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NEW CARNIVORA FROM THE TERTIARY OF MONGOLIA[1]

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Most of the species here described are from the Oligocene *Baluchitherium* zone, Hsanda Gol formation, in the Tsagan Nor basin, in outer Mongolia. One is from the Eocene Irdin Manha *Protitanotherium* zone in the Iren Dabasu basin, eastern Mongolia.

Paracynohyænodon morrisi, new species

TYPE.—No. 19160, lower jaw, immature, with m_1 unworn, p_3 and m_3 preformed, Irdin Manha beds. Found by F. K. Morris, 23 miles south of Iren Dabasu.

CHARACTERS.—The molars, as in Dr. Martin's type,[2] are distinguished from those of *Cynohyænodon* and *Tritemnodon* by the more compressed and secant character of the talonids. The species appears to be distinguished from the genotype, *P. schlosseri* of the Phosphorites, by the reduced and crowded premolars.

Hyænodon pervagus, new species

TYPE.—No. 19005, part of lower jaw.

PARATYPES.—Nos. 19006, 19015, 19125, 1926, parts of jaws; No. 19002, hind limbs and feet.

HORIZON AND LOCALITY.—Oligocene, Hsanda Gol formation, Loh, Mongolia.

DIAGNOSIS.—Species of moderate size in the genus, about equalling *H. heberti* and *cruentus*. So far as comparisons can be made, it belongs among the shorter-jawed species. Distinguished from *heberti* by entire lack of anterior accessory cusps on premolars, by larger relative size of m_1, etc. The hind limb and foot bones are finely preserved and agree very closely with *H. cruentus* in size and in all details of construction.

REMARKS.—*Hyænodon* is widespread in the Upper Eocene and older Oligocene of Europe (Débruge, Phosphorites, older Bohnerzen, Ronzon), in the Lower and Middle Oligocene of America (*Titanotherium* and *Oreodon* zones of the White River) and in the Lower Oligocene of Egypt (Fluvio-marine beds). Its occurrence in the Hsanda Gol points to a rather early Oligocene age for this formation.

Didymoconus colgatei, new genus and species

TYPE.—No. 19124, skull and jaws.

PARATYPES.—Nos. 19003, 19004, lower jaws.

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[1]Publications of the Asiatic Expeditions of The American Museum of Natural History. Contribution No. 21.

[2]Martin, Rudolf, 1906, 'Revision obereoc. u. unterolig. Creodonten Europas.' Rev. Suisse de Zool., XIV, p. 424. *Paracynohyænodon schlosseri.*

HORIZON AND LOCALITY.—Oligocene, Hsanda Gol formation.

GENERIC DIAGNOSIS.—Dentition $\frac{i.1.3.2}{i.1.3.2}$. Incisors small, crowded, ? reduced; canines of normal carnivore type, $p\frac{4}{4}$ molariform; p^2 and p_{2-3} simple, two-rooted, compressed, with sharp cusp and small posterior heel, p^3 with two external cusps. Molars of leptictid type, the trigonid of lower molars composed of two high round, twinned cusps and a small low paraconid, the heel rising sharply at posterior margin to a transverse crest, incompletely separated into hypoconid and entoconid. M_2 slightly larger than m_1, heel narrower than trigonid; m_1 with heel and trigonid of equal width; p_4 quite molariform (but the crown less worn and the tooth less fully emerged

