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THE INSECTIVORES OF THE HAGERMAN LOCAL FAUNA, UPPER PLIOCENE OF IDAHO

By

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VOLUME 23

THE INSECTIVORES OF THE HAGERMAN LOCAL FAUNA, UPPER PLIOCENE OF IDAHO

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ABSTRACT—The insectivore fauna of the Hagerman local fauna includes the shrews *Sorex* (four species) and *Paracryptotis gidleyi;* a shrew-like mole of uncertain generic affinity; and the mole *Scapanus* sp. Among the species of *Sorex,* three are new: *S. hagermanensis, S. powersi,* and *S. meltoni. Sorex* cf. *S. rexroadensis* is also present. On the basis of upper dentition the most common shrew at Hagerman is removed from the genus *Blarina* and assigned to *Paracryptotis*.

INTRODUCTION

THE STREAM, floodplain, and marsh deposits of the Glenns Ferry Formation (Malde & Powers, 1962) near Hagerman, Idaho, contain the largest known Upper Pliocene fauna in North America. Among the specimens collected from these sediments are palates and lower jaws of the shrew *Blarina gidleyi* Gazin (1933), lower jaws of four species of *Sorex,* a fragmentary lower jaw of a shrew-like mole, and postcranial elements of the mole *Scapanus*.

The potassium-argon date of $3.48 \pm 0.27 \times 10^6$ years reported by Evernden, *et al.* (1964), establishes the Late Pliocene age of the Hagerman local fauna. For a more thorough discussion of the stratigraphic sequence of important fossil sites, history of paleontological investigations, and taxonomic contributions refer to the recent publications of Zakrzewski (1969) and Bjork (1970).

We wish to thank the following for permission to study specimens under their care: William H. Burt and Emmet T. Hooper, Museum of Zoology, The University of Michigan (UMMZ).

Special credit is due The University of Michigan field parties of 1962, 1964, 1965, 1966, and 1967. William A. Akersten wrote and executed a computer program for which we are most grateful.

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Unless otherwise designated, all specimens are catalogued and deposited in The University of Michigan Museum of Paleontology.

Order INSECTIVORA
Family SORICIDAE
SOREX HAGERMANENSIS n. sp.
Text-figs. 1A, B

Holotype. — V56100, The University of Michigan Museum of Paleontology. Posterior part of a left lower jaw with M_1-M_3. The coronoid process of the ascending ramus is missing.

Horizon and type locality.—This shrew was taken in the summer of 1967 by Philip Bjork and Richard Zakrzewski in the SW¼ sec. 28, T. 7 S., R. 13 E., Twin Falls County, Idaho. Elevation 3050 ft. Glenns Ferry Formation, Hagerman local fauna.

Diagnosis.—A shrew the size of *Sorex obscurus* Merriam. The anterior mandibular foramen is more anteriorly placed than in *S. arcticus* Kerr, *S. obscurus* Merriam, and *S. trowbridgii* Baird. A small posterior mandibular foramen is present like the condition observed in *S. fumeus* Miller. Teeth are pigmented. A distinct entoconid is present on M_3.

Description of holotype.—The jaw is that of an adult shrew (text-fig. 1A). The teeth are pigmented like those of *Sorex obscurus.* The talonid of M_1 and M_2 is wider than the trigonid. The M_3 has a well-developed talonid. We have not observed an entoconid on an M_3 in this stage of wear in Recent *Sorex.* When present it has been observed on teeth of young and young adult specimens. The mental foramen is anterior to the anterior labial root of M_1.

The anteroposterior length of M_1-M_3 is 3.62 mm (see table 1 for measurements).

Discussion.—*S. hagermanensis* is distinguished from *S. powersi* n. sp. by its heavier and larger jaw, also by its more anteriorly placed mandibular foramina and the broader talonid of M_3.

TABLE 1—MEASUREMENTS (IN MILLIMETERS) OF THE HOLOTYPES OF *Sorex hagermanensis*, *Sorex powersi*, AND *Sorex meltoni* FROM THE HAGERMAN LOCAL FAUNA.

	Sorex hagermanensis V56100	*Sorex powersi* V55028	*Sorex meltoni* V55173
M_1–M_3	3.62	3.57	2.92
M_1 AP	1.38	1.47	1.16
M_1 Tri AP	0.85	0.85	0.73
M_1 W	0.85	0.83	0.64
M_2 AP	1.30	1.31	1.02
M_2 Tri AP	0.76	0.80	0.62
M_2 W	0.80	0.81	0.63
M_3 AP	1.12	1.02	0.82
M_3 Tri AP	0.69	0.59	0.49
M_3 W	0.67	0.66	0.50

Abbreviations: AP, anteroposterior length; Tri AP, anteroposterior length of trigonid; W, greatest width.

SOREX POWERSI n. sp.
Text–figs. 1C, D

Types.—Holotype (V55028), posterior part of left jaw with M_1–M_3. Paratype (V56065), posterior part of left jaw with P_4–M_2. Both types in The University of Michigan Museum of Paleontology.

Horizon and type locality.—United States National Museum Horse Quarry. NW¼ sec. 16, T. 7 S., R. 13 E., Twin Falls County, Idaho. Elevation 3290 ft. Glenns Ferry Formation, Upper Pliocene, Hagerman local fauna.

