A NEW GENUS OF LAGOMORPH FROM THE PLIOCENE OF MEXICO

By Robert W. Wilson

Among mammalian remains recently obtained in Pliocene deposits near Rincon, Chihuahua, Mexico, are materials of a new genus of lagomorph. Lagomorph types other than *Hypolagus* are rare in the later Tertiary of the New World, and the present record should be of interest to students of fossil leporids.

FAMILY LEPORIDAE

Notolagus velox, gen. et sp. nov.

Type Specimen—Left ramus with *I* and $P^{\bar{3}}$-$M^{\bar{2}}$, Calif. Inst. Tech. No. 2133.

Referred Specimens—Incomplete palate with left and right $P^{\bar{2}}$-$M^{\bar{3}}$, C. I. T. No. 2137; several fragmentary rami, C. I. T. Nos. 2134-36; and isolated teeth, C. I. T. Nos. 2138-40.

Geologic Age and Locality—Middle (?) Pliocene beds near Rincon, Chihuahua, Mexico.

Generic and Specific Characters—Dental formula: 2/1, 0/0, 3/2, 3/3. Upper incisors with simple, relatively narrow and deep groove which is filled with cement. $P^{\bar{2}}$ with two rather narrow and deep anterior inflections of the enamel. $P^{\bar{3}}$-$M^{\bar{2}}$ with median inflections crenulated and extending approximately two- thirds of the distance across the occlusal surfaces of the teeth. $P^{\bar{3}}$ with a postero-external inflection extending somewhat less than half-way across face of tooth; no postero-internal inflection; antero-internal inflection present and extremely deep and complexly folded, usually cutting completely across the tooth to unite with an antero-external inflection, thus isolating extreme anterior portion of tooth as a separate column. Size approximately as in *Hypolagus limnetus*.

Description

Superior Dentition—A right and a left first upper incisor, No. 2139, are referred to *Notolagus velox*. In cross-section these teeth are relatively narrow transversely. The wearing surface

has a rather long bevel, and, in the specimens available, lacks the pronounced bench usually present in the incisor. The anterior groove of the incisor is simple and rather narrow and deep. It is situated somewhat internal to the mid-point, and is filled with a deposit of cement.

The second upper incisors are also represented by two isolated teeth, No. 2140. These minute teeth are nearly circular in cross-section.

$P^{\bar{2}}$ of No. 2137 (fig. 3) possesses two relatively deep and narrow anterior inflections. The internal fold is slightly the deeper of the two, and its inner margin is faintly crenulated.

The median enamel folds of $P^{\bar{3}}$-$M^{\bar{2}}$ extend two-thirds or more of the way across the occlusal surfaces of the teeth. They exhibit rather strongly crenulated anterior borders, but the posterior borders are only slightly folded. The degree of crenulation in $M^{\bar{2}}$ is decidedly less than in the anterior teeth. $M^{\bar{3}}$ is small and simple, and the wearing surface is of elliptical outline.

Inferior Dentition—The lower incisor is relatively narrow transversely, and the enamel face is very slightly concave. Posteriorly the tooth terminates beneath or slightly in back of the hinder part of $P_{\bar{3}}$ and rather high in the ramus as in *Hypolagus*, instead of at the anterior margin of $P_{\bar{3}}$ as in a number of Recent lagomorph specimens which are available for comparison.

The chief diagnostic characters of the new form lie in the pattern of $P_{\bar{3}}$ (fig. 1a). This tooth is somewhat elongate in outline although the projecting lateral ribs make the antero-posterior and transverse measurements nearly equal. Specimen No. 2133, the type, has a $P_{\bar{3}}$ composed of two distinct parts connected only by cement. The anterior half is much the smaller of the two, and is compressed antero-posteriorly to form an elliptical column. The enamel of the anterior border of this portion of the tooth is smooth, but the external border has two small inflections. The posterior half of $P_{\bar{3}}$ has one external inflection of the enamel which extends less than half the distance across the wearing surface of the tooth. The posterior side of this fold is slightly crenulated. No postero-internal fold is present but the postero-internal border of the tooth is slightly concave. The anterior border of the posterior column of $P_{\bar{3}}$ is strongly crenulate. The most constant feature of this crenulation is the presence of a deep, posteriorly-directed median plication. Specimens Nos. 2136 and 2135 in which $P_{\bar{3}}$ is preserved, as well as an isolated left $P_{\bar{3}}$, No. 2138, possess essentially the same pattern as that of $P_{\bar{3}}$ in the type although crenulation may be intensified or reduced through individual variation. However, No.

