THE PEARCE-SELLARDS *Series*

Number 23

EARLY TERTIARY VERTEBRATE FAUNAS, VIEJA GROUP, TRANS-PECOS TEXAS: INSECTIVORA

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W. W. Newcomb, Director

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The Pearce-Sellards Series is an occasional, miscellaneous series of brief reports of museum and museum associated field investigations and other research. Its title seeks to commemorate the first two directors of the Texas Memorial Museum, both now deceased: J. E. Pearce and Dr. E. H. Sellards, professors of anthropology and geology respectively, of The University of Texas.

A complete list of *Pearce-Sellards* papers, as well as all other publications of the museum, will be sent upon request.

INTRODUCTION

This paper is another in a series of contributions dealing with the vertebrate faunas from the Vieja group. Early publications, primarily Stovall (1948), DeFord (1958), Wilson *et al.* (1968), and Wilson (1971a), discussed the location, previous work, stratigraphy, and age of the Vieja group. For a stratigraphic section showing the positions of the local faunas, see Wilson (1971b, Fig. 1, p. 4).

METHODS

The dental nomenclature employed here follows that of Rich (1971: 4), who slightly modified dental terminology proposed by Van Valen (1966: 7-9).

All specimens were measured on an Ehrenreich Photo Optical "Shopscope." Measurements were in millimeters and were rounded off to the nearest one-hundredth of a millimeter. The following orientations for measuring cheek teeth (Fig. 1) were used in this report:

ANTEROPOSTERIOR AXIS ("A–P") AXIS

Lower posterior premolars – long axis of tooth.

Lower molars – line drawn through the apices of the metaconid and the entoconid.

Upper posterior premolars – line extended from anteriormost point of the anterolabial lobe to the posteriormost point of the metastylar lobe.

Upper molars (M^{1-2}) – line drawn through the apices of the paracone and metacone, except in the case of *Apternodus* cf. *brevirostris* where criteria immediately below apply for all upper molars.

Upper molars (M^3) – line drawn at right angles to a line which divides the tooth into equal anterior and posterior halves.

LENGTH

Lower posterior premolars – total length of crown, i.e., greatest dimension measured parallel to "A-P" axis.

Lower molars – total distance from the anterior face of the paraconid to the back of the talonid along a line parallel to the "A-P" axis (anterior cingulum not included in measurement).

Upper posterior premolars and upper molars – greatest dimension parallel to the "A-P" axis of tooth.

WIDTH

Lower posterior premolars – widest part of crown; greatest dimension measured at right angles to "A-P" axis.

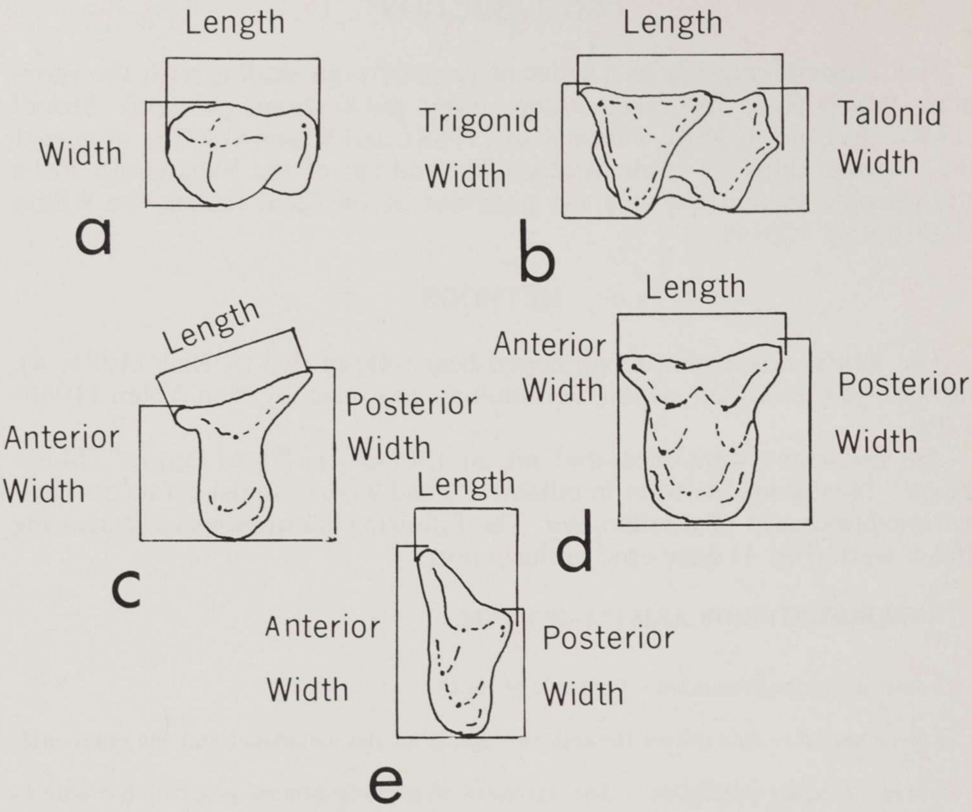

Fig. 1.—Occlusal view of diagrammatic cheek teeth showing orientations for measurements: (a) lower posterior premolar, (b) lower molar, (c) upper posterior premolar, (d) upper molar (M^1 or M^2), (e) upper molar (M^3).

Lower molars – two width measurements: trigonid width, talonid width, widest part of each of these sections of the crown measured at right angles to "A-P" axis.

Upper posterior premolars and upper molars – two measurements: anterior width, distance from the labialmost point of the anterolabial corner of the crown to the lingualmost point of the protocone; posterior width, distance from posterolabialmost point of metastylar lobe to lingualmost point of protocone; both width measurements taken at right angles to the "A-P" axis.

All specimens described in this report are conserved in the Texas Memorial Museum (TMM). Detailed descriptions of localities are on file at the Vertebrate Paleontology Laboratory, Balcones Research Center, The University of Texas at Austin.

ACKNOWLEDGMENTS

I thank Dr. J. A. Wilson for generously offering me the Vieja insectivores for study. Dr. Malcolm C. McKenna helped me with the identification of *Apternodus* cf. *brevirostris.* Mrs. Margaret Stevens prepared all illustrations except Figure 1.