Horizon and occurrence of paratype.—United States Geological Survey Cenozoic locality 20765. Elevation 3025 feet. Glenns Ferry Formation, Upper Pliocene, Hagerman local fauna.

Diagnosis.—A shrew the size of *Sorex saussurei* Merriam and *S. trowbridgii*. The transverse width of the talonid of M_1 and M_2 is approximately the width of the trigonid. In *S. trowbridgii* (UMMZ No. 106694) the lingual base of the hypoconid extends slightly over the anterior cingulum of M_2 and to a greater extent in *S. saussurei* (UMMZ No. 88637). The talonid is wider than the trigonid in these two Recent species. In *S. powersi* the hypoconid of M_1 joins the lingual cingulum of M_1. The coronoid spicule is well developed and more anterior like the condition observed in *Sorex cinereus*. The posterior mandibular foramen is larger than the anterior mandibular foramen. Both foramina occur in a deep depression.

Description of holotype and paratype.—There is evidence of pigment on M_1. The P_4, M_1, and M_2 of the paratype (V56065) are distinctly pigmented. In the holotype, the M_3 has a well-developed labial cingulum. The talonid is not reduced (text–fig. 1C). The anteroposterior length of M_1–M_3 of the holotype is 3.57 mm (see table 1 for measurements). The characters of the M_1 and M_2 and of the jaw of the paratype agree with those of the holotype.

The lingual side of P_4 is not as excavated as the P_4 in Recent species of *Sorex* examined. The tooth is more bulbous. The mental foramen in the paratype is located just anterior to the anterior labial root of M_1. The anteroposterior length of P_4–M_2 is 3.25 mm.

This species is named for Howard A. Powers, who has contributed greatly to the stratigraphic knowledge of the western Snake River Plains.

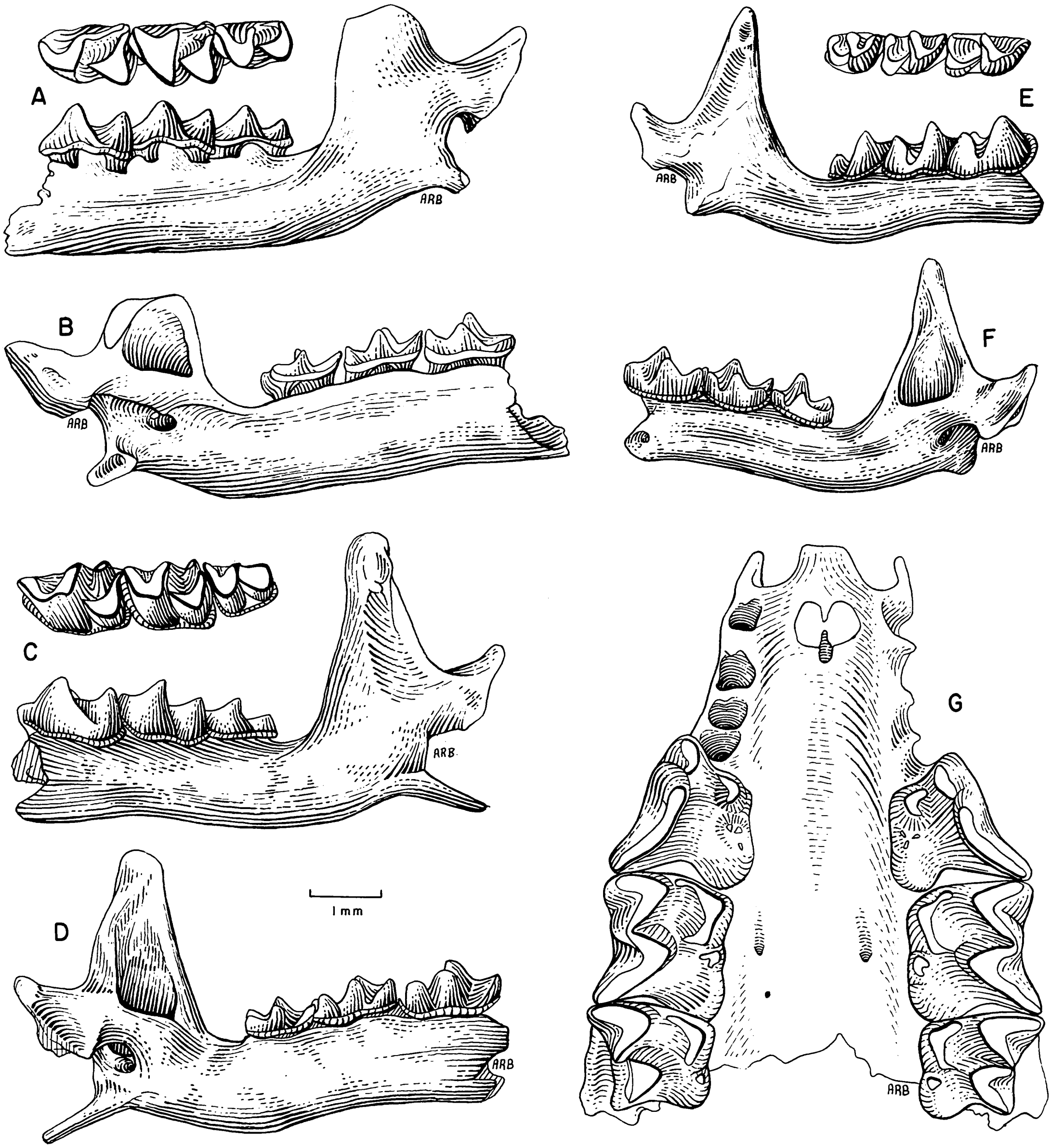
SOREX MELTONI n. sp.
Text–figs. 1E, F

Holotype.—V55173, The University of Michigan Museum of Paleontology; posterior part of right jaw with M_1–M_3. Collected in the summer of 1966 by William G. Melton, Jr.