2134, left and right rami with P_3-M_1, apparently pertaining to one individual, exhibits a noteworthy difference (fig. 2). In P_3 of this specimen, the anterior column instead of being isolated completely from the posterior one, is connected with the latter by a narrow bridge of dentine near the external side of the tooth. Hence, this tooth exhibits a crenulated antero-external fold which is shallow and broad, and a deep and complexly folded antero-internal one of trefoil pattern. No. 2134 is slightly larger than the type but no larger than other specimens of *N. velox* with tooth patterns comparable to that in No. 2133. Since aside from the character mentioned, No. 2134 is identical in pattern with the type, the difference is believed to represent individual variation. It is possible that isolation of the anterior column of P_3 is an expression of individual age differences. Since minor complications of folding in P_3 are rather pronounced in No. 2134, and No. 2135 has a P_3 with an isolated anterior column but with a relatively smooth enamel pattern, it is assumed tentatively that No. 2134 represents a young individual, and complete isolation of the anterior column occurs in a more adult stage. In any case, the pattern in No. 2134 parallels a necessary structural stage antecedent to that developed in the others.

Cheek-teeth P_4-M_2 do not present any very noteworthy features. The posterior borders of the external inflections are slightly crenulated. Transverse width of the posterior columns is about four-fifths that of the anterior ones. M_3 is not represented in the collections.

Additional Remains—The rami and skull fragments which are available are too incomplete to require much comment. However, the material possesses features which suggest that with better preserved specimens of *Notolagus velox*, characters of value will be revealed by the skull and mandible. Thus, in the skull the anterior root of the zygomatic arch is relatively anterior in position in respect to the tooth-row: the depression of the angle below the inferior border of the horizontal ramus of No. 2136 is very marked.

Fragmentary specimens representing the appendicular skeleton and vertebral column are present but are too incomplete to permit comparisons.

Comparisons and Relationships

The mammalian fauna associated with *Notolagus velox* is nearest in affinities to the Hemphill fauna of Texas. The Hemphill assemblage is regarded by R. A. Stirton as of late middle Pliocene age.[1] Although the more southerly position of the Mex-

[1] R. A. Stirton: Amer. J. Sci., vol. 32, pp. 174-175, 1936.

ican fauna may introduce some measure of doubt as to its geologic age, it is certain that *N. velox* is of either middle or upper Pliocene age, and more probably the former. The sole genus of lagomorph recorded from the North American middle Pliocene is *Hypolagus*. Moreover, this genus and its close relatives are the only later Tertiary (exclusive of the upper Pliocene) leporids known from this continent. *Hypolagus* is also rather common in the upper Pliocene, but in addition relatively rare remains of true leporines and *Alilepus*(?) have been reported. These latter forms are presumably emigrants from outside the North American area. On the basis of the known history and geographic distribution of the Lagomorpha, it might be expected that *Notolagus* would show a closer relationship to *Hypolagus* than to any other known genus. If the views of L. R. Dice[2] on the fundamental importance of $P^{\bar{3}}$ are correct, such would seem to be the case.

Presence, in $P^{\bar{3}}$ of *Notolagus*, of a short postero-external inflection and absence of a corresponding inflection from the postero-internal side of the tooth ally this genus with *Hypolagus*. Likewise, these characters separate it from those forms with a deep external re-entrant (*Lepus, Oryctolagus, Sylvilagus* and other typical leporines), and from those with opposed postero-external and internal inflections (*Pronolagus, Romerolagus, Pentalagus*).

Except for more anterior portion of $P^{\bar{3}}$, the cheek-tooth characters of *Notolagus* can be duplicated in one or another of the various species of *Hypolagus*. However, the pattern developed in front of the postero-external inflection of the third premolar is so strikingly different as to justify the establishment of a distinct genus. In *Hypolagus* the entire front half of $P^{\bar{3}}$ is free of flexures except for a shallow antero-external fold. Since the genus *Hypolagus* is known in North America from the middle Miocene to lower Pleistocene, sufficient time is available for a transformation of $P^{\bar{3}}$ to the type seen in *Notolagus*.