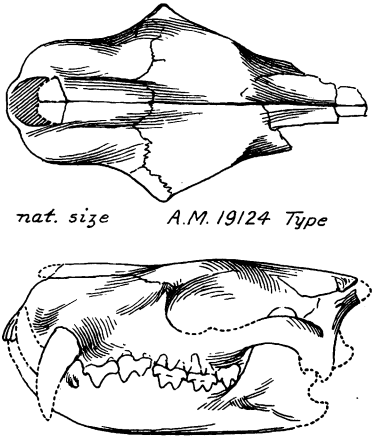

Fig. 1

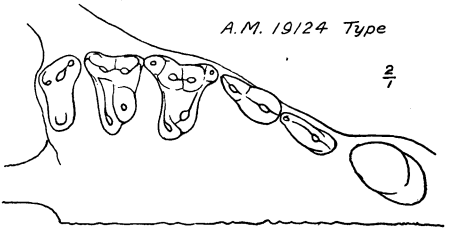

Fig. 2

Fig. 1. *Didymoconus colgatei*, skull and jaws, type specimen, side and top views. The original is somewhat broken and crushed and the distortion has been corrected in the drawing. Oligocene, Hsanda Gol formation, Mongolia. Natural size.

Fig. 2. *Didymoconus colgatei*, upper dentition, c^1-m^2. Principally from the type skull, supplemented by comparison of several referred specimens. Twice natural size.

from the jaw than the one behind it, and therefore assigned to the premolar series), the heel wider than trigonid, and paraconid a little stronger than on the true molars. Posterior mental foramen under p_3. Jaw short and deep with strongly sutured symphysis.

Upper molars transversely extended, m^1 consisting of a pair of separate subequal outer cusps, an inner conical protocone opposite the paracone and a strongly developed posterior cingular crest extending somewhat further inward than the protocone. On p^4 this posterior crest is represented chiefly by a posterointernal cusp with a rather rudimentary cingular crest extending from it toward the base of the metacone; the external stylar cusps, very rudimentaryon m^1, are quite distinct and the external cingulum, distinct on m^1, is obsolete. P^3 has two external cusps, the metacone much smaller.

SPECIFIC DIAGNOSIS.—Size of *Spilogale*, $c\text{-}m_2 = 28$ mm.; lower jaw, shallower, depth below $m_1 = 9$ mm.; lower canine, comparatively small and slender.

Didymoconus berkeyi, new species

TYPE.—No. 19001, lower jaws, from the same horizon and locality as the preceding.

SPECIFIC DIAGNOSIS.—Size of *Mephitis*, c-m_2 = 3.5 mm.; lower jaw, deep, robust; lower canines, very large and stout.

REMARKS.—This genus is unlike any known Oxyænidæ, and in some respects it has a marked resemblance to Mesonychidæ, in others to Leptictidæ. The formula is not so positively determined as one would like, nevertheless it seems almost sure that the first molariform tooth is a premolar (as in Leptictidæ). The true molars have almost lost their carnivore construction, nevertheless one can see in the pattern that it is a derivative of the oxyænid type of carnassiform teeth with the carnassial socket between m^1 and m^2; the great posterior crest of m^1 is evidently an exaggerated cingulum and without it the tooth would be much of the *Limnocyon* pattern.

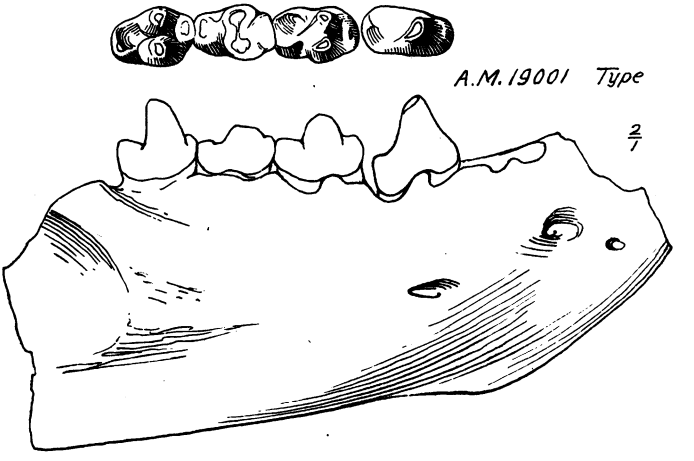

Fig. 3. *Didymoconus berkeyi*, lower jaw, type specimen, external view and crown view of teeth, p_3-m_2. Twice natural size.