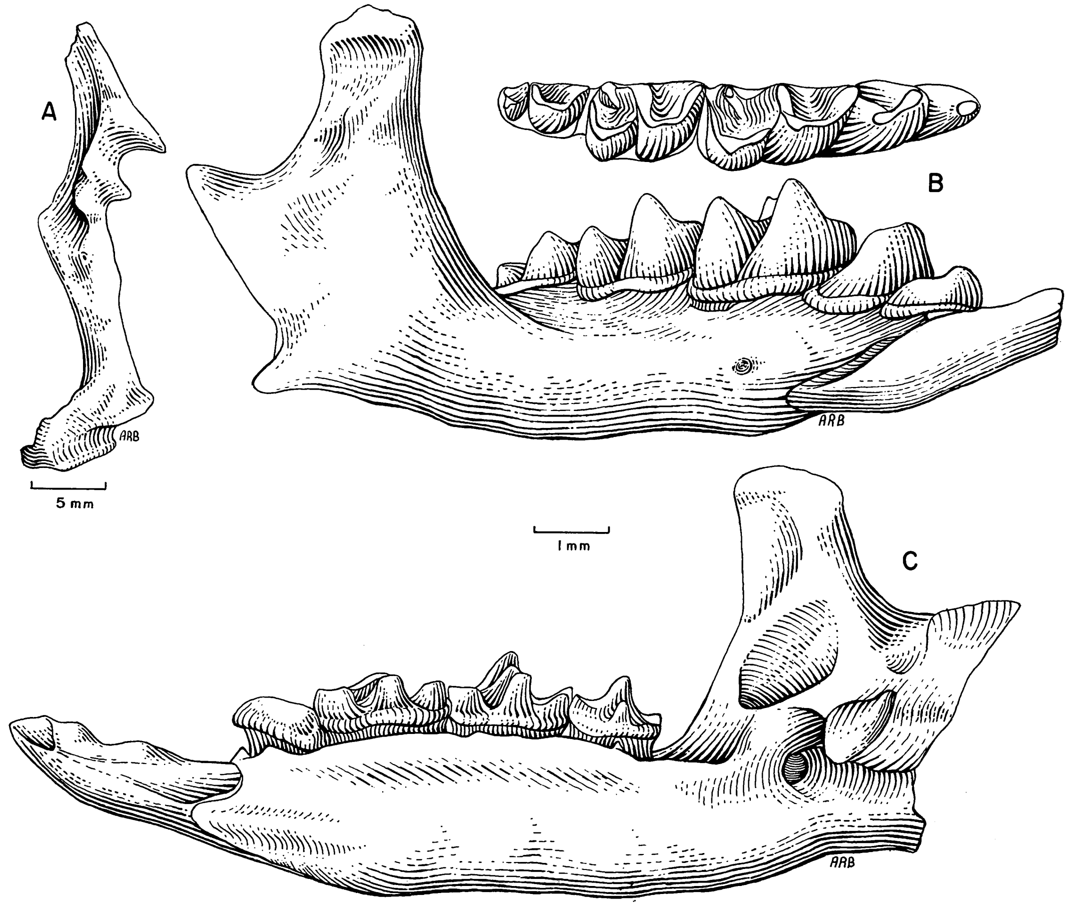
Horizon and type locality.—The University of Michigan locality (UM–Ida 1a–65), sec. 32, T. 7 S., R. 13 E. Elevation 3260 ft. Hagerman Quadrangle, Twin Falls County, Idaho. Glenns Ferry Formation, Hagerman local fauna.

Diagnosis.—A shrew the size of *Sorex c. cinereus* Kerr, with a distinct posterior and anterior mandibular foramen. Both foramina are located in a depression (text–fig. 1F). The posterior mandibular foramen is located under the posterior border of the posterointernal ramal fossa. The anterior mandibular foramen occurs approximately one-third of the distance anterior to the posterior border of the posterointernal ramal fossa. The lower jaw is not as deep and wide as that of *S. rexroadensis* Hibbard but is the size of the jaw of *S. c. cinereus*.

Description of holotype.—The coronoid process and the articular condyles are badly eroded and the angular process is missing. The M_1–M_3 are in good shape. The talonid of M_1 and M_2 is not as wide in comparison to the trigonid as in Recent species of *Sorex*. The entoconid is more distinctly separated from the metaconid on M_1 and M_2 than in Recent species of *Sorex*. The characters are like those



TEXT-FIG. *1*—Shrews from the Hagerman local fauna. A, B, V56100, *Sorex hagermanensis,* holotype, part of left lower jaw with M_1–M_3; A, occlusal and labial views; B, lingual view. C, D, V55028, *Sorex powersi,* holotype, part of left lower jaw with M_1–M_3; C, occlusal and labial views; D, lingual view. E, F, V55173, *Sorex meltoni,* holotype, part of right lower jaw with M_1–M_3; E, occlusal and labial views; F, lingual view. G, V55058, *Paracryptotis gidleyi,* part of palate with P^4–M^2, ventral view. All $\times$ 10.