Archaeolagus from the John Day and lower Miocene of the Great Plains has a $P^{\bar{3}}$ similar to that of *Hypolagus*. However, the dentition as a whole is decidedly more primitive than that of the latter genus, and the form is less related to *Notolagus*.

So far as I can determine, the isolation of the extreme anterior portion of $P^{\bar{3}}$ in *Notolagus* is unique among lagomorphs. *Prolagus* and *Piezodus*, European forms referred to the ochotonids, have third premolars with small but isolated anterior columns[3] but the resemblance ends with this character. Specimen

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[2] See especially L. R. Dice: Jour. Mamm., vol. 10, no. 4, pp. 340-44, 1929.

[3] Jean Viret: Ann. Univ. Lyon, n. ser., 1, Sci., Med., Fasc. 47, p. 98, figs. 14a and e, 1929.

No. 2134 in which complete isolation of the anterior column does not occur, suggests that the separation is produced by a deep antero-internal fold which breaks across the dentine to join the short antero-external fold. The latter is comparable to the antero-external fold in P_3^3 of *Hypolagus, Lepus* and other genera. Apparently, the antero- internal inflection is present only in the genera *Pentalagus, Caprolagus* and *Notolagus*. According to the taxonomy adopted by L. R. Dice, *Pentalagus* is a member of the Palaeolaginae, *Caprolagus* of the Leporinae, and *Notolagus* of the Archaeolaginae. *Pentalagus* is a Recent genus found only on the Liu Kiu islands, south of Japan. *Caprolagus* is also a living form inhabiting the foothill region of the Himalayas in northeastern India, southern China, and Formosa. Extinct species of this genus have been recorded from Europe and India. Apparently neither *Pentalagus* nor *Caprolagus* ever exhibit P_3^3's with an isolated anterior column.

Among the Recent Mexican lagomorphs is the unusual *Romerolagus,* of rather indeterminate affinities, found only on the slopes of some high mountain peaks, such as Popocatepetl. Apparently this genus is more closely related to *Pentalagus, Pronolagus* (South Africa) *and Alilepus* (Asia, Europe and North America?) than to *Notolagus.*[4] However, the form is mentioned since it suggests that stocks are present in Mexico which may not be related to either the later Tertiary "Archaeolaginae" or to the modern "Leporinae."

Conclusions: *Notolagus,* a new genus of lagomorph from the Pliocene of Mexico, is regarded tentatively as representing a derivative of *Hypolagus.* The geologic time range of *Hypolagus* is in accord with this hypothesis. The Mexican type adds to the list of lagomorphs which have a P_3^3 with short postero-external inflection and no corresponding internal inflection, and hence may strengthen Dice's view that forms with such characters represent a distinct group which he has termed the Archaeologinae.

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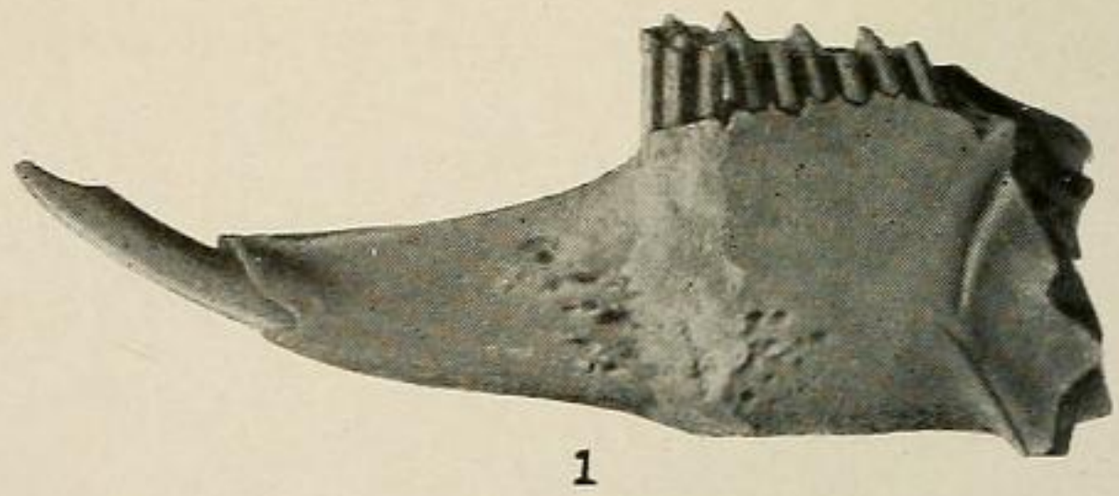
[4] M. W. Lyon, Jr.: Smithsonian Misc. Coll., Quarterly Issue, vol. 1, pp. 424-25, 1904.
L. R. Dice: *op. cit.*, pp. 340-43, 1929.
C. L. Gazin: Proc. U. S. Nat. Mus., vol. 83, no. 2976, p. 120, 1934.

