REVIEW OF THE INSECTIVORA FROM THE EARLY MIOCENE SHARPS FORMATION OF SOUTH DAKOTA¹

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ABSTRACT: Five of the seven reported insectivore taxa from the Sharps Formation (early Arikareean) of South Dakota are considered valid: *Ocajila makpiyahe*, *Proscalops evelynae*, *Quadrodens wilsoni*, *Domnina greeni*, *D. dakotensis*. One additional genus of shrew, *Trimylus*, is added to the fauna. *Quadrodens* is the senior synonym of *Palaeoscalopus* and is regarded as a talpid.

INTRODUCTION

In two papers covering the early Miocene (early Arikareean) vertebrate faunas from the Sharps Formation of the Wounded Knee area of southwestern South Dakota, Macdonald (1963, 1970) described six new species and three new genera of insectivores. A survey of the more recent paper and subsequent examination of the figured material indicates a need for some taxonomic revision and re-allocation of several of his specimens.

METHODS

Measurements were made with a Gaertner measuring microscope and are given to the nearest hundredth of a millimeter (mm). Length of lower teeth equals the maximum possible length of parallel planes normal to a best fit line along the lingual margin of the tooth, with entoconid perpendicular to plane of view. Width equals the maximum width between parallel planes parallel to the length line. All specimens are conserved in either the Museum of Geology, South Dakota School of Mines and Technology (SDSM) or the Natural History Museum of Los Angeles County (LACM).

SYSTEMATICS

FAMILY Erinaceidae Fischer von Waldheim, 1817

SUBFAMILY Galericinae Pomel, 1848

TRIBE Echinosoricini (Cabrera, 1925) Gill, 1872

GENUS *Ocajila* Macdonald, 1963

Ocajila makpiyahe Macdonald, 1963

Macdonald (1963) initially described *Ocajila makpiyahe* on a single dentary fragment with M₂-M₃, but he made no subfamily assignment of the

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genus. Van Valen (1967: 262) placed *Ocajila* in the tribe Echinisoricini and suggested that the type jaw "may represent the otherwise unknown lower dentition of *Brachyerix* but is more probably a synonym of the echinosoricine *Lanthanotherium*." The lower dentition of *Brachyerix* has subsequently been identified (Rich and Rich, 1971) and is quite unlike *Ocajila*. The reduction of the paralophid and low profile of the molars support the placement in the Echinisoricini and close relationship with *Lanthanotherium*.

Subsequently Macdonald (1970) referred two new specimens to *Ocajila makpiyahe*, one of which he figured. He stated (p. 19) that "the M₁ of LACM 9380 represents the first record of this tooth. It is an enlarged version of M₂ with no significant variations in the pattern." LACM 9380 is referable to the soricid species *Trimylus* (see below). The second referred specimen (LACM 9491) is referable to *O. makpiyahe* but contributes no new information.

FAMILY Talpidae Fischer von Waldheim, 1817

SUBFAMILY Proscalopinae K. M. Reed, 1961

GENUS *Proscalops* Matthew, 1901

Arctoryctes Matthew, 1907

Before any discussion of the evolutionary position of *Proscalops evelynae* from the Sharps Formation is undertaken, the probable stratigraphic position of the types of the named species of *Proscalops* needs clarification. The type localities of *P. tertius* K. M. Reed, 1961, *P. terrenus* (Matthew, 1907), and *P. secundus* Matthew, 1909 lack precise data as to location or formation or both. However, study of isolated teeth (to be published elsewhere) from known formations in South Dakota and adjacent states provides a reference to which the probable chronostratigraphic position of those type specimens may be determined. K. M. Reed (1961) states that *P. tertius* came from the " "White River fm.," possibly Brule, "Badlands, South Dakota." " The presence of *Oligoscalops* in the lower member (Scenic Member) of the Brule Formation (K. M. Reed, 1961, and unpublished) and the slightly more advanced character of *P. evelynae* from the Sharps Formation which overlies the Brule Formation indicate that *P. tertius* is probably from the Poleslide member of the Brule Formation. This assumption is strengthened by a specimen of the P⁴-M¹, LACM 1493 from locality 1990, from the Poleslide Member in the Wounded Knee area that is essentially identical with *P. tertius*; however, the possibility that the type of *P. tertius* is from the lower part of the Sharps Formation or is conspecific with *P. evelynae* (see below) cannot be objectively ruled out with the present small sample sizes.

