NEW FOSSIL LEPORIDAE FROM MONGOLIA

BY J. J. BURKE

The fossil Leporidae described in the following pages are represented in the collections of the American Museum of Natural History made by the Central Asiatic Expeditions under the leadership of Dr. Roy Chapman Andrews. It has been the privilege of the author to study and to describe this material from the Eocene and the Oligocene of Mongolia through the courtesy of Dr. Walter Granger and the authorities of the American Museum of Natural History. The illustrations for this article are taken from the drawings of Mr. Sydney Prentice. The present study, carried out in the Graduate School of Duquesne University, was made possible by the writer’s tenure of a Thornton Fellowship in Scientific Research.

ORDER Duplicidentata (LAGOMORPHA)

LEPORIDAE Gray

Mytonolaginae, new subfamily

Lagomorphs with tooth formula of I₂ C₂ P₂ M₂; cheek teeth with roots and without cement. Terminal members of cheek tooth series functional. P₂ approximating M₂ in size; M₁ approximating P₁ or P₂. M₁ the largest and most transverse of the superior cheek teeth; M₂ the largest and most transverse of the inferior cheek teeth. P₁ trilobate, with one external and two internal reentrants, its anterior lobe without grooves or furrows on its anterior face.

INCLUDED GENERA.—Mytonolagus, Shamolagus, new genus, and Gobiolagus, new genus.

KNOWN RANGE.—Upper Eocene, North America and Asia, Lower Oligocene, Asia.

SHAMOLAGUS,² new genus

Gennholotype.—Shamolagus grangeri, new species.

DIAGNOSIS.—A genus nearly related to Mytonolagus, but less progressive in specialization; M₁ considerably exceeding M₂ in size, M₂ approximating P₁ in size. Lateral slopes of cheek teeth not as steep as in Mytonolagus. Protoconids of P₁ and M₁ tapering to the occlusal surface but showing hypertrophy and inflation toward the base of the crown.

¹ Publications of the Asiatic Expeditions of the American Museum of Natural History, Contribution No. 143.
² From the Chinese Shā-mo—‘sand desert,’” an old name for the Gobi, and the Greek λαγος—hare.

SHAMOLAGUS grangeri,² new species

Figure 1

Holotype.—A.M.N.H. No. 26289, a left mandibular ramus with P₄, M₁₋₄, incisor lost.

Horizon.—Ulan Shireh, Upper Eocene. Ir-din Manha Beds.


Diagnosis.—A smaller species than Mytonolagus petersoni, mandible more slender, of lighter construction throughout and narrowing anteriorly in front of M₂. P₄ and M₁ apparently lower-crowned than in Mytonolagus petersoni, M₁ large, functional, with prominent third lobe.

In comparison with Mytonolagus petersoni of the North American Eocene, the present species is smaller, while the mandibular ramus is more slender and lighter. The diastema appears to have had nearly the same relative extent in both forms. The ramus of Shamolagus grangeri does not show the anterior depth of Mytonolagus petersoni, anteriorly the transverse narrowing of the ramus occurs just in advance of M₂, whereas in the American species this narrowing begins just in advance of M₁. The anterior mental foramen is located well in advance of P₄ in Shamolagus grangeri but is posterior to the mid-point of the diastema. A posterior mental foramen is
found beneath the anterior root of $M_1$, posterior to its place in *Mytonolagus petersoni*. The slope of the ascending ramus is definitely lower than in *Palaeolagus* and in most species of *Desmatolagus*. There is a fairly shallow musceteric fossa, the inferior border of which is rounded, not sharp; anteriorly the ridge-like scar becomes a relatively large boss-like tubercle, larger than I have noted this structure in any other duplicidentate species. Between the tubercle and the ascending wing of the ramus there is an area where the anterior border of the fossa is poorly defined, but its limits are sharply shown in relation to the ascending ramus. Beyond the fact that it is quite shallow and does not contain the foramen posterior to $M_3$,

but it is still a fair-sized tooth, functional, and with a prominent third lobe. The largest tooth in the row is $M_2$; the increase in size initiated here has not yet affected $M_1$ and the premolars to a comparable degree.

Although $P_3$ is lost, its alveoli indicate a tooth the base of which narrowed anteriorly. Apparently $P_3$ had a greater antero-posterior extent than $P_4$, and was a little less transverse posteriorly. It seems to have been double-rooted, the roots arranged antero-posteriorly.

Judging from the relatively more transverse $P_4$ of *Shamolagus grangeri* and the gentler slope of its protomere walls when the tooth is compared with $P_4$ of *Mytonolagus petersoni*, that tooth in the Mongo-

![Fig. 1. Shamolagus grangeri Burke, holotype, A.M.N.H. No. 26289. Lateral view of mandibular ramus and occlusal view of $P_4$, $M_1-3$ left, $\times 3$.](image)

the *sulcus ascendens* appears of the leporine type, and what is preserved of the plate representing the coronoid would indicate that the latter process was already well reduced in Upper Eocene lagomorphs. The dental foramen is large and slit-like, and obliquely directed, in contrast with its nearly vertical direction in *Palaeolagus*.

None of the incisor is preserved, and it is difficult to trace its former extent, but it is probable that it took its origin beneath $M_2$.

The cheek teeth of the holotype contrast strongly with those of more recent lagomorphs. They are low-crowned, rooted, without cement, and, in proportion to the slender ramus, large and transverse. The reduction of $M_3$ has begun, the Uinta Eocene form, the transition from crown to root on
the protomere is not indicated by any abrupt expansion of the crown, whereas in *Shamolagus grangeri* there is a decided buccal inflation of the tooth above the root. In occlusal section the trigonid of P₄ of *Shamolagus grangeri* has more of a pear-shape than that of *Mytonolagus petersoni*.

The “third lobe” of P₄ of *Shamolagus grangeri* is indicated by a notch at the postero-internal angle of the talonid. The implantation of the tooth is essentially as in *Mytonolagus petersoni*. There are two roots, antero-posteriorly arranged; the anterior root is compressed fore and aft.

In *Shamolagus grangeri* M₁ is a larger tooth than in P₄ and differs from the latter in the greater antero-posterior compression of its trigonid on the buccal side; this gives the trigonid a narrower occlusal section on the protomere and makes for a wider external valley in the tooth. From M₁ of *Mytonolagus petersoni* this tooth differs in showing gentler buccal wall slopes, greater projection at the antero-external angle, and more abrupt expansion of the crown wall above the roots. The talonid of M₁ of *Shamolagus grangeri* is larger, relative to the trigonid, than is the talonid of P₄; it is also larger, in this respect, than in M₁ of *Mytonolagus petersoni*. In M₁ of the Gobi species, as also in P₄, the lingual reentrant is quite persistent, reaching well toward the base of the crown, as in the Uinta species. The two roots are arranged antero-posteriorly.

As mentioned above, M₂ is the largest of the cheek teeth, exceeding M₁ in both transverse and antero-posterior dimensions. The buccal wall of the trigonid is more compressed antero-posteriorly and is bent anteriorly; the anterior face of the trigonid bears a distinct groove on its protomere side. The external valley is wider than in M₁ and the talonid larger. Compared with M₂ of *Mytonolagus petersoni* the tooth shows greater extension and compression of the protomere wall of the trigonid, with the antero-external angle of the crown produced much farther buccally; there is a more prominent groove on the protomere side of the anterior face of the trigonid, while the external valley is wider and the talonid larger, relatively, than in the Uinta Eocene species. A further difference is to be found in the roots of M₂ in the two forms; in *Shamolagus grangeri* the anterior and the posterior roots are separated; they are conjoined in *Mytonolagus petersoni*.

In size, M₂ approaches P₄ and is a larger tooth than the last molar in *Mytonolagus petersoni*. It shows more extension antero-posteriorly than M₂ of the American Eocene species and has a prominent talonid; there is, in addition to the main buccal valley, a postero-external valley marking off a large “third lobe.” The internal valley is still indicated. The entire crown has not yet appeared above the alveolar wall in the holotype; the tooth appears to have been fully as high crowned as M₂ in *Mytonolagus petersoni*.

**Measurements**

*Shamolagus grangeri* Burke, A.M.N.H. No. 26289

(holotype)

<table>
<thead>
<tr>
<th>Tooth</th>
<th>Length of inferior premolar series (at alveolus)</th>
<th>Length of inferior molar series (occlusal surface)</th>
<th>Length of inferior molar series (at alveolus)</th>
<th>Length mandibular tooth row at alveoli</th>
<th>Depth ramus under M₁ (lingual side)</th>
<th>Width superior region of ramus below M₂</th>
<th>Width superior region of ramus below M₁</th>
<th>Width superior region of ramus below P₄</th>
<th>Width superior region of ramus below P₃</th>
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*Shamolagus medius,¹* new species

**Figure 2**

**Holotype.—** A.M.N.H. No. 26144, the anterior portion of a right mandibular ramus with broken incisor and P₄-M₁.

¹ The specific name is suggestive of its intermediate position between species of *Desmatolagus* and *Shamolagus*. 
HORIZON.—Shara Murun, Upper Eocene.
DIAGNOSIS.—Near Shamolagus grangeri in size. Crown of P₃ trilobate at occlusal surface, with one external and two internal reentrants; anterior lobe sub-round in occlusal section, not compressed or grooved anteriorly. External valleys of P₄ and M₁ wider than in Shamolagus grangeri; talonid of P₃ more reduced, talonid of M₁ more triangular and trigonid of M₁ more compressed antero-posteriorly along the protomere.