In the lower molars the twinned conical cusps of the trigonid are leptictid in type, but the same construction is approached in *Dissacus* and *Hapalodectes* of the Mesonychidæ and in *Apterodon* among the hyænodonts. The short, heavy jaw, stout canines and massive compact symphysis are typically oxyænid, and the two subequal molars are as in the limnocyonines.

Amphicticeps shackelfordi, new genus and species

TYPE.—No. 19010, a skull.

HORIZON AND LOCALITY.—Oligocene, Hsanda Gol formation, Loh, Mongolia.

DIAGNOSIS.—Dentition $\frac{1.1.4.2}{1.1.4.2}$. Canines of moderate size. Premolar region rather short, premolars somewhat reduced, simple, stout, much as in *Cynodon*. P^4 fully carnassiform, protocone (deuterocone) anterointernal, well developed, forming a low, broad inner heel; no parastyle. M^1 large, much extended transverely, paracone close to antero-external margin, metacone only slightly smaller, more internal in position; protocone low and a heavy inner cingulum. M^2 quite small, aligned with inner margin of m^1, apparently not extending beyond inner half of the preceding tooth, the roots connate or single. Cranium wide and rather short, with heavy sagittal and occipital crests; basicranial region wide and short, tympanic bulla incomplete or loosely attached, paroccipital processes free, directed backward. Mastoid processes prominent, flattened and projecting laterally.

The lower jaw is very like that of *Cynodon*, except that the carnassial has a narrower and shorter heel with more distinct hypoconid crest and m_3 is absent. M_2 is not preserved in our specimens; its alveolus indicates a tooth of about the same size and proportions as in *Cynodon*, with connate roots.

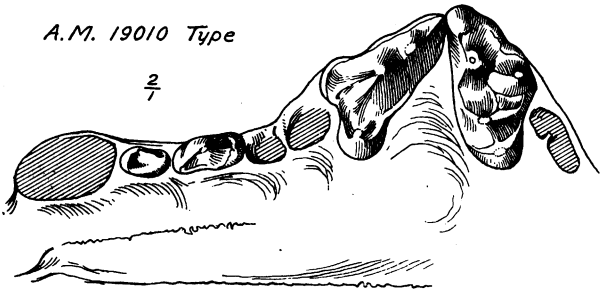

Fig. 4. *Amphicticeps shackelfordi*, upper jaw with the first, second and fourth premolars and first true molar preserved. From the type skull, No. 19010. Twice natural size.

This genus is intermediate between the cynodontoid and stenoplesictoid groups of the Phosphorite fauna. It has the sharply reduced post-carnassial dentition of the latter with the short, heavy precarnassial dentition of the former. It is not close to any one genus with which I have made comparisons and might be regarded as a highly progressive miacid rather than as a member of any of the existing families of fissipede carnivora.