MEASUREMENTS (in millimeters) OF *Notolagus velox*.

	Left maxillary, P^{2}-M^{3} No. 2137	I_{1}, No. 2139
1_{1}, antero-posterior diameter	..	2.1
I_{1}, transverse diameter	..	2.3
Occlusal length, P^{2}-M^{3}	11.7	..
Alveolar length, P^{2}-M^{3}	13.4 (e)	..
P^{2}, antero-posterior diameter*	1.4	..
P^{2}, transverse diameter	2.8	..
P^{3}, antero-posterior diameter	2.0	..
P^{3}, transverse diameter	4.3	..
P^{4}, antero-posterior diameter	2.0	..
P^{4}, transverse diameter	4.1	..
M^{1}, antero-posterior diameter	1.9	..
M^{1}, transverse diameter	3.8	..
M^{2}, antero-posterior diameter	1.9	..
M^{2}, transverse diameter	3.5	..
M^{3}, antero-posterior diameter	0.9	..
M^{3}, transverse diameter	1.5	..

	Left ramus, P_{3}-M_{2} No. 2133 (type)
Depth of ramus below M_{1}	11.7
Thickness of ramus below M_{1}	4.3
Length of diastema, I-P_{3}	13.8
Length of P_{3}-M_{2} (occlusal surface)	9.3
Length of P_{3}-M_{2} (alveolar)	10.2
I, antero-posterior diameter	2.0
I, transverse diameter	2.1
P_{3}, antero-posterior diameter*	2.6
P_{3}, transverse diameter	2.6?
P_{4}, antero-posterior diameter	2.2
P_{4}, transverse diameter	2.8
M_{1}, antero-posterior diameter	2.2
M_{1}, transverse diameter	2.5
M_{2}, antero-posterior diameter	2.2
M_{2}, transverse diameter	2.5

* Measured at occlusal surface.
(e) Estimated.



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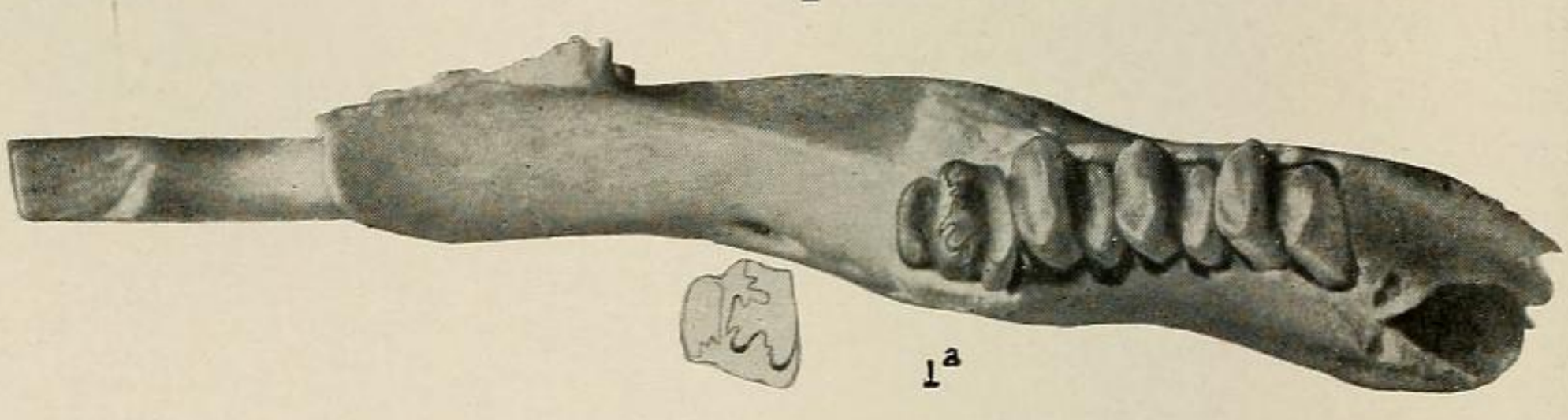