The anterior part of the ramus which constitutes the holotype does not display any marked departures from that of Shamolagus grangeri, except that it shows somewhat greater fullness in the region of P₄ and M₁, and its outline below these teeth suggests less expansion below M₂ than is found in the latter species. The two forms are nearly the same in size and correspond fairly well in length of diastema. In Shamolagus medius both mental foramina are preserved; the anterior mental foramen has a more anterior position and is higher on the ramus than in Shamolagus grangeri.

The inferior incisor is flattened, or only slightly rounded anteriorly and extends posteriorly alongside the roots of M₁; it may have reached alongside the roots of M₂.

Fortunately, P₃ is preserved in this specimen and is not badly worn. If the alveolus for P₃ of the holotype of Shamolagus grangeri can be depended upon as indicative of the antero-posterior dimensions of that tooth, the P₃ of Shamolagus medius is reduced in comparison with P₃ of the genotypic species. This tooth, as preserved in the holotype, shows three reentrants, one external and two internal. The external reentrant is the most transverse and persistent; together with the antero-internal reentrant, which occurs well in advance of it, it delimits the prominent anterior lobe of the tooth. The anterior lobe is attenuated from below to the occlusal surface, particularly on the anterior and buccal sides, sub-round in occlusal section and apparently represents the trigonid. The lobe shows no definite evidence of flattening or grooving on the anterior face at this stage of wear.

The postero-internal reentrant occurs a little posterior to the external reentrant. It is less persistent than the antero-internal reentrant and has less transverse extent across the crown. The posterior wall of the talonid is flattened and compressed against the anterior face of P₄; the protomere pillar of the talonid is attenuated from the base upward. The tooth is strongly produced laterally at the postero-external angle. The enamel of P₃ is carried well down the anterior root.

In the holotype of Mytonolagus petersoni P₃ is too worn to furnish adequate comparison with this premolar in Shamolagus medius. However, P₃ of the Uinta Eocene species appears to have had steeper lateral and medial walls; the anterior lobe was relatively larger and the base of the crown was not produced laterally beyond the anterior lobe at the postero-external angle of the tooth.

From the corresponding tooth in Shamolagus grangeri P₄ differs in having a wider external valley, in showing a less swollen crown base, and in having the talonid reduced. In some respects the tooth shows an approach to P₄ of Mytonolagus petersoni, but P₄ of the Uinta Eocene species shows steeper lateral slopes, less inflation of the base of the trigonid, the inflation of the lateral crown base above the root is generally less marked, and the antero-external angle of the tooth is not produced laterally to such an extent. P₄ of the holotype of Shamolagus medius still shows a trace of the postero-internal reentrant.

The M₁ of Shamolagus medius shows a
wider external valley, greater antero-posterior compression of the lateral side of the trigonid, and less inflation of the crown base at the antero-external angle of the tooth than does \( M_1 \) of *Shamolagus grangeri*. The talonid is also larger and more triangular in the Shara Murun species. It is distinguished from \( M_1 \) of *Mytonolagus petersoni* by the same characters that differentiate \( P_1 \) in the two species.

**Fig. 3.** *Gobiolagus tolmachovi* Burke, holotype, A.M.N.H. No. 26142. Lateral view of mandibular ramus and occlusal view of \( P_2-4, M_1-3 \) left, \( \times 3 \).

### Measurements

*Shamolagus medius* Burke, A.M.N.H. No. 26144

( holotype)

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<tr>
<th>Tooth</th>
<th>Measurement</th>
<th>Unit</th>
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<tr>
<td>( P_4 ) antero-posterior (occlusal surface)</td>
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<td>mm.</td>
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<tr>
<td>( P_3 ) transverse (occlusal surface)</td>
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<td>( M_1 ) transverse (at alveolus)</td>
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<tr>
<td>Length of inferior premolar series at alveoli</td>
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<td>Length of inferior premolar series at occlusal surface</td>
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<td>Width superior region of ramus below ( M_1 )</td>
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<tr>
<td>Inferior I transverse</td>
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**Gobiolagus, new genus**

**Genoholotype.** *Gobiolagus tolmachovi*, new species.

**Diagnosis.**—Related to *Mytonolagus* and *Shamolagus*, but distinguished by marked unilateral hypsodonty and non-persistence of the internal valleys of the cheek teeth; talonid of \( P_1 \) reduced; talonids of \( P_2-4 \) with slight lateral exposure, \( P_4 \) and molars showing strong lateral hypertrophy of trigonids, \( M_1-3 \) predominating over other mandibular cheek teeth in size. \( P_4 \) with modified *Shamolagus* pattern.

*Gobiolagus tolmachovi*, new species

**Holotype.**—A.M.N.H. No. 26142, a left mandibular ramus with all the cheek teeth and a broken incisor.

**Referred Specimen.**—A.M.N.H. No. 26143, a fragmentary left mandibular ramus preserving \( P_4, M_1-3 \) in shattered state. Anterior region of ramus missing.

**Horizon.**—Shara Murun, Upper Eocene.

**Locality.**—Near Baron Sog, Inner Mongolia. Central Asiatic Exped., 1925.

**Diagnosis.**—Cheek teeth more hypsodont than in any other known Eocene duplicidentate; \( P_4 \) with main internal reentrant well in advance of external reentrant, as in *Shamolagus*. \( M_1 \) approaching \( P_4 \) in occlusal dimensions, but much less hypsodont. \( M_1 \) with somewhat, \( P_4 \) with definite pear-shaped occlusal section of trigonid. Talonid of \( P_4 \) weak. \( P_2-4 \) characterized by slight lateral exposure of talonids, strong trigonids, groove-like external reentrants.

The mandibular ramus of the holotype indicates a species smaller than *Mytonolagus petersoni* but approaching *Shamolagus grangeri* in size. In depth (particularly in the anterior region) and in heaviness, the ramus falls short of that of the American form, but exceeds that in the species of *Shamolagus* in these respects. The diastema is somewhat greater than in *Shamolagus* and in *Mytonolagus*. The

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1 The specific name is given in honor of Dr. I. P. Tolmachoff.
ramus narrows transversely anterior to M₃. In the holotype specimen there are two anterior mental foramina; the most anterior of the two is carried farther forward than in *Shamolagus medius*, while the posterior one occurs between the latter and P₂, but lower on the ramus. The posterior mental foramen occurs under P₄. The slope of the ascending ramus is steeper than in *Shamolagus grangeri*, the masseteric fossa is moderate, with better definition of the superior border than in the holotype of *Shamolagus grangeri*. The tubercle marking the apex of the fossa anteriorly is prominent but not comparable with the boss-like tubercle found there in *Shamolagus grangeri*. The dental foramen occurs to have had more of a vertical direction than that of the latter species.

The mandibular incisor is triangular in transverse section, with the apex of the triangle posterior. Its anterior face is flattened or only a little rounded. The incisor was carried back under M₂, as indicated by the incisive swelling.

The outstanding feature of the cheek teeth of *Gobiolagus* is hypsodonty, which quickly distinguishes them from those of *Shamolagus*. In this respect also they go beyond *Mytonolagus*. The hypsodonty is of the unilateral type, with the enamel carried well down the shaft on the lateral side; correlated with it is non-persistence of the internal valleys, which disappear after moderate wear. These features have their effect on the tooth pattern, and in particular on that of P₃, but not enough to conceal its ultimate origin from a pattern which must have been much like that of P₃ of *Shamolagus medius*.

Another character of these teeth has its origin in hypertropic development of the lateral side of the trigonids. This tendency has been mentioned in the case of *Shamolagus*, but it should be indicated that in *Mytonolagus* also, particularly in the premolars, the base of the trigonid shaft shows some hypertrophy. It may be that early lagomorph cheek teeth in general showed something of this tendency, but in *Shamolagus* and in *Gobiolagus* it is quite marked. In these forms we trace, first, marked inflation of the lateral base of the trigonid; in a later sequence there follows antero-posterior compression of the trigonid shaft on the lateral side, which causes this element of the crown to jut laterally and out of proportion to the rest of the tooth.

The anterior cheek teeth of *Gobiolagus tolmachowi* are still in the first stage—that of hypertrophy of the lateral side of the trigonid. The posterior cheek teeth, on the other hand, have undergone the antero-posterior compression of the trigonid and show it jutting laterad.

The unique type of tooth row found in *Gobiolagus*, then, appears to be the result of a combination of two growth factors: hypertrophy of the lateral trigonid walls—a characteristic which *Gobiolagus* shares with *Desmatolagus* and to a lesser degree with *Mytonolagus*—and precocious (in a phylogenetic sense) unilateral hypsodonty. (Antero-posterior compression of the proto-mere walls is no unique feature, but appears to occur in all lagomorph lines.) Further individuality of the tooth row is due to a third factor, atrophy, displayed by the talonids of the premolars.

The P₃ of this species arises as a stout shaft, like a cylinder compressed transversely. In lateral view the cylindrical appearance is particularly striking. Postero-laterally the external reentrant is found; in the present specimen it extends but half the height from the occlusal surface to the alveolar border, and is in any case quite narrow and slit-like, extending a little more than a third of the distance across the crown surface at the present stage of wear.

On the median side is found the last trace of the antero-internal reentrant, here carried well in advance of the external reentrant. The two reentrants divide the crown into two lobes, an anterior, subround trigonid, without additional reentrants, and a posterior triangular talonid, which probably, at an earlier stage of wear, retained a postero-internal reentrant. The talonid shows little exposure on the lateral side—merely the apex of the triangle appears at the postero-lateral angle of the crown—but its median exposure exceeds that of the trigonid. The
tooth shows marked unilateral hypsodonty; the enamel extends down the lateral side beneath the alveolar border in the holotype specimen: on the median side of the crown the enamel descends more than half the height of the crown and is most persistent anteriorly.