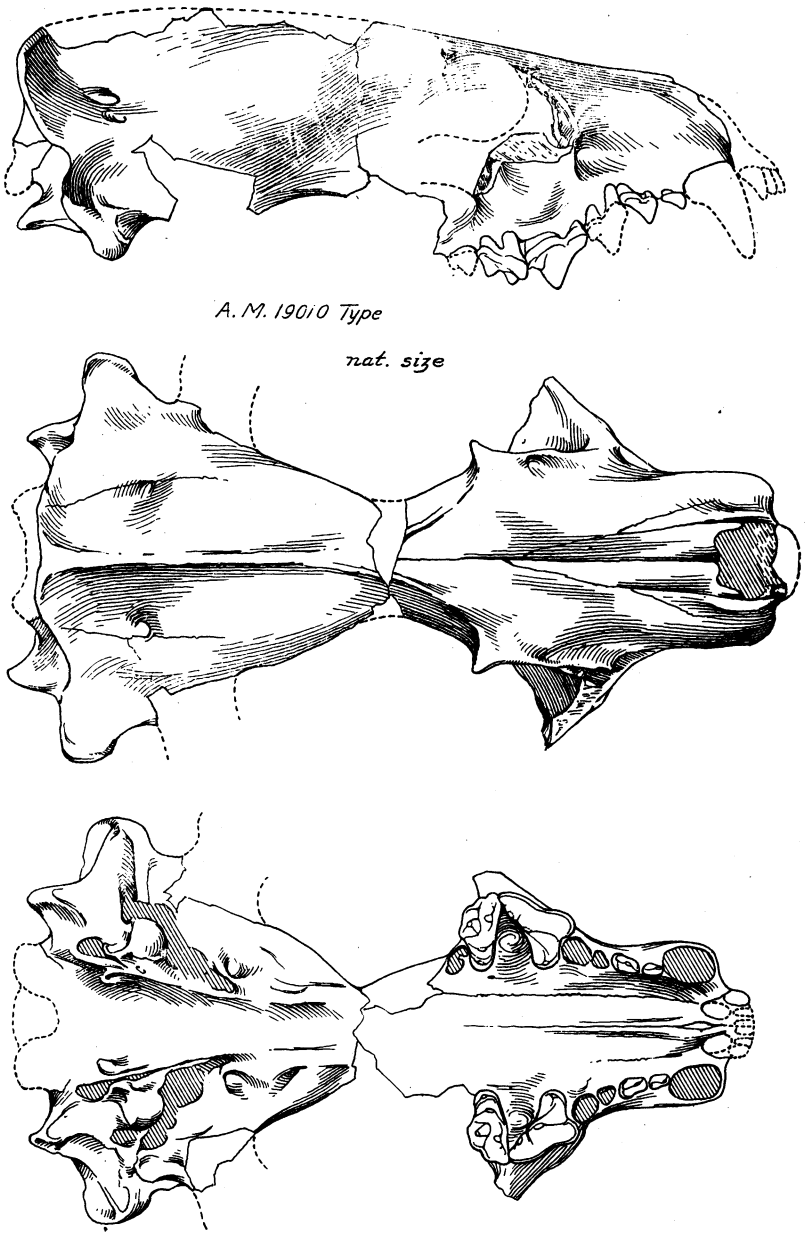

Fig. 5. *Amphicticeps shackelfordi*, type skull, side, top and palatal views. Natural size.