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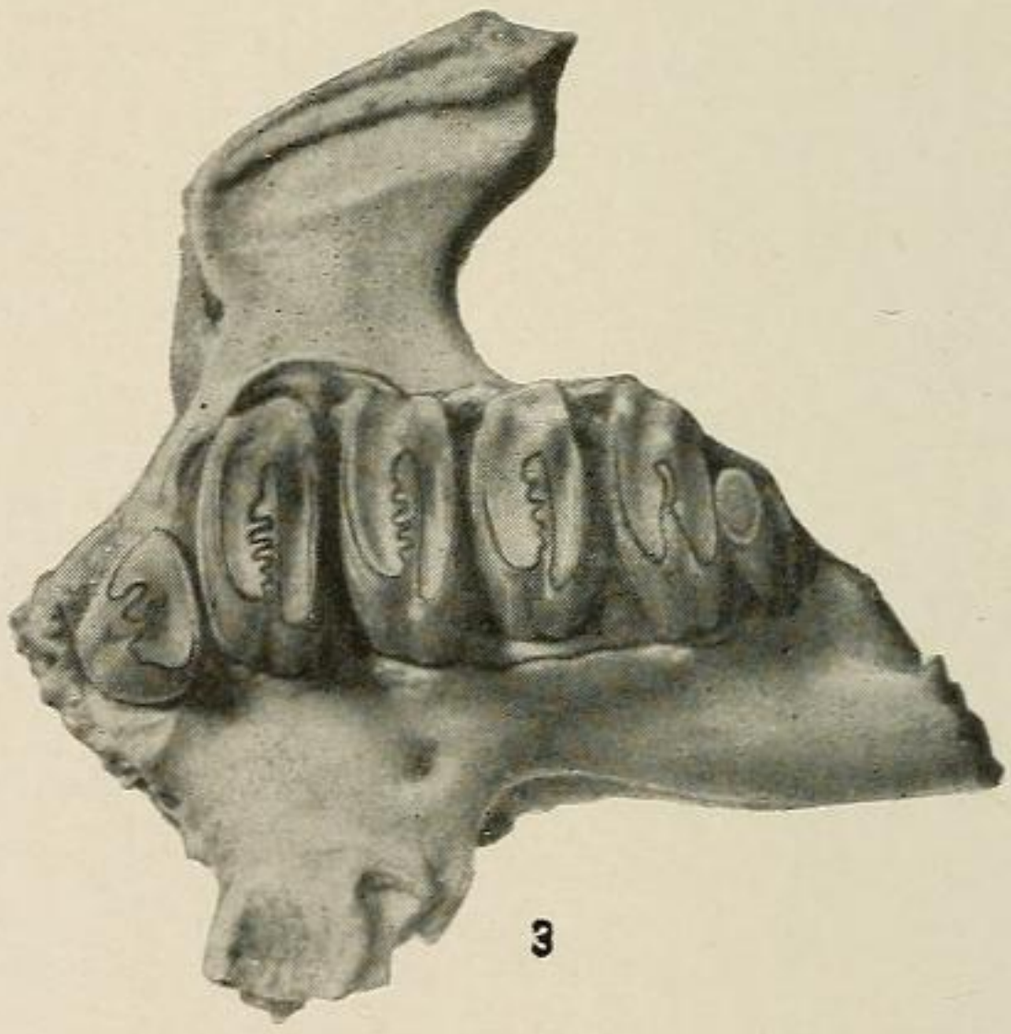

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PLATE 43

NOTOLAGUS VELOX, GEN. ET SPEC. NOV.

Figures 1, 1a. Type specimen, left ramus with *I* and P_3-M_2, No. 2133. Fig. 1, external view, X1½; fig. 1a, occlusal view, X3.

Figure 2. Left ramus with *I* and P_3-M_1, No. 2134. Occlusal view, X3.

Figure 3. Left maxillary with P_2-M_3, No. 2137. Occlusal view, X3.

Size of figures approximate; enlargement not exactly to same scale.

Calif. Inst. Tech. Coll. Pliocene: Rincon, Chihuahua, Mexico.