

The most prominent Lagomorpha from the Oligocene and Early Miocene of Mongolia

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(With 16 figures and 1 table)

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Abstract

Lagomorpha are one of the most abundant and species-rich small mammal groups recovered from Oligocene and Early Miocene fossil localities of Mongolia. From numerous fossil beds of the Hsanda Gol and Loh Formations, 7 genera and 22 species were identified. The decrease and extinctions of the Oligocene genera *Desmatolagus*, *Ordolagus* and *Bohlinotona* in the Late Oligocene initiated the striking turnover of Lagomorpha-assemblages around the Oligocene-Miocene transition. Only *Sinolagomys* survived this critical period. Finally, Lagomorpha reached their highest diversities during the Early Miocene, when 3 new genera, *Amphilagus*, *Bellatona* and *Alloptox*, developed 9 new species.

Key words: Leporidae, Palaeolagidae, Ochotonidae, taxonomy, systematics, stratigraphy.

Kurzfassung

Hasenartige gehören zu den häufigsten und artenreichsten Kleinsäugetieren, die aus oligozänen und untermiozänen Fossilfundstellen der Mongolei bekannt wurden. Aus zahlreichen Fossilagen der Hsanda Gol- und Loh Formation wurden 7 Gattungen und 22 Arten geborgen. Mit Rückgang und Aussterben der oligozänen Gattungen *Desmatolagus*, *Ordolagus*, *Bohlinotona* im Oberoligozän setzte um die Wende Oligozän / Miozän eine markante Veränderung der Vergesellschaftung von Hasenartigen ein. Nur *Sinolagomys* überlebten diese kritische Periode. Schließlich erreichten die Hasenartigen im Untermiozän ihre größte Vielfalt, als sich drei neue Gattungen, *Amphilagus*, *Bellatona* und *Alloptox*, mit 9 Arten entwickelten.

Schlüsselwörter: Leporidae, Palaeolagidae, Ochotonidae, Taxonomie, Systematik, Stratigraphie.

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Introduction

Lagomorpha are one of the most abundant and species-rich small mammal groups from Oligocene and Early Miocene deposits in Mongolia. Since the 1920s, fossil remains of Lagomorpha were collected in Mongolia in the course of several international projects. The presently studied material stem from joint Mongolian-Austrian geoscientific projects conducted during eight field seasons since 1995. These cooperation projects (FWF: P-10505-GEO, P-15724-N06 and P-23061-N19) focused on an integrated geoscientific programme carried out in the Taatsiin Gol and Taatsiin Tsagaan Nuur area, part of the Valley of Lakes (Uvurkhangai Aimag).

Stratigraphic background

The Oligocene-Miocene sedimentary sequence of the Taatsiin Gol and Taatsiin Tsagaan Nuur area (Central Mongolia) is unique and important: here, the exposed sediments of the Hsanda Gol and the Loh Formations display imbedded basalt layers and fossil concentrations along caliche and paleosol horizons. In the frame of foregoing FWF-projects, a stratigraphic concept of the Oligocene and Miocene was elaborated which is based on the evolution of mammals (mainly rodents) and on radiometric ages of basalts (Tab. 1). Eight informal biozones were established: the biozones A, B, C, C1, D, D1/1, D1/2 and E. The Oligocene part of the sequence is indicated by fossils of biozones A, B, C, C1 and basalts I and II; the Miocene part is indicated by fossils of biozones D, D1/1, D1/2, E and basalt III. $^{40}\text{Ar} / ^{39}\text{Ar}$ -datings revealed three groups of basalt ages: the Early Oligocene basalt I group around 31.5 million years, the Late Oligocene basalt II group around 27–28 million years, and the Middle Miocene basalt III group around 13 million years ago (HÖCK *et al.* 1999; DAXNER-HÖCK & BADAMGARAV 2007; DAXNER-HÖCK *et al.* 2010; DAXNER-HÖCK *et al.* 2013). The basalt III (Middle Miocene) and fossils of biozone E (Late Miocene) are outside the scope of this issue. At present, the Taatsiin Gol and Taatsiin Tsagaan Nuur area serves as key area for Oligocene-Miocene stratigraphy of Mongolia and as a tie point for interregional correlations.

Material and methods

The fossils were collected from the surface of exposed deposits and by screen washing of about eighty tons of sediment from more than seventy fossil layers. For localization of fossil sites we refer to preceding (HÖCK *et al.* 1999; DAXNER-HÖCK & BADAMGARAV 2007). In the field-camp, jaws, teeth and bones were picked out from dry residues using head-lenses and field microscopes. The subsequent process of cleaning, identification, arrangement and drawing of fossils was done by the first author. All investigated and figured specimens are catalogued and housed in the collection of the Natural History Museum, Department of Geology & Palaeontology, Vienna (coll. NHMW). One reference number is attributed per species and per level. A second rich Lagomorpha collection

from the identical fossil sites is housed in the Mongolian Paleontological Center, Academy of Sciences, Ulaanbaatar (coll. MPC). For classification above genus level we follow MC KENNA & BELL (1997) in part, and ERBAJEVA (1988).

Oligocene-Miocene biostratigraphy of the Taatsiin Gol area reflected in lagomorphs

From the Oligocene and Early Miocene of Mongolia, three families and seven genera of Lagomorpha were identified, *i.e.*, Leporidae (*Ordolagus*), Palaeolagidae (*Desmatolagus* and *Amphilagus*) and Ochotonidae (*Bohlinotona*, *Sinolagomys*, *Bellatona* and *Alloptox*). Together they comprise twentytwo species. Moreover, several so far unspecified Lagomorpha of the *Desmatolagus*-, *Sinolagomys*- and *Bohlinotona*-groups will be described later in follow-up issues.

The presently investigated taxa are:

Genus *Ordolagus* DE MUIZON, 1977

Ordolagus cf. *teihardi* (BURKE, 1941)

Genus *Desmatolagus* MATTHEW & GRANGER, 1923

Desmatolagus gobiensis MATTHEW & GRANGER, 1923

Desmatolagus robustus MATTHEW & GRANGER, 1923

Desmatolagus youngi (GUREEV, 1960)

Desmatolagus cf. *vetustus* BURKE, 1941

Desmatolagus cf. *simplex* (ARGYROPULO, 1940)

Desmatolagus cf. *shargaltensis* BOHLIN, 1937

Desmatolagus cf. *chinensis* ERBAJEVA & SEN, 1998

Desmatolagus cf. *orlovi* (GUREEV, 1960)

Genus *Amphilagus* POMEL, 1853

Amphilagus orientalis ERBAJEVA, 2013

Amphilagus plicadentis ERBAJEVA, 2013

Amphilagus magnus ERBAJEVA, 2013

Genus *Bohlinotona* DE MUIZON, 1977

Bohlinotona cf. *pusilla* (TEILHARD DE CHARDIN, 1926)

Genus *Sinolagomys* BOHLIN, 1937

Sinolagomys kansuensis BOHLIN, 1937

Sinolagomys major BOHLIN, 1937

Sinolagomys ulungurensis TONG, 1989

Genus *Bellatona* DAWSON, 1961

Bellatona cf. *kazakhstanica* ERBAJEVA, 1988

Bellatona yanghuensis ZHOU, 1988

Bellatona cf. *forsythmajori* DAWSON, 1961

Bellatona sp.

Genus *Alloptox* DAWSON, 1961

Alloptox gobiensis (YOUNG, 1932)

Alloptox cf. *minor* LI, 1978

The characteristic Lagomorpha genera of the Oligocene in Mongolia are *Desmatolagus* (range: biozone A to C1), *Ordolagus* (range: biozone A to C1) and *Bohlinotona* (range: biozone C to C1). The long-lived genus *Sinolagomys* ranges from the Early Oligocene to the Early Miocene (range: biozone B to D). The Early Miocene genera are *Bellatona*, *Amphilagus* and *Alloptox*, of which *Bellatona* and *Amphilagus* have their first occurrences at the Oligocene-Miocene transition (biozone: C1–D). The last occurrence of *Amphilagus* is evidenced from biozone D, and the last occurrence of *Bellatona* from biozone D1/1. Finally, *Alloptox*, ranging from biozone D to D1/2 has its first occurrence in Unkheltseg (UNCH-A/4: it is the youngest assemblage of biozone D). The majority of the Oligocene genera disappeared in the course of the Oligocene, other genera occur first at the Oligocene-Miocene transition (biozone C1–D) and in the course of the earliest Miocene (biozone D).

The species diversity was low in the early Early Oligocene (five species of biozone A), it increased in the late Early Oligocene, and reached its maximum at the beginning of the Miocene (ten species of biozone D). *Desmatolagus gobiensis*, *Desmatolagus* cf. *orlovi*, *Desmatolagus youngi* (Early Oligocene: biozone A), *Desmatolagus gobiensis* (Late Oligocene: biozone C), *Sinolagomys ulungurensis* and *Amphilagus orientalis* (early Early Miocene: biozone D) and *Alloptox gobiensis* (middle to late Early Miocene: biozone: D1/1 to D1/2) are very abundant. The majority of species, however, is represented by one to ten fossil remains per assemblage. These latter species were exclusively found by wet screening of bulk samples. The dramatic decrease of species numbers toward the end of the Early Miocene may be explained as a result of small sample sizes, and the relatively low number of investigated fossil sites from this time interval.

Decrease and extinctions of the Oligocene genera *Desmatolagus*, *Ordolagus*, *Bohlinotona* initiated the striking turnover of Lagomorpha-assemblages around the Oligocene-Miocene transition. Only *Sinolagomys* survived this critical period. Finally, the lagomorphs reached their new diversities during the Early Miocene, when nine new species of the genera *Amphilagus*, *Bellatona* and *Alloptox* developed.

Systematic palaeontology

Order Lagomorpha BRANDT, 1855

Family Leporidae FISCHER, 1817

Genus *Ordolagus* DE MUIZON, 1977

1977 *Ordolagus* gen. nov. – DE MUIZON: 266–268, figs 1, 2.

1941 *Gobiolagus* gen. nov. – BURKE: 5, fig. 6.