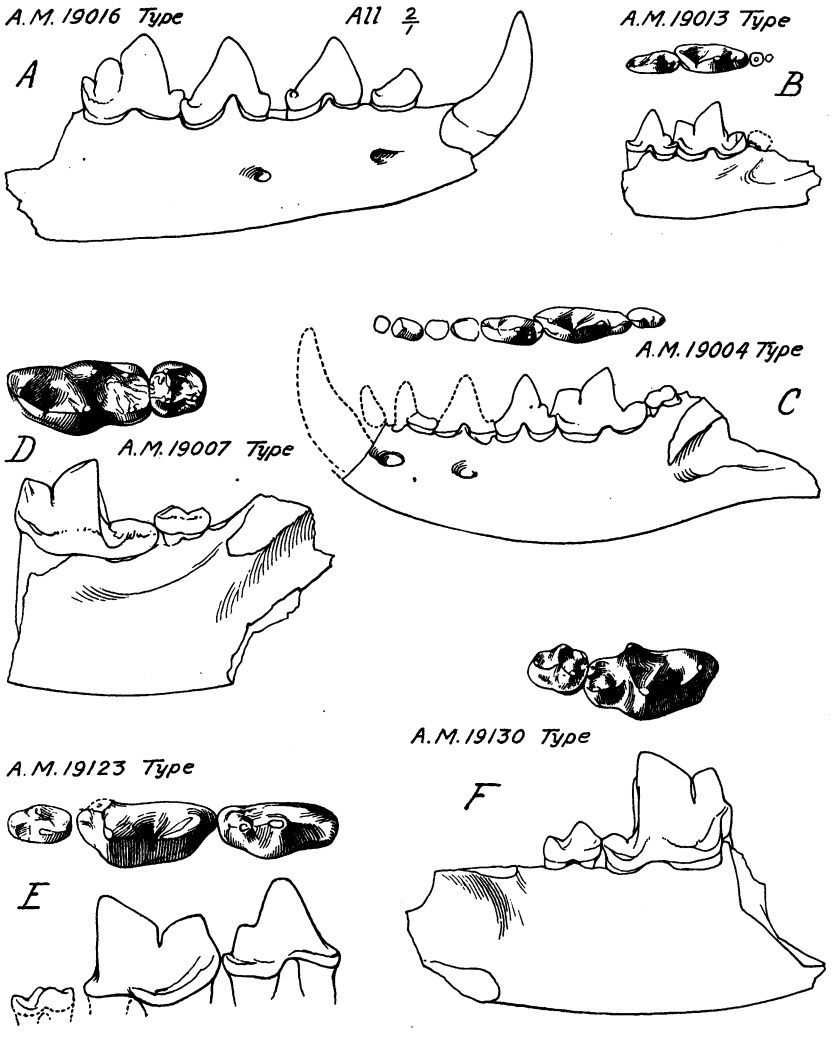

Fig. 6. Jaws of Carnivora from Hsanda Gol formation, external and crown views. *A*, ?*Cynodictis elegans*; *B*, *Bunælurus parvulus*; *C*, *Bunælurus ulysses*; *D*, *Cynodon* (*Pachycynodon*) *teilhardi*; *E*, *Palæoprionodon gracilis*; *F*, *Viverravus constans*. All twice natural size.

Palæoprionodon gracilis, new species

TYPE.—No. 19123, lower teeth and parts of skeleton.

HORIZON AND LOCALITY.—Oligocene, Hsanda Gol beds, Loh, Mongolia.

DIAGNOSIS.—Carnassial compressed, cat-like, with metaconid much reduced and heel vestigial. M_2 very small, narrow and elongate, with flattened trigonid of three low cusps and a trenchant heel. P_4 large, compressed much as in *Felis domestica.* Upper and lower canines subequal, very much alike, of moderate size, long, sharp-pointed, not compressed. Limb bones long and slender, humerus expanded trans-

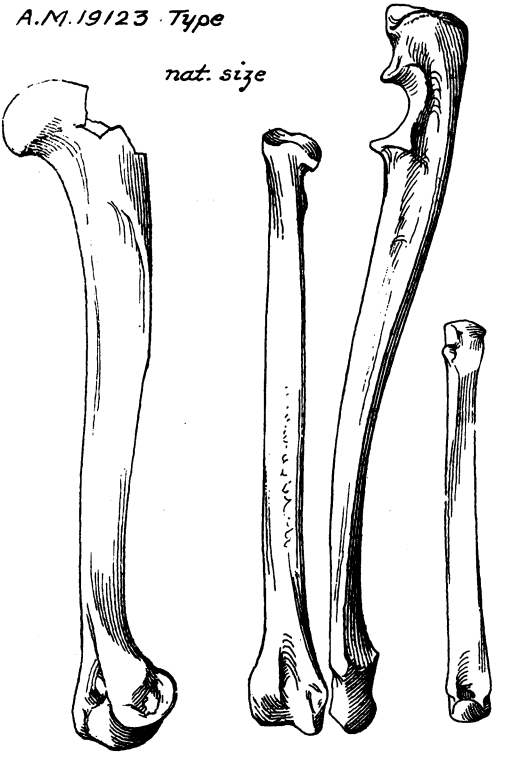

Fig. 7. *Palæoprionodon gracilis,* limb bones and metatarsal of the type specimen (teeth shown in Fig. 6); outer views of humerus, radius and ulna, anterior view of third metatarsal. Natural size.

versely at distal end with strong epicondylar bridge. Radius slender, ulna wide and flattened at proximal half of shaft, the distal half triangular, considerably less than radius in sectional area.

Astragalus with narrow deep trochlea, the inner crest well developed. No fibular facet on calcaneum. Metatarsals long and slender; mt. I, vestigial or absent.

This species agrees with the Phosphorite genus in dentition, so far as known, and in the character and proportions of the limbs and feet as figured and described by Schlosser; its reference, however, is provisional until the dentition is better known.