I am very grateful to the following individuals and institutions for allowing me to study leptictid specimens under their care: Dr. William Turnbull, Chicago Field Museum of Natural History; Dr. Mary R. Dawson, Carnegie Museum of Natural History; Ms. Gay Vostreys and Dr. Dave Gillette, Philadelphia Academy of Sciences; Dr. Malcolm C. McKenna, American Museum of Natural History; Dr. Farish Jenkins, Museum of Comparative Zoology at Harvard University; Dr. Donald Baird, Princeton Geological Museum; Dr. Robert J. Emry, United States National Museum of Smithsonian Institution; Drs. Robert W. Wilson and Morton Green, Museum of Geology, South Dakota School of Mines and Technology; Dr. J. T. Gregory, University of California, Museum of Paleontology; and Messrs. Bruce Lander, Ken Rose, and Craig Wood. I thank Drs. M. C. McKenna, D. E. Savage, J. A. Lillegraven, and W. A. Clemens, for their critical readings of earlier versions of this paper

SYSTEMATIC PALEONTOLOGY

No recent classification of the Insectivora has met with widespread acceptance among students of the group (for conflicting views on insectivore taxonomy see Van Valen, 1966, 1967; Butler, 1956, 1972; and Novacek, in press). I follow here Van Valen's (1967) designation of higher insectivore categories, pending further study and revision of the order.

Order Insectivora	Illiger, 1811
Suborder Proteutheria	Romer, 1966
Family Leptictidae	Gill, 1872
Subfamily Leptictinae	Gill, 1872
Genus *Leptictis*	Leidy, 1868

Leptictis wilsoni sp. nov.
Figs. 2, 3; Table 1

Etymology.—Named in honor of Dr. J. A. Wilson.

Referred material.—TMM 40209-215, incomplete skull with P^3-M^3 on right maxillary; $M^{1\text{-}3}$ and a fragment of P^3 on left maxillary.

Stratigraphic position.—Upper part of Chambers Tuff, 60 feet below Bracks Rhyolite, Vieja Group. Reeves Bonebed, Presidio Co., Texas. Little Egypt local fauna, Chadronian (Early Oligocene).

Diagnosis.—Skull and dentition significantly smaller than those referred to *Leptictis haydeni, L. dakotensis, L. bullatus*, and *L. douglassi* (see below); zygomatic arch narrow, no dorsoventral swelling of the jugal; paroccipital process or squamosal flange not strongly produced ventrally; shallow antorbital fossa; depression in back of the zygomatic process of squamosal for opening of the subsquamosal foramen very shallow; P^3 tricuspid with lingual and anterior spurs; molariform P^4 longer but not quite as wide as M^1 with hypocone and precingulum; $M^{1\text{-}3}$ with well developed hypocones, precingula, and labial spurs; molar cusps conical but not swollen at their bases or bulbous; M^3 not greatly reduced relative to $M^{1\text{-}2}$ with stronger metacone than in most species of *Leptictis*; length P^3-M^3 14.52 mm.

TABLE 1.–Measurements of skull and teeth (in mm) of *Leptictis wilsoni* sp. nov., TMM 40209-215. Measurements were taken on the right dentition only.

Skull width at orbital constriction	11.13
Skull width at P^2	10.13
Palate width at P^2	6.65
Length P^3-M^3	14.52
Length M^{1-3}	7.62

	Length	Anterior Width	Posterior Width
P^3	3.66	2.90	–
P^4	3.35	3.63	3.92
M^1	3.05	4.03	4.13
M^2	2.91	4.10	3.94
M^3	2.12	3.41	2.99

DESCRIPTION

The dentition in TMM 40209-215 is complete from the P^3 through M^3 in the right maxillary. Only M^{1-3} and a fragment of P^3 are preserved in the left maxillary. P^3 is a three-rooted, vaguely triangular tooth dominated by a high paracone which is broken not far above its base. There appears to have been a metacone but the area of its location in the crown has been subject to breakage and heavy wear. A small parastylar spur projects directly anteriorly from the base of the paracone. The protocone, better preserved in the left P^3, is a prominent cusp but lower than the metacone. A small paraconule is situated just lingual to the base of the paracone at the labial termination of the preprotocrista. The posterior base of the protocone is bordered by a very narrow precingulum. There is no hypocone.

P^4 is a three-rooted molariform tooth, considerably larger than P3 and less transversely wide than M^1 and M^2. The paracone and metacone are broken just above their bases. The labial face of the paracone is nearly continuous with the labial edge of the crown, and there is a very narrow ectocingulum external to the metacone. There is an anteriorly projecting parastylar spur but details of its morphology are obscured by damage and wear. The paraconule and metaconule are well developed bulbous cuspules situated labially on the crown. The paraconule lies nearly at the base of the paracone; the metaconule is separated from the metacone by a shortly extending postmetaconule wing. There is no premetaconule wing or postparaconule wing. The protofossa is deep, its lowest point situated directly between the paraconule and the metaconule. The protocone is a prominent cusp with a steep prevallum and postvallum. The postcingulum extends from the base of the crown below the metaconule terminating in a small hypocone. There is a narrow precingulum.

M^1 is more transversely elongate and less anteroposteriorly long than P^4. A narrow ectocingulum borders the labial faces of the metacone and paracone. The paracone is considerably higher than the metacone and well separated from the latter. There is no paracrista. The parastylar spur is smaller than that on P^4. A short, low metacrista runs to a point just labial to the posterolabial corner of the crown. The paraconule and metaconule are subequal in size and are situated much closer to the paracone and metacone respectively than to the protocone. The premetaconule and postparaconule wings are poorly developed. A narrow metacingulum runs from the metaconule to the posterior border of the crown just labial to the metacrista. The protocone is higher than the metacone but not as tall as the paracone. A long postcingulum terminates lingually in a heavily worn hypocone. The narrow precingulum extends along the base of the crown from a point below the preprotocrista to a point below the anterior face of the protocone short of the anterolingual corner of the crown.

M^2 has a deep ectoflexus whose most lingual point is external to the metacone. There is a prominent metastylar spur. The metaconule is much lower and smaller in basal dimensions than the paraconule. The precingulum is broader in M^2 than in M^1. In all other features M^2 is nearly identical to M^1.

M^3 differs from M^1-M^2 in its more transverse outline, and in having a strongly anterolabially projecting parastylar spur, a wide ectocingulum labial to the paracone, a posteriorly canted metacone that is considerably reduced relative to the paracone, and a paraconule about midway between the protocone and the base of the paracone. Unlike M^{1-2}, M^3 virtually lacks a metastylar spur and has a much narrower postcingulum with a vestigial hypocone.

Wear on the molars is most extensive along the prevallum: a wear facet on the protocone is confluent with that running along the preprotocrista and that on the paraconule. Wear is less evident on the postprotocrista and on the apices of the metacone and paracone. The skull is incomplete, missing much of the facial portion, the rostrum, the left side of the basicranial and squamosal region, and the occipital region. Much of the remaining portions are badly damaged and deformed. The top of the skull in the region of the parietals is fragmentary. The base of the skull posterior to the palatine has been compressed and twisted sinistrally, leaving many structures, including the left epipterygoid process and the alisphenoid, severely damaged or missing. What follows is a description of the major cranial features which are reasonably well preserved.

