1-3} , and Amer. Mus. No. 22526, including part of an isolated lower premolar, partly worn associated M_{1-2} , an isolated broken M_3 , and a broken and weathered upper molar. This form has some resemblance to *Bachitherium* of the European Miocene, but the material is too worn to allow close comparison.

DIMENSIONS				
Amer. Mus. No. 22525	M_1	M_2	M_3	M_{1-3}
Length	6.3	8	11	26
Breadth	4.8	5.5	5.5	—

MYOHYRACOIDEA

Myohyracidae

Myohyrax doederleini Stromer

Six fragments of lower jaws, Amer. Mus. No. 22534, and three upper molars, Amer. Mus. No. 22535, are referred to this species.

The most important mandibular fragments are an anterior portion with the first two left incisors and a styliform P_2 , and a broken left mandible with P_3 - M_2 entire and M_3 broken off short in the alveolus. The incisors are procumbent; I_1 is chisel-shaped and I_2 subspatulate. Both are convex and covered with enamel on the labial surface, whereas their lingual surfaces are either flat (I_1) or gently concave (I_2) and entirely devoid of enamel. The second lower premolar is a simple slender

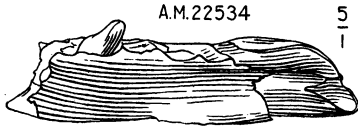


Fig. 4. *Myohyrax doederleini* Stromer. Part of left lower jaw with I_{1-2} and P_2 . Referred specimen. Crown view. Five times natural size.

cone. From P_3 to M_2 the teeth have each two roots. Their crowns increase in height to M_1 and then decrease. Each tooth is long and narrow, with a deep fold on the labial and lingual surfaces. That on the labial surface is slightly anterior to that on the lingual surface. The two grooves are almost confluent, the enamel of one being separated from that of the other by a film of dentine only distinguishable

with certainty under a high-power binocular microscope. These grooves give the teeth the appearance of being composed of two pillars which are subcircular in outline and joined by a very narrow neck. The inner surface of the anterior pillars is slightly concave; all other surfaces are strongly convex. M_3 was reduced to a single pillar.

The upper teeth show no details additional to Stromer's description.

Myohyrax osborni, new species

TYPE.—Amer. Mus. No. 22532, a left maxilla with P_3 - M_2 .

PARATYPE.—Amer. Mus. No. 22529, parts of a left mandibular ramus with P_4 and M_2 .

HORIZON AND LOCALITY.—Lower Miocene, south of Lüderitz Bay, South West Africa.

DIAGNOSIS.—A *Myohyrax* in which P^3 - M^2 measures 19.5 mm. Lower molars with an island of enamel in each pillar; pillars flat or slightly concave on the lingual surface, strongly convex on the labial surface.

The fourth upper premolar is completely molariform and presents no special features. P^3 is not quite so complicated as the other teeth. It has four cusps, but no styles. There is one external rib, which is formed by the tritocone. Two islands of enamel on the grinding surface are near the tritocone and tetartocone respectively; the former is divided into a larger anterior and a smaller posterior portion. A narrow groove in the anterior surface separates protocone and deuterocone, and a second, somewhat broader and shallower groove is on the anterior surface of the deuterocone.

Apart from their much greater size, the remaining cheek teeth bear a close resemblance to those of the other species of *Myohyrax*. They are markedly hypsodont, each with four roots, which are grooved on the inner surfaces. Their crowns are prismatic and subquadrate; the

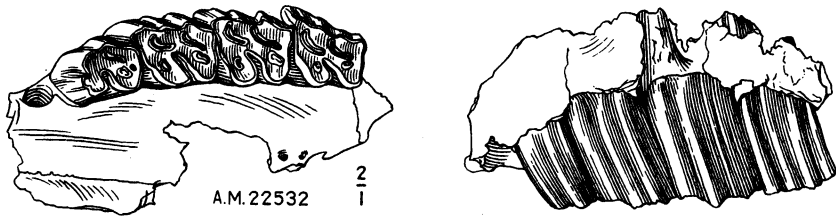


Fig. 5. *Myohyrax osborni*, new species. Left upper jaw with P^3 - M^2 . Type. External and crown views. Twice natural size.

anterior and labial sides longer than the posterior and lingual. There is a well-marked parastyle and a smaller metastyle, but no mesostyle; between the parastyle and metastyle are two strong ribs formed by the paracone and metacone. Each tooth has four islands of enamel on the occlusal surface, one by each of the four cusps. Those by the paracone and metacone—the two external islands—are crescentic and placed obliquely with regard to the long axis of the tooth, the anterior end being outermost. The two inner islands are almost circular.