TEXT-FIG. 2—*Scapanus* sp. (a mole) and *Paracryptotis gidleyi* (a shrew) from the Hagerman local fauna. A, V54560, *Scapanus* sp., a right ulna, lateral view, × 2. B, C, *Paracryptotis gidleyi;* B, V50692, a right lower jaw with part of the incisor –M_3, occlusal and labial views, × 10; C, V52744, a right lower jaw, with incisor, last unicuspid and M_1–M_3, lingual view, × 10.

observed in *S. rexroadensis*. Anteroposterior length of M_1–M_3 is 2.92 mm (see table 1 for measurements).

Discussion.—The presence of the posterior mandibular foramen is more anterior than in the subgenus *Sorex*. This character is variable in the subgenera *Sorex* and *Otisorex* (Findley, 1955, and Hall & Kelson, 1959). In a specimen of *S. v. vagrans* Baird (UMMZ No. 86692) where the posterior mandibular foramen is present, it is not as posteriorly placed as in *S. meltoni;* also in *S. v. vagrans* the anterior mandibular foramen is more anterior than in *S. meltoni. Sorex taylori* Hibbard, *S. leahyi* Hibbard, *S. dixonensis* Hibbard, and *S. sandersi* Hibbard have only the anterior mandibular foramen, while *S. cudahyensis* Hibbard has both the anterior and posterior mandibular foramina.

This species is named for William G. Melton, Jr. who helped to collect and prepare the Hagerman vertebrates.

SOREX cf. S. REXROADENSIS Hibbard

Parts of two right lower jaws (V55984) of this shrew were taken in the summer of 1967 by Philip Bjork and Richard Zakrzewski in NW¼ sec. 5, T. 8 S., R. 13 E., Twin Falls County, Idaho (Loc. UM–Ida 2–65) at an elevation of 3280 ft. to 3300 ft.

Only one of the jaws contains teeth. The teeth present are M_1 and M_2, with an anteroposterior length of 2.28 mm. The characters of the jaws and teeth agree with those of *Sorex rexroadensis* Hibbard. In the holotype of *S. rexroadensis* there is a very small posterior mandibular foramen, less than one-half the size of the anterior mandibular foramen. The anterior mandibular foramen is well forward, and the small posterior foramen is more anterior than in *Sorex meltoni* and *S. powersi*. The two jaws from Idaho have only a single mandibular foramen (the anterior) which is located below the middle of the ventral edge of the posterointernal ramal fossa.

PARACRYPTOTIS Hibbard, 1950

Genotype.—*Paracryptotis rex* Hibbard, 1950.

Emended diagnosis.—Dental formula: $\frac{1\text{–}5\text{–}3;}{1\text{–}2\text{–}3}$ upper incisors with a well-developed constriction between the tip and the posterior basal cusp, each of four unicuspids weakly overlaps tooth immediately anterior, unicuspids have well-developed lingual cingula without posterolingual cusplet, posterior emargination of P^4–M^2 variable from absent to moderately developed, M^1 and M^2 with small isolated hypocone, M^2 anterior border much longer than posterior border; thus, the trapezoidal outline is well developed. The zygomatic arch arises from the skull adjacent to the anterior half of the M^2. The lacrimal foramen is dorsal to the mesostyle of M^1. Rostrum is short, lower jaw heavy, articular facets well separated, lower articular condyle is anteriorly situated and in lateral view it is slightly visible. Profile of the ventral border of the lower jaw is relatively straight. M_1 and M_2 metalophids join protolophid well lingual to the protoconid; the entoconid is well developed and separated from hypolophid by a small valley. M_3 is reduced with a small talonid which is usually an enclosed basin with a single crest. Labial cingula on lower molars are heavy.

Geologic and geographic range.—Hemphillian of Kansas, Early Blancan of Kansas and Idaho.

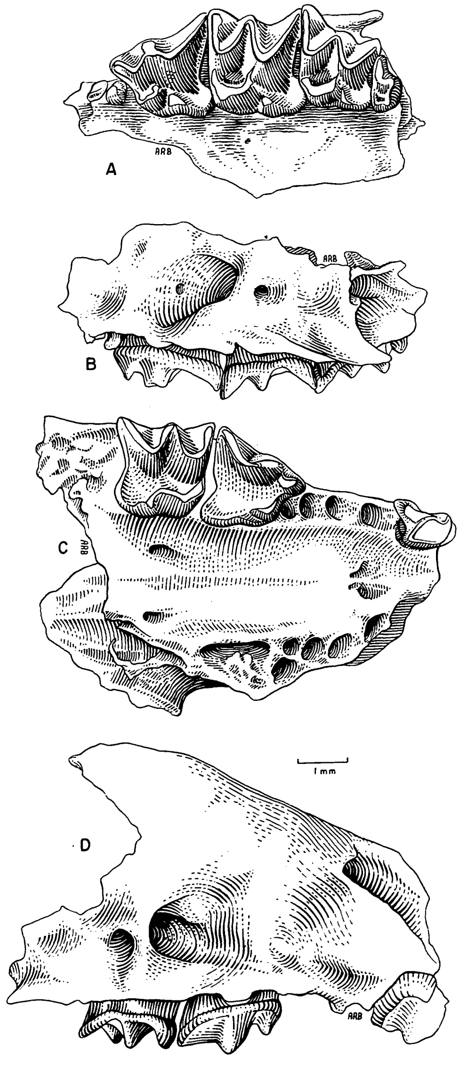
Remarks.—During the course of our investigation, additional occurrences of *Paracryptotis* have come to our attention. An upper left incisor (V29202) from the Saw Rock Canyon local fauna of Seward County, Kansas, is clearly referable to this genus on the basis of size and the prominent constriction between the tip and posterior basal cusp. From the Wendell Fox locality described by Woodburne (1961), 5 fragmentary lower jaws (V45464, V45465, and V57067) and a right maxillary fragment with M^2 (V45466) are here referred to *P. rex* Hibbard.