1986 *Ordolagus*. – HUANG: 275, 282, figs 1, 3.

Type species: *Ordolagus teilhardi* (BURKE, 1941)

Stratigraphic range: Late Oligocene

Dental characters: Teeth large to medium size; hypsodont, wider than long. P2: anterior fold with cement. P3: molariform; occlusal surface (oval) resembles P4–M2. P4–M2: external walls of teeth covered by enamel band; occlusal surface concave (variable degree). M3: relatively small, one relatively wide column. p3: longer than wide; moderately narrow postero-external fold filled with thin cement. p4–m2: trigonid and talonid lingually connected by narrow band of enamel.

Referred species / type localities:

- *Ordolagus* cf. *teilhardi* (BURKE, 1941) from Hsanda Gol (Mongolia); Oligocene.

Ordolagus cf. *teilhardi* (BURKE, 1941)

(Figs. 1/1–3)

Occurrences of *O.* cf. *teilhardi* in Mongolia (Valley of Lakes, Uvurkhangai Aimag). ERBAJEVA (2007: table 1). Stratigraphic range: Early Oligocene to Late Oligocene (biozone A to C1).

Early Oligocene (biozone A): Tatal Gol (TAT-D/1: NHMW2011/0201/0003).

Early Oligocene (biozone B): Hsanda Gol (SHG-A surface; SHG-AB surface: NHMW2011/0199/0002; SHG-AB surface: NHMW2013/0315/0000; Ikh Argalatyn Nuruu (IKH-A/1–2: NHMW2011/0199/0001, NHMW2011/2200/0001–0002).

Late Oligocene (biozone C or C1): Toglorhoi (TGW-A surface: NHMW2011/0198/0001), Del (DEL-B/12: NHMW2013/0382/0000).

Dental characters: The main dental structures are identical with the genus.

Upper teeth: labially curved shaft. P3 and P4: occlusal surface almost flat. M1 and M2: occlusal surface with visible depression. p3: relatively large, with variable anterior margin of tooth; one or two shallow folds, or fold lacking. m1: largest tooth of lower tooth-row. m3: smallest tooth of lower-tooth row. Trigonid of lower teeth: much wider and larger than talonid; united by narrow band of enamel.

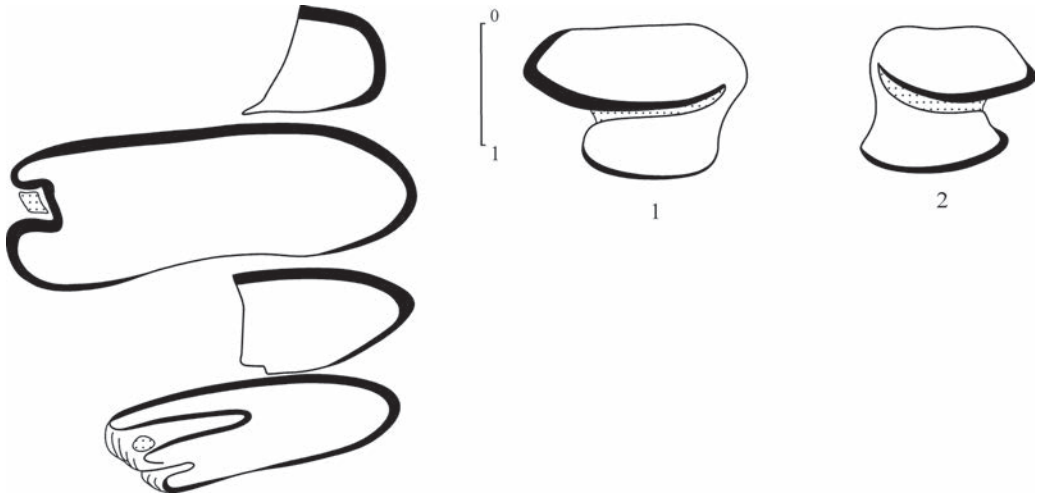


Fig. 1. *Ordolagus* cf. *teilhardi* (BURKE, 1941) from the Valley of Lakes in Mongolia. 1: Right P3–M2 (damaged) (NHMW2011/0201/0003) from Tatal Gol (TAT-D/1), Early Oligocene (biozone A). 2: Left m1 (NHMW2011/0198/0001) from Toglorhoi (TGW-A surface), Late Oligocene (biozone C or C1). 3: Right m2 (NHMW2011/0199/0001) from Ikh Argalatyn Nuruu (IKH-A/1–2), Early Oligocene (biozone B).

Remarks: *Ordolagus* cf. *teilhardi* resembles the type material by the general pattern of the lower teeth, but differs by slightly larger size and by the shape of p3. Other than the short, rounded p3 of the type specimen, the large Mongolian p3 has a variable anterior margin.

Family Palaeolagidae DICE, 1929

Subfamily Desmatolaginae BURKE, 1941

Genus *Desmatolagus* MATTHEW & GRANGER, 1923

- 1923 *Desmatolagus* gen. nov. – MATTHEW & GRANGER: 1923: 8–10.
 1937 *Desmatolagus* – BOHLIN: 16–31, figs 11–49
 1942 *Desmatolagus* – BOHLIN: 70–79, figs 17, 22, 23.
 1941 *Desmatolagus* – BURKE: 13–21, figs. 7–9.
 1960 *Desmatolagus* – GUREEV: 12–29, figs 4–10.
 1975 *Desmatolagus* – SYCH: 184–193, pl. LII, figs 1–4, pl. LIII, figs 1–3, pl. LIIV, figs 1–3.

Stratigraphic range: Late Eocene to Late Oligocene.

Dental characters: Teeth either small, of medium-size or large. Upper teeth: unilateral hypsodont; three roots: two small lateral, one large internal. P2: small, with two anterior folds. P3: three cones separated by reentrant folds with or without cement; internal and middle cones large; external cone small; paraflexus deep; anteroloph short. P4: large, rectangular. M1, M2: smaller than P4; postero-external corner reduced. M3: small.

p3: variable morphology; triangular; shaft of some teeth with antero-external cingulum of variable size; antero-external fold with or without cement. p4–m2: two roots; trigonid wider and shorter than talonid; talonid of young individuals with hypoconulid. m3: small; two conids (MATTHEW & GRANGER 1923: 10–12; BOHLIN 1937: 15–17; BURKE 1941: 13–14).

Referred species / type localities:

- *D. gobiensis* MATTHEW & GRANGER, 1923 from Hsanda Gol (Mongolia); Early Oligocene (type species).
- *D. robustus* MATTHEW & GRANGER, 1923 from Hsanda Gol (Mongolia); Early Oligocene.
- *D. shargaltensis* BOHLIN, 1937 from Shargaltein Tal (China); Late Oligocene.
- *D. simplex* (ARGYROPULO, 1940) from Akespe (Kazakhstan); Late Oligocene
- *D. vetustus* BURKE, 1941 from Jhama Obo (Inner Mongolia, China); Late Eocene.
- *D. youngi* (GUREEV, 1960) from Tatal Gol (Mongolia); Oligocene.
- *D. orlovi* (GUREEV, 1960) from Tatal Gol (Mongolia); Late Oligocene.
- *D. chinensis* ERBAJEVA & SEN, 1998 from San-Tao-ho (= Saint-Jaques) (China); Late Oligocene.

***Desmatolagus gobiensis* MATTHEW & GRANGER, 1923**

(Figs. 2/1–2)

Occurrences of *Desmatolagus gobiensis* in Mongolia (Valley of Lakes, Uvurkhangai Aimag). ERBAJEVA (2007: table 1).

Stratigraphic range: Early Oligocene to Late Oligocene (biozone A to C).

Early Oligocene (biozone A): Taatsiin Gol (TGR-A/13: NHMW2013/0316/0000), Tatal Gol (TAT-D/1: NHMW2013/0111/0001); TAT-C/1, TAT-C/2: NHMW2013/0317/0000).

Early Oligocene (biozone B): Taatsin Gol (TGR-B/1: NHMW2013/0318/0000; TGR-AB/21: NHMW2013/0319/0000).

Late Oligocene (biozone C): Toglorhoi (TGW-A/2, TGW-A/2a, TGW-A/2b: NHMW2013/0320/0000; TGW-A surface: NHMW2011/0198/0001; biozone C-?C1); Taatsin Gol (TGR-C/2, TGR-C/1, TGR-C/1–2: NHMW2013/0321/0000), Unzing Khurem (TAR-A/2: NHMW2013/0322/0000).

Dental characters: Teeth of medium size. Upper teeth: partially (= unilateral) hypsodont; three roots: two small lateral and one large internal. P2: relatively small with two anterior folds. P3: occlusal surface variable; three cones: internal and middle cones large; external cones small, separated by reentrant folds; deep internal fold filled with thick cement; shallow external fold without cement; anteroloph short. P4, M1: rectangular; short hypostria of young individuals. M2: postero-external corner rounded. M3: reduced. p3: small, triangular; anteriorly sharp; antero-external fold without cement.

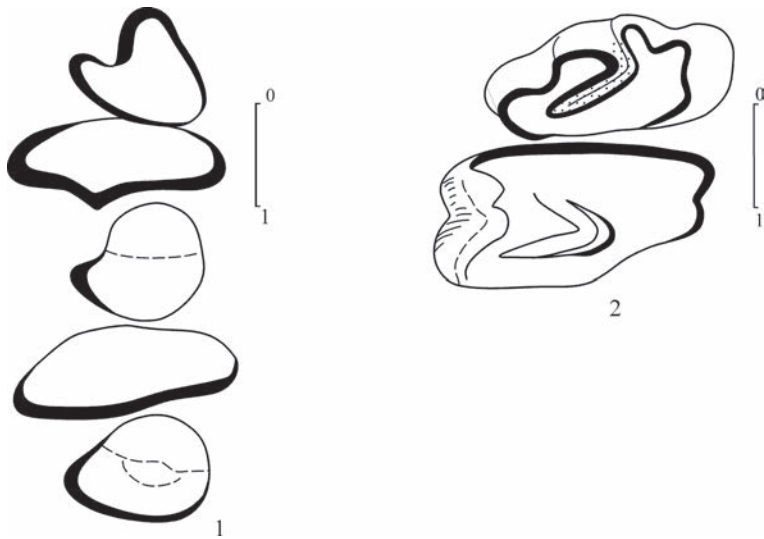


Fig. 2. *Desmatolagus gobiensis* MATTHEW & GRANGER, 1923 from Tatal Gol (TAT-D/1), the Valley of Lakes in Mongolia. Early Oligocene (biozone A). 1: Left p3–m1 (NHMW2013/0111/0001). 2: Right P3–P4 (NHMW2013/0111/0002)

p4–m2: trigonid wider and much shorter than talonid; short hypoconulid. m3: small, reduced.