Macdonald (1963, 1970) has concluded that the type skull of *P. secundus* may have come from the upper portion of the Monroe Creek Formation or the lower Harrison Formation. Although lack of lower teeth of this type prohibit a refined interpretation of its evolutionary stage, Macdonald's conclusion is in agreement with the supposed position of *P. secundus* in the biostratigraphic series that has been based upon upper molar and premolar

FIGURE 1. *Proscalops evelynae* (Macdonald, 1963), LACM 21416, incomplete rostrum with right I³ to P⁴ and lingual moieties of M¹-M² and left C to M¹; A, palatal view; B, lateral view of left side. Scale line equals 1 mm.

specializations. *P. terrenus* is a form species based on the humerus. Specimens referred to this species range in age from Whitneyan (Poleslide Member of Brule Formation) to Hemingfordian (Split Rock Formation, Wyoming). Thus, the concept of *P. terrenus* more than covers the entire chronostratigraphic span of all the species of *Proscalops* named on skulls and jaws. Macdonald (1963: 170) stated in regard to the type humerus of *P. terrenus* that "We can assume that the specimen was found anywhere between Porcupine Creek and the top of the divide east of Wounded Knee creek. The reference to "Upper Rosebud" [by Matthew, 1907] probably precludes the possibility that the type came from beds below the Harrison." Although Macdonald (1970:24) later suggested on less objective criteria that the type came from the Sharps Formation, I accept his original placement. *P. terrenus* is probably a valid species. Proscalopine teeth from the Harrison Formation near Agate, Nebraska, represent either an advanced species of *Proscalops* (more advanced than *P. secundus*) or a primitive species of *Mesoscalops*.

At present there are many reasons to assume that the sequence *Oligoscalops galbreathi* (C. A. Reed, 1956) — *P. tertius* — *P. evelynae* — *P. secundus* — *Mesoscalops* K. M. Reed represents a phyletic lineage with gaps. *O. galbreathi* was first named on the basis of a humerus as *Arctoryctes galbreathi* C. A. Reed, 1956 then later named again as *Oligoscalops whitmanensis* K. M. Reed, 1961 on the basis of a skull from Wyoming and a referred jaw from the same locality as the humerus in northeastern Colorado; there seems to be no reason to assume that the humerus belongs to a different species than the skull. *P. miocaenus* Matthew, 1901 may also belong in the sequence and on size and available dental characters (K. M. Reed, 1961) would fall between *Oligoscalops* and *P. tertius*.

Proscalops evelynae (Macdonald), 1963

Domninoidea evelynae Macdonald, 1963

Arctoryctes terrenus Matthew, 1907 in part, Macdonald, 1963

Proscalops evelynae (Macdonald), Hutchison, 1968, including

Arctoryctes terrenus of Macdonald, 1963

Proscalops evelynae (Macdonald), Macdonald, 1970

Arctoryctes terrenus Matthew in part, Macdonald, 1970

A previously unpublished rostrum with C-M¹ and fragments of the M² (LACM 21416 from locality 6898 [Fig. 1]), collected by Mr. Robert Machris, aids in comparing *Proscalops evelynae* (previously known only from the type, incomplete mandible, and from humeri) with other proscalopines known from skulls.

The type mandible (SDSM 5338) of *Proscalops evelynae* was originally described under another genus and has not previously been compared in detail to known jaws of other species of *Proscalops*. There is a chronological trend in *Proscalops* towards increasing hypsodonty of the molars. *P. evelynae* appears to be slightly more hypsodont, has greater extension of the enamel down the

labial side of the roots, and has narrower anterior cingula than in *P. tertius*, *P. miocaenus*, and *Oligoscalops*. In size of teeth *P. evelynae* agrees closely with *P. tertius* but is significantly larger than *P. miocaenus* and *Oligoscalops* (see Macdonald, 1963, and K. M. Reed, 1961 for measurements). The low longitudinal crest (entocristid) at the base and lingual opening of the talonid valley is similar in all three species. *P. evelynae* differs markedly from *Mesoscalops scopelotemos* K. M. Reed, 1960, which has greater crown height, enamel extension, very high entocristid, and better developed cingular shelf between the labial bases of the protoconid and hypoconid.