The pattern is plainly a derivative of the type found in *Shamolagus mediis*. There is no evidence of any division of the anterior lobe, and the deviations from the *Shamolagus* pattern shown in *P*₃ of the holotype of *Gobiolagus tolmachovi* are plainly due to the peculiar effects of progressive unilateral hypsodonty.

The *P*₄ of this species is a distinctive tooth. It shows the features of *P*₄ in the *Gobiolagus* line (hypertropic growth of the trigonid and a weak talonid) but at the same time retains characters relating it to *Shamolagus*. The outjutting trigonid of this form is simply an exaggeration of the basal inflation of the trigonid seen in *P*₃ of *Shamolagus*, emphasized in the process of hypsodonty. The pear shape of the occlusal surface is a feature also found in *P*₄ of *Shamolagus*. What is distinctly a *Gobiolagus* character, however, is the slight development of the talonid, which appears compressed between the trigonids of *P*₄ and *M*₁ and has such a slight lateral exposure as to make the lateral side of the trigonid of *P*₄ appear the only functional part of the protomere of the tooth. To my knowledge this is the most distinctive feature of the *Gobiolagus* line—the diminutive size of the talonid of *P*₄.

Among other characters of *P*₄ of this species which should be emphasized are the non-persistence of the internal valley and some median projection of the trigonid beyond the talonid. In A.M.N.H. No. 26143 the base of the tooth shaft is preserved; it shows the enamel extending down the lateral side of the shaft at a sharp angle. The tooth is rooted, and grooves would indicate that there are two roots, antero-posteriorly arranged.

The molars of this species resemble *P*₄ in that they show the hypertrophy of the trigonid and the lack of persistence of the internal valley, together with unilateral hypsodonty. The protomere sides of the molar trigonids are not robust and rounded in section, however, but have undergone antero-posterior compression and jut laterad. Medial they also project beyond the talonids to a degree. None of the talonids are of the diminutive type found in *P*₄.

The *M*₁ of *Gobiolagus tolmachovi* somewhat resembles *P*₄ in preserving the pear-shaped occlusal section found in the latter. The trigonid has undergone antero-posterior compression to a much greater degree than in the latter tooth, though, and projects far lateral to the talonid. It is interesting to find that the pear-shaped occlusal section in *M*₁ of this species is more marked than in *M*₁ of *Shamolagus*. Although the talonid of *M*₁ of *Gobiolagus tolmachovi* is small, relative to the wide trigonid, it is not of the reduced type found in *P*₄, and the external valley is wider. The discrepancy in size between *P*₄ and *M*₁ is marked, the molar is well in excess of the premolar in size.

The largest tooth in the row, as in *Mytonolaginae* generally, is *M*₂, although it is not greatly in excess of *M*₁ in this case. Unlike the latter, the trigonid occlusal section has lost the pear shape and the protomere side of the trigonid is compressed antero-posteriorly. The external valley is wider than in *M*₁. As in *M*₁, the trigonid juts out laterally to a marked degree. My specimens do not show the number of roots in this tooth.

The *M*₃ of this species is smaller, in comparison with *M*₁₋₂, than in *Shamolagus grangeri* and *Mytonolagus petersoni*. Its trigonid is compressed antero-posteriorly, as is that of *Shamolagus grangeri*, but the talonid is sub-round in occlusal section. The *M*₃ of the holotype shows both the internal and the external reentrants valleys, but no trace of the "third lobe."

**Measurements**

*Gobiolagus tolmachovi* Burke, A.M.N.H. No. 26142 (holotype) mm.

- Inferior I, antero-posterior: .................. 1.5
- Inferior I, transverse: ........................ 1.3
- *P*₄, antero-posterior (occlusal surface): ... 1.4
- *P*₄, transverse (occlusal surface) ........ 1.3
- *P*₄, antero-posterior (occlusal surface) ... 1.6
P₄ transverse (occlusal surface) .......... 1.0
M₃ antero-posterior (occlusal surface) ... 2.0
M₄ transverse (occlusal surface) .......... 2.5
M₄ antero-posterior (occlusal surface) ... 2.1
M₃ transverse (occlusal surface) .......... 2.8
M₄ antero-posterior (occlusal surface) ... 1.4
M₃ transverse (occlusal surface) .......... 1.8
Length of inferior premolar series at occlusal surface .......... 3.1
Length of inferior premolar series at alveoli .......... 4.5
Length of inferior molar series at occlusal surface .......... 5.5
Length of inferior molar series at alveoli .......... 6.5
Length mandibular cheek teeth at occlusal surface .......... 8.8
Length mandibular cheek teeth at alveoli .......... 10.1
Depth ramus under M₁ (lingual side) .......... 7.5
Width superior region of ramus below M₂ .......... 4.0
Width superior region of ramus below M₁ .......... 4.0
Width superior region of ramus below P₄ .......... 3.5
Width superior region of ramus below P₃ .......... 2.5
Diastema between inferior I and P₄ .......... 7.1

A.M.N.H. No. 26097 from Twin Obo, East Mesa, Shara Murun Region, Inner Mongolia.

**Diagnosis.**—General construction much as in *Gobiolagus tolmachovi*, but P₄ more compressed transversely with main lingual reëntrant more posterior (on worn teeth opposite buccal reëntrant). P₁ somewhat exceeding M₂ in occlusal dimensions. Occlusal sections of P₄ and M₁ not pear-shaped. Protomere walls of cheek teeth steeper, more angular in occlusal section; talonids more transverse. Lateral exposure of talonids of P₃-₄ greater; lateral valleys of P₃-₄ wider.

As a whole, the mandibular ramus of the holotype of *Gobiolagus andrewsi* is larger than that of *Mytonolagus petersoni*; it is also deeper, although the ramus of the American form is relatively heavier. Compared with *Gobiolagus tolmachovi* the ramus is larger and deeper, but has about the same heaviness. The diastema is about the same as in *Gobiolagus tolmachovi*. The transverse narrowing of the ramus is abrupt in advance of M₁, an approximation to the condition in *Mytonolagus*. The holotype shows an anterior mental foramen, somewhat atypical, in about the same situation as in *Gobiolagus tolmachovi*. Referred specimen A.M.N.H. No. 26092 shows a typical anterior mental foramen much like the anterior in *Gobiolagus tolmachovi*. The posterior mental foramen is found under P₄. A.M.N.H. No. 26092 shows two posterior mental foramina in this vicinity. The masseteric fossa ap-
pears essentially as in *Gobiolagus tolmachovi*, although the tubercle directly ante-
rior to it does not appear to have been as prominent as in that species.

The incisor of this species appears some-
what less angular than that of *Gobiolagus
tolmachovi*, perhaps in this respect resem-
bling that of *Mylonolagus petersoni*. The
incisive swelling shows that the tooth took
origin under M₂.

In the holotype, P₃ is reminiscent of the
same tooth in *Gobiolagus tolmachovi*. The
tooth shows greater transverse compres-
sion, however, and is elongate antero-pos-
teriorly; the trigonid is attenuated in an
anterior direction, the anterior face of the
tooth is less rounded. There are two re-
entrants preserved, as in P₃ of the holotype
of *Gobiolagus tolmachovi*: in the holotype
of *Gobiolagus andrewsi* both show greater
extent across the crown, although they
might approximate the condition found in
the latter at a later stage of wear. The
internal reentrant appears somewhat more
persistent than in *Gobiolagus tolmachovi*.
Both reentrant valleys are wider than those
in P₃ of the latter species and are more
nearly opposite; in comparison with P₃ of
the Shara Murun Eocene species the an-
tero-internal reentrant appears to have
migrated posteriorly while the external re-
entrant has been carried anteriorly. Rela-
tive to the talonid, the trigonid is less
prominent than in *Gobiolagus tolmachovi*;
the talonid, while still triangular in oc-
cclusal view, shows less angularity and a
greater lateral exposure. The holotype
shows no postero-internal reentrant, but
in A.M.N.H. No. 26092 an unworn P₃
shows it. The distribution of enamel on
the shaft is much as in *Gobiolagus tolma-
chovi*; the tooth is unilaterally hypsodont,
the enamel being carried down the shaft
beneath the alveolar border on the lateral
side, but the dentine is partly exposed on
the median side. One specimen, A.M.N.-
H. No. 26097, preserves the base of the
shaft of P₃; the tooth is double-rooted,
with the roots arranged antero-posteriorly.

It is of interest, but not necessarily in-
dicative of close relationship, that the
pattern of P₃ of this species bears a strong
resemblance to that found in P₃ of *Mega-
lagus turgidus* and *Megalagus intermedius*,
except that the anterior lobe of the tri-
gonid is not divided. The *Shamolagus* P₃
pattern appears to approximate the primitive
pattern of lagomorphs in general.

The P₄ of *Gobiolagus andrewsi* shows
specialization beyond that of *Gobiolagus
tolmachovi* in the trigonid region. The
pear-shaped occlusal section which char-
acterizes the latter species and species of
*Shamolagus* is no longer in evidence; in
occlusal section the protomere approxi-
mates the paramere of the trigonid. This
seems to have come about through antero-
posterior extension of the trigonid on the
paramere, coupled with compression on the
protomere. The external valley is wider
and the talonid has a greater lateral ex-
posure but it shows little tendency toward
an increase in size. A.M.N.H. No. 26097
shows an interruption of the enamel of
this tooth on the anterior face toward the
base of the shaft. The internal valley is
of slight persistence: it appears to have
been obliterated in the holotype, but is
present in A.M.N.H. Nos. 26097 and 26092.

The molars in *Gobiolagus andrewsi* show
greater antero-posterior compression of
the trigonids on the protomere; they are
in general less transverse with steeper pro-
tomere slopes and show relatively larger
talonids. The talonids of these teeth
have also expanded laterally and the al-
veolar border is more regular.