Remarks: *D. gobiensis* from Mongolia resembles the type material by size, general tooth pattern and by variable structures of p3 and of mandibles.

***Desmatolagus robustus* MATTHEW & GRANGER, 1923**

(Figs. 3/1–2)

Occurrences of *D. robustus* in Mongolia (Valley of Lakes, Uvurkhangai Aimag). ERBAJEVA (2007: table 1).

Stratigraphic range: Early Oligocene (biozone B).

Early Oligocene (biozone B): Taatsin Gol (TGR-AB/21: NHMW2013/0323/0000), Del (DEL-B/7: NHMW2013/0324/0000), Ikh Argalatyn Nuruu (IKH-A/1–2: NHMW2013/0208/0001–0002).

Dental characters: Teeth large, robust. Upper teeth: partially hypsodont; three roots: two relatively large lateral roots and one very large internal root. P3: occlusal surface of variable shape; three cones separated by reentrant folds; deep internal fold filled with thick cement; shallow external fold without or few cement; anteroloph short. P4: rectangular. M1, M2: postero-external edge rounded, postero-internally inclined; upper teeth of young individuals with short hypostria. p3: large, triangular; anteriorly rounded; antero-external fold without cement. p4–m2: trigonid wider than rounded talonid.

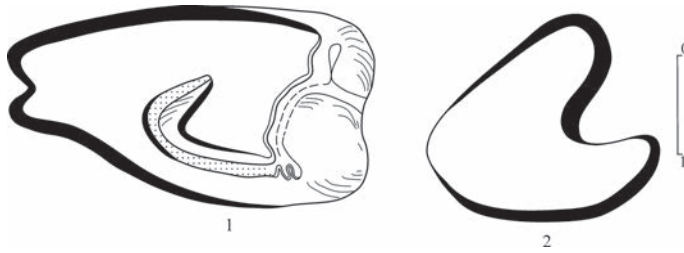


Fig. 3. *Desmatolagus robustus* MATTHEW & GRANGER, 1923 from the Valley of Lakes in Mongolia. Early Oligocene (biozone B). 1: Left P4 (NHMW2013/0208/0001) from Ikh Argalatyn Nuruu (IKH-A/1–2). 2: Right p3 (NHMW2013/0208/0002) from Ikh Argalatyn Nuruu (IKH-A/1).

Remarks: *Desmatolagus robustus* of Mongolia resembles the type material by size and general pattern of upper teeth, but differs by the structure of p3. The holotype of *D. robustus* has a peculiar p3 with straight anterior margin.

***Desmatolagus youngi* (GUREEV, 1960)**

(Figs. 4/1–2)

Occurrences of *D. youngi* in Mongolia (Valley of Lakes, Uvurkhangai Aimag). ERBAJEVA (2007: table 1). Stratigraphic range: Early Oligocene (biozone A to B).

Early Oligocene (biozone A): Tatal Gol (TAT-D/1, TAT-D/ surface: NHMW 2011/0209/0003–0011), Tatal Gol (TAT-C/2: NHMW 2011/0209/0001), Hsanda Gol (SHG-C/1: NHMW 2011/0206/0004).

Early Oligocene (biozone B): Tatal Gol (TAT-D/2: NHMW2013/0326/0000), Del (DEL-B/7: NHMW2013/0327/0000).

Dental characters: Teeth large. Upper teeth: partially hypsodont; three roots: one large internal and two slightly smaller lateral roots. P3: of variable occlusal outline; three cones separated by reentrant folds; deep internal fold filled with thick cement; shallow external fold without cement; anteroloph short; P4–M2: rectangular. M2: postero-external corner slightly postero-internally inclined. Upper teeth of young individuals with short internal hypostria. p3: large, triangular; prominent anterior margin rounded; antero-external fold without cement. p4–m2: robust; trigonid wider than talonid.

Remarks: *Desmatolagus youngi* of Mongolia resembles the type material by size, by general dental structures of upper teeth and p3, but differs by variable features of p3.

***Desmatolagus cf. vetustus* BURKE, 1941**

(Fig. 5/1–2)

Occurrences of *Desmatolagus cf. vetustus* in Mongolia (Valley of Lakes, Uvurkhangai Aimag). ERBAJEVA (2007: table 1). Stratigraphic range: Early Oligocene (biozone A).

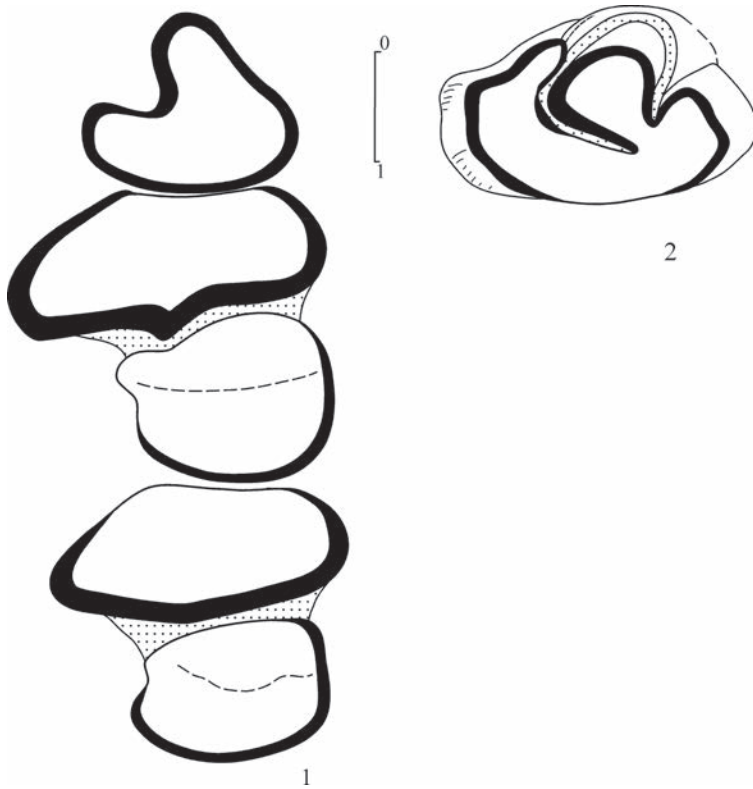


Fig. 4. *Desmatolagus youngi* (GUREEV, 1960) from Tatal Gol (TAT-D/1), the Valley of Lakes in Mongolia. Early Oligocene (biozone A). 1: Left p3–m1 (NHMW2011/0209/0011). 2: Left P3 (NHMW2011/0209/0005).

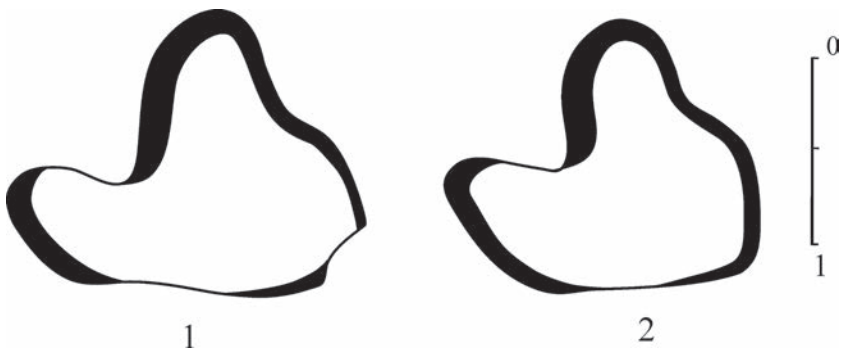


Fig. 5. *Desmatolagus* cf. *vetustus* (BURKE, 1941) from the Valley of Lakes in Mongolia. Early Oligocene (biozone A). 1: Left p3 (NHMW2013/0328/0001) from Tatal Gol (TAT-D/1). 2: Left p3 (NHMW2013/0329/0001) from Taatsin Gol (TGL-A/2).

Early Oligocene (biozone A): Tatal Gol (TAT-D/1: NHMW2013/0328/0001), Taatsin Gol (TGL-A/2: NHMW2013/0329/0001), unnamed locality (GRAB-II/2: NHMW2013/0330/0000), Khongil (HL-A/1: NHMW2013/0331/0000).

Dental characters: Teeth relatively low-crowned and robust, of medium size. dP2: two roots; occlusal surface with two shallow folds without cement. P2: rounded; three cones: internal and middle cones large, external cone small; separated by reentrant folds without cement. p3: triangular, with rounded anterior margin; antero-internal margin with shallow depression; antero-external fold without cement. p4–m2: trigonid significantly wider than talonid; hypoconulid well preserved in young individuals.

Remarks: *Desmatolagus* cf. *vetustus* of Mongolia resembles the type material by the occlusal outline of teeth and by general dental structures, but differs by slightly larger size.

***Desmatolagus* cf. *simplex* (ARGYROPULO, 1940)**

(Figs. 6/1–2a)

Occurrences of *D.* cf. *simplex* in Mongolia (Valley of Lakes, Uvurkhangai Aimag). ERBAJEVA (2007: table 1). Stratigraphic range: Oligocene (biozone B to C).

Early Oligocene (biozone B): Uncheltseg (UNCH-A/4B, UNCH-A/3B: NHMW2013/0332/0000).

Late Oligocene (biozone C): Taatsin Gol (TGR-C/1–2: NHMW2013/0333/0001–0002).