The rostrum (LACM 21416) lacks the tip of the snout and posterolateral margins of the palate, thus only the left M¹ and lingual shelves of the right M¹⁻² are preserved. Preceding the P⁴'s, three teeth and two alveoli (one with root) are preserved on the left side and four teeth on the right side. Following the dental terminology of K. M. Reed (1961), these are I³, C, P²⁻³. The I³-P³ are unicuspid and single rooted with ovate to drop-shaped cross-sectional outlines. I³ is the smallest tooth and canine the largest between the I³ and P⁴ with P²-P³ subequal in size (Table 1). The P⁴ supports a single labial blade and lingual shelf with cusp. A minute cusp on the anterior side and near the base of the paracone represents the remnant parastyle as in *Proscalops tertius*, *P. miocaenus*, and *P. secundus* but not *Mesoscalops* in which it is absent. K. M. Reed (1961:286) states that the parastyle is absent in all *Proscalops* and *Mesoscalops* but in the types of all *Proscalops* species my observations indicate

TABLE 1
Measurement (in mm) of the upper teeth of *Proscalops evelynae*,
LACM 21416

		Left	Right
P4*	length	2.27	—
	width	2.28	—
P3*	length	0.87	0.87
	width	0.70	0.68
P2	length	0.84	0.87
	width	0.60	0.61
P1	length	0.93	0.94
	width	0.74	0.69
C	length	—	0.55
	width	—	0.48

*P4 maximum length between parallel planes perpendicular to the line connecting the parastyle and posterior tip of ectoloph (this is not the parameter used but undefined by K. M. Reed, 1961). Unicuspid tooth length is the maximum cross-sectional diameter

FIGURE 2. *Proscalops evelynae* (Macdonald, 1963), LACM 9362, damaged right humerus; A, anterior view; B, posterior view. Scale line equals 1 mm.

a small vertical ridge or distinct minute cuspiration occurred in the ancestral area of the parastyle. The lingual cusp is rather posteriorly situated as in *P. tertius* but more shelflike, although, not to the extreme as in *P. secundus*. There is no indication of a second cusp behind the main lingual cusp as in the unworn P^4 of *Mesoscalops*. The molars as preserved agree closely with *P. tertius* in presence of well-developed metaconules (hypocone of K. M. Reed), protoconules (protostyle of K. M. Reed), and minute "hypostyles." Despite the qualitative differences in degree of angulation and development mentioned by K. M. Reed (1961) between the molars of *P. tertius* and *P. secundus*, I believe that at present it is difficult to distinguish such features on worn teeth; the relative proportions or distinctness of these cusps change significantly due to differential wear and to stage of wear. Unworn teeth and an analysis of wear progression in larger samples of the various species are needed to evaluate these features. The rostrum agrees in detail with those already described by K. M. Reed (1961) for other species of *Proscalops*.

Measurements (following Reed and Turnbull, 1965) on 11 humeri (Fig. 2) from the LACM collections show a wide range in variation, with measurements of the smaller specimens ranging from 74 to 88% of the largest; however, the ratios of these measurements produced ranges essentially identical to those calculated by Reed and Turnbull (1965) for "*Arctoryctes terrenus*" except

FIGURE 3. *Quadrodens wilsoni* Macdonald, 1970; A, LACM 9331 (Type) occlusal view of M_1 - M_2 ; B, SDSM 6244 (referred specimen of *Palaeoscalopus*) reversed occlusal outline of M_1 - M_2 , hachures indicate edge of apparently anomalous shear wear surface. C-E, SDSM 55135 (Type of *Palaeoscalopus*); C, reversed occlusal outline of M_1 - M_2 ; D, lingual view of dentary fragment with P_4 - M_3 ; E, occlusal view of P_4 and antemolar alveoli; F, SDSM 6244, occlusal view of P_4 and antemolar alveoli. Scale lines equal 1 mm.

those incorporating the measurement of the proximal shaft width. Reed and Turnbull (1965:132) noted that this measurement is difficult to duplicate objectively. The range in gross size is of the magnitude seen within some living species (*Scalopus aquaticus*) but is unusual for a series from a specific local area. However, nearly all the measurable specimens came from different sites of unknown or differing stratigraphic levels. There is no consistent size relationship with stratigraphic level when both are known.