The M₁ of this species has lost the pear-
shaped occlusal section which character-
izes M₁ of *Gobiolagus tolmachovi* and both
its trigonids and its talonids are com-
pressed antero-posteriorly on the lateral
side. The increase in size of the talonid
is most apparent on the protomere. As
in *Gobiolagus tolmachovi* this tooth con-
siderably exceeds P₃ in size. A.M.N.H.
No. 26097 shows this tooth rooted: ap-
parently the anterior and posterior root
Canals are conjoined.

As in *Gobiolagus tolmachovi*, M₂ is the
largest cheek tooth in the mandibular
ramus. The M₂ of the holotype shows a
larger talonid than does M₂ of the Shara
Muron species, and its talonid shows a re-
entrant curve at the postero-external angle
not shown in M₂ of *Gobiolagus tolmachovi*. 
The increase in size of the talonid is most evident in the antero-posterior direction, although in lateral extent the base of the talonid approximates that of the trigonid. The M3 of A.M.N.H. No. 26097 shows that this tooth is rooted, but while a strong groove appears on the shaft on the buccal side, the anterior and the posterior root canals are conjoined.

While, as in Gobiolagus tolmachovi, M3 in this species is reduced in comparison with M1-2, it is still a functional tooth. It shows a more transverse talonid than that found in M3 of Gobiolagus tolmachovi. The holotype preserves the external valley, but not the internal, and shows indications of the "third lobe" toward the base of the crown. A.M.N.H. No. 26097 shows the "third lobe" present as a tiny style on the posterior wall of the tooth, well below the functional occlusal surface of the crown. In A.M.N.H. No. 26097 the tooth is also shown as rooted, with distinct anterior and posterior root canals separated by a common wall.

**Measurements**

<table>
<thead>
<tr>
<th>Gobiolagus andrewsi Burke, A.M.N.H. No. 26091 (holotype)</th>
<th>mm.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inferior I antero-posterior</td>
<td>1.9</td>
</tr>
<tr>
<td>Inferior I transverse</td>
<td>2.0</td>
</tr>
</tbody>
</table>

P1 antero-posterior (occlusal surface).............. 1.7
P1 transverse (occlusal surface)...................... 1.3
P1 antero-posterior (occlusal surface).............. 1.8
P1 transverse (occlusal surface)...................... 1.7
M1 antero-posterior (occlusal surface).............. 2.0
M1 transverse (occlusal surface)...................... 2.3
M2 antero-posterior (occlusal surface).............. 2.2
M2 transverse (occlusal surface)...................... 2.5
M3 antero-posterior (occlusal surface).............. 1.3
M3 transverse (occlusal surface)...................... 1.4
Length of inferior premolar series at occlusal surface ............ 2.5
Length of inferior premolar series at alveoli ............ 4.0
Length of molar series at occlusal surface ............ 5.8
Length of molar series at alveoli ...................... 6.4
Length of mandibular cheek teeth at occlusal surface ............ 9.1
Length of mandibular cheek teeth at alveoli ............ 10.3
Depth ramus under M1 (lingual side) ..................... 8.3
Width superior region of ramus below M2 ............ 3.9
Width superior region of ramus below M1 ............ 3.5
Width superior region of ramus below P4 ............ 2.9
Width superior region of ramus below P3 ............ 2.0
Diastema between inferior I and P1 ............ 7.0

**Gobiolagus (?) major**, new species

**Figure 5**

**Holotype.**—A.M.N.H. No. 26098, portion of a right mandibular ramus with P4, M1-3 and broken incisor.

**Horizon.**—Ulan Gochu, Lower Oligocene. Central Asiatic Exped., 1928.

**Diagnosis.**—Resembling Gobiolagus (?) teilhardi, new species, in heaviness of mandibular ramus and reduction of incisor, but a larger species. Cheek teeth much as in Desmatolagus, but P4 of the Gobiolagus type.

The mandibular ramus of this species is at once characterized by its relatively great size and heaviness; in these respects it exceeds both Desmatolagus robustus and Gobiolagus (?) teilhardi, new species. The transverse narrowing of the ramus is anterior to M1; in relative depth the ramus appears nearer Gobiolagus tolmachovi but is much heavier. The posterior mental foramen occurs beneath P4. The superior border of the masseteric fossa is shown sharply defined and rising about as steeply as in Gobiolagus tolmachovi. The tubercle anterior to the fossa is strong and boss-like, resembling that in Shamolagus grangeri although not as prominent as that in the latter. The dental foramen appears to have been much as in Gobiolagus tolmachovi.

The incisor in this form is small, in rela-
tion to the size of the ramus. It is more round, less trihedral than in Gobioagus tolmachovi. This tooth extended back beneath M1 at least, as indicated by the incisive swelling.

The P3 is not preserved in the holotype and only specimen.

The P4 is the most diagnostic tooth in the mandibular ramus; it points to an alliance of this particular species with Gobioagus despite other atypical features of the dentition. The tooth shows atrophy—it is reduced in size in comparison with the molars; the characteristic small talonid of Gobioagus, flattened against the trigonid and without a broad notch at the entrance of the lateral valley, is found here. It is true that the trigonid occlusal section does not have the pear-shape characteristic of the same section in P4 of Gobioagus tolmachovi but the section is not angular on the lateral side. The trigonid is prominent and appears sub-cylindrical, like a rounded peg, in lateral view, much as in Gobioagus andrewsi; the lateral exposure of the talonid is slight, as in Gobioagus generally. Laterally and medially the trigonid projects beyond the talonid.

Certain features suggest that the molars of this species (M1 and M2 at least) are not as advanced in specialization as those of Gobioagus tolmachovi and Gobioagus andrewsi. The ramus of this form is not as deep, indicating a shorter tooth shaft; the enamel of the internal side is persistent, although the teeth are well worn and the internal valley persists in M1 even at this stage of wear—it shows in conjunction with the external valley in that tooth. These characteristics would indicate that Gobioagus (?) major is not only a lower-crowned form than the latter species, but also shows less unilateral hypsodonty in its cheek teeth.

In general, the molars show less antero-posterior compression of the lateral sides of the trigonids than those of Gobioagus andrewsi, thus resembling Gobioagus tolmachovi. Although M1–2 are transverse, the trigonids show less lateral expansion than in the same molars in the above species. The trigonids also project mediad beyond the talonids.

The M2 is the largest cheek tooth in the ramus; its large talonid gives it the excess in size.

The M3 is much reduced in comparison with M2; it resembles that of Gobioagus tolmachovi in showing the trigonid larger and more transverse than the somewhat rounded talonid. The tooth is rooted.

The molars of this species are suggestive of those of Desmatolagus, but the P4 is definitely of the Gobioagus type. Further evidence of affinity with Gobioagus may be shown in P3 when that tooth is known in this form. In the meantime, the evidence furnished by P4 cannot be overlooked; this type of P4 is not found in Shamolagus, which in every respect seems to stand ancestral to Desmatolagus. A further discussion of possible relationships of Gobioagus (?) major is given in conjunction with the description of Gobioagus (?) teihardi, new species, which follows.

**Measurements**

<table>
<thead>
<tr>
<th>Gobioagus (?) major Burke, A.M.N.H. No. 26098 (holotype)</th>
<th>mm.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inferior I, antero-posterior</td>
<td>2.3</td>
</tr>
<tr>
<td>Inferior I, transverse</td>
<td>2.2</td>
</tr>
<tr>
<td>P1 antero-posterior (occlusal surface)</td>
<td>2.6</td>
</tr>
<tr>
<td>P1 transverse (occlusal surface)</td>
<td>3.3</td>
</tr>
<tr>
<td>M1 antero-posterior (occlusal surface)</td>
<td>3.0</td>
</tr>
<tr>
<td>M1 transverse (occlusal surface)</td>
<td>3.6</td>
</tr>
<tr>
<td>M2 antero-posterior (occlusal surface)</td>
<td>3.1</td>
</tr>
<tr>
<td>M2 transverse (occlusal surface)</td>
<td>3.5</td>
</tr>
<tr>
<td>M3 antero-posterior (occlusal surface)</td>
<td>1.7</td>
</tr>
<tr>
<td>M3 transverse (occlusal surface)</td>
<td>2.0</td>
</tr>
<tr>
<td>Length inferior molar series at occlusal surface</td>
<td>7.8</td>
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<tr>
<td>Length inferior molar series at alveoli</td>
<td>8.9</td>
</tr>
<tr>
<td>Depth ramus under M2 (lingual side)</td>
<td>10.7</td>
</tr>
<tr>
<td>Width superior region of ramus below M2</td>
<td>5.0</td>
</tr>
<tr>
<td>Width superior region of ramus below M1</td>
<td>5.0</td>
</tr>
<tr>
<td>Width superior region of ramus below P4</td>
<td>4.7</td>
</tr>
</tbody>
</table>

**Gobioagus (?) teihardi,** new species

Figure 6

Duplicitende indeterminate TEILHARD, 1926, Annales de Paleontologie, Tome 15, Fig. 14C, p. 26.

Holotype.—A.M.N.H. No. 20236, a portion of a left mandibular ramus with broken incisor, base of P1 and P4, M1.

Horizon.—Hsanda Gol Red Beds, Upper Oligocene.

1 The species is named for Pierre Teilhard de Chardin, who first described the form but refrained from giving it a specific name.
Locality.—Ten miles west of Loh, Inner Mongolia. Central Asiatic Exped., 1922.

Diagnosis.—Considerably larger than contemporary species of Desmatolagus; ramus heavier and deeper. Lateral walls of cheek teeth steeper and P4 larger, relative to M1, than in Gobiolagus andrewsi; trigonid of P4 more compressed antero-posteriorly on lateral side and lateral exposure of talonid of P4 greater, but talonid of reduced type.