Dental characters: Teeth small; P2: small, three equally sized large cones, separated by reentrant folds without cement; relatively wide cingulum joins base of external and internal cones across from anterior margin of tooth; anterior cingulum present on P3; p3: triangular; anterior margin varies from slightly sharp to rounded; antero-external fold without cement; antero-internal margin of tooth almost straight, with cingulum.

Remarks: *Desmatolagus* cf. *simplex* of the Mongolian material resembles the type material by tooth sizes and by p3 with a cingulum. It differs, however, by variable structures of the occlusal surface.

***Desmatolagus* cf. *shargaltensis* BOHLIN, 1937**

(Fig. 7)

Occurrences of *D.* cf. *shargaltensis* in Mongolia (Valley of Lakes, Uvurkhangai Aimag). ERBAJEVA (2007: table 1). Stratigraphic range: Late Oligocene.

Late Oligocene (biozone C): Unzing Khurem (TAR-A/2: NHMW2013/0110/0001).

Dental characters: Teeth medium-sized. P2: rounded; three cones: large internal and middle cones, a rudimentary external cone; cones separated by reentrant folds, filled with little cement. p3: slightly robust; of triangular occlusal outline; relatively prominent; rounded anterior margin; antero-external fold filled with cement; antero-internal margin almost straight.

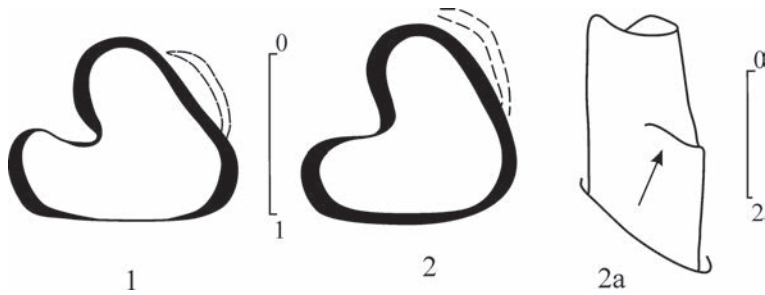


Fig. 6. *Desmatolagus* cf. *simplex* (ARGYROPULO, 1940) from Taatsiin Gol (TGR-C/1–2), the Valley of Lakes in Mongolia. Late Oligocene (biozone C). 1: Left p3 (NHMW2013/0333/0001). 2: Left p3 (NHMW2013/0333/0002); 2a: antero-labial view, arrow shows the cingulum.

Remarks: *Desmatolagus* cf. *shargaltensis* of Mongolia resembles the type material by dental structures and size of p3, but differs by a tiny cingulum on the shaft of p3.

***Desmatolagus* cf. *chinensis* ERBAJEVA & SEN, 1998**

Occurrences of *Desmatolagus* cf. *chinensis* in Mongolia (Valley of Lakes, Uvurkhangai Aimag). ERBAJEVA (2007: table 1). Stratigraphic range: Late Oligocene (biozone C-C1).

Late Oligocene (biozone C): Toglорhoi (TGW-A/2b, TGW-A surface: NHMW2013/0334/0000), Taatsin Gol right (TGR-C/1, TGR-C/7: NHMW2013/0335/0000).

Late Oligocene (biozone C1): Loh (LOH-C/1: NHMW2013/0336/0000).

Dental characters: Teeth small, hypsodont. p3: of triangular occlusal outline; top relatively rounded; antero-external fold without cement, slightly undulated; internal margin of tooth variable from straight to slightly concave. p4–m2: trigonid much wider and shorter than talonid.

Remarks: *Desmatolagus* cf. *chinensis* of Mongolia resembles *Desmatolagus chinensis* by tooth sizes and by the general structures of p4 and m2, but species identification remains questionable because, from the type material, no p3 is preserved and available for comparisons.

***Desmatolagus* cf. *orlovi* (GUREEV, 1960)**

(Fig. 8)

Occurrences of *Desmatolagus* cf. *orlovi* in Mongolia (Valley of Lakes, Uvurkhangai Aimag). ERBAJEVA (2007: table 1). Stratigraphic range: Early Oligocene to Late Oligocene (biozone A to C1).

Early Oligocene (biozone A): Hsanda Gol (SHG-C/2: NHMW2013/0337/0001), Tatal Gol (TAT-D/1: NHMW2013/0338/0000; TAT-C/2: NHMW2013/0339/0000).

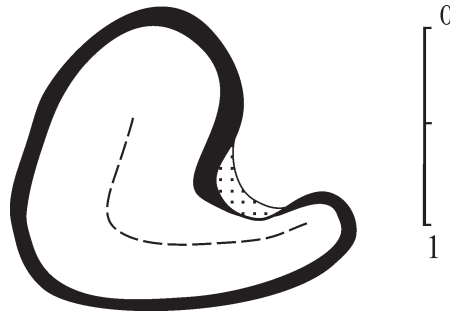


Fig. 7. *Desmatolagus* cf. *shargaltensis* (BOHLIN, 1937) from Unzing Khurem (TAR-A/2), the Valley of Lakes in Mongolia. Late Oligocene (biozone C). Right p3 (NHMW2013/0110/0001).

Early Oligocene (biozone B): Taatsin Gol (TGR-B/1: NHMW2013/0383/0000).

Late Oligocene (biozone C): Taatsin Gol (TGR-C/2, TGR-C/1: NHMW2013/0340/0000); Unzing Khurem (TAR-A/2: NHMW2013/0112/0001–0000); Toglorhoi (TGW-A surface: NHMW2013/0341/0000).

Late Oligocene (biozone C1): Toglorhoi (TGW-A/4–5: NHMW2013/0342/0000).

Dental characters: Tooth-size varies from small to medium; hypsodont molars. p3: of triangular occlusal outline; relatively prominent; sharp anterior margin; anterior part of internal border inclined, with shallow depression; posterior part of internal border almost straight, with small fold in postero-internal edge; antero-external fold without cement. p4–m2: trigonid wider and shorter than talonid; talonid large, rounded.

Remarks: *Desmatolagus* cf. *orlovi* of Mongolia resembles the type material by size and by the general dental pattern, but displays more variable structures of p3.

Subfamily Amphilaginae GUREEV, 1953

Genus *Amphilagus* POMEL, 1853

1853 *Amphilagus* gen. nov. – POMEL: 42–43.

1974 *Amphilagus*. – TOBIEN: 107–108.

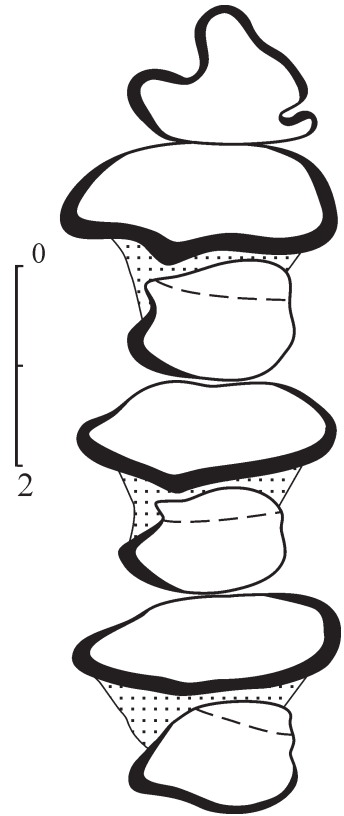
Stratigraphic range: Late Oligocene (Chattian) to early Late Miocene (Vallesian).

Dental characters: Teeth large to medium-sized; partial hypsodonty of upper teeth; three roots: laterally two small roots, one large internal root. P2: with two anterior folds. P3: three cones separated by reentrant folds; internal fold (paraflexus) deep, filled with thick cement; external fold shallow, without cement. p3: variable shape; antero-external fold filled with cement. p4–m2: two roots; trigonid significantly wider than talonid; talonid rounded; young individuals display hypoconulid (POMEL 1853: 43; TOBIEN 1974:107).

Fig. 8. *Desmatolagus* cf. *orlovi* (GUREEV, 1960) from Hsanda Gol (SHG-C/2), the Valley of Lakes in Mongolia. Early Oligocene (biozone A). Left p3–m2 (NHMW2013/0337/0001).

Referred species / type localities:

- *A. antiquus* POMEL, 1853 from Langy and Volvic [lectotype from Coderet] (France); Late Oligocene (type species).
- *A. fontannesi* (DEPERET, 1887) from La Grive St. Alban (France); Middle Miocene.
- *A. magnus* ERBAJEVA, 2013 from Unkheltseg (Mongolia); Early Miocene.
- *A. orientalis* ERBAJEVA, 2013 from Hotuliin Teeg (Mongolia); Early Miocene.
- *A. plicadentis* ERBAJEVA, 2013 from Unkheltseg (Mongolia); Early Miocene.
- *A. ulmensis* TOBIEN, 1974 from Tomerdingen (Germany); Early Miocene.
- *A. wuttkei* MÖRS & KALTHOFF, 2010 from Enspel (Germany); Late Oligocene.



***Amphilagus magnus* ERBAJEVA, 2013**

(Figs. 9/1–2)

Occurrences of *Amphilagus magnus* in Mongolia (Valley of Lakes, Uvurkhangai Aimag). ERBAJEVA (2013: 316). Stratigraphic range: Oligocene-Miocene transition to Early Miocene (biozone C1–D to D).

Oligocene-Miocene transition (biozone C1–D): Hotuliin Teeg (HTS-056: NHMW2013/0347/0000); Huch Teeg (RHN-022: NHMW2013/0348/0000).

Early Miocene (biozone D): Unkheltseg (UNCH-A/3, UNCH-surface; NHMW2011/0211/0001–0012); Huch Teeg (RHN-A/12, RHN-020: NHMW2013/0384/0000); Hotuliin Teeg (HTE-surface: NHMW2011/0213/0001–0006; HTE-008: NHMW2013/0349/0000; HTE-005: NHMW2013/0350/0000; HTE-014–17: NHMW2013/0351/0000); Luuny Yas (LUS-078: NHMW2013/0352/0000).

