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REVIEW OF THE WHITE-FOOTED MICE, GENUS *PEROMYSCUS*, OF NICARAGUA

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White-footed mice of the genus *Peromyscus* have the broadest distribution in North America of any of the New World cricetine genera, occurring from north-central Canada southward to Panamá (and barely into South America). Radiation in this diverse group has been especially pronounced in southern México and adjacent parts of Central America, and this situation, while not yet fully understood, has been the subject of several recent studies. Nevertheless, virtually nothing is known of distribution and variation in the *Peromyscus* of Nicaragua, the subject of the present paper.

In the first of two publications on collections of mammals from Nicaragua, J. A. Allen (1908:658) named and described "*Peromyscus nicaraguae*," based on a holotype and other specimens from Matagalpa, but including also material from San Rafael del Norte, Ocotal, Volcán de Chinandega, and Chontales. In the second paper (1910:100), Allen listed additional material from Matagalpa and San Rafael del Norte as well as from the new localities of Peña Blanca, Río Coco, and Uluse. However, in his monographic study of the genus, Osgood (1909:203) placed *P. nicaraguae* in the synonymy of *Peromyscus mexicanus saxatilis* Merriam, wherein it has remained (Hall, 1981:711). Until now, *P. mexicanus* has been the only species of *Peromyscus* reported from Nicaragua.

In the winter and spring of 1956, J. R. Alcorn and his family obtained mammals in Nicaragua for the Museum of Natural His-

tory at the University of Kansas. Subsequently, between February 1964 and the spring of 1968, several other field parties from Kansas, supported by a contract (DA-49-193-MD-2215) to one of us (Jones) from the U.S. Army Medical Research and Development Command, collected both mammals and their ectoparasites in Nicaragua. Furthermore, L. G. Clark, then associated with the University of Pennsylvania, collected mammals in that country in connection with studies of leptospirosis; his material was divided between the Museum of Natural History at Kansas and the U.S. National Museum of Natural History.

Among the specimens accumulated as a result of these endeavors were more than 400 individuals of *Peromyscus* representing three species as currently understood (Huckaby, 1980). Two of these, *P. gymnotis* and *P. stirtoni*, are new to the known fauna of Nicaragua.

METHODS AND MATERIALS

All specimens listed as examined are in the University of Kansas Museum of Natural History, and catalogue numbers relate to that collection. Measurements are given in millimeters. Those of the cranium were taken as described by Hooper (1952) to the nearest 0.1 millimeter by means of dial calipers. External measurements were taken directly from museum specimen labels.

For *Peromyscus mexicanus* and *P. gymnotis*, individual, age, and secondary sexual variation was analyzed with the statistical analysis system (SAS) designed and implemented by Barr *et al.* (1976). All specimens were assigned to one of six age classes following the technique used by Schmidly (1972). Means were calculated for each character, and a one-way analysis of variance was used to test for differences among age classes and between sexes. Duncan's multiple range test was used to identify maximally non-significant subsets. Coefficients of variation (CV) were calculated to determine the extent of variability for each character.

Geographic variation was analyzed by means of univariate (mean, standard deviation, standard error) and multivariate statistics. The latter consisted of a multivariate analysis of variance (MANOVA) in SAS (see Yates *et al.*, 1979). *Peromyscus stirtoni* was not included in these analyses because so few specimens were available for study.

Because undue crowding of symbols would have resulted, some localities from which specimens are known were not plotted on

the distribution map. These localities are indicated in italic type in the accounts that follow.

Statistical Analyses

Nongeographic variation owing to sex and age was examined prior to analysis of geographic variation. Single-classification analysis of variance was used to test each of 15 external and cranial characters in selected samples of *Peromyscus mexicanus* and *P. gymnotis* to ascertain if any significant morphological differences were related to sex. No differences of significance were found between sexes for any measurement; thus males and females were considered together in all subsequent analyses. Likewise, analysis of variance among age classes of both species revealed no consistent significant differences among specimens categorized in age classes 3 through 6 (Table 1), and all mice in these age classes were treated as adults for further statistical analysis. Actually, most of our samples (as in Table 1) contained adults classified only in age classes 3 to 5.

In order to determine the extent of variation among samples and between species with all cranial characters considered simultaneously, a multivariate analysis of variance was used. Samples of *P. mexicanus* and *P. gymnotis* (Fig. 1) were analyzed together, based on 10 cranial measurements, in an effort to assess the relative degree of morphological distinctness between the two in addition to assessing geographic variation within each species. Because of a relatively high level of variability and some missing data, external measurements and zygomatic breadth were excluded from the multivariate portion of the analysis.