Dentally *Proscalops evelynae* differs only slightly from *P. tertius* and might be considered conspecific, but it is axiomatic that a better understanding of the variability of both proposed species needs to be known. Considering the probably older but uncertain age and locality of *P. tertius* and small samples of the other species of *Proscalops*, it seems prudent to retain *P. evelynae* as a distinct species for the time being.

Talpidae incertae sedis

Quadrodens wilsoni Macdonald, 1970:21

Quadrodens wilsoni Harksen, 1967, *nomen nudum*

Palaeoscalopus pineridgensis Harksen, 1967, *nomen nudum*

Palaeoscalopus pineridgensis Macdonald, 1970:23

Macdonald (1970) described *Quadrodens wilsoni* on the basis of a dentary fragment containing the M_1 and trigonid of the M_2 . He diagnosed the genus on the basis of the large rectangular M_1 with trigonid cusps confined to approximately one third of the trigonid. He stated (p. 21) "This form seems to be another variation of the "hedgehog" theme." A few pages later he described a new genus and species of talpid, *Palaeoscalopus pineridgensis*, on the basis of two incomplete dentaries including the P_4 - M_3 . He diagnosed the M_1 of this form as having greatly reduced anterolabial cingulum. In discussion Macdonald stated that *P. pineridgensis* is the earliest record of a shrew-mole in North America.

There is a great similarity between Macdonald's figures (Figs. 6, 8) of *Quadrodens* and *Palaeoscalopus* and subsequent examination of the types revealed that these two forms are congeneric and probably conspecific. The material referred to *Palaeoscalopus* is slightly smaller than the type of *Quadrodens*, but shows the same overall proportions. The three specimens (Fig. 3) show some variation in the M_1 outlines and M_1 anterior cingula, but I regard these as insignificant for generic allocation. A fourth specimen of *Quadrodens* (LACM 9253) consisting of a dentary fragment with M_2 and alveoli of P_4 - M_3 was referred to *Domnina greeni* by Macdonald (1970:21). The structure of the M_2 and situation of the mental foramen is nearly identical in all four specimens. Although more than one species may be represented, the sample is too small to meaningfully define even two taxa. The name *Quadrodens wilsoni* has page priority over *Palaeoscalopus pineridgensis* and is more descriptive without implication of relationships; thus I chose *Quadrodens wilsoni* as the senior synonym.

TABLE 2
Measurement of the lower dentition of *Quadrodens wilsoni* Macdonald, 1970
*To posterior margin of posterior root

Macdonald, 1970 reference	Specimen number	LACM loc. numbers	SDSM loc. number	P4 length	P4 width	M1 length	M1 width	M2 length	M2 width	M3 length	M3 width
<i>Quadrodens wilsoni</i> (type)	LACM 9331	1821 = 1981	V5359	—	—	2.45	1.60	2.01*	1.42	—	—
" <i>Palaeoscalopus pineridgensis</i> " (type)	SDSM 55135	1861 = 1982	V5360	1.75	1.09	2.39	1.54	2.14	1.44	1.56	0.98
" <i>Palaeoscalopus pineridgensis</i> " (referred)	SDSM 6244	1861 = 1982	V5360	1.56	1.08	2.16	1.55	2.02	1.43	—	—
" <i>Domnina greeni</i> " (referred)	LACM 9253	1955	V541	—	—	—	—	2.08	1.51	—	—

TABLE 3
Measurement of the lower dentition of *Domnina* and *Trimylus*

Identification	Specimen number	LACM loc. numbers	SDSM loc. number	M1 length	M1 width	M2 length	M2 width
<i>Domnina greeni</i>	SDSM 5895	—	V5413	2.20	1.37	—	1.19*
<i>Domnina dakotensis</i>	LACM 9351	1981 = 1821	V5359	2.33	1.39	1.99	1.31
<i>Trimylus</i>	LACM 9380	1958	V6228	2.35	1.69	1.91	1.51