Dental characters: Large tooth size; partial hypsodonty. Upper teeth with three roots: two small lateral and one large internal. P3: three cones: large internal cone from which anteroloph extends to the half width of tooth, middle cone slightly smaller, and external cone smallest. Cones separated by two folds: deep internal reentrant fold (= paraflexus) filled with thick cement, and shallow external fold without cement. Protocone

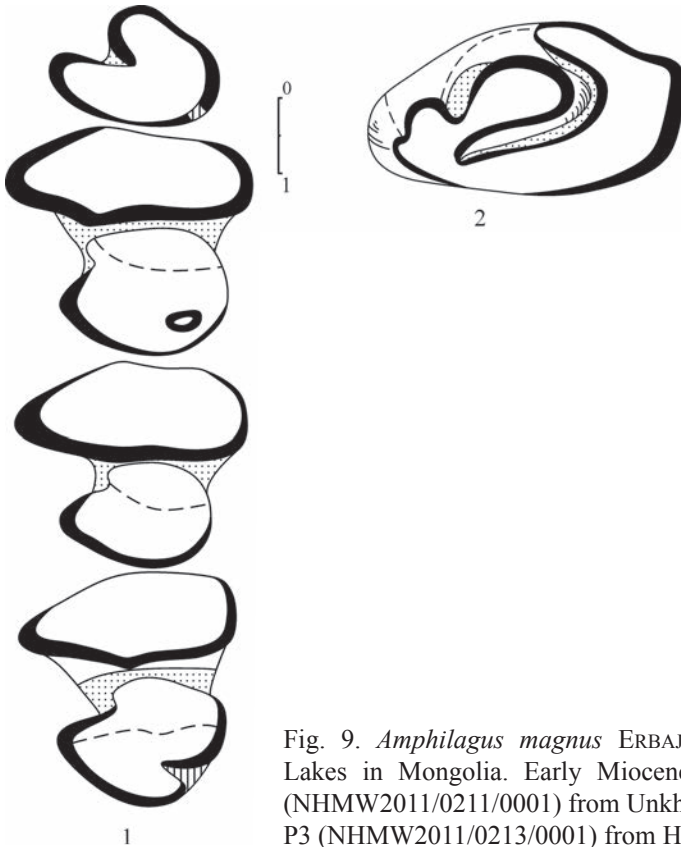


Fig. 9. *Amphilagus magnus* ERBAJEVA, 2013 from the Valley of Lakes in Mongolia. Early Miocene (biozone D). **1:** Left p3–m2 (NHMW2011/0211/0001) from Unkheltseg (UNCH-surface). **2:** Right P3 (NHMW2011/0213/0001) from Hotuliin Teeg (HTE-surface).

and hypocone are equal in size. P4–M1: shallow hypostria with little cement. p3: one column with root; occlusal surface triangular with rounded edges; small cingulid in front of column halfway between occlusal surface and tip of root; antero-external fold filled with little cement. Dentary robust, external side weakly convex below p4.

Remarks: *Amphilagus magnus* differs from all known species by the larger size and presence of a small cingulid of p3.

***Amphilagus orientalis* ERBAJEVA, 2013**

(Figs. 10/1–2)

Occurrences of *Amphilagus orientalis* in Mongolia (Valley of Lakes, Uvurkhangai Aimag). ERBAJEVA (2013: 311). Stratigraphic range: Early Miocene (biozone D).

Hotuliin Teeg (HTE surface: NHMW2011/ 0214/0001–0034; HTE-005: NHMW2013/0343/0000); Luuny Yas (LUS-028, LUS-027: NHMW2013/0344/0000).

Dental characters: Teeth medium-sized. Upper teeth: partially hypsodont; three roots: two small lateral, one large internal. P3: three cones; internal cone largest, middle cone slightly smaller, external cone small; cones separated by two anterior reentrant

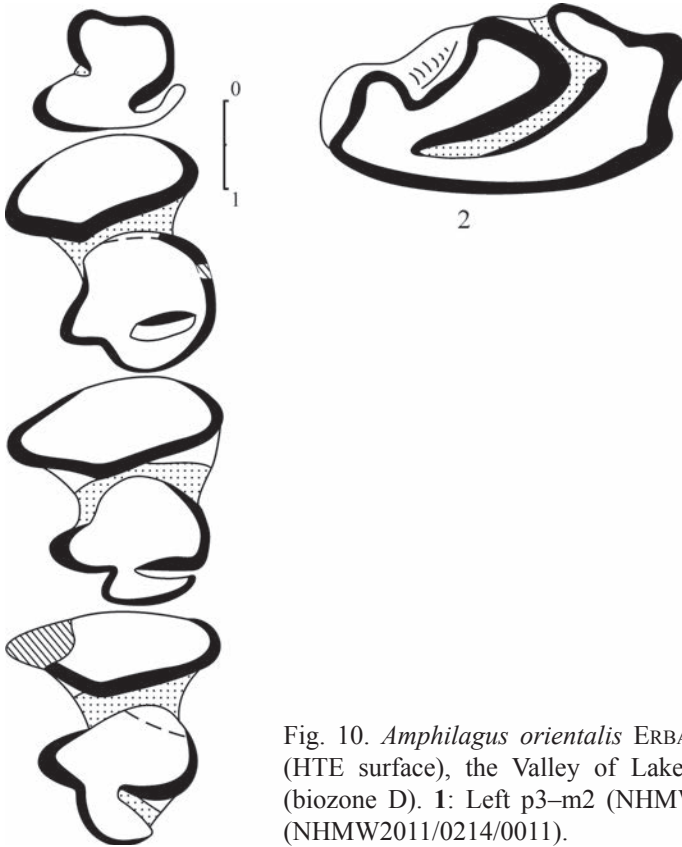


Fig. 10. *Amphilagus orientalis* ERBAJEVA, 2013 from Hotuliin Teeg (HTE surface), the Valley of Lakes in Mongolia. Early Miocene (biozone D). 1: Left p3–m2 (NHMW2011/0214/0001). 2: Right P3 (NHMW2011/0214/0011).

folds; internal fold (paraflexus) deep, filled with thick cement; external reentrant fold shallow without cement; protocone and hypocone of equal size; length of anteroloph varies: extends to half of tooth-width or is even longer. p3: occlusal outline quadrangular (young individuals) or triangular (adult individuals); anterior wall with shallow depression or smooth; deep antero-external fold filled with cement; p4: trigonid significantly wider than talonid of rounded shape.

Remarks: *Amphilagus orientalis* differs from all known species by the specific square occlusal outline of p3, and by the long, deep fold that extends along the internal tooth side and is filled with few cement in young individuals.

***Amphilagus plicadentis* ERBAJEVA, 2013**

(Figs. 11/1–2)

Occurrences of *Amphiagus plicadentis* in Mongolia (Valley of Lakes, Uvurkhangai). ERBAJEVA (2013: 315). Stratigraphic range: Early Miocene (biozone D). Unkheltseg (UNCH-A/3, UNCH-A/4: NHMW2011/2010/0001–0002); Luuny Yas (LUS-078: NHMW2013/0345/0000); Hotuliin Teeg (HTE-012: NHMW2013/0346/0000).

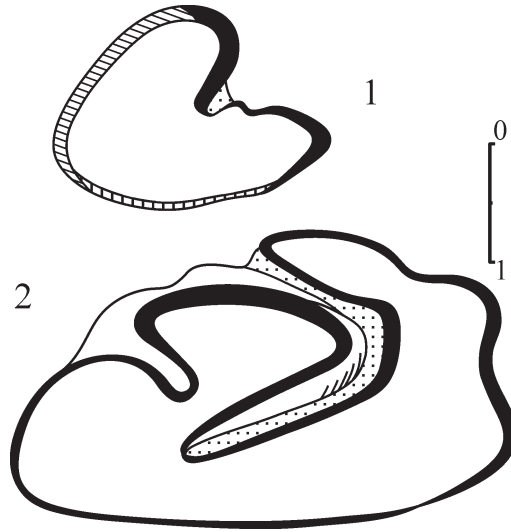


Fig. 11. *Amphilagus plicadentis* ERBAJEVA, 2013 from the Valley of Lakes in Mongolia. Early Miocene (biozone D). **1:** Right p3 (NHMW2011/0210/0001) from Unkheltseg (UNCH-A/3). **2:** Right P3 (NHMW2011/0210/0002) from Unkheltseg (UNCH-A/4).

Dental characters: Teeth large; pronounced lateral hypsodonty. P3: three roots: laterally two small roots, one internal large root; three cones: large internal cone with anteroloph extending to the mid-width of tooth; large middle cone of “mushroom-like” shape; external cone smallest; internal reentrant fold (paraflexus) deep, separates cones, filled with cement; external reentrant fold shallow, without cement. Protocone smaller than hypocone. p3: of triangular occlusal outline, with rounded anterior and postero-internal edges and slightly sharpened external edge; antero-external fold with little cement; posterior wall of fold undulated.

Remarks: *Amphilagus plicadentis* differs from all known species by the large tooth size and the undulated posterior wall of the reentrant fold in p3.

Family Ochotonidae THOMAS, 1897

Genus *Bohlinotona* DE MUIZON, 1977

1926 *Desmatolagus* – TEILHARD DE CHARDIN: 23, figs 11, 12B.

1977 *Bohlinotona* gen. nov. – DE MUIZON: 272, figs 3 b–d.

1998 *Bohlinotona* – ERBAJEVA & SEN: 98–100, figs 2, 3 A.

Type species: *Bohlinotona pusilla* (TEILHARD DE CHARDIN, 1926)

Stratigraphic range: Late Oligocene.

Dental characters: Small, rather hypsodont teeth; upper teeth with rudimentary external and robust internal roots. p4–m2: two roots. P2: small, without anterior fold.

P3: width varies from normal to very wide, depending on the extent of wear; depth of paraflexus of worn P3 varies; anteroloph of unworn teeth short. P3–M2: no hypostria. M3: small. p3: shorter than wide; anterior border rounded; antero-external fold filled with little cement. p4–m2: trigonid wider than talonid, labial border of trigonid relatively rounded (DE MUIZON 1977: 3 b-d; ERBAJEVA & SEN 1998: 100).

Referred species / type localities:

- *Bohlinotona pusilla* (TEILHARD DE CHARDIN, 1926) from Saint Jacques (China); Late Oligocene.