The anterior opening of the infraorbital canal is large and is situated directly above the M^1. There is a distinct depression running along the anterior border of the orbit, presumably for the origin of the snout muscles (levator labii superioris, levator alae nasi, zygomaticus). The anterior border of the orbit is crested, and the lacrimal foramen opens within the orbit. The lacrimal does not have a distinct facial extension.

The jugal is a long, large bone with a furcate anterior end. Its lower anterior branch contacts the short zygomatic process of the maxillary while the upper branch runs up the anterior border of the orbit, terminating just below the lacrimal-maxillary suture. The jugal continues for a long distance along the zygomatic arch gradually tapering posteriorly and moving below the zygomatic process of the squamosal. There is no postorbital process on the jugal nor is there one on the frontal, and no demarcation exists between the orbit and the temporal fossa.

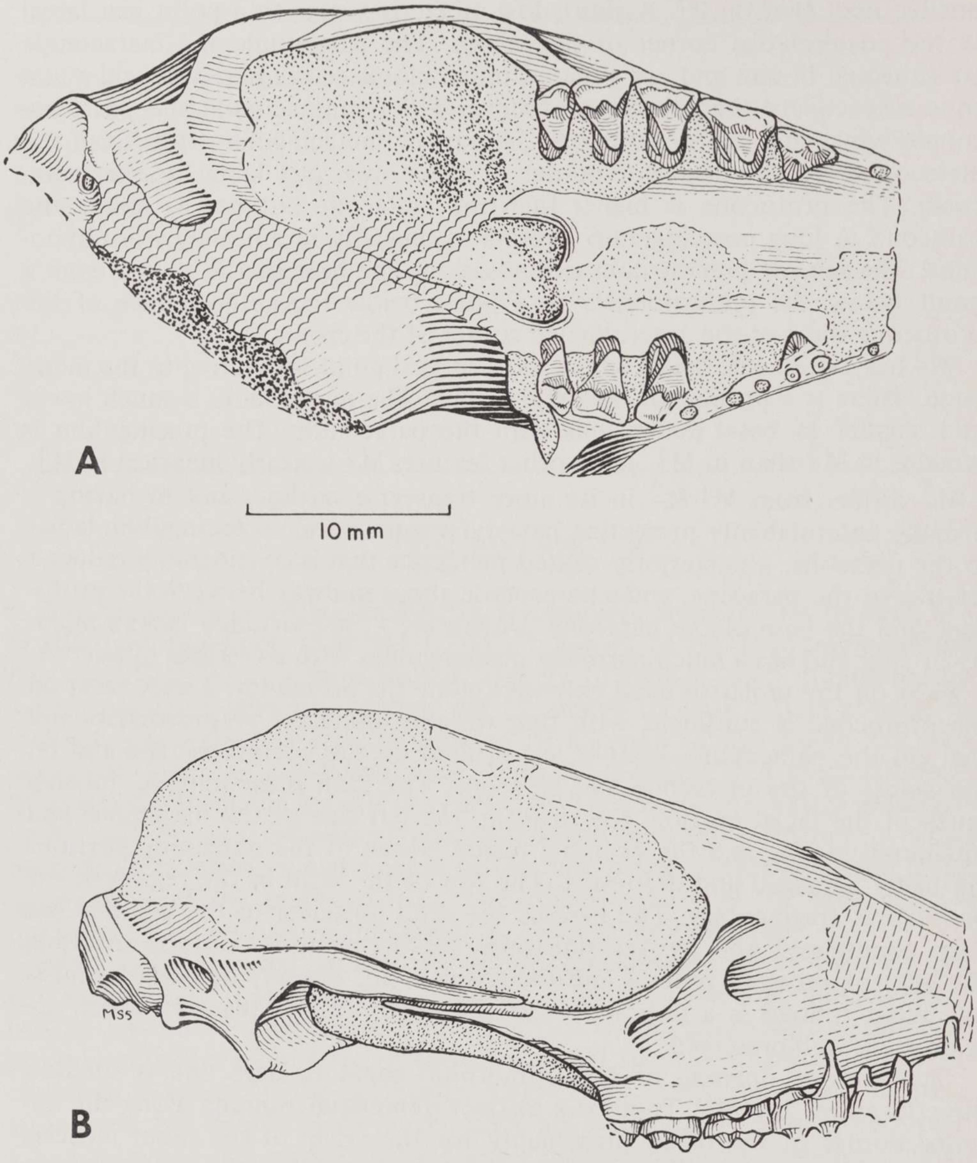

Fig. 2.–*Leptictis wilsoni* sp. nov. TMM 40209-215. Partial skull with posterior premolar, molar dentition: (a) ventral view, (b) view of right side of skull.

The anterior root of the zygoma arises opposite the M^{2-3}.

A small, shallow fossa on the zygomatic process of the squamosal surrounds the subsquamosal foramen. The large postglenoid foramen is located at the internal posterior base of the partially preserved postglenoid process.

Details of the tympanic chamber are obscured by damage, but it is possible to discern a few important structures. There is no auditory bulla, but this has probably been lost in fossilization, as is the case in many specimens of *Leptictis*. A flange of the periotic at the posterior wall of the tympanic chamber is lacking and the fenestra rotunda is fully exposed. The stylomastoid foramen is not isolated from the tympanic chamber by the tympanohyal. The promontorium (incompletely preserved) is well developed with a "high knob" above the foramen rotunda. Grooves on the promontorium for the passage of the lateral internal carotid artery and its branches are not preserved.

Between the mastoid and paroccipital processes is a gutter in the ventral surface of the mastoid bone, presumably for the facial nerve. The small paroccipital process is situated slightly posterior to the suture between the mastoid and occipital bones. The mastoid exposure faces directly backward and does not have a lateral component.