PARACRYPTOTIS GIDLEYI (Gazin)
Text–figs. 1G; 2B, C; 3A–D

Blarina gidleyi Gazin, 1933, Jour. Mammalogy, v. 14, p. 142–144, 1 fig.
Blarina gidleyi Gazin, Hibbard, 1957, Trans. Kansas Acad. Sci., v. 60, p. 329–331, figs. 2C, D, E.
Blarina gidleyi Gazin, Repenning, 1967, USGS Prof. Paper 565, p. 43–44, fig. 30.

Holotype.—United States National Museum No. 12650, a fragmentary left ramus with M_1–M_3.

Type locality and horizon.—T. 7 S., R 13 E., near Hagerman, Idaho. Flood plain facies of the Glenns Ferry Formation.



TEXT-FIG. 3—*Paracryptotis gidleyi* from the Hagerman local fauna. A, B, V59935, part of a left maxillary with P^4–M^3, occlusal and lateral views. C, D, V53311, part of skull with right I, P^4–M^1, palatal and lateral views. All × 10.

TABLE 2—STATISTICAL DATA FOR THE UPPER DENTITION OF *Paracryptotis gidleyi* COMPARED TO MEASUREMENTS OF THE HOLOTYPE OF *Paracryptotis rex*. All measurements in millimeters.

	Paracryptotis gidleyi (all localities)					*Paracryptotis rex*
	N	$\bar{x} \pm S_{\bar{x}}$	S	V	OR	UMMP V25172
Incisor length	4	2.28 ± .097	0.194	8.509	2.11–2.46	2.02
Incisor width	4	1.03 ± .037	0.074	7.184	0.96–1.12	1.12
U^2 AP	2	1.23			1.20–1.26	1.14
U^2 W	2	0.88			0.83–0.92	1.09
U^3 AP	1	0.90				0.90
U^3 W	1	0.78				0.66
U^4 AP	2	0.51				0.45
U^4 W	2	0.58			0.55–0.64	0.54
P^4 AP	14	2.14 ± .020	0.077	3.579	1.94–2.24	2.39
P^4 W	14	2.02 ± .022	0.084	4.148	1.85–2.13	1.87
M^1 AP	13	1.98 ± .021	0.077	3.904	1.87–2.15	2.18
M^1 W	13	2.02 ± .025	0.090	4.455	1.90–2.21	2.15
M^2 AP	9	1.57 ± .019	0.056	3.554	1.49–1.64	1.47
M^2 AW	8	1.99 ± .029	0.081	4.075	1.88–2.12	1.98
M^2 PW	7	1.41 ± .035	0.093	6.617	1.28–1.52	1.30
M^3 AP	1	0.72				0.67
M^3 W	1	1.22				1.29

Abbreviations: N, number; $\bar{x} \pm S_{\bar{x}}$, mean plus or minus the standard error of the mean; S, standard deviation; V, variability; OR, observed range; AP, anteroposterior length; W, width; AW, anterior width; PW, posterior width.

Emended diagnosis.—P^4 narrow anteriorly and with moderate posterior emargination, talonid of M_1 and M_2 is short, and M_3 is reduced with talonid shorter than in *Paracryptotis rex,* but entire tooth is relatively longer compared to length of M_1 than in *P. rex.* Teeth not as robust as in *P. rex.*

Material.—A minimum number of 120 individuals from 36 localities with a maximum stratigraphic separation of 320 feet. USGS Cenozoic locality 20765 has yielded at least 32 individuals and USGS Cenozoic locality 19216, 17 individuals.

Description. — Dental formula: $\frac{1\text{–}5\text{–}3,}{1\text{–}2\text{–}3}$ as in *Cryptotis* and *Paracryptotis rex.* Upper incisor with well-developed posterior cusplet separated from the anterior chiseling portion of the incisor by a distinct constriction as in *Cryptotis parva* (Say) and *P. rex. Blarina brevicauda* (Say), *B. carolinensis* (Bachman), *C. alticola* (Merriam), *C. magna* (Merriam), and *C. mexicana* (Coues) do not have this constriction.