***Bohlinotona cf. pusilla* (TEILHARD DE CHARDIN, 1926)**

(Figs. 12/1–2)

Occurrences of *Bohlinotona cf. pusilla* in Mongolia (Valley of Lakes, Uvurkhangai Aimag): ERBAJEVA (2007: table 1). Stratigraphic range: Late Oligocene (biozones: C to C1).

Late Oligocene (biozone C): Toglorhoi (TGW-A/2, TGW- surface: NHMW2013/0353/0001); Taatsiin Gol (TGR- C/1, TGR-C/2, TGR-C/1–2: NHMW2013/0354/0001); Unzing Khurem (TAR-A/2: NHMW2013/0355/0000).

Late Oligocene (biozone C1): Del (DEL-B/12: NHMW2013/0356/0000); Huch Teeg (RHN-A/9: NHMW2013/0357/0000).

Dental characters: Small-sized, hypsodont teeth. Upper teeth: tiny rudimentary external and robust strongly curved internal roots. p4–m2: no visible roots. P2: small, wider than long; two shallow anterior folds without cement. P3: width varies from normal to very wide, depending on the extent of wear; depth of paraflexus of worn P3 varies from shallow to deep; anteroloph of unworn teeth short. P3–M2: very short internal hypostria; no cement. M3: small. p3: shorter than wide; anterior border of variable shape, with shallow depression; antero-external fold filled with little cement. p4–m2: trigonid significantly wider than talonid; with sharp external margin; talonid small, oval. m3: small.

Remarks: *Bohlinotona cf. pusilla* of Mongolia resembles the type material by general tooth-pattern and size. It differs by strongly reduced roots, by the rectangular shape of p3 and by the sharp trigonid margin of p4–m2.

Genus *Sinolagomys* BOHLIN, 1937

- 1937 *Sinolagomys* gen. nov. – BOHLIN: 31–39, textfigs 50–85.
 1942 *Sinolagomys* – BOHLIN: 79–104, pl. 1, figs 18–31, figs 24–32.
 1960 *Sinolagomys* – GUREEV: 8–10, fig. 2.
 1980 *Sinolagomys* – LI & QIU: 198–200, pl. 1, fig. 1, figs 1, 2.
 1989 *Sinolagomys* – TONG: 103–116, figs 1–7, 9.

Stratigraphic range: Late Oligocene to Early Miocene

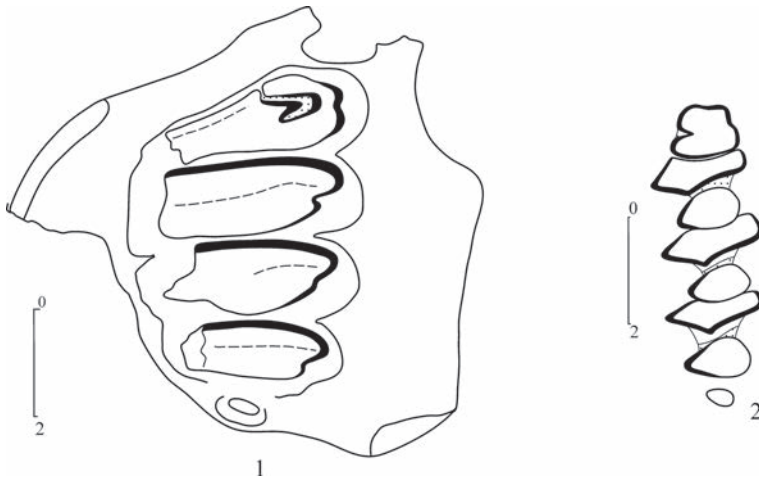


Fig. 12. *Bohlinotona cf. pusilla* (TEILHARD DE CHARDIN, 1926) from the Valley of Lakes in Mongolia. Late Oligocene (biozone C). **1:** Right P3–M3 (NHMW2013/0353/0001) from Toglorhoi (TGW-A/2). **2:** Right p3–m3 (NHMW2013/0354/0001) from Taatsin Gol (TGR-C/2)

Dental characters: Teeth small to medium-sized, moderately high crowned or hypsodont; external roots absent. P3: paraflexus relatively deep; anteroloph short, up to 1/3 of tooth width; small internal hypostria filled with cement. P4–M2: hypostria extends to half of tooth width. M3: absent. p3: varies from rectangular to square; antero-external fold filled with cement; anterior wall with groove of variable shape: shallow groove without cement; deeper groove filled with cement. Some p3 (Sh. 783, textfig 76) with closed root (“eine vollständig geschlossene Wurzel”, BOHLIN 1937: 37); p4–m2: trigonid wider than talonid (BOHLIN 1937: 32; 1942: 95).

Referred species / type localities:

- *S. gracilis* BOHLIN, 1942 from Shargaltein-Tal (China); Late Oligocene.
- *S. kansuensis* BOHLIN, 1937 from Shargaltein-Tal (China); Late Oligocene (type species).
- *S. major* BOHLIN, 1937 from Shargaltein-Tal (China); Late Oligocene.
- *S. pachygnathus* LI & QIU, 1980 from Xiejia (China); Early Miocene.
- *S. tatalgolicus* GUREEV, 1960 from Tatal-Gol (Mongolia); Late Oligocene.
- *S. ulungurensis* TONG, 1989 from Chibaerwoyi (China); Late Oligocene.

Sinolagomys kansuensis BOHLIN, 1937

(Figs. 13/1–2)

Occurrences of *Sinolagomys kansuensis* in Mongolia (Valley of Lakes, Uvurkhangai Aimag): ERBAJEVA (2007: table 1). Stratigraphic range: Early Oligocene to Early Miocene (biozones: B to D).

Early Oligocene (biozone B): Hsanda Gol (SHG-AB/17–20: NHMW2013/0358/0000).

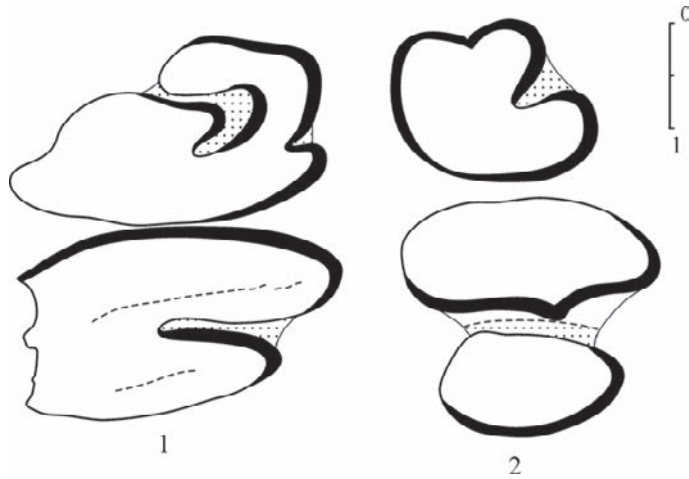


Fig. 13. *Sinolagomys kansuensis* BOHLIN, 1937 from the Valley of Lakes in Mongolia. Late Oligocene to Early Miocene (biozone C to D). 1: Left P3–P4 (NHMW2013/0418/0001) from Huch Teeg (RHN-020, biozone D). 2: Right p3–p4 (NHMW2013/0419/0001) from Taatsin Gol right (TGR-C/2, biozone C).

Late Oligocene (biozone C): Taatsiin Gol (TGR-C/2: NHMW2013/0419/0000).

Late Oligocene (biozone C1): Tatal Gol (TAT-043, TAT-050, TAT-051/2: NHMW2013/0359/0000); Togglerhoi (TGW-A/5: NHMW2013/0360/0000; TGS-W: NHMW2013/0361/0000); Loh (LOH-C/1: NHMW2013/0362/0000).

Oligocene-Miocene transition (C1–D): Hotuliin Teeg (HTS-056/2– 3: NHMW2013/0415/0000), Huch Teeg (RHN-021: NHMW2013/0416/0000).

Early Miocene (biozone D): Hotuliin Teeg (HTE surface: NHMW2013/0417/0000), Huch Teeg (RHN-020: NHMW2013/0418/0000).

Dental characters: Teeth small-sized; roots of upper and lower teeth absent. P3: moderately deep paraflexus; internal hypostria with rather thick cement; protocone slightly larger than hypocone; anteroloph extends to half of tooth width. P4–M2: depth of hypostria does not exceed half of tooth width. p3: rectangular; anterior wall with shallow depression, not filled with cement; antero-external fold filled with cement; trigonid of lower teeth wider than talonid; talonid oval.

Remarks: *Sinolagomys kansuensis* resembles the type material by size and general tooth structures, but differs by absence of roots, shorter anteroloph of P3, and slightly deeper hypostria of P4–M1.

***Sinolagomys major* BOHLIN, 1937**

(Figs. 14/1–2)

Occurrences of *Sinolagomys major* in Mongolia (Valley of Lakes, Uvurkhangai Aimag): ERBAJEVA (2007: table 1). Stratigraphic range: Early Oligocene to Early Miocene (biozones B to D).

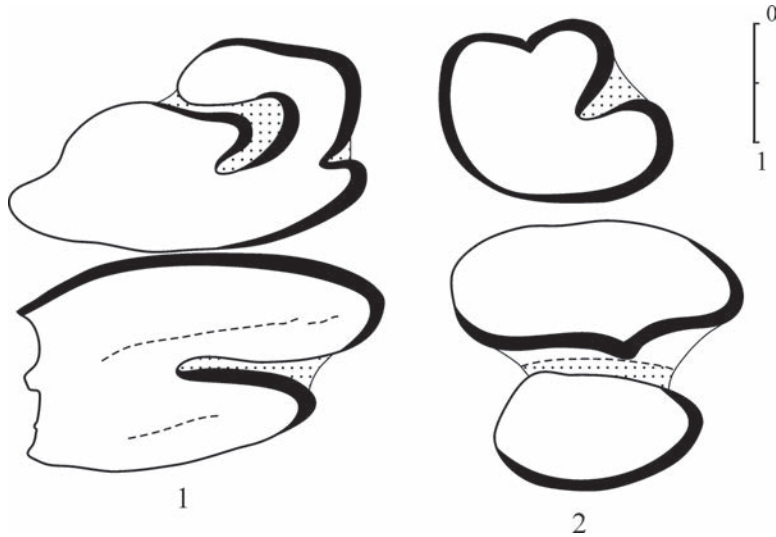


Fig. 14. *Sinolagomys major* BOHLIN, 1937 from Huch Teeg (RHN-021), the Valley of Lakes in Mongolia. Oligocene-Miocene transition (biozone C1–D). 1: Right P3–P4 (NHMW2013/0387/0001). 2: Right p3–p4 (NHMW2013/0387/0002).