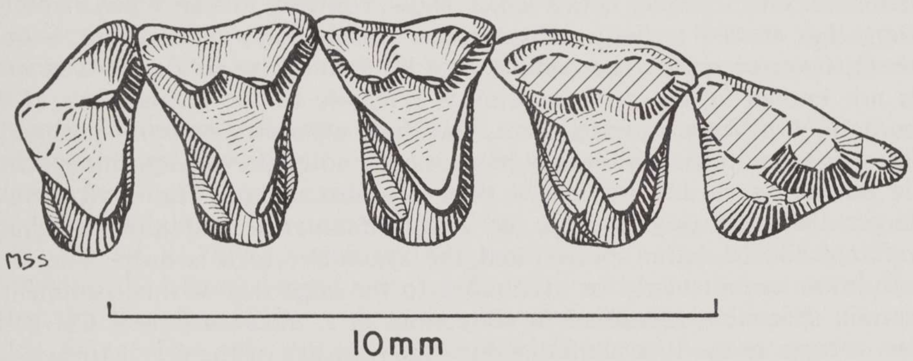

Fig. 3.–*Leptictis wilsoni* **sp. nov. TMM 40209-215. Right P^3-M^3.**

DISCUSSION

The premolars in the above described specimen may be deciduous, but certain observations vitiate against this possibility. Although the last upper premolar is molariform, permanent molariform premolars are diagnostic of the Leptictidae in general. The protocone, hypocone, and conules in the last upper right premolar show less wear than homologous cusps in M^{1-2}. The low relief of the paracone and metacone in the fourth premolar, and the protocone and metacone in the third, is probably a result of breakage rather than wear. Unlike the DP^3 in known specimens referable to *Leptictis* (Lillegraven, 1969), the third upper premolar does not have a strong posterior cingulum and well developed conules. West (1972) observed a general tendency among individuals of this genus for late retention of DP^3-DP^4. Almost all of the *Leptictis* specimens I have examined, however, show that the presence of a permanent P^3, P^4, and the phenomenon of late replacement seems more characteristic of *Leptictis accutidens* than other species of the genus.

The genus *Leptictis* was first described by Leidy (1868) from the Brule formation of the White River Group in the Badlands of South Dakota. The type and only specimen of *Leptictis haydeni* was a beautifully preserved skull. Leidy also described a fragmentary skull in the same paper which he made the type of *Ictops dakotensis. Leptictis haydeni* was distinguished from *Ictops dakotensis* in having a P^3 without an inner cusp (protocone), and in the alignment of P^3 and the anterior premolars with the lingual, instead of the labial, border of P^4. Despite such minor differences, recognition of both genera persisted in the literature until Van Valen's (1967) synonomy of *Ictops dakotensis* with *Leptictis haydeni*. There seems little case for retaining the name *Ictops* as these differences hardly warrant separation at the generic level, but whether or not *L. haydeni* and *I. dakotensis* are conspecific is a matter worth further consideration. Van Valen (1967) claimed that the P^3 characters in *L. haydeni* were of minor taxonomic significance as the morphology of this tooth showed such a high degree of intraspecific variation. I have examined approximately 100 skulls and dentitions of Oligocene leptictids which show, contrary to Van Valen's observation, that the P^3 is fairly consistent in morphology, and, in fact, is quite useful taxonomically. The condition of P^3 in the type of *Leptictis haydeni* is not known in any other specimens referable to the genus. Thus, if one accepts Van Valen's arrangement, the most atypical *Leptictis* specimen is the type specimen. Although it has not been noted previously, this specimen is distinctive in features other than P^3 morphology. The skull is much larger than the original type of *Ictops dakotensis* and most specimens referred to the latter species, and the zygomatic arch is deep. The latter condition cannot easily be attributed to the large size of this specimen, as certain specimens identified in collections as *I. dakotensis* (e.g. CM 2149) are as large as the type skull but show the presence of the very narrow zygomatic arch typical of the hypodigm. Thus, the possibility that the type of *L. haydeni* represents a species distinct from that represented by the original type of *I. dakotensis* cannot easily be dismissed.

I propose the following taxonomic arrangement as a partial solution to the problem. *Leptictis haydeni* should be regarded as a species distinct from *Leptictis dakotensis,* the latter for which Leidy's type of *Ictops dakotensis* would serve as the type specimen. The hypodigm of *L. haydeni* would then consist of a single specimen, but such is far from the rare case in fossil taxa where the typological concept of a species predominates in lieu of adequately large samples. If the diagnostic features in *L. haydeni* can be attributed to intraspecific variation based on well documented evidence, this species can be synonymized with *L. dakotensis.* Pending such a study it seems more useful to recognize *L. haydeni* as a distinct species. The diagnoses for *Ictops dakotensis* provided by Leidy (1868) and Scott and Jepsen (1936) would thus stand as the diagnosis for *Leptictis dakotensis.* A further consideration of this matter is presented in a formal revision of the Leptictidae now in preparation by this author.

Leptictis wilsoni from the Vieja differs from *Leptictis haydeni* Leidy (1868) in having a P^3 with a metacone and a protocone, and in that the labial border of P^3 is in line with the external margin of the molars and P^4 as part of a gradual arc curving in an anterolingual direction. These differences correspond to those, originally cited by Leidy (1838), between *Leptictis (= Ictops) dakotensis* and *Leptictis haydeni.*

Leidy's type of *Ictops dakotensis* was so fragmentary that it was not certain whether it belonged to either one of the two variants from the Brule formation. Because Matthew (1903) referred the larger and more robust of these to his *Leptictis (= Ictops) bullatus,* Scott and Jepsen (1936) restricted the name *Leptictis (= Ictops) dakotensis* to the smaller and more slender specimens from the Brule. It is possible, as Scott and Jepsen recognized, that *L. dakotensis* and *L. bullatus* merely represent different growth stages of the same species. Nevertheless, the latter is distinctive in the very small size of M^3 and its specific separation may be valid. In *Leptictis wilsoni, M^3* is not greatly reduced relative to M^{1-2}.

Skulls referred to *Leptictis (= Ictops) dakotensis* differ from *Leptictis wilsoni* in: (1) their larger size; (2) having more transverse molars with much narrower ectocingulum on M^{1-2}; (3) a vestigial metacone on M^3; (4) less prominently projecting parastylar spurs on P^3-M^3; (5) more bulbous molar cusps; and (6) the presence of a much deeper and larger fossa in the zygomatic process of the squamosal for the opening of the subsquamosal foramen.

Leptictis thompsoni (Matthew, 1903) is easily distinguished from all other *Leptictis* species, including *L. wilsoni*, in having extremely transverse teeth with sharper, more piercing cusps, a more projecting anterior spur on P^3, in lacking precingula on the upper molars, and a postcingulum and hypocone on M^3 and P^4. *L. thompsoni* is also the smallest of the species of *Leptictis.*

Showing the closest resemblance to *Leptictis wilsoni* is *L. acutidens* described by Douglass (1901, 1905) from Pipestone Springs, Montana, Chadronian fauna. The only differences observed between the two species are (1) the smaller relative size of M^3 and P^4; (2) the more transverse upper molars; (3) the more labial position of the molar precingula; and (4) the weaker labial lobes, particularly the parastylar lobes on M^2 and M^3 in *L. acutidens.* Matthew (1903) stated that *L. acutidens* is in some ways structurally intermediate between *Palaeictops* and Oligocene leptictids. I agree with his assertion. The dental resemblance between *L. acutidens* and *Palaeictops tauricinerei* is strong.