Unicuspids are simple and rounded in outline thus the posterior-anterior overlap of adjacent unicuspids is not as pronounced as in the first and second unicuspids of *Blarina brevicauda.* Size of the unicuspids from largest to smallest is U_2, U_3, and U_4. U_1 is not present in the material at hand. U_2 is largest in *P. rex.* U_4 is small and peg-like. The unicuspids have well-developed lingual cingula but posterolingual cuspules are absent. *Paracryptotis rex*

TABLE 3—STATISTICAL DATA FOR THE LOWER DENTITION OF *Paracryptotis gidleyi* FROM USGS LOCALITY 19216. All measurements in millimeters. Abbreviations as in tables 1 and 2.

	N	$\bar{x} \pm S_{\bar{x}}$	S	V	OR
Hgt. coronoid	11	5.66 ± .039	0.128	2.268	5.37–5.87
Hgt. condyloid	11	4.13 ± .041	0.137	3.306	3.84–4.32
Width condyle	13	2.03 ± .036	0.128	6.292	1.79–2.27
P_3–M_3	0				
M_1–M_3	13	4.84 ± .032	0.115	2.384	4.61–5.10
M_1 AP	19	2.14 ± .014	0.062	2.917	2.03–2.24
M_1 Tri AP	19	1.32 ± .013	0.055	4.195	1.18–1.41
M_1 W	19	1.30 ± .010	0.044	3.407	1.21–1.38
M_2 AP	21	1.74 ± .017	0.077	4.405	1.60–1.90
M_2 Tri AP	21	1.09 ± .013	0.059	5.420	0.99–1.20
M_2 W	21	1.12 ± .010	0.048	4.284	1.01–1.21
M_3 AP	16	1.18 ± .019	0.077	6.518	1.00–1.31
M_3 Tri AP	16	0.83 ± .012	0.047	5.692	0.72–0.90
M_3 W	16	0.80 ± .012	0.047	5.899	0.74–0.89

Abbreviation: Hgt., height.

TABLE 4—STATISTICAL DATA FOR THE LOWER DENTITION OF *Paracryptotis gidleyi* FROM USGS LOCALITY 20765. All measurements in millimeters. Abbreviations as in tables 1–3.

	N	$\bar{x} \pm S_{\bar{x}}$	S	V	OR
Hgt. coronoid	6	5.59 ± .104	0.254	4.547	4.82–5.12
Hgt. condyloid	6	4.04 ± .092	0.225	5.562	3.67–4.29
Width condyle	7	1.95 ± .047	0.124	6.373	1.76–2.13
P_3–M_3	2	6.57			6.51–6.63
M_1–M_3	16	4.80 ± .039	0.155	3.231	4.49–4.99
M_1 AP	26	2.14 ± .016	0.083	3.865	1.93–2.30
M_1 Tri AP	26	1.32 ± .012	0.061	4.603	1.21–1.42
M_1 W	26	1.23 ± .012	0.061	4.967	1.12–1.37
M_2 AP	22	1.68 ± .013	0.059	3.533	1.56–1.77
M_2 Tri AP	22	1.06 ± .010	0.045	4.256	0.94–1.13
M_2 W	22	1.10 ± .016	0.079	7.187	0.96–1.21
M_3 AP	17	1.19 ± .017	0.070	5.923	0.99–1.28
M_3 Tri AP	17	0.81 ± .011	0.045	5.562	0.72–0.88
M_3 W	17	0.78 ± .016	0.064	8.142	0.67–0.90

is similar in these respects to *Paracryptotis gidleyi.* Both *Cryptotis parva* and *Blarina brevicauda* possess posterolingual cuspules. The latter is distinctive with 5 unicuspids, the posterior three are short and broad compared to the posterior unicuspids of *Cryptotis* and *Paracryptotis.*

Anterior border between parastyle and protocone of P^4 is concave as in *Blarina brevicauda.* Parastyle is separated from the paracone by a labial excavation. Protocone is a small distinct cusp and opposite the paracone. A moderate posterior emargination of P^4 is present (text. fig. 1G). Posterolingual shelf (hypoconal flange) slopes mesially. P^4 is not as robust anteriorly as in *Paracryptotis rex.*

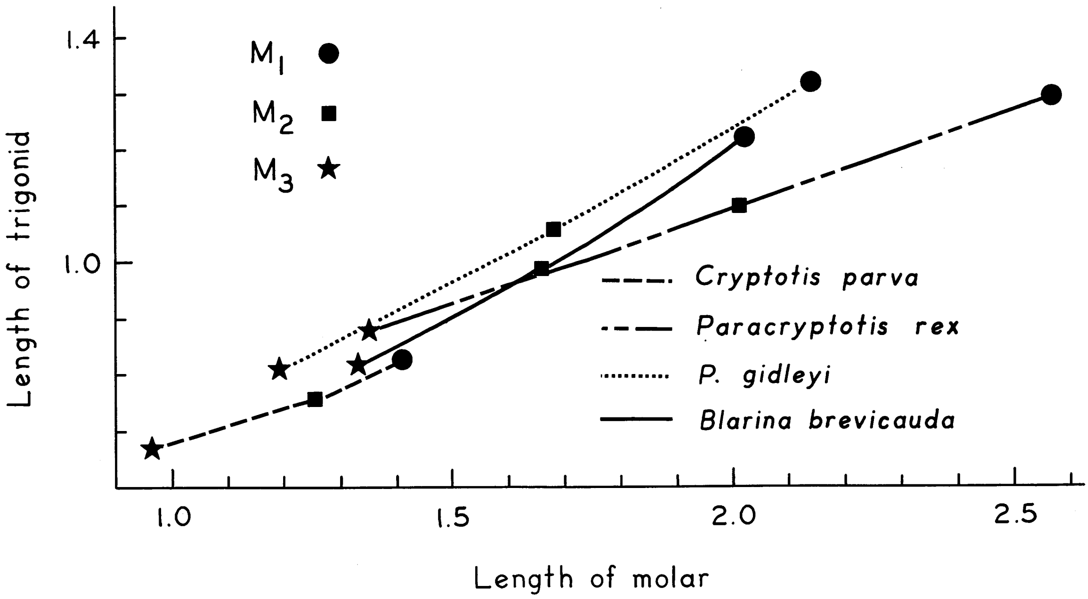
The hypocone of M^1 in *P. gidleyi* is relatively small and close to the protocone as in *P. rex.* The development and placement of the hypocone varies among the genera compared. The hypocone is farther posterior in *Cryptotis parva.* In *Blarina brevicauda* a short metaloph arises from the hypocone and connects with the protoloph. Thus, the M^1 of *Blarina* is clearly distinguishable from those of *Cryptotis* and *Paracryptotis.*