Early Oligocene (biozone B): Ikh Argalatyn Nuruu (IKH-A/1: NHMW2013/0194/0002).

Late Oligocene (biozone C1): Tatal Gol (TAT-044: NHMW2013/0105/0000; TAT-052/1: NHMW2013/0363/0000); Toglorhoi (TGW-A/5, TGW-surface: NHMW2013/0194/0004; TGS-W: NHMW2013/0194/0001); Loh (LOH-B/3: NHMW2013/0364/0000); Hotuliin Teeg (HTSE-009: NHMW2013/0365/0000); Huch Teeg (RHN-A/7: NHMW2013/0366/0000; RHN-019: NHMW2013/0367/0000).

Oligocene-Miocene transition (C1–D): Hotuliin Teeg (HTS-056/1–3: NHMW2013/0385/0000); Tatal Gol (TAT-052/2: NHMW2013/0386/0000); Huch Teeg (RHN-021: NHMW2013/0387/0000; RHN-022: NHMW2013/0325/0000).

Early Miocene (biozone D): Hotuliin Teeg (HTE-016–017: NHMW2013/0388/0000; HTE-008: NHMW2013/0389/0000); Huch Teeg (RHN-020: NHMW2013/0390/0000); Uncheltseg (UNCH-A/4: NHMW2013/0391/0001).

Dental characters: Teeth medium- to large-sized; rootless. P3: paraflexus moderately deep; anteroloph extends to half of tooth width; internal hypostria with little cement; protocone much larger than hypocone. P4–M2: protocone much larger than hypocone; depth of hypostria does not exceed half of tooth width; hypostria filled with cement. p3: anterior wall with shallow depression, filled with cement or not; antero-external fold filled with cement. p4–m2: trigonid wider than talonid; internal wall rounded, labial wall sharper.

Remarks: *Sinolagomys major* resembles the type material by size and general structures of lower teeth, but differs by much deeper hypostria of upper teeth.

***Sinolagomys ulungurensis* TONG, 1989**
(Figs. 15/1–4)

Occurrences of *Sinolagomys ulungurensis* in Mongolia (Valley of Lakes, Uvurkhangai Aimag): ERBAJEVA (2007: table 1). Stratigraphic range: Late Oligocene to Early Miocene (biozones C1 to D).

Late Oligocene (biozone C1): Del (Del-B/12: NHMW2013/0368/0000); Toglorkhoi (TGW-A/5, TGW surface: NHMW2013/0369/0000); Huch Teeg (RHN-019: NHMW2013/0370/0000; RHN-A/7: HMW2013/0371/0000).

Oligocene-Miocene transition (C1–D): Hotuliin Teeg (HTS-056/1–2: NHMW2013/0372/0000).

Early Miocene (biozone D): Luugar Khudag (LOG-A/1: NHMW2013/0373/0000); Luuny Yas (LUS-029: NHMW2013/0392/0000); Hotuliin Teeg (HTE-014–017, HTE-002, HTE-005, HTE-008, HTE-012: NHMW2013/0374/0000); Huch Teeg (RHN-020, RHN-A/12: NHMW2013/0375/0000); Unkheltseg (UNCH-A/3–4, surface: NHMW2013/0376/0001–0004).

Dental characters: Small tooth size; roots absent. P2: with shallow anterior groove, lacks cement. P3: with moderately deep paraflexus; anteroloph extends to mid-width of tooth; internal hypostria with little cement; protocone and hypocone of identical size. P4–M2: hypostria filled with cement; hypostria of variable depth: reaches the tooth-middle (P4), or extends a little further (M1), or much further (M2). p3: anterior wall can display a shallow depression without cement, or a deeper depression filled with cement; antero-external fold filled with thick cement. p4–m2: trigonid slightly wider than talonid; internal wall of talonid rounded; the labial wall slightly sharper.

Remarks: The Mongolian fossils resemble the type material of *Sinolagomys ulungurensis* in general dental features and size of the upper and lower dentition.

Genus *Bellatona* DAWSON, 1961

1961 *Bellatona* gen. nov. – DAWSON: 8–13, figs. 3–7.

Stratigraphic range: Miocene

Dental characters: Small sized hypsodont cheek teeth without roots. P2: variable number of anterior reentrant folds: one or two or absent (archaic taxa). P3: paraflexus moderately deep; internal hypostria short; anteroloph extends to mid-width of tooth. P4–M2: hypostria filled with thick cement. M2: hypostria deep, shallower in M1 and P4; posterior wall of M2 smooth or with small visible protrusion (of advanced forms). M3 absent. p3: triangular outline; its antero-external groove filled with cement. p4–m2: trigonid and talonid of equal width, or trigonid slightly wider than talonid. m3: single column (DAWSON 1961: 9; ERBAJEVA 1988: 60; ZHOU 1988: 148).

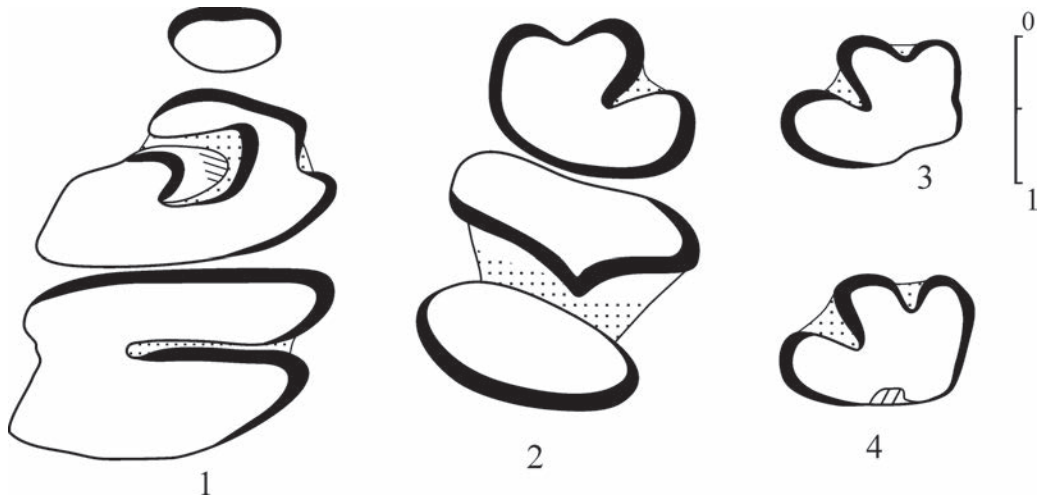


Fig. 15. *Sinolagomys ulungurensis* TONG, 1989 from Unkheltseg (UNCH-A/3), the Valley of Lakes in Mongolia. Early Miocene (biozone D). 1: Right P2–P4 (NHMW2013/0367/0001). 2: Right p3–p4 (NHMW2013/0367/0002). 3: Left p3 (NHMW2013/0367/0003). 4: Left p3 (NHMW2013/0367/0004).

Referred species / type localities:

- *B. forsythmajori* DAWSON, 1961 from Tairum Nor Basin (China); Late Miocene (type).
- *B. kazakhstanica* ERBAJEVA, 1988 from Ashutas, Zaisan Basin (Kazakhstan); Early Miocene.
- *B. yanghuensis* ZHOU, 1988 from Yanghu, (China); Middle Miocene

***Bellatona cf. kazakhstanica* ERBAJEVA, 1988**

(Figs. 16/1–2)

Occurrence of *Bellatona cf. kazakhstanica* in Mongolia (Valley of Lakes, Uvurkhangai Aimag): ERBAJEVA (2007: tab. 1). Stratigraphic range: Early Miocene (biozone D). Unkheltseg (UNCH-A/3: NHMW2011/0188/0001–0002); Hotuliin Teeg (HTE-012: NHMW2013/0393/0000; HTE-005: NHMW2013/0377/0000).

Dental characters: P3: small size; paraflexus moderately deep; anteroloph rather long, almost exceeds half of tooth width; protocone and hypocone of equal size; hypostria short, filled with cement. M1: hypostria deep.

Remarks: *Bellatona cf. kazakhstanica* is close to the type material by size and structure of P3 and by having deep hypostria of M1. Because p3 is not found, the ascription to *Bellatona kazakhstanica* is uncertain.

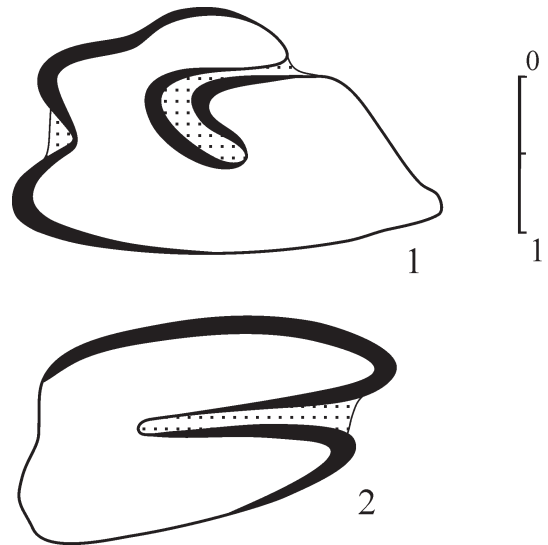


Fig. 16. *Bellatona* cf. *kazakhstanica* ERBAJEVA, 1988) from Unkheltseg (UNCH-A/3), the Valley of Lakes in Mongolia. Early Miocene (biozone D). 1: Left P3 (NHMW2011/0188/0001). 2: Right M1 (NHMW2011/0188/0002).