Douglass also described *Leptictis montanus* and *L. tenuis* in his 1905 monograph on the Tertiary of Montana. The types and only known specimens referred to these species were both from the Chadronian McCarty's Mtn. fauna. Comparisons of these specimens lead me to believe that *L. montanus* is a senior synonym of *L. tenuis* and that *L. montanus* is referable to a new undescribed leptictid genus from the Bates Hole of Wyoming. A diagnosis and description of this new genus will be provided elsewhere. *L. montanus (= L. tenuis)* is easily set apart from *Leptictis wilsoni* in having (1) a very deep and short zygomatic arch; (2) a strongly produced paroccipital process and squamosal flange; (3) a very deep anteorbital fossa;

(4) M^3 relatively much smaller than M^2; and (5) a more projecting anterior spur on P^3.

There remain for comparison three poorly represented species of *Leptictis* whose specific status may not be valid. *Leptictis intermedius* (Douglass, 1905), also from the McCarty's Mtn. fauna, looks like a smaller individual referable to *L. montanus*. *Leptictis major* (Douglass, 1905), the largest species from the McCarty's Mtn. locality, is probably a *nomen dubium*. Dental characters, other than greater size, do not readily distinguish it from *L. montanus*. *L. major* differs from *L. wilsoni* in its larger size and in having less transverse upper molars with weaker labial lobes, a vestigial metacone on M^3, and a more projecting anterior spur on P^3. Cope's species *Leptictis (= Mesodectes) caniculus* is identical to *Leptictis dakotensis* except for the lack of a posteroexternal cusp on P^3. The species is a *nomen dubium* best referred to *Leptictis dakotensis* (Scott and Jepsen 1936, p. 22).

To sum up, *Leptictis wilsoni* seems different enough from all recognized species of *Leptictis* to warrant its specific recognition. This Vieja leptictid shows the closest morphological similarity to *Leptictis acutidens* from the early Oligocene (Chadronian) of Montana.

Leptictis douglassi sp. nov.
Figs. 4, 5; Table 2

Etymology.—Named in honor of Earl Douglass, a vertebrate paleontologist of the late 19th and early 20th centuries.

Type.—TMM 40688-6, both halves lower jaw; left ramus with P_{3-4}-M_{1-2}, right ramus with P_4-M_3; upper maxillary fragment with P^3.

Stratigraphic position.—Rifle Range Hollow, Presidio Co., Texas. Approximately 200 feet above the base of Chambers Tuff, Vieja Group. Porvenir local fauna, Chadronian (early Oligocene).

Diagnosis.—Significantly larger than all other known species of *Leptictis*; P^3 with trenchant outer row of cusps, a prominently projecting anterior spur, a large anterior accessory cusp, and a reduced protocone; P^4 paraconid well developed and bulbous, with apex positioned anterior to the lowest point of the protolophid.

TABLE 2.—Measurements of mandible and teeth of *Leptictis douglassi* sp. nov.

Depth of mandible below M_3	8.30
Length P_4-M_3	18.86
Length M_1-M_3	13.46
Length P^3	5.99
Width P^3	3.92

	Length	Trigonid Width	Talonid Width
P_4	5.92	3.21	3.32
M_1	4.58	3.53	3.86
M_2	4.36	3.67	3.60
M_3	4.37	3.28	2.64

TMM 40688-6 is a robust mandible (depth of jaw below alveolar border of M3 is 8.60 mm.) with a well preserved series of teeth from the P4-M3 in the right ramus and P4-M2 in the left. The left P3 is only partially preserved. It is a trenchant two-rooted tooth with a prominent posterior cusp positioned directly above the posterior root. The anterior cusp appears to have been still larger but it is broken near its base. A narrow cingulum arcs along the posterior and lingual bases of the posterior cusp. The labial termination of this cingulum is marked by a minute cuspule. The cingulum is separated from the lingual base of the posterior cusp by a shallow fossa.

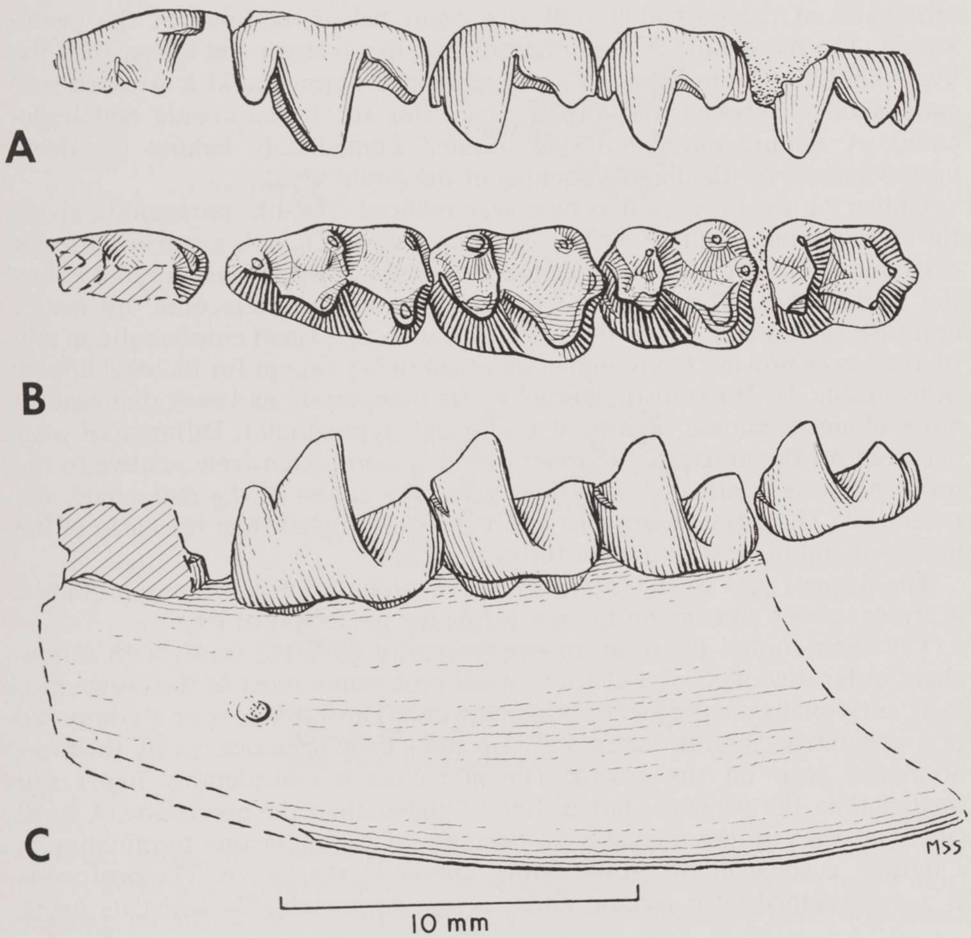

Fig. 4.—*Leptictis douglassi* **sp. nov. TMM 40688-6. Left ramus with P3-4, M1-2; right M3 shown reversed. (a) lingual view, (b) occlusal view, (c) labial view.**