Bunælurus ulysses, new species

TYPE.—No. 19004, left ramus of lower jaw with p_4-m_2 l complete.

HORIZON AND LOCALITY.—Hsanda Gol formation, Loh, Mongolia.

DIAGNOSIS.—Dentition c_1, p_4, m_2. First premolar one-rooted, others two-rooted, the fourth with small accessory cusp. Carnassial without metaconid, heel narrow, trenchant; m_2 small, two-rooted with narrow trenchant crown. Length c-m_2, estimated, 25 mm.; p_4-m_2 12.5 mm.

Bunælurus parvulus, new species

TYPE.—No. 19013, part of lower jaw from Hsanda Gol formation.

DIAGNOSIS.—Very like the preceding species, but smaller; p_4-m_2 = 9.5 mm.

We have referred these species to the American genus *Bunælurus*, which is separable from *Palæogale* by retention of a minute m^2 in the upper jaw. As the upper dentition of the Mongolian species is unknown, they might be referred to *Palæogale*, but the reduction of m_2 is relatively greater than in *P. felina*, conforming somewhat better with *Bunælurus*.

Cynodon (Pachycynodon) teilhardi, new species

TYPE.—No. 19007, lower jaw fragment with m_{1-2} and alveolus of m_3.

HORIZON AND LOCALITY.—Oligocene, Hsanda Gol formation, Loh, Mongolia.

DIAGNOSIS.—Size of *Amphicticeps shackelfordi*. Carnassial somewhat less robust and with larger and longer heel, the heel as wide as the trigonid surface, a shallow basin with wrinkles radiating from anterointernal notch to the marginal crests. M_2 subquadrate with proto- and metaconid cusp, hypoconid cusps somewhat smaller, and an internal and posterior marginal crest enclosing a small basin. M_3 smaller than m_2, the crown not preserved, two closely approximate roots.

REMARKS.—This species can be referred only provisionally until better specimens are available. It appears to fall within *Pachycynodon* rather than the typical *Cynodon*, by Teilhard's key to the Phosphorite genera.

Cynodictis ? elegans, new species

TYPE.—No. 19016, anterior part of the lower jaws with the canine and premolars preserved.

HORIZON AND LOCALITY.—Oligocene, Hsanda Gol formation, Loh, Mongolia.

DIAGNOSIS.—Size about that of the smaller individuals of *C. compressidens*, but distinguished from this species, as also from the American "*Cynodictis*," by the simple compressed p_3 without accessory cusps. The accessory cusp of p_4 is strong, well

separated, and somewhat external in position. P_1 is single-rooted with compressed crown, anteriorly pitched and recurved at the tip; p_2 is two-rooted, nearly as large as p_3, both being compressed simple crowns, p_4 with some forward pitching and recurving tip, p_3 nearly upright. The canine is quite small, slender, the jaw shallow and thin with loose symphysis extending back to the middle of p_2.

REMARKS.—This species is provisionally referred in absence of the molar teeth. See below under *Viverravus*.

Viverravus constans, new species

TYPE.—No. 19130, part of lower jaw with m_{1-2} preserved.

HORIZON AND LOCALITY.—Oligocene, Hsanda Gol formation, Loh, Mongolia.

DIAGNOSIS.—Size somewhat less than *V. sicarius;* the teeth show the generic characters in the high, somewhat compressed trigonid with angulate cusps, pr^d overtopping the others, heel small, sharply trenchant; m_4 tuberculosectorial with rather high trigonal trigonid of three subequal cusps and narrow trenchant heel; m_3 absent. Considerably smaller than *V. antiquus* of the Phosphorites.

REMARKS.—The reference of this species to *Viverravus* is necessarily provisional, but it agrees quite closely so far as it goes. It is quite possible, however, that the anterior portion of lower jaws provisionally referred to *Cynodictis* is the same species as No. 19130; in which case it certainly is not *Viverravus*, as p_3 of that genus has always a strong accessory cusp.