Macdonald has already fully described the teeth allocated to *Quadrodens* and *Palaeoscalopus*; however, the variation in outline of M_1 , variable expression of the M_1 anterior cingulum, and slight range in size should be noted (Table 2). The two preserved P_4 's show some variation of the talonid. The hypoconid of SDSM 55135 (Fig. 3E) is a simple distinct cusp flanked by only one ridge which joins the hypoconid to the protoconid. However, SDSM 5244 (Fig. 3F) has a subdued hypoconid which forms the posterolabial rim of a continuous ridge extending posteriorly from the base of the protoconid curving lingually on the hypoconid to the lingual margin and then deflecting anteriorly, thus forming (but not quite enclosing) a small talonid basin.

The dentary is most completely represented in SDSM 55135 and SDSM 6244 but has not previously been described in detail. It shows no transverse curvature and is broadly convex ventrally with the deepest portion below the molars. Its anterior part tapers quite sharply anteriorly, indicating a short antemolar region and reduced dentition, although the tip of the dentary is not preserved. The mandibular symphysis extends posteriorly to below the posterior moiety of the P_4 . Alveoli anterior to P_4 are preserved in both specimens but are not identical. SDSM 6244 has one posterior alveolus preceded by two incomplete but apparently subequal and longitudinally aligned smaller ones. Five alveoli (both incomplete and complete) precede the P_4 in SDSM 55135. The posterior wall of the anterior-most alveolus indicates a rather large, long, and anteriorly inclined (about 45°) root. This alveolus is followed by three small and tightly crowded alveoli arranged in a equilateral triangle with two of the alveoli labial. This clustering is followed by a larger centrally placed alveolus and P_4 . There are several ways to interpret these alveoli but analogy with talpids and progressive erinaceids suggests that the enlarged anterior alveolus represents an incisor (I_2) followed by two to four crowded antemolars and a P_4 .

The family assignment of *Quadrodens wilsoni* is troublesome without more data on the morphology of the mandible, skull, or skeleton. Chiroptera are excluded from consideration on the grounds of their probable rarity in the samples and degree of transverse curvature of their mandibles. Low profile of the teeth, relatively equal height of the talonid and trigonid of the molars, reduced molarity of the P_4 , and overall morphology eliminate from consideration most of the more primitive and highly specialized insectivore suborders (fide Van Valen, 1967) except the Erinaceota. Most families of this suborder except the Erinaceidae and Talpidae are either too generalized in molar morphology and P_4 reduction (Nesophonitidae, Adapisoricidae) or too specialized (Soricidae, Dimylidae) for close comparison. Plesiosoricids show a greater and/or more primitive emphasis on development of prominent shearing paralophids on the lower molars (especially the M_1) in contrast to the rather bulbous and crushing-like M_1 of *Quadrodens*. Macdonald's error in describing the same genus under two different families illustrates the difficulties of separating the Talpidae from the Erinaceidae on the basis of molars alone (*Talpa incerta* Matthew, 1924 is a brachyericine hedgehog). Members of both

families may be characterized by loss of a distinct hypoconulid and merging of the hypolophid and entoconid of the molars. Most talpids and many erinaceids (Echinosoricinae, Erinaceinae) exhibit quadrate low crowned molars without great disparity between the talonids and trigonids. *Quadrodens wilsoni* resembles some erinaceids and differs from known talpids in: 1) even convexity of the lower margin of the dentary; 2) M_1 larger than M_2 ; and 3) basined (in one specimen of two) talonid on P_4 . *Quadrodens* resembles the Talpidae and differs from the Erinaceidae in: 1) lack of paraconid on P_4 ; 2) transverse basal posterior cingulum and posterolingual accessory cuspid on M_1 - M_2 ; and 3) mental foramen small and not depressed into dentary. Although the anterior part of the dentary was apparently short, there is no obvious indication in the area of the P_4 suggesting an enlarged incisor as in progressive erinaceids; however, talpids frequently develop a reduced dentition with prominent but not greatly hypertrophied lower incisor (I_2).