P_4 is a large molariform tooth, longer anteroposteriorly than the lower molars. The paraconid is robust, somewhat bulbous, and subequal in height with the hypoconid. The apex of the paraconid is anterior to the lowest point of the protolophid. There is no anterior cingulum on the prevallid of the tooth. A deep prefossid opens lingually, separating the paraconid and metaconid nearly at their bases. The paralophid is a sharp crest, V-shaped in labial profile, which diverges from its lowest point steeply up the protoconid and the metaconid faces. The latter two cusps are subequal in height but the protoconid is slightly more bulbous, robust, and is situated more anteriorly on the crown than the metaconid. The steep, but not sheer, postvallid is formed by the posterior faces of the protoconid and metaconid. The talonid is well developed, with a basin and three cusps. The crista obliqua terminates at the postvallid wall at a point below the apex of the protolophid. The hypoconid is a prominent cusp, much larger and higher than the hypoconulid and entoconid. The apex of the hypoconulid is situated subequidistantly between and slightly posterior to the entoconid and hypoconid. A minute entoconulid is situated immediately behind the deep, narrow groove for the lingual opening of the talonid basin.

Unlike P_4, the lower molars have very reduced crest-like paraconids, giving the teeth a more quadrate outline in occlusal view. There is a narrow anterior cingulum that runs for a short distance dorsolingually up the prevallid below the protolophid. The apices of the protoconid and metaconid are nearly opposite each other. There does not appear to be a small entoconulid in any of the lower molars. M_2 is almost identical to M_1 except for its basal dimensions (Table 2). M_3 is distinguished by its transversely narrower dimensions, more elongate talonid, and very prominent hypoconulid. Differential wear occurred on the molars, as the metaconid is worn extensively relative to the protoconid. A confluent wear facet joins the apices of the metaconid and paraconid. The latter is worn to a flat shelf, no higher than the basin of the prefossid and the lowest part of the protolophid.

The deepest part of the jaw is below the talonid of M_2. A mental foramen is present about midway on the jaw below the paraconid of P_4.

The three-rooted P^3 is an anteroposteriorly elongate tooth with a trenchant outer row of cusps and a very weak protocone: most of the crown projects anterior to the protocone and metacone. The anterior spur is composed of a prominent anterior accessory cusp and a large paracone, easily the most dominant cusp on the crown. The metacone is considerably lower and smaller than the paracone but distinctly higher than the protocone. A small cingulum rises up the lingual posterior base of the metacone terminating in a minute cuspule in the posterolabial corner of the crown. The protocone is a cone-shaped cusp lacking either a pre- or postcingula along its bases.

DISCUSSION

Despite the current problems and complexities in the intrageneric taxonomy of *Leptictis*, there seems little doubt that *Leptictis douglassi* is a distinct species. Its considerably larger size alone easily distinguishes it from other species of the genus. I know of no other member of *Leptictis* that has

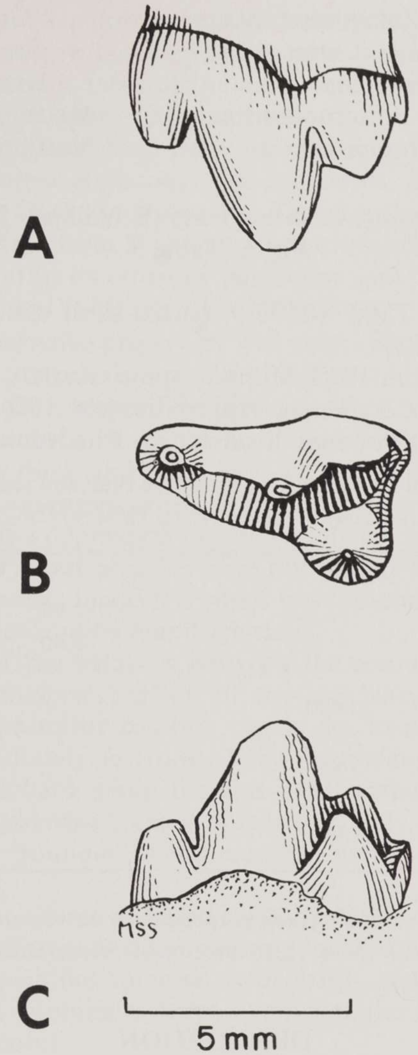

Fig. 5.—*Leptictis douglassi* sp. nov. TMM 40688-6. P^3 (left): (a) labial view, (b) occlusal view, (c) lingual view.

such an exaggerated development of the anterior spur of the P^3, although this condition is approached in *L. montanus* and *L. acutidens.* The P^3 morphology in this animal is interesting because it suggests a condition structurally intermediate between the simple elongate P^3 lacking a protocone in the type of *Leptictis haydeni* and the condition seen in the P^3s of most other known *Leptictis* individuals.

Suborder Zalambdodonta	Gill, 1884
Super Family Tenrecoidea	Gray, 1821
Family Tenrecidae	Gray, 1821
Subfamily Apternodontinae	Matthew, 1910
Genus *Apternodus*	Matthew, 1903

Apternodus cf. *brevirostris* (Schlaikjer, 1934)
Fig. 6, Table 3

Referred material.—TMM 40492-9, partial skull with right M^{1-3}, left P^4, M^{1-2}, and fragment of M^3.

Stratigraphic position.—Red Mound, approximately one-half mile north of Big Cliff, Presidio Co., Texas. Approximately 100 feet above Buckshot Ignimbrite Formation. Porvenir local fauna, Chadronian (early Oligocene).

TABLE 3.—Measurements of the skull and teeth of *Apternodus* cf. *brevirostris*, TMM 40429-29

Palate width at M^2	7.22	
Length P^4-M^3	8.30	

	Length	Width[1]
P^4	2.49	2.45
M^1	2.57	3.54
M^2	2.32	3.46
M^3	1.68	3.21

[1]Width = the greatest dimension taken perpendicular to the anteroposterior axis of the tooth. The morphology of these teeth precluded measurement of both anterior and posterior width with accuracy.