The fragmentary mandibular ramus which represents this species in the collection of The American Museum of Natural History indicates a lower jaw which is larger, deeper, and heavier than that of Desmatolagus robustus, with which it is associated in the Hsanda Gol fauna. The ramus shows no abrupt transverse narrowing in the vicinity of the anterior cheek teeth. There is a posterior mental foramen beneath and between P3 and P4. The mandibular incisor is small, considering the size of the ramus. It shows little curvature on its anterior face and exhibits greater transverse compression than that of Gobiolagus andrewsi. The incisive swelling indicates that the tooth arose beneath M1.

The P4 of this specimen is broken off at the alveolar border. The transverse section is comma-like, much as the worn occlusal section of the Megalagus P4, but the internal reentrant cuts into the tooth in its posterior half, reducing the lateral exposure of the talonid. In the present condition of the tooth no other reentrants are discernible.

The P4 is in a good state of preservation. The trigonid is stout, and in occlusal section the protomere area nearly approximates that of the paramere, but the lateral angle of the section is sharper than the median angle. The talonid, on the other hand, is small and shows slight lateral exposure in comparison with the trigonid—in general resembling the talonid of P4 in Gobiolagus tolmachowi and Gobiolagus andrewsi—particularly the latter.

The M1 shows a talonid approximating the trigonid in antero-posterior measurement, and the talonid contrasts further with that of P4 in being considerably more transverse and in showing a greater lateral exposure; this comparison between P4 and M1, it will be noted, holds true in Gobiolagus tolmachowi and Gobiolagus andrewsi also. The trigonid of M1 is somewhat more compressed antero-posteriorly on the lateral side than in Gobiolagus andrewsi.

The cheek teeth of this species show steeper lateral walls than those of Gobiolagus andrewsi. In P4 and M1 the trigonids have greater lateral extent than the talonids, although in M1 the talonid shows a greater lateral extent relative to the trigonid, than in Gobiolagus andrewsi. In both teeth the trigonids jut medially beyond the talonids to some degree. The internal valley is not persistent and is not preserved in the teeth of this specimen.

A most interesting feature of P4 and M1 of this species and one not found in these teeth in Gobiolagus tolmachowi, Gobiolagus (?) major and Gobiolagus andrewsi, is shown on the internal wall of the crown of each. There is a reentrant curve in the wall posterior to the internal reaches of the external valley. Within this vertical trough run two parallel grooves, with a delicate ridge between them. The origin of this ridge is not clear, in the absence of the internal valley, but it might represent a slight development of something in the way of a mesostyle. Some support for this hypothesis might be found in a specimen of Desmatolagus robustus in the Car-

Fig. 6. Gobiolagus (?) teilhardi Burke, A.M.N.H. No. 20236. Lateral view of portion of mandibular ramus and occlusal view of broken P3 and P4, M1 left, ×3.
negie Museum collection which shows a small tubercle in the exit of the internal valley of $P_4$. Such a tubercle might persist, with hypsodonty, as a ridge, defined by grooves anterior and posterior to it.

The anterior wall of the alveolus for $M_2$, as preserved in this specimen, is coated with a thick layer of cement.

Teilhard\(^1\) has described a mandibular ramus which appears to represent this species; I am quoting his description for the benefit of other workers who may not have it at hand:

Cette mandibule, dont la face interne et les couronnes dentaires sont malheureusement trop altérées pour qu'on puisse fonder sur elle la description d'une espèce nouvelle, pourrait être confondue, à première vue, avec une mâchoire de *Desmatolagus robustus* dont elle a, à peu de chose près, la longueur dentaire ($P_3-M_2 = 10$ millimètres, au lieu de 11). Mais de cette espèce elle diffère, en réalité, par plusieurs caractères importants:

a. D'abord, chez elle, la branche horizontale de la mandibule est notablement plus profonde (10, 5 au lieu de 9).

b. Ensuite, $P_3$ est à croissance absolument continue, et plus longue (dans le sens antéro-postérieur) que $P_4$.

c. Enfin, sur $P_4$, le talon, au lieu d'être au moins aussi long que sur $M_1$, est notablement plus court, moins détaché, plus arrondi que sur cette dent. A son tour, $M_1$ a un talon moins développé que $M_2$. $M_2$ paraît relativement plus long, avec racines mieux séparées que sur les autres *Desmatolagus*.

Par la brièveté de sa $P_2$ et la longueur relative de sa $P_3$, la mandibule que nous venons de décrire diffère, non seulement de *Desmatolagus robustus*, mais de tous les *Desmatolagus* que nous avons énumérés plus haut. Elle mériterait donc peut-être la création d'un genre spécial. Son mauvais état de conservation et le fait que sa $P_2$ ne présente, comme elle des *Desmatolagus*, que deux lobes (ou colonnettes) externes, au lieu de trois (comme celles des *Lagomys* et des *Léporidés*), nous décident à ne pas lui donner, au moins provisoirement, de nom nouveau.

The generic position of *Gobiolagus (?) teihardi* must remain in some doubt until better material representing the species is available; when such material is studied, the species may prove to belong to a distinct genus. It is a temptation to propose the phylogenetic series *Gobiolagus tolmachovi* → *Gobiolagus andrewsi* → *Gobiolagus (?) teihardi*; which may prove to be such, but certain considerations make me hesitate in this case. For one thing, *Gobiolagus (?) teihardi* has in common with the Ulan Gochu *Gobiolagus (?) major* a few characters (large size, heavy ramus, and disproportionately small incisor) which, although not usually given much phylogenetic weight, nevertheless are suggestive of relationship between these forms. It is true that *Gobiolagus (?) major* lags behind its contemporary *Gobiolagus andrewsi* in specialization, but my recent studies of species of *Desmatolagus* in the Hsanda Gol have shown me that in that genus the larger *Desmatolagus robustus* is persistently less specialized than the contemporary *Desmatolagus gobiensis*; it is possible that within the *Gobiolagus* group we have a somewhat similar situation, with greater specific disparity, in the Ulan Gochu.

**Measurements**

*Gobiolagus (?) teihardi* Burke, A.M.N.H. No. 20236 (holotype)

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inferior I, antero-posterior</td>
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<td>$P_4$, antero-posterior (occlusal surface)</td>
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<td>Width superior region of ramus below $P_4$</td>
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<tr>
<td>Width superior region of ramus below $P_3$</td>
<td>4.3</td>
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**Desmatolaginae**, new subfamily

Derivatives of *Shamolagus* paralleling the *Megalaginae*, but with generally less progressive cheek teeth and with terminal cheek teeth (particularly $P_3$) more reduced and simplified.

**Included Genera.—** *Desmatolagus* and possibly *Amphiolagus*.

**Range.**—Oligocene, Asia, ?Europe, and North America.

**Desmatolagus Matthew and Granger**

**Desmatolagus vetustus**, new species

Figsures 7-8

**Holotype.**—A.M.N.H. No. 26089, a right mandibular ramus with complete dentition.

**REFERRED SPECIMENS.**—A.M.N.H. No. 26094, a left maxilla with $P^2-4$, $M^1-2$; A.M.N.H. No. 26095, a right maxilla with $P^4-4$, $M^1-2$; A.M.-

N.H. No. 26093, a left mandibular ramus with complete dentition; A.M.N.H. No. 26099, a right mandibular ramus with all cheek teeth and broken incisor; A.M.N.H. No. 26083, a left mandibular ramus with cheek teeth complete, incisor broken; A.M.N.H. No. 26081, part of right mandibular ramus with $P_3$, $M_1$; A.M.N.H. No. 26082, part of left mandibular ramus with $P_4$, $M_1$, $M_2$, A.M.N.H. No. 26080, damaged right mandibular ramus with shattered $P_4$, $M_1$, $M_2$, and roots of $P_5$; A.M.N.H. No. 26090, a left mandibular ramus with $P_4$, $M_1$, $M_2$.

Horizon.—Ulan Gochu, Lower Oligocene.


![Fig. 7. Desmatolagus vetustus Burke, referred specimen. A.M.N.H. No. 26094. Ventral aspect of left maxillary with $P_1^4$, $M_1^4$, $M_2^3$, $X_3$.](image)

Diagnosis.—Distinguished from other species of Desmatolagus by: size (somewhat larger than Desmatolagus gazini but smaller than Desmatolagus gazini); lesser antero-posterior compression of cheek teeth; greatest width of maxillary tooth row usually at $M_1$, of mandibular tooth row usually at $M_2$; $P_4$ rotund, not attenuated, less reduced; $P_3$ not compressed at antero-posterior angle; $P_4$ without notch between lateral cusps; attenuation of $P_1$ not marked, trigonid lobe of $P_4$ with anterior reentrant, but protoconid prominent; $M_3$ less reduced.

In addition to the holotype and several other mandibular rami, two maxillae are referred to this species. These specimens, A.M.N.H. Nos. 26094 and 26095, compare best in size with those of Desmatolagus gobiensis from the Hsanda Gol Oligocene, but are larger than the holotype maxilla of that species, and more robustly constructed. The Oreodon Beds Oligocene species Desmatolagus gazini is somewhat larger than the species under description, but its holotype maxilla, though considerably damaged, would appear to be nearer that of Desmatolagus vetustus in relative heaviness. So, too, are the maxillae of the larger species of Desmatolagus of which we know—those of Desmatolagus dicei and Desmatolagus robustus, both of the latter showing the heaviness on the external side in the antorbital region which distinguishes Desmatolagus vetustus from Desmatolagus gobiensis. Both of these maxillae referred to Desmatolagus vetustus preserve the suture between the maxilla and the malar; the latter bone dove-tails with the maxilla and extends forward above the posterior part of $P_3$. In lateral external view, the maxilla shows as a thin splint above the malar, but below the suture is more oblique and considerable of the maxilla is exposed. It is of interest that the suture is preserved in these specimens, in which the teeth are mature and well worn: I find the suture showing well in the holotype of Desmatolagus dicei also, and in that specimen the teeth are much worn. In all the specimens of Desmatolagus gobiensis and Desmatolagus robustus which I have examined, the suture is either obliterated entirely or in part.