M^2 in *Paracryptotis gidleyi* is markedly trapezoidal in occlusal outline as in *P. rex.* Repenning (1967) also noted that *Blarina* has a trapezoidal M^2. The outline of M^2 in *Blarina* is not as extremely developed as in *Paracryptotis* (if an object can be more trapezoidal than another). In fact, the M^2 in *Blarina* closely approaches a parallelogram. Correlated with the shape of M^2 is the position of the zygomatic process on the skull. In forms with a trapezoidal M^2 this process originates adjacent to the mesostyle of M^2. As a rectangular M^2 is approached, the process migrates posteriorly. In *Blarina* it is near the mesostyle and metacone and in *Cryptotis* the process originates at the contact of the M^2 and M^3. M^3 is not well known in *P. gidleyi* and appears to be a tooth which is approaching a vestigial condition.

The lower articular condyle of the lower jaw is anteriorly situated as in *Blarina.* Repenning (1967) considers this to be an advanc-

TABLE 5—STATISTICAL DATA FOR THE LOWER DENTITION OF *Paracryptotis rex* FROM THE FOX CANYON LOCAL FAUNA. All measurements in millimeters. Abbreviations as in tables 1–4.

	N	$\bar{x} \pm S_{\bar{x}}$	S	V	OR
Hgt. coronoid	12	6.34 ± .060	0.207	3.264	5.98–6.63
Hgt. condyloid	13	4.55 ± .080	0.289	6.351	3.99–5.02
Width condyle	13	2.27 ± .036	0.128	5.649	2.09–2.50
P_3–M_3	10	6.97 ± .103	0.325	4.665	6.39–7.29
M_1–M_3	22	5.34 ± .047	0.218	4.092	4.90–5.74
M_1 AP	25	2.44 ± .022	0.108	4.442	2.14–2.65
M_1 Tri AP	25	1.45 ± .018	0.092	6.372	1.22–1.58
M_1 W	24	1.41 ± .018	0.090	6.330	1.26–1.59
M_2 AP	33	1.92 ± .018	0.106	5.537	1.67–2.10
M_2 Tri AP	33	1.18 ± .013	0.075	6.357	1.04–1.36
M_2 W	32	1.20 ± .016	0.088	7.373	1.03–1.40
M_3 AP	31	1.31 ± .013	0.070	5.357	1.10–1.45
M_3 Tri AP	31	0.87 ± .010	0.058	6.662	0.74–1.02
M_3 W	30	0.82 ± .010	0.058	6.807	0.71–0.92



TEXT-FIG. 4—Comparison of the length of molar teeth to the length of trigonid for *Paracryptotis rex, P. gidleyi, Blarina brevicauda,* and *Cryptotis parva.* Measurements in millimeters.

ed characteristic in *Blarina* over the condition observed in *Cryptotis.* The strong angulation of the ventral border of the lower jaw which is present in *Blarina* is not present in *Paracryptotis gidleyi* (text–fig. 2B, C) or *P. rex.*

Reassignment of *Blarina gidleyi* to *Paracryptotis* is not surprising, for in his concluding remarks, Gazin (1933) noted that the new species may belong to an as yet undescribed genus. Repenning (1967) echoed Gazin's doubt as to the correctness of the generic assignment of *Blarina gidleyi.* Hibbard (1950) suggested that *Paracryptotis rex* may be closely related to *Blarina gidleyi* and the latter perhaps belongs to the genus *Paracryptotis.* Proper evaluation, he noted, depended on the recovery of the upper dentition of the Hagerman form. Each worker was handicapped by small samples of lower jaw material and no skull elements. Intensive collecting by The University of Michigan Museum of Paleontology field parties from 1962–1967 has resulted in a large sample of lower jaw material as well as a small sample of skull material.

On the basis of this material, we believe that *Blarina gidleyi* should be assigned to the genus *Paracryptotis.* Hibbard (1950) noted the following characteristics in his description of the holotype of *Paracryptotis rex:*

1) I^1 has a rectangular heel and an external cingulum.
2) Unicuspids have no lingual cuspules, but lingual cingula are present.
3) U^2 is the largest unicuspid, U^1 next, U^3 next, and U^4 smallest.
4) P^4 is molariform with large posterior shelf and no posterior emargination.
5) M^1 has a well-defined loph from protocone to metacone.
6) M^2 is wider anteriorly than posteriorly.
7) The metalophid-protolophid junction is medial on M^1.