DESCRIPTION

The cheek teeth preserved in TMM 40492-9 are all highly specialized for a shearing and piercing mode of occlusion. The crown is dominated by a single sharp cusp. On the molars, two distinct ridges diverge from the apex of the high central cusp (probably homologous with a paracone; see Butler, 1972) and run to either corner on the labial edge of the tooth, lending to the crown a V-shaped appearance when viewed in a horizontal plane. Such a condition is commonly known as "zalambdodonty."

P^4 is a three-rooted, triangular tooth consisting essentially of a high central cusp and narrow basal anterior and external cingula. A strong crest runs from the apex of the central cusp to the posterolabial corner of the crown. The prevallum surface of the central cusp, formed by its anterior, labial, and part of its lingual faces, is rounded. The postvallum is a sheer wall, set obliquely in a posterolingual direction in plan view. The height of the postvallum is much greater than the height of the prevallum.

The upper molars are separated from each other by extremely deep interdental embrasures. A narrow basal cingulum runs completely around the posterior, lingual, and anterior faces of the paracone, connecting the metastylar spur with the parastylar spur. The parastylar spur is prominent and cuspidate. The preparacrista is a sharp ridge running from the apex of the paracone to a well developed stylocone. The metastyle, also well developed, is situated more labially than the stylocone. The ectoflexus is deep on all the upper molars. M^2 differs from M^1 in its more transverse outline, in its weaker metastylar spur, and in its stronger parastylar spur. M^3 is nearly identical to M^2 in structure except for its smaller dimensions.

The skull is only partially preserved. The rostrum and much of the postorbital region of the cranium is entirely missing. The large anterior opening of the infraorbital canal is above P^4. The very large lacrimal foramen is not hidden in lateral view by a flange from the anteorbital ridge. The anterior rim of the lacrimal is thick and torus-like. The posterior opening of the infraorbital canal is an extensive orifice with the outline of a vertically oriented ellipse. The lack of a depression on the maxillary immediately anterior to the orbit suggests the snout muscles were not well developed. The maxillary has no zygomatic process; instead, a small boss situated above the M^2 is the final buttress of the descending maxillary ridge.

The widest part of the palate is between the second molars. This is also the region of the transverse portion of the maxillary-palatine suture. The ventral openings of posterior palatine canals are located on the maxillary-palatine suture immediately in front of the postpalatine torus. The maxilla does not extend backward along the side of the pterygoid lamina for any great distance. A postpalatine torus is only moderately developed. The pterygoid process is a low, rounded protuberance. There is no evidence of a distinct hamular process.

There appears to be a large rounded sphenopalatine foramen in the orbital component of the palatine. A small opening located below and slightly posterior to the sphenopalatine foramen is probably the dorsal orifice of the postpalatine canal. A prominent torus overhangs the anterior lacerate foramen (sphenorbital fissure).

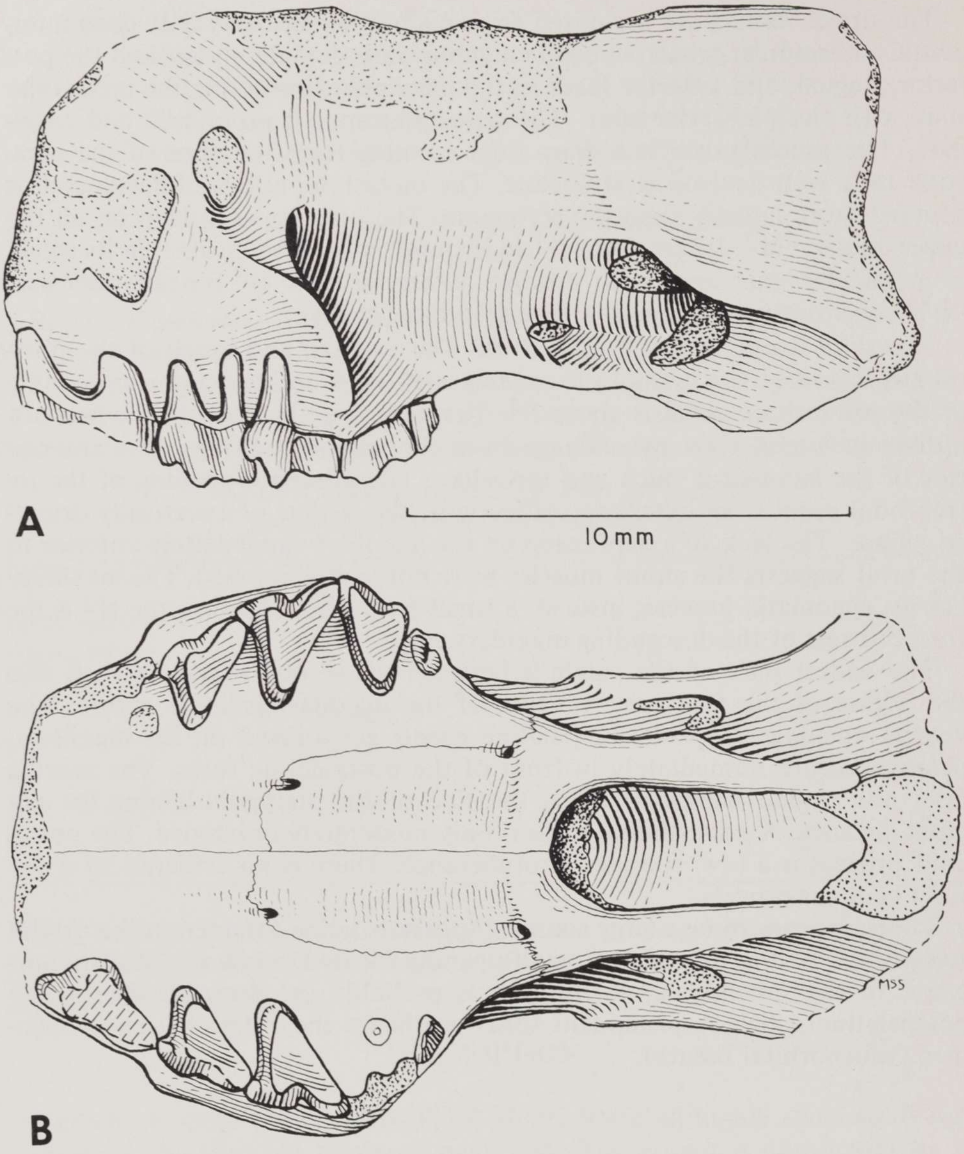

Fig. 6.—*Apternodus* cf. *brevirostris* TMM 40492-9. Partial skull with posterior premolar, molar dentition: (a) view of left side of skull, (b) ventral view.