The maxillary portion of the palatal bridge in Desmatolagus vetustus arises in advance of $P_3$, which is in contrast with the situation in Desmatolagus gobiensis, where this portion of the bridge arises posterior to the alveolus of $P_3$. However, in Desmatolagus robustus, which is the only other species represented by specimens preserving this region of the palate, the maxillary portion of the palatal bridge also extends farther anteriorly.

The $P_2$ of Desmatolagus vetustus is preserved in A.M.N.H. No. 26094. It is a relatively larger tooth than in Desmatolagus gobiensis generally, less attenuated, and swells more rapidly toward the base. In these respects it approaches to some extent the same tooth in Desmatolagus robustus, although $P_2$ of the latter is usually relatively smaller, and like that of Desmatolagus gobiensis shows a tendency toward flattening of the anterior face of the tooth and reduction of the paracone lobe.

$P_3$ in both maxillae of the species under
description lacks a protoloph, not even showing a short protoloph of the type found in the holotypes of Desmatolagus dicei and Desmatolagus gazini. It differs from P³ of the latter forms also in showing a much more robust development at the postero-external angle, and in being more extended antero-externally, which gives it more of a triangular outline in occlusal view. However, neither of the North American species shows the compressed or pinched antero-external angle of P³ which usually characterizes Desmatolagus gobiensis and which contrasts so strongly with the condition found in Desmatolagus vetustus. In general, the more triangular type of P³ found in Desmatolagus robustus is more like that of Desmatolagus vetustus than the type of P³ found in other species of Desmatolagus. The P³ of Desmatolagus robustus also approaches that of Desmatolagus vetustus in failing to show marked reduction of the postero-external angle, but it differs from the latter, also from the American species and agrees with Desmatolagus gobiensis, in showing a better defined vertical groove on the anterior face in the region of the protocone.

P⁴, M¹, and M² of the Hsanda Gol species of Desmatolagus show a tendency (most marked in Desmatolagus gobiensis) toward the development of a reentrant outer border between the trigon and talon external cusps. This is shown to some extent in the molars of the earlier Oligocene forms, including Desmatolagus vetustus but I have not noted it in P⁴ of the Lower Oligocene species.

Neither P³ nor P⁴ of Desmatolagus vetustus is as transverse, i.e., extends as far externally, as do those teeth in the maxilla of the American species of Desmatolagus and the forms from the Hsanda Gol. When the superior tooth row of Desmatolagus vetustus is viewed at the occlusal surface, the external outline does not approximate a smooth curve, but is staggered and jagged anterior to M³. However, if one observes this outline of the maxillary tooth row in Desmatolagus vetustus, Desmatolagus dicei, and Desmatolagus gazini, Desmatolagus robustus and Desmatolagus gobiensis in the order named, he will observe that P³–⁴ gradually becomes more transverse on the external side, approximating each other and the molars, so that in the Hsanda Gol forms, this external outline of the tooth row, in occlusal view presents a fairly uniform curve from P³ to M³, best shown in Desmatolagus gobiensis which in this, as in most other respects, is more specialized than its contemporary Desmatolagus robustus.

This increase in transverse extent carries with it, in P⁴ at least, an increase in size which is also observable in the series, so that, while we find P⁴ in Desmatolagus vetustus a tooth a little smaller than, or approximating M¹ in size, in the Hsanda Gol forms it is as a rule definitely the larger tooth.

I find little in the pattern of P⁴ of Desmatolagus vetustus which might serve as a basis for specific distinction. Even the ectoloph-like external wall occurs as a variation in Desmatolagus gobiensis. In the two maxillae referred to Desmatolagus vetustus the internal reentrants are still preserved in P³ and P⁴, but, as in other species of Desmatolagus there is no trace of the enamel island such as we find in Palaeolagus, although the island is present in M³⁻². In this respect, as in many others, Desmatolagus resembles Magalagus and Mytonolagus.

The M¹ and M² of Desmatolagus vetustus appear to differ from the same teeth in later Oligocene forms, and notably from Desmatolagus gobiensis in being less compressed antero-posteriorly, and in showing lesser delicacy and sharpness of the pattern elements. It is also worthy of note that in M¹⁻² of Desmatolagus vetustus the internal reaches of the external valleys have been obliterated by wear, although the enamel island still remains. This is in contrast to the condition found in Desmatolagus gobiensis where the inner reaches of the antero-external valley persist, together with the island, even after the external course of the valley has been obliterated.

M³ of Desmatolagus vetustus does not show an unusually short postero-external crest of the type found in Desmatolagus gazini. However, as the penultimate cheek tooth, M³ in these forms can be ex-
pected to show rather considerable variation, and I doubt whether this short crest will prove a constant specific character in *Desmatolagus gazini*.

Neither of the two maxillae referred to *Desmatolagus vetustus* preserves M3, but the alveolus for this tooth is shown in both cases, and its size suggests that the tooth was less reduced than in later Oligocene forms.

While in point of size the mandible of *Desmatolagus gobiensis* comes nearest that of the species under description, although a little smaller, it is in full accord with the maxilla of that species in lacking the heaviness found in *Desmatolagus vetustus*. In this respect, again as was noted under the description of the maxilla, *Desmatolagus vetustus* makes an approach to *Desmatolagus robustus* and *Desmatolagus dicesi*. The diastema appears to be about the same as in the two Hsanda Gol species. In the holotype mandibular ramus of *Desmatolagus vetustus* the anterior mental foramen is located midway of the diastema, the posterior mental foramen beneath the talonid of P4; in a paratype of *Desmatolagus gobiensis* the posterior mental foramen is somewhat, and the anterior mental foramen noticeably, posterior to these positions. Although there is considerable variation in regard to the placement of these foramina in both species, the tendency in *Desmatolagus gobiensis* seems to be in the direction of a more posterior location. Two posterior mental foramina sometimes occur in *Desmatolagus vetustus* as in *Desmatolagus gobiensis*. In *Desmatolagus robustus* the anterior and the posterior mental foramina sometimes occur even anterior to their position in the holotype of *Desmatolagus vetustus*. The ascending ramus arises at a much steeper angle in *Desmatolagus gobiensis* than it does in *Desmatolagus vetustus*; the species under description again approaching *Desmatolagus robustus* in this respect, for the ascending ramus of the larger Hsanda Gol species also arises at a lower angle than that of *Desmatolagus gobiensis*. A.M.N.H. No. 26083, referred to *Desmatolagus vetustus*, preserves enough of the dental foramen to show the latter as slit-like and extended nearly vertically, as in later species of *Desmatolagus*, rather than obliquely, as in *Shamolagus grangeri*. In the specimens of *Desmatolagus vetustus* at hand, the masseteric fossa is not well preserved except in A.M.N.H. No. 26083, which is a young specimen, but from what I can make out of it in the older specimens, it was not as deeply excavated as in the Hsanda Gol forms of *Desmatolagus*, and it did not have its antero-dorsal boundary as sharply defined. The present species is somewhat larger than *Shamolagus medius*, the Eocene form with which it compares best, and from which it appears to be derived. The Ulan Gochu species shows a little increase in depth and heaviness of the ramus anteriorly, but the principal differences of note are to be found in the cheek teeth.

The mandibular incisor of this species is trihedral in cross-section, with a flattened anterior face. It arises beneath M1 and is larger than that of *Shamolagus medius*. It seems to present no salient characters distinguishing it from the lower incisors of other species of *Desmatolagus*.

The P4 of *Desmatolagus vetustus* is a stout tooth, a crudely cylindrical peg, expanding somewhat toward the base anteriorly and laterally. There is a single external reentrant which extends less than half the distance across the occlusal surface of the tooth in the holotype. In the holotype also the anterior face of this tooth is broadly concave on its lingual side.

![Fig. 8. Desmatolagus vetustus Burke, holotype, A.M.N.H. No. 26089. Lateral view of mandibular ramus and occlusal view of P3-4, M1-2 right, ×3.](image-url)
but the reëntrant thus indicated is somewhat less persistent than the external reëntrant. This is the usual pattern shown in P₃ of mature specimens of Desmatolagus vetustus; no other reëntrants show at this stage of wear and the shaft is tri-lobed at the occlusal surface.

This, in its essentials, is the worn Desmatolagus P₃ pattern. I am strongly inclined to believe that it has not been derived from the P₃ pattern of Shamolagus without marked modification. There is a mandibular ramus of a young specimen of Desmatolagus vetustus, A.M.N.H. No. 26083, which preserves P₃ at an early stage of wear; in this specimen the broad anterior reëntrant is shown, as in the holotype, but posterior to it, on the lingual side and anterior to the external reëntrant is a third reëntrant, not as persistent as either of the former. This could represent either one of the two internal reëntrants of P₃ of Shamolagus—the antero-internal or the postero-internal, but I am interpreting it as the antero-internal because it resembles that reëntrant as it usually appears in P₃ of the Duplicidentata, because it arises in advance of the external reëntrant, and because the postero-internal reëntrant is least persistent in Shamolagus and might be expected, in view of the compression of the talonid found in Desmatolagus, to be eliminated from the crown surface.