A second specimen of a maxilla, Amer. Mus. No. 22533, is similar to the type. Expressing the breadth as a percentage of the length, and comparing with the corresponding ratios of the type, it is seen that the teeth are slightly narrower:

Number	P^4	M^1
22532	76.5	83.8
22533	73	80

The lower cheek teeth differ from those of *M. oswaldi* and *M. doederleini* and, in some respects, resemble those of the genus *Protypotheroides*. Each pillar is strongly convex on the labial side and almost

flat lingually, and each has an island of enamel on the occlusal surface. The longest diameter of the pillars is oblique with reference to the long axis of the mandible, the anterior end being the external one.

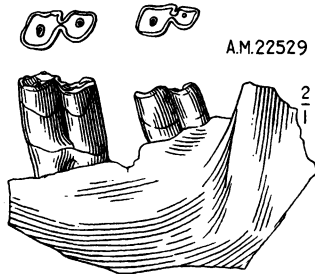


Fig. 6. *Myohyrax osborni*, new species. Left lower jaw with P₄ and M₂. Paratype. External view and occlusal surface of the teeth. Twice natural size.

DIMENSIONS

Type, Amer. Mus. No. 22532.

	P ³	P ⁴	M ¹	M ²
Length	3.9	5.5	5.5	5.3
Breadth	3.7	4.2	4.6	4.9

Paratype, Amer. Mus. No. 22529:

	P ₄	M ₂
Length	5.0	4.4
Breadth	2.4	2.1

HABITS OF *Myohyrax*

From characters of the teeth it is evident that *Myohyrax* differed from *Procavia* both in habits and skull structure. The incisors of the latter genus have, when unworn or partly worn, a comb-like appearance, the upper part of each crown being composed of three pegs. As wear proceeds, the teeth of the lower jaw oppose the lingual surfaces of the curved, triangular upper teeth, and become worn in such a manner that the occlusal surface is practically at right angles to the long axis of the tooth, but more on the labial surface. The outline is that of a slightly oblique cross-section of the tooth, and varies from an oval to an irregular oblong. In *Myohyrax* the occlusal surface is on the lingual side of the tooth, is nearly parallel to the long axis, and is triangular in outline. Added to these distinctions are differences in the distribution of the enamel on the incisors of the two genera. *Procavia* has the upper portion of the crown entirely surrounded by enamel, but, as wear proceeds, the tooth, which roots late in life and is of semi-persistent growth, is

further extruded from the jaw; it gradually loses the enamel on the sides, until, in old animals, only the labial and lingual surfaces are covered. *Myohyrax*, on the other hand, never has any enamel on the lingual surface of the incisors, and the differential wear keeps the teeth sharply chisel-edged as in the rodents.

The upper incisors of *Myohyrax* bore no resemblance to those of *Procavia*; they were pro-odont, projecting forward and downward, so as to form with the lower teeth a pincer-like equipment for picking up and hulling hard seeds.

The cross-ridged grinding surface of the cheek teeth of *Myohyrax* is evidence for a considerable amount of lateral movement of the jaws. This movement, if it exists at all, is very limited in *Procavia*, in which genus the jugal bears a descending process which closes the outer end of the glenoid fossa and which articulates with the mandibular condyle. On the other hand, the plane of wear of the incisors of *Myohyrax* indicates that the mandible was also moved in an anteroposterior direction. Combining the two motions, it seems probable that *Myohyrax* first picked up seeds by means of the incisors, which were moved back and forth to prepare the material by removing the outer shell. The cheek teeth were then moved mainly in a transverse direction, and ground the food into a consistency suitable for swallowing. This is bound to have affected the shape of the glenoid cavity, which, if ever discovered, should prove to be broad and shallow, as in the ruminants and the majority of rodents, and not on the hinge type of *Procavia*.

CONCLUSIONS

The fossils described above emphasize Professor Stromer's conclusions that the fauna was a rich one, apparently living under savanna conditions, as shown by the presence of antelopes (*Propalæoryx* Stromer) and jumping hares, with sheltering woodland bordering the water-courses indicated by the tragulid remains.