Although the above comparisons may not lead to an obligatory conclusion of talpid affinities, I believe that *Quadrodens wilsoni* is a talpid and, on theoretical zoogeographical grounds (Hutchison, 1968:108), this species is probably aligned with the Proscalopinae.

FAMILY Soricidae Fischer von Waldheim, 1817
SUBFAMILY Heterosoricinae Viret and Zapfe, 1951
GENUS *Domnina* Cope, 1873
Domnina greeni Macdonald, 1963
Domnina greeni Macdonald, Hutchison, 1966
Domnina greeni Macdonald, Repenning, 1967
Domnina greeni Macdonald, Macdonald, 1970

This species is still known only from the type specimen; the specimen subsequently referred to it (Macdonald, 1970) belongs to *Quadrodens*. The teeth were described by Macdonald (1963) but the specimen is abraded and much of the lingual side of the M_2 is worn away. Macdonald's (1963, Fig. 5, teeth are incorrectly captioned M_{2-3}) illustration of the type indicates a greater longitudinal compression of the trigonid than exists on the specimen (Fig. 4C). The mental foramen is partly preserved below and just anterior to the M_1 hypoconid.

For discussion of this species see that of *Domnina dakotensis* below.

Domnina dakotensis Macdonald, 1970
Domnina dakotensis Harksen, 1967, *nomen nudum*

This species, known only from the type mandible, was characterized by its widely open M_1 trigonid and closure of the M_1 - M_2 talonid valleys by the entoconid crest (entocristid). In addition, there is a postsymphyseal foramen below the level of the M_1 hypoconid and the root of the large incisor extends posteriorly as far as the M_1 hypoconid.

Considering relative temporal and geographic proximity of *Domnina*

FIGURE 4. A-B *Domnina dakotensis* Macdonald, 1970, LACM 9351 (Type), A, lingual view of dentary fragment with M_1 - M_2 ; B, occlusal view of M_1 - M_2 ; C, *Domnina greeni* Macdonald, 1963, SDSM 5895 (Type), occlusal view of M_1 - M_2 . Scale lines equal 1 mm.

greeni and *D. dakotensis*, discussion of relationships of these two poorly known species is necessary. The relative openness of the M_1 trigonid of *D. dakotensis* is not particularly diagnostic and may be the same as in *D. greeni* when relative differences in wear, preservation, and individual variation are considered. Macdonald (1970) stressed the uniqueness of the closure of the trigonid valley by the entoconid crest, but I fail to see any difference between the two species in the closure or height of the crest (compare Fig. 4B with Macdonald, 1963, Fig. 5). Indeed, Repenning (1967) characterizes the genus by the entoconid "united to the metaconid by a high ridge (entoconid crest)." Although the "diagnostic" characters are nullified, there are subtle differences between the two specimens which may be of specific significance when better samples are available. The postentoconid valley is comparatively well developed in *D. greeni* (as in *D. gradata* Cope, 1873) but absent in *D. dakotensis* (Fig. 4A). The presence or absence of this valley seems to be relatively constant in other species of shrews; however, if these specimens represent transition to a closed-valley condition, then variability in this character is significant. The molars of *D. dakotensis* appear to be relatively longer (Table 3), more delicate, and have perhaps a better-developed metastylar ridge on the metaconid than in *D. greeni*, although preservation of the *D. greeni* specimen is not ideal for comparison. In the absence of a larger sample of either species, it seems prudent to tentatively retain both species names on the basis of the above characters.

The closure of the postentoconid valley and delicacy of the molars suggests that *Domnina dakotensis* might be on the lineage of *Paradomnina* Hutchison, 1966, but the relatively greater posterior extension of the incisor root, more posterior position of the postsymphyseal foramen, and perhaps fewer anteromolars are specialized characters over the later *Paradomnina*. There are no serious obstacles to deriving *D. dakotensis* from *D. gradata*.

GENUS *Trimylus* Roger, 1885

Trimylus sp.