If this interpretation is correct, however, we must conclude that the anterior lobe of P₃ of Desmatolagus is only homologous in part with that of P₃ of Shamolagus: to put it in another way, the trigonid lobe of Shamolagus is undivided—in Desmatolagus the trigonid lobe is divided by an anterior reëntrant corresponding to an anterior valley. There are indications that "molarization" of P₃ (sub-division of the trigonid) has been attained by most duplicidentates during the Oligocene, as shown in Palaeolagus, Megalagus, and Titanomys, even though in some cases it shows as little more than a flattening of the anterior face of the trigonid.

The modification of the trigonid in P₃ of Desmatolagus vetustus from the condition found in P₃ of Shamolagus medius has drawn the anterior wall of the external reëntrant valley mediad, widening the latter valley and giving considerably more exposure of the lateral talonid wall in anterior view. The lateral side of the talonid is also more compressed antero-posteriorly than in P₃ of Shamolagus medius and its lateral wall is steeper.

The P₃ of Desmatolagus robustus shows less attenuation than that of Desmatolagus gobiensis, however, and the unworn pattern may resemble that of Desmatolagus vetustus.

A.M.N.H. No. 26080 shows this tooth to have been double-rooted, with the roots arranged antero-posteriorly.

The principal differences between P₃ of Desmatolagus vetustus and the same tooth of Desmatolagus gobiensis consist in greater attenuation of the tooth shaft in the Hsanda Gol species, which carries with it less marked expansion of the tooth toward the crown base, and steeper crown walls, particularly anteriorly and externally; some transverse compression of the anterior lobe and antero-posterior compression of the talonid—the latter exhibited in the sharp external talonid wall, the flattening of the posterior wall against P₄, and the antero-posterior reduction of the talonid on the internal side. This reduction of the talonid on the internal side seems to be due to a great extent to the continued widening and shallowing of the anterior reëntrant; the latter often appears more like a wide plane face, rather than a groove, on the antero-lingual side of P₃ of Desmatolagus gobiensis. Perhaps the most noticeable features of P₃ of Desmatolagus gobiensis in contrast with that tooth in Desmatolagus vetustus are the greater attenuation of the tooth in the Hsanda Gol species, and the wider groove or face at the antero-lingual angle.

Prevalent in many specimens of Desmatolagus gobiensis but not shown in any of the specimens of Desmatolagus vetustus at hand is the development of a tubercle at the base of the antero-internal reëntrant valley.

As might have been expected, considering other similarities in the two forms, the P₃ of Desmatolagus robustus makes a much closer approach to that of Desmatolagus.
vetustus than does P₃ of Desmatolagus gobiensis. In fact, the only differences, outside of size, which appear to me as consistently distinguishing the two are shown in the greater attenuation of the tooth shaft, lesser expansion toward the base of the crown, and steeper walls; also the greater persistence of the external reentrant, in Desmatolagus robustus.

The P₄ of Desmatolagus vetustus is a relatively larger tooth than that of Shamolagus medius. The tooth is less attenuate from the base to the crown surface on the external side; the external walls of the trigonid and the talonid are steeper; the trigonid is less swollen toward the base on the protomere side, the transition from crown to root is less abrupt, and the enamel has extended further down the trigonid root on the lateral side. The trigonid, laterally, no longer crowds the talonid toward the base of the crown to the extent that it did in Shamolagus medius; while the talonid shows more expansion toward the base on that side. Seen at the occlusal surface, the talonid is larger than in Shamolagus medius and sub-round in outline, not triangular as in Shamolagus medius; the trigonid is more compressed antero-posteriorly, particularly on the protomere side, its occlusal surface showing less of the pear-shaped outline. The external valley is wider.

When comparison is made with P₄ of Desmatolagus gobiensis, P₄ of Desmatolagus vetustus is seen to approximate that tooth in Shamolagus in the rotundity of the lateral side of its trigonid and its preservation of something of the pear-shaped trigonid occlusal section. The P₄ of Desmatolagus gobiensis is a more hypsodont tooth, with steeper walls and more angular occlusal sections; the trigonid is compressed antero-posteriorly and the talonid shows a triangular, rather than a sub-round occlusal section. Its reentrant valleys are also narrower and less persistent, and the external valley is V-shaped. In regard to its "molarization" stage, the tooth probably makes its nearest approximation to Desmatolagus dicei. It is interesting that Desmatolagus dicei also shows the small P₄ (M₂ is the largest mandibular cheek tooth in that species). The greatest width of the mandibular tooth row is usually at M₂, in Desmatolagus vetustus also, although I have found one exception to this, A.M.-N.H. No. 26090, a mandibular ramus of a young individual showing the greatest width of the tooth row at P₄. In Desmatolagus robustus P₄ appears to be consistently the widest tooth.

A.M.N.H. No. 26080 indicates that this tooth was double-rooted.

One specimen, A.M.N.H. No. 26099, shows a P₄ which has revolved 90° in the ramus, with the trigonid medial in position and the talonid lateral. Judging from the wear on the tooth I think it must have functioned in this position during the animal's lifetime.

In general, in comparison with Desmatolagus gobiensis, many of the differences pointed out in the discussion of the fourth premolars of the two species hold true for the molars as well. The M₂ of Desmatolagus vetustus differs rather strikingly from the M₂ of Shamolagus medius in showing the sub-round, rather than triangular talonid occlusal section; the talonid is also reduced in size when compared with that of the latter species. But the molars of Desmatolagus vetustus still approximate the type found in Shamolagus in being relatively low-crowned with persistent internal valleys, whereas in Desmatolagus gobiensis the teeth are more hypsodont and the internal valleys less persistent. In the latter species, too, the molars have undergone more antero-posterior compression, the lateral protomere walls are more angular, the external valleys are V-shaped and the talonids are triangular, rather than sub-round in occlusal section. In the above assemblage of characters Desmatolagus robustus approximates Desmatolagus vetustus more nearly than Desmatolagus gobiensis does; it shows less antero-posterior compression of the molars and more persistent internal valleys. Nevertheless, in addition to greater size, the larger Hsanda Gol species shows the greatest width of mandibular tooth row at P₄ and greater reduction of M₃ than Desmatolagus vetustus. The M₃ is also reduced in Desmatolagus dicei, although the latter approaches
Desmatolagus vetustus in crown height and in having the greatest width of mandibular tooth row at M₂; it is, however, a much larger species.

The postero-internal reëntrant marking off the “third lobe” is shown in P₄ and M₁ in A.M.N.H. No. 26090 and in the same teeth in A.M.N.H. No. 26083. The M₃ of the latter specimen also shows two distinct cusps, one lateral, the other medial, on the talonid.

**Measurements**

Desmatolagus vetustus Burke, A.M.N.H. No. 26089 (holotype)

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<td>Length of mandibular tooth row</td>
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A.M.N.H. No. 26094 (referred specimen)

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<td>M₄ transverse (external border to inner edge of occlusal surface)</td>
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**Desmatolagus ardynense, new species**

Figure 9

Holotype.—A.M.N.H. No. 20373, a left mandibular ramus with P4, M1–2, anterior root of DP3, and broken incisor.

Referred Specimen.—A.M.N.H. No. 20374, a right mandibular ramus with P4, M1–2.


Diagnosis.—About the size of Desmatolagus robustus but with smaller P4; cheek teeth less compressed antero-posteriorly. M1, the largest mandibular cheek tooth.

In general proportions (size, relative heaviness, diastema, and depth of ramus) the mandibular ramus of this species would apparently fall within the range of Desmatolagus robustus. The ramus narrows transversely anterior to M1, however, in the holotype, which is of a young individual; in the referred specimen, from an old individual, the narrowing at this place is slighter. In Desmatolagus robustus the narrowing of the ramus seems usually to occur anterior to P4. The anterior mental foramen is carried forward and occurs at the incisive region of the diastema in the young holotype specimen. The posterior mental foramen lies between and beneath P4 and M1 (in A.M.N.H. No. 20374 just beneath the talonid of P4). The slope of the ascending ramus is not as steep as in Desmatolagus robustus and Desmatolagus dicei. The masseteric fossa is very shallow in the young holotype specimen, but shows moderate development in A.M.N.H. No. 20374. The scar is not as distinct as in Desmatolagus robustus and Desmatolagus dicei, but in A.M.N.H. No. 20374 the tubercle anterior to the scar is a little reminiscent of that in Shamolagus. The slit of the dental foramen is more oblique than in Desmatolagus robustus.

The incisor of A.M.N.H. No. 20373 seems less angular in cross-section than that of Desmatolagus robustus but this may be a character dependent upon the stage of growth. The incisive swelling, however, indicates that the incisor extended posteriorly beneath M1, whereas in Desmatolagus robustus the incisor does not appear to extend posterior to P4.

P3 is not preserved, but its alveolus suggests that it was larger than P3 of Desmatolagus robustus. Anterior to the alveolus appears the base of the root of DP3; this is the “minute vestigial stump of a tooth” mentioned by Matthew and Granger.1 This is plainly the remnant of the anterior root of the milk tooth, not a vestige of P3.

The cheek teeth, in general, show less antero-posterior compression than those of Desmatolagus robustus.

The P4 is relatively a smaller tooth than in Desmatolagus dicei and much smaller than in Desmatolagus robustus, where P4 is “molariform” and as large as, or larger than M1. P4 in the holotype preserves the postero-internal reentrant marking off the “third lobe.”

The M1 is the largest and most transverse of the mandibular cheek teeth. This contrasts with the situation in Desmatolagus robustus where M1 is sometimes smaller than P4 or M2. In Desmatolagus dicei M2 is the largest of the mandibular cheek teeth and the most transverse.

The M2 in the holotype of Desmatolagus ardynense preserves the postero-internal reentrant.

The alveolus for M3 suggests that the tooth was larger than in Desmatolagus dicei or Desmatolagus robustus.