DISCUSSION

Of the recognized species of *Apternodus*, only two, *A. brevirostris* and *A. gregoryi*, are represented by more than upper and lower dentitions. The hypodigm of the type species, *A. mediaevus* (Matthew, 1903), consists of a lower jaw with P_2, P_4, M_2, and M_3, thus precluding its comparison with the Vieja apternodontine.

Matthew (1910) described a beautifully preserved skull and jaws and referred them to *Apternodus mediaevus*. Schlaikjer (1934), however, allocated this material to a new species, *A. brevirostris*. He distinguished *A. brevirostris* from *A. gregoryi* (Schlaikjer, 1934) by a number of features in the skull and upper dentition. The Vieja apternodontine differs from *Apternodus gregoryi* in: (1) the less acutely triangular outline of the P^4; (2) the posterolingual, rather than anterolingual, slant of the lingual corner of the P^4 crown; (3) the larger size of the P^4 relative to the upper molars; (4) the much narrower basal cingula on the upper molars; (5) the deeper ectoflexi, particularly on M^3; and (6) the more prominently projecting parastylar spur of M^3. In these dental features, the Vieja apternodontine compares much more closely with *A. brevirostris* than with *A. gregoryi*. Unfortunately, the cranial features, including the diagnostic snout region, which Schlaikjer (1934) used for differentiating the latter two species, are not preserved in the Vieja skull.

CONCLUSIONS

Wilson (1971a, b, and various papers) has recognized the Porvenir and Little Egypt local faunas of the Vieja Group as early Oligocene in age. New evidence derived from fossil rodents (Wood, 1974) further supports this interpretation. Wood (1974) observed a great similarity in rodent composition between the Porvenir local fauna and the McCarty's Mtn. fauna of Montana (Chadronian) and between the Little Egypt local fauna and the Pipestone Springs fauna of Montana (Chadronian; somewhat younger than that of the McCarty's Mtn.). The small sample of Vieja insectivores described in this report provides minor biostratigraphic information, but they certainly do not conflict with interpretations for a Chadronian age for the Porvenir and Little Egypt local faunas. *Leptictis wilsoni* shows the closest morphological resemblance to *L. acutidens* from the Pipestone Springs locality, thus supporting Wood's (1974) contention for age correlation of the Little Egypt with Pipestone Springs. *Apternodus* cf. *brevirostris* from the Little Egypt local fauna does not resemble an undescribed species of *Apternodus* from McCarty's Mtn. (McKenna, personal communication) but is closely similar to *Apternodus brevirostris* from Bates Hole locality (Chadronian) of Wyoming.

REFERENCES

BUTLER, P. M., 1956. The skull of *Ictops* and the classification of the Insectivora. Proc. Zool. Soc. London, v. 126, pp. 453-481.

----------, 1972. The problem of insectivore classification. In Studies in vertebrate evolution. K. A. Joysey and T. S. Kemp (eds.), Winchester, New York, 284 pp.

DEFORD, R. K., 1958. Tertiary formations of Rim Rock Country, Presidio County, Trans-Pecos Texas. Texas Journ. Sci., v. 10, no. 1, pp. 87-108.

DOUGLASS, E., 1901. Fossil mammalia from the White River Beds of Montana. Trans. Amer. Philos. Soc., v. 20, pp. 237-279.

----------, 1905. The Tertiary of Montana. Mem. Carnegie Mus., II, pp. 146-199.

LEIDY, J., 1868. Notice of some remains of some extinct Insectivora from Dakota. Proc. Acad. Nat. Sci. Phila., 1868, pp. 315-316.

LILLEGRAVEN, J. A., 1969. Latest Cretaceous mammals of the upper part of the Edmonton Formation of Alberta, Canada, and review of the marsupial-placental dichotomy in mammalian evolution. Paleont. Contrib. Univ. Kansas, v. 50, p. 1-122.

MATTHEW, W. D., 1903. The fauna of the Titanotherium beds of Pipestone Springs, Montana. Bull. Amer. Mus. Nat. Hist., v. 19, pp. 197-226.

-----------, 1910. On the skull of *Apternodus* and the skeleton of a new artiodactyl. Bull. Amer. Mus. Nat. Hist., v. 28, pp. 33-42.

NOVACEK, M. J. (In Press). Insectivora and Proteutheria (Mammalia) of the later Eocene (Uintan) of San Diego County, California. Los Angeles County Mus. Nat. Hist. Contributions.

RICH, T. H. V., 1971. Deltatheridia, Carnivora, and Condylarthra (Mammalia) of the early Eocene, Paris Basin, France. Univ. Calif. Publ. Geol. Sci., v. 88, pp. 1-72.

SCHLAIKJER, E. M., 1934. A new fossil zalambdodont insectivore. Amer. Mus. Novit., no. 698, pp. 1-8.

SCOTT, W. B., and G. L. JEPSEN, 1936. The mammalian fauna of the White River Oligocene. Part I. Insectivora and Carnivora. Trans. Amer. Philos. Soc.; v. 28, pp. 1-287.

STOVALL, J. W., 1948. Chadron vertebrates from below the Rim Rock of Presidio County, Texas. Amer. Journ. Sci., v. 246, pp. 78-95.

VAN VALEN, L., 1966. The Deltatheridia a new order of mammals. Bull. Amer. Mus. Nat. Hist., v. 132, pp. 1-126.

-----------, 1967. New Paleocene insectivores and insectivore classification. Bull. Amer. Mus. Nat. Hist., v. 135, pp. 217-284.

WEST, R. M., 1972. Upper deciduous dentition of the Oligocene insectivore *Leptictis (= Ictops) acutidens*. Ann. Carnegie Mus., v. 44, art. 3, pp. 25-32.

WILSON, J. A., 1971a. Early Tertiary Vertebrate Faunas, Vieja Group, Trans-Pecos, Texas: Agriochoeridae and Merycoidodontidae. Tex. Mem. Mus. Bull. 18, 83 pp.

---------, 1971b. Early Tertiary Vertebrate Faunas, Vieja Group, Trans-Pecos Texas: Entelodontidae. Tex. Mem. Mus. Pearce-Sellards Series No. 17, 17 pp.

WILSON, J. A., P. C. TWISS, R. K. DEFORD, S. E. CLABAUGH, 1968. Stratigraphic succession, potassium-argon dates and vertebrate faunas, Vieja Group, Rim Rock Country, Trans-Pecos Texas, Amer. Journ. Sci., v. 266, pp. 590-604.

WOOD, A. E., 1974. Early Tertiary Vertebrate Faunas, Vieja Group, Trans-Pecos Texas: Rodentia. Tex. Mem. Bus. Bull. 21, 112 pp.