***Bellatona yanghuensis* ZHOU, 1988**

(Figs. 17/1–2)

Occurrence of *Bellatona yanghuensis* in Mongolia (Unkheltseg, Valley of Lakes, Uvurkhangai Aimag). Stratigraphic range: Early Miocene (biozone D).

Unkheltseg (UNCH-A/3–4: NHMW 2011/0189/0001–0011).

Dental characters: Teeth small. P3: paraflexus moderately deep; protocone larger than hypocone; hypoconia located close to posterior border of tooth, filled with cement; anteroloph equal to half of tooth width. P4: hypoconia deep. p3: antero-external fold filled with cement; anterior border of variable structure: slightly tapering, curved and flat; p4–m2: trigonid and talonid of the same width, but talonid slightly shorter.

Remarks: *Bellatona yanghuensis* resembles the type material by size and structure of both upper and lower dentition, and by having deep hypoconia of P4.

***Bellatona* cf. *forsythmajori* DAWSON, 1961**

Occurrence of *Bellatona* cf. *forsythmajori* in Mongolia (Ulaan Tolgoi, Valley of Lakes, Uvurkhangai Aimag). (ERBAJEVA, 1981). Stratigraphic range: Early Miocene (biozone D1/2). Ulaan Tolgoi (UTO: NHMW2013/0378/0000).

Dental characters: Teeth small sized. p3: antero-external fold deep, filled with cement; anterior border convex, moderately sharp; p4–m2: trigonid slightly longer than talonid, but of identical width.

Remarks: *Bellatona* cf. *forsythmajori* resembles the type material by size and structures of the lower dentition, specifically by the rather elongate p3. The elongate p3 provides the main difference from *Bellatona yanghuensis* and *Bellatona* cf. *kazakhstanica*.

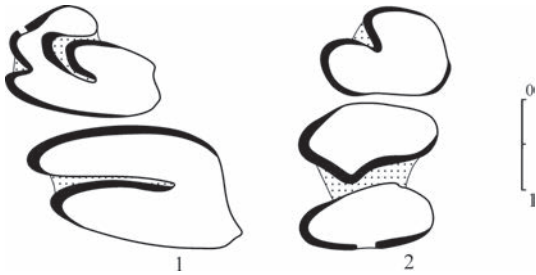


Fig. 17. *Bellatona yanghuensis* ZHOU, 1988 from Unkheltseg (UNCH-A/3-4), the Valley of Lakes in Mongolia. Early Miocene (biozone D). 1: Left P3-P4 (NHMW2011/0189/0009). 2: Left p3-p4 (NHMW2011/0189/0008).

Bellatona sp.

Occurrences of *Bellatona* sp. in Mongolia (Valley of Lakes, Uvurkhangai Aimag). Stratigraphic range: Oligo-Miocene transition to Early Miocene (biozone C1-D to D1/1).

Oligo-Miocene transition (biozone C1-D): Hotuliin Teeg (HTS-056: NHMW2013/0379/0000).

Early Miocene (biozone D): Hotuliin Teeg (HTE-005: NHMW2013/0380/0000).

Early Miocene (biozone D1/1): Olon Ovoony Khurem (ODO-B/1: NHMW2013/0381/0000).

Dental characters: Teeth small sized. p3: anterior border slightly convex; antero-external fold deep, filled with cement.

Remarks: The structure of p3 identifies *Bellatona* sp. as being close to *Bellatona* cf. *yanghuensis*, but it differs by smaller size.

Genus *Alloptox* DAWSON, 1961

1961 *Alloptox* gen. nov. – DAWSON: 6–8, figs 1, 2.

1941 *Metochotona* nov. gen. – KRETZOI: 111, Abb. 2A.

Stratigraphic range: Early to Late Miocene

Dental characters: Teeth small and medium-sized, hypsodont. P2: with anterior folds. P3: large, of triangular occlusal outline; paraflexus rather deep; shallow internal hypostria filled with thick cement; anteroloph extends to half or over the half of tooth width. P4–M2: depth of hypostria variable, extends almost to half of tooth width (P4 and M1) and deeper in M2. p3: triangular; single deep antero-internal fold; relatively deep postero-external fold filled with thick cement; two shallow antero-external folds with little or without cement. Lower teeth: trigonids and talonids of equal width. m3: one small column (DAWSON, 1961: 6).

Referred species / type localities:

- *A. anatoliensis* ÜNAY & SEN, 1976 from Ankara-Kalecik-Candir (Turkey); Late Miocene.

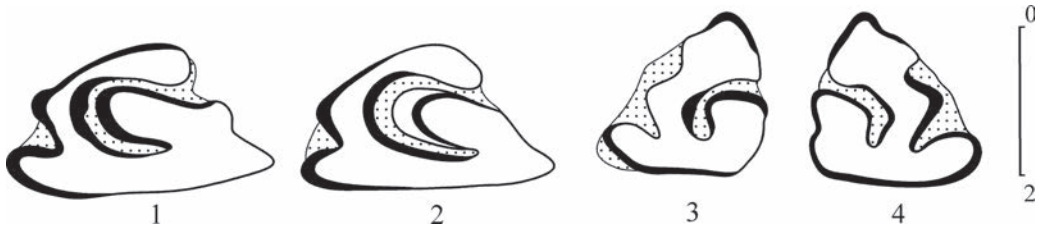


Fig. 18. *Alloptox gobiensis* (YOUNG, 1932) from Ulaan Tolgoi (UTO-A/5), the Valley of Lakes in Mongolia. Early Miocene (biozone D 1/2). 1: Left P3 (NHMW2011/0182/0012). 2: Left P3 (NHMW2011/0182/0011). 3: Left p3 (NHMW2011/0182/0005). 4: Right p3 (NHMW2011/0182/0003).

- *A. chinghaiensis* QIU, LI & WANG, 1981 from Minhe County Xining Basin (China); Late Miocene.
- *A. gobiensis* (YOUNG, 1932) from Tunggur Basin (China); Miocene (type species).
- *A. japonicus* TOMIDA, 2012 from Matsugasecho (Japan); Early Miocene.
- *A. katinkae* ANGELONE & HIR, 2012 from Litke (Hungary); Middle Miocene.
- *A. minor* LI, 1978 from Lantian, Shanxi (China); Early Miocene.
- *A. sihongensis* WU, 1995 from Songlinzhuang, Sihong County (China); Early Miocene.
- *A. xichuanensis* LIU & ZHENG, 1997 from Liangjiagang, Xichuan County (China); Early Miocene.

Alloptox gobiensis (YOUNG, 1932)

(Figs. 18/1–4)

Occurrences of *Alloptox gobiensis* in Mongolia (Valley of Lakes, Uvurkhangai Aimag): ERBAJEVA (2007: table 1). Stratigraphic range: Early Miocene (biozone D1/1, D1/2).

Early Miocene (biozone D1/1): Uolon Ovoony Khurem (ODO-A/2: NHMW2011/0184/0001–0012)

Early Miocene (biozone D1/2): Ulaan Tolgoi (UTO-A/5, UTO-A/6: NHMW2011/0182/0001–0133); Loh (LOH-A/2, LOH-A/4: NHMW2011/0183/0001–0004).

Dental characters: Tooth of medium size; hypsodont teeth. P2: two or three anterior folds filled with thick cement. P3: triangular; prominent anterior border; deep paraflexus, filled with thick cement; internal hypostria deep, filled with thick cement; protocone and hypocone of equal size; anteroloph exceeds half of tooth width. P4–M2: deep hypostria. p3: triangular; long anteroconid with sharp anterior margin; posteroconid short; antero-internal fold deep; two or three antero-external folds, the anterior one shallow, without cement. p4: talonid wider than trigonid. m1–m2: trigonid wider than talonid.

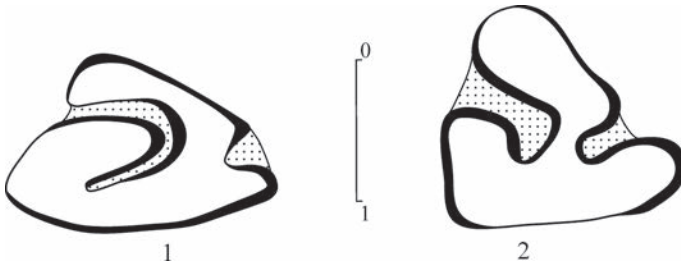


Fig. 19. *Alloptox cf. minor* LI, 1978 from the Valley of Lakes in Mongolia. Early Miocene (biozone D to D 1/1). 1: Right P3 (NHMW2011/0185/0001) from Olon Ovoony Khurem (ODO-B/1), biozone D1/1). 2: Right p3 (NHMW2011/0186/0001) from Unkheltseg (UNCH-A/4), biozone D).

Remarks: *Alloptox gobiensis* from Mongolian sites resembles the type material by the general tooth pattern. Nonetheless, small differences are: slightly larger tooth size and longer anteroloph of P3.

***Alloptox cf. minor* LI, 1978**

(Figs. 19/1–2)

Occurrence of *Alloptox cf. minor* in Mongolia (Valley of Lakes, Uvurkhangai Aimag): ERBAJEVA (2007: table 1). Stratigraphic range: Early Miocene (biozone D to D1/1)

Early Miocene (biozone D): Unkheltseg (UNCH-A/4: NHMW2011/0186/0001).

Early Miocene (biozone D1/1): Olon Ovoony Khurem (ODO-B/1: NHMW2011/0185/0001).

Dental characters: Teeth small sized; rootless. P3: triangular occlusal outline; anterior margin convex, covered with thin enamel; protocone and hypocone of almost equal size covered by thick enamel; paraflexus rather deep, filled with cement; hypostria short with little cement. p3: triangular occlusal outline; deep antero-internal and short external folds filled with cement; anteroconid long with oval anterior margin and straight external and internal borders; posteroconid short.

Remarks: *Aalloptox cf. minor* resembles the type material by size and general tooth pattern, but differs by the more simple p3 and by the absence of any visible depressions and folds on both external and internal borders of anteroconid.

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