The Idaho form shares all of these characteristics with the exception of the presence of the posterior emargination of P^4 and M^1 in *Paracryptotis gidleyi.* In *Paracryptotis gidleyi* the lower articular condyle is slightly anterior (i.e., hidden in lateral view) to the position in *P. rex. Paracryptotis gidleyi* has reached the *Blarina brevicauda* stage of evolution in this respect.

In table 2 statistical data on the upper dentitions of *Paracryptotis gidleyi* are presented and compared with the same measurements of the holotype of *P. rex.* Material from all localities at Hagerman was lumped because of the dearth of upper dentitions at any locality. In tables 3, 4, and 5 the data for measurements of the lower jaws from USGS Cenozoic localities 19216 and 20765 are presented and compared to similar measurements of the holotype of *P. rex.* USGS Cenozoic locality 19216 is 270 feet stratigraphically higher than locality 20765. The former is distinguished by the presence of the microtine *Ophiomys taylori* (Hibbard) and the absence of *Cosomys primus* Wilson. Zakrzewski (1969) has reported on the stratigraphic distribution of these two forms and other rodent taxa. A slight shift in the fauna during Hagerman time is recognizable. Superficial examination of the means in tables 3 and 4 shows the sample from locality 19216 is slightly larger than that from locality 20765. Comparison of the means of each variable was made with a student's t test. The null hypothesis is that the two samples were drawn from the same population. At the 5% level of significance, the null hypothesis is accepted for all variables except the width of M_1 and the length of M_2. An F distribution comparison of the variances for the same variables at a 5% level of significance indicates that the differences in variances are acceptable except in one instance. M_2 width variances are significantly different. The discrepancies in the comparison of means and variances may reflect remote chance occurrences (i.e., less than 5% of the time), a slight shift in ecology, or an incipient change or trend in the population of *Paracryptotis gidleyi* during Hagerman time.

In text–figure 4, an interesting relationship is noted in a comparison of the length of molar teeth to the length of the trigonid for *Paracryptotis rex, P. gidleyi, Blarina brevicauda,* and *Cryptotis parva.* Trends in length of talonid may be inferred from the diagram; for the flatter the curve, the greater the reduction of the talonid, particularly on M_3. Reduction of length of M_2 and M_3 is greatest in *Paracryptotis rex* and *P. gidleyi* relative to M_1.

Family Talpidae
Talpid gen. and sp. indet.

Part of a right ramus (V53272) of a small shrew-like mole larger than *Neurotrichus gibbsii* (Baird) was recovered by Richard Wilson at locality UM–Ida 3–65, in the SW¼ sec. 32, T. 7 S., R. 13 E., in Twin Falls County, Idaho, at an elevation of 3110 ft. in the summer of 1965. The posterior part of the jaw is missing. It is broken across the posterior alveolus of M_2. The talonid of M_1 is missing. The trigonid of M_1 and the P_4 are greatly worn. The trigonid of M_1 is much wider than the trigonid of M_1 of *Neurotrichus gibbsii.* P_4 is rounded anteriorly. Anterior to P_4 are seven alveoli. It appears that the other teeth were single rooted. If P_3 had two roots, it was as large a tooth as P_4. If we are correct, the two anterior incisors grew in line with the other teeth and the most anterior tooth was the smallest as in *Galemys* but not displaced lingually.

The two mental foramina are not placed as in *Mystipterus* (*M.*) *pacificus* Hutchison (1968), *M.* (*M.*) *martini* Wilson (1960); *? Neurotrichus columbianus* Hutchison (1968), or the Recent *Neurotrichus gibbsii.*

The fossil has the posterior mental foramen under the middle of P_4 and the anterior mental foramen, which is the larger, under the second alveolus anterior to P_4. A slight groove extends anteriorly and dorsally from the foramen.

Scapanus sp.
Text–fig. 2A

Two fragmentary right humeri (V53167) from SW¼ sec. 28, T. 7 S., R. 13 E., Twin Falls County, Idaho (USGS Cenozoic locality 20765) at an elevation of 3025 ft., and a right ulna (V54560) from NE¼ NE¼ sec. 32, T. 7 S., R. 13 E., Twin Falls County, Idaho (Loc. UM–Ida 48–65) at an elevation of 3075 ft., are assignable to the genus *Scapanus.* The humeri are approximately the size of *Scapanus* cf. *S. proceridens* Hutchison from the McKay Reservoir local fauna. The total length is approximately 12.2 mm, and the midshaft width is 3.8 mm. Hutchison (1968) noted that *S. proceridens* is about the size of the extant species *S. orarius* True. The head of the humerus of the Hagerman form is laterally situated relative to the shaft as in *Scapanus.* The brachialis fossa is very deeply excavated.

The ulna (text–fig. 2A) lacks most of the olecranon process. Enough of the anterior border of the olecranon is present to demonstrate the presence of a medial olecranon crest. Hutchison (1968) used this to distinguish *Scapanus* from *Scalopus.* The processus anconeus projects anteriorly rather than curving anteroventrally as in *Scalopus.*

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