Desmatolagus ardynense is apparently little advanced beyond Desmatolagus dicei in specialization but is definitely less specialized than Desmatolagus robustus; it probably gave rise to the Hsanda Gol species.

Measurements

Desmatolagus ardynense Burke, A.M.N.H. No. 20373 (holotype) mm.

P4 alveolus, antero-posterior .................................. 2.6
P4 alveolus, transverse ........................................ 2.0
P4, antero-posterior (occlusal surface) .................... 2.2
P4, transverse (occlusal surface) .......................... 2.0
M1, antero-posterior (occlusal surface) .................. 2.8
M1, transverse (occlusal surface) .......................... 2.4
M2, antero-posterior (occlusal surface) .................. 2.9
M2, transverse (occlusal surface) ......................... 2.4
M3 alveolus, antero-posterior ............................... 2.2
M3 alveolus, transverse .................................... 1.8

Length of inferior premolars at alveoli (app.) .......... 5.5
Length of inferior molars at alveoli (app.) ............... 8.5
Length mandibular tooth row at alveoli (app.) .......... 14.2

Depth ramus under M1 (lingual side) ...................... 9.7

There are now represented, in the Upper Eocene, three genera of Leporidae—Mytonolagus in North America, Shamolagus, and Gobiolagus in Asia. Gobiolagus is also found in the Lower Oligocene of Mongolia. These genera have in common certain features of the cheek teeth—presence of roots, general pattern, and molar-premolar proportions, plus an undivided trigonid lobe of P3—which in combination are not found in later Leporidae. For this reason I have grouped the three genera in a common subfamily, the Mytonolaginae. Since the characters delimiting the Mytonolaginae will probably apply to an Upper Eocene and Eocene-Oligocene transition stage in the evolution of the Leporidae generally, the group will likely prove to include the stem stock of all later Leporidae.

The genus Shamolagus approximates the North American Mytonolagus in many respects, but differs from the latter mainly in showing more brachyodont anterior cheek teeth and a characteristic construction of the trigonids. The exceptionally large M3 of Shamolagus grangeri will probably not be found in Shamolagus mediust from the Ulan Shireh Beds, which are apparently older than the Myton Member of the Uinta Eocene in which Mytonolagus petersoni is found, and the smaller M2 which characterizes the American Upper Eocene species will probably be approximated in Shamolagus mediust which is derived from the Shara Murun Eocene, a geologically younger formation than the Ulan Shireh.

In P4 of the holotype of Shamolagus mediust we find P3 preserving its full complement of reentrants; the tooth in this specimen demonstrates that in that genus the trigonid lobe of P3 is without grooves or reentrants.

Contemporaneous with Shamolagus mediust in the Shara Murun is Gobiolagus tolmachovi, representing the second genus of the Leporidae in the Mongolian Upper Eocene. Gobiolagus differs from Shamolagus and Mytonolagus in showing marked unilateral hypsodonty and a reduced P4 characteristic of the genus.

In the next higher horizon recognized in Mongolia, the Ulan Gochu Lower Oligocene, Gobiolagus andrewsi appears to be an immediate descendant of Gobiolagus tolmachovi. Fortunately one specimen of this species in the present collection shows P3 in an early stage of wear, and agrees with the holotype of Gobiolagus tolmachovi (in which P3 is worn, however) in showing the trigonid lobe to be without grooves or reentrants.

In the Ulan Gochu Lower Oligocene there occurs a large and aberrant species, Gobiolagus (?) major which combines cheek teeth in general much like those of Shamolagus and Desmatolagus with a P4 of the Gobiolagus type. The true affinities of this form remain to be demonstrated; the P3 is lacking in the unique holotypic specimen.

Before entering into a discussion of a third Ulan Gochu form, I think it best to point out the evolutionary lines present in the Mytonolaginae. As we have seen, the unilaterally hypsodont Gobiolagus is already represented by a sequence of two species and possibly by another but aberrant form. In the North American Upper Eocene occurs Mytonolagus, a form somewhat intermediate between Shamolagus and Gobiolagus in its specialization. Shamolagus, in the Mongolian Eocene, is represented by two species. So far, these three genera conform to the Mytonolaginae as defined, but in their later specializations these evolutionary lines all appear to diverge too widely to be retained in the stem subfamily. Mytonolagus, for example, appears to be allied with the North American Oligocene Megalagus. Gobiolagus is related to an advanced species in the Hsanda Gol Upper Eocene. Shamolagus leads up
to *Desmatolagus*. To trace the later evolution of these stocks, already represented in the Megalaginae, the all-inclusive family term "Leporidae" is not adequate.

In an attempt to cope with this difficulty I propose to use subfamily names rather freely, an action opposed to my former practice, since I feel that taxonomic prefixes are often the prelude to taxonomic confusion. But the subfamily is already established as a major taxonomic unit in the Leporidae and I am trying to make the most of it.

The term Palaeolaginae, at least to the extent that it includes the species of *Palaeolagus*, is an extremely convenient one. I would not extend it, as Wood1 has recently proposed, for by doing so, the utility of the term is lost; it must be remembered that the phyla of Oligocene Leporidae can be established on more characters than the pattern of P₃ alone. I have found no transitions between *Palaeolagus* and *Megalagus* in the Oligocene; the two generic lines seem quite distinct. For this reason I propose to utilize Walker's term, Megalaginae, to characterize the forms included in this genus, rather than my previous clumsy term of "turgidus group." Dice's term Archeolaginae might be extended to cover these forms, but it seems to me that the use of subfamily names to mark off evolutionary stages in the phyla of Leporidae also has its advantages—and gives rise to fewer wild surmises. The term Megalaginae might well be restricted to the Oligocene representatives of the *Megalagus* phylum which have rooted cheek teeth, among other characters, to distinguish them from later Leporidae.

For the *Desmatolagus* phylum, I am proposing a new subfamily, the Desmalaginiae, characterized by persistently unprogressive dentition and a tendency toward reduction and simplification of the terminal cheek teeth. The first representative of *Desmatolagus* is *Desmatolagus vetustus*, found in the Ulan Gochu Lower Oligocene of Mongolia. The form is the most primitive and generalized of the genus, but is advanced beyond the Mytonolaginae in a very important respect; the anterior lobe of the trigonid of P₃ is divided by a broad anterior reentrant. From this species it is a fair conclusion that the anterior (or antero-lingual) reentrant of later species of *Desmatolagus* does not correspond to the main lingual reentrant valley, as might be supposed at first glance.

From a higher Lower Oligocene horizon than the Ulan Gochu, the Ardyn Obo, comes the second species of *Desmatolagus* described in the present paper—*Desmatolagus ardyense*. This large species is close to the Hsanda Gol form *Desmatolagus robustus* in specialization and is evidently ancestral to the latter.

In Asia the record of *Desmatolagus* is incomplete from the Ardyn Obo to the Upper Oligocene, but in North America *Desmatolagus dicei* in the Lower Oligocene and *Desmatolagus gazini* in the Middle Oligocene show increasing specialization of the genus. The record is completed in Asia in the Hsanda Gol Upper Oligocene where the genus culminates in species of the type of *Desmatolagus robustus* and *Desmatolagus gobiensis*.

Size and tooth pattern resemblances between *Desmatolagus vetustus* and *Desmatolagus gobiensis* suggest that there may be at least two evolutionary lines within the genus, the one represented by these smaller forms, more precocious in specialization, the other composed of larger, more conservative species including *Desmatolagus ardyense*, *Desmatolagus dicei*, and *Desmatolagus robustus*. The relationship of *Desmatolagus gazini* to these groups is not clear, although it appears to belong with the latter association.

After the Ulan Gochu Lower Oligocene, the record of the *Gobiolagus* stock is blank until we come to the Hsanda Gol Upper Oligocene. Here there occurs a large species, well specialized but with the characteristic reduced P₄ of the *Gobiolagus* stock. This form, *Gobiolagus (?) teiardi*, may well represent a new genus, and when known from more complete material will probably be excluded from the Mytonolaginae by virtue of advanced specializa-

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tion. While there is abundant time for this large species to have evolved from the small and more typical species Gobiolagus andrewsi of the Ulan Gochu, it is suggested that Gobiolagus (?) teilhardi might have descended from the aberrant Gobiolagus (?) major which also occurs in the Ulan Gochu and which tends toward Gobiolagus (?) teilhardi in size, heaviness of mandibular ramus, and in incisor reduction.

I fail to find any close relationship between these Mongolian genera and the genus Sinolagomys of Bohlin from Western Kansu. Sinolagomys presents an interesting combination of characters, as Bohlin has described and figured it, including a wide internal reentrant valley in the superior cheek teeth, the prevailing direction of which appears to be antero-lateral. The mandibular molars show a deep channel extending down the lateral side of the anterior face of the trigonid and a persistent internal reentrant; in the mandibular tooth row the molar talonids tend to extend medial to the trigonids posterior to them. Bohlin apparently could not derive Sinolagomys from Desmatolagus (its contemporary) but suggested that the two forms had a common ancestry. However, the basic pattern of Desmatolagus is already present in Shamolagus, its Eocene ancestor; while these latter genera are relatively unprogressive and preserve various “primitive” duplicidentate characters, there seems little possibility that either might have given rise to Sinolagomys. Gobiolagus, a more progressive Mongolian genus, approximates even more decidedly the pattern of the modern Leporidae than Shamolagus and Desmatolagus, and likewise seems removed from possible ancestry of Sinolagomys.

In a previous paper I have pointed out that the difference between the cheek teeth of the Ochotonidae and the Leporidae would seem to be chiefly a matter of pattern torsion; the two families appear to represent the extremes of divergent pattern trends. The derivation of the tooth pattern of the Ochotonidae from that of the Leporidae, while often inferred, remains to be demonstrated.