Macdonald (1970:19, Fig. 4) figured a dentary fragment, LACM 9380, and referred it to *Ocajila makpiyake*. The deep robust jaw, position of the mental foramen, and construction of the teeth showed remarkable similarity to those features in the heterosoricine shrews, especially *Trimylus*. Subsequent examination of this specimen confirms its assignment to *Trimylus*.

Macdonald did not describe this specimen in detail and some diagnostic features are misleadingly illustrated or not figured. LACM 9380 consists of a midsection of the horizontal ramus containing M_1 - M_2 . The dentary (Fig. 5) is deep and robust with a large mental foramen set below the ectoflexus of the M_1 in the posterior end of an elongate depression extending anterodorsad. A prominent postsymphyseal foramen opens anterolabially near the ventral margin of the dentary below the junction of the M_1 - M_2 . The dentary is broken off just anterior to this foramen with the break extending anterodorsally to just in front of the M_1 . No part of the symphysis is preserved. The cavity for

FIGURE 5. A-C, *Trimylus* sp., LACM 9380, dentary fragment with M_1 - M_2 ; A, occlusal view; B, lingual view; C, labial view. Scale line equals 1 mm.

the root of the large incisor extends as far as the symphyseal foramen but none of its external margins are preserved. Remains of one antemolar alveolus (P_4) are preserved just anterior to M_1 . There apparently is room for only one or two additional alveoli between the P_4 and I_1 .

The molars are graded in size (Table 3) with the M_1 about one-third larger than M_2 . M_1 resembles other *Trimylus* in its robust proportions and major features of the trigonid and talonid (see Mawby, 1960, Wilson, 1960,

and Repenning, 1967). The anterior cingulum of M_1 is well defined but terminates labially to the lingual extremity of the paraconid. The hypolophid is well fused to the entoconid but a small hypoconulid persists in early wear high up the posterolabial flank of the entoconid. M_2 resembles M_1 but the trigonid is more closed thus shortening and compacting the tooth. A small (adventitious?) cuspid on the posterolabial flank of the paraconid occludes part of the trigonid valley. A slight vertical ridge on the posterolabial wall of the talonid indicates the position of the hypoconulid. Only the anterior root of the M_3 is preserved. No pigmentation is evident on the teeth.

The massive construction of the jaw, large incisor, posteriorly-situated and recessed mental foramen, postsymphyseal foramen, strong size gradation of the robust molars with nearly complete fusion of the entoconid and hypolophid conspire to situate LACM 9380 firmly within the genus *Trimylus* (Mawby, 1960, Repenning, 1967).

The Sharps Formation specimen agrees better with near contemporary forms of *Trimylus* in North America than with later Miocene and Pliocene species of North America and Europe in its more anterior location of the mental foramen and incisor root and retention of vestiges of the hypoconulid on the molars. The Sharps specimen differs from *T. dakotensis* Repenning, 1967 in nearly complete fusion of M_1 and M_2 hypolophids to the entoconids, slightly larger size, persistent anterior cingulum on M_1 , and slightly more anterior position of the mental and postsymphyseal foramina. The Sharps specimen closely resembles *T. compressus* (Galbreath, 1953) in tooth morphology but differs in slightly more anterior situation of the mental and postsymphyseal foramina. The Sharps species differs from *T. roperi* in the anterior position of the mental and (?) post-symphyseal foramina, more anterior position of the I_1 root, and possibly the greater prominence of the hypoconulids.

Although nearest in time to *Trimylus dakotensis* (early Hemingfordian), the Sharps specimen seems a little closer to *T. compressus* (Orellan) in those meager features available, such as the greater coalescence of the M_1 - M_2 hypolophids and entoconids and persistent M_1 anterior cingulum. I think it prudent, however, to leave specific allocation in abeyance until more diagnostic material (i.e., antemolar region) is found and a better understanding of the variation of the named species is obtained.

SUMMARY

Of the seven insectivores reported from the Sharps Formation by Macdonald (1963, 1970), I recognize five of which two species are only tentatively retained as distinct. The shrew, *Trimylus*, is an addition to the Sharps Formation fauna. The revised insectivore fauna is as follows:

Family: Erinaceidae

Ocajila makpiyahe Macdonald, 1963

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