The variance-covariance matrix yielded canonical variates based on the 10 characters used in the study. The first vector expressed 61.45 per cent of the phenetic variation whereas vector two expressed an additional 12.64 per cent. A two-dimensional plot of vector one against vector two (Fig. 2) revealed two clusters of samples. The first cluster consisted of samples of *P. gymnotis* from western Nicaragua (departments of Chinandega, Managua, Carazo, Granada, and Rivas). The second cluster consisted of samples of *P. mexicanus* from the departments of Estelí, Jinotega, and Matagalpa, and from Isla de Ometepe.

The contributions of each character to the first two canonical variates are presented in Table 2. Greatest length of skull and breadth of braincase exerted the heaviest influence on the first vec-

TABLE 1.—Results of analysis of variance among age classes in external and cranial measurements in a selected sample of *Peromyscus gymnotis* from the vicinity of Diriamba, Carazo, Nicaragua. Statistics given are sample size, mean, and F. Results of Duncan's multiple range test are also given. Means connected by a vertical bar are not significantly different at $P < .05$. Groups of means that were found not to be significantly different are marked NS.

Measurements and age classes	N	Mean	F	Results Duncan MRT
Total length				
IV	21	227.7	29.0	
V	2	226.0		
III	24	221.9		
II	3	210.0		
I	4	171.0		
Length of tail				
V	2	117.0	16.6	
IV	21	115.2		
III	24	111.9		
II	3	107.3		
I	4	87.0		
Length of hind foot				
IV	22	24.2	1.3	NS
III	25	24.1		
I	4	23.5		
II	3	23.3		
V	2	23.0		
Length of ear				
V	2	19.5	2.9	
IV	21	19.0		
III	22	18.8		
II	3	17.7		
I	4	17.0		
Greatest length of skull				
IV	24	30.6	21.1	
V	2	30.1		
III	27	29.9		
II	3	28.5		
I	2	25.6		
Zygomatic breadth				
V	2	15.2	31.1	
IV	22	15.1		
III	22	14.8		
II	3	13.9		
I	4	11.8		

TABLE 1.—Continued.

Interorbital breadth				
V	2	4.9	0.5	NS
III	29	4.9		
IV	25	4.9		
I	4	4.8		
II	3	4.8		
Breadth of braincase				
V	2	13.4	2.5	
IV	26	13.3		
II	3	13.2		
III	29	13.1		
I	2	12.5		
Depth of braincase				
V	2	10.0	1.0	NS
IV	26	9.9		
III	29	9.9		
II	3	9.7		
I	2	9.5		
Length of rostrum				
V	2	12.2	10.3	
IV	24	12.0		
III	29	11.9		
II	3	11.0		
I	3	10.3		
Length of palate				
V	2	4.6	2.3	NS
IV	24	4.5		
III	29	4.4		
II	3	4.3		
I	4	4.2		
Length of maxillary toothrow				
V	2	4.5	8.6	
IV	26	4.5		
III	29	4.5		
II	3	4.4		
I	4	4.1		
Length of incisive foramen				
IV	26	6.1	26.3	
III	29	5.8		
V	2	5.8		
II	3	5.5		
I	4	4.4		

TABLE I.—Continued.

Breadth of zygomatic plate				
V	2	2.6	5.0	
IV	26	2.3		
III	29	2.3		
I	4	2.1		
II	3	2.0		
Breadth of rostrum				
IV	26	5.4f	14.6	
V	2	5.3		
III	29	5.3		
II	3	4.9		
I	3	4.3		

tor. Length of maxillary toothrow exerted the greatest influence on the second. Thus, the first vector tended primarily to separate individuals with longer, broader skulls (*P. mexicanus*) from those with shorter, narrower skulls (*P. gymnotis*). Vector two tended to separate samples within each of the two major clusters from each other although no major subclusters were evident. When sample means were plotted along vector one, those of *gymnotis* (samples 1, 8, 9, 10, 12) from western Nicaragua all fell along coordinates from 3.59 to 3.68 (Fig. 2), whereas samples of *mexicanus* (2, 3, 4, 5, 6, 7, 11) fell along coordinates from 3.76 to 3.90. When all individuals were plotted, however, some overlap occurred between the extremes (that is, the edges of the two major clusters overlapped). We recognize these two taxa as distinct at the specific level following Musser (1971) and Huckaby (1980), although much remains to be learned concerning their precise systematic relationships. The intermediate nature of individuals in samples 2, 3, and 7 (Fig. 2) suggests the possibility that hybridization between the two may occur in north-central Nicaragua, for example, and that *gymnotis* and *mexicanus* thus may be conspecific. We thank Michael D. Carleton for verifying our initial identify of the smaller of these species as *P. gymnotis*.

ACCOUNTS OF SPECIES

Peromyscus gymnotis Thomas, 1894

Distribution in Nicaragua.—Pacific lowlands and isolated volcanos of western Nicaragua southward to Costa Rican border (Fig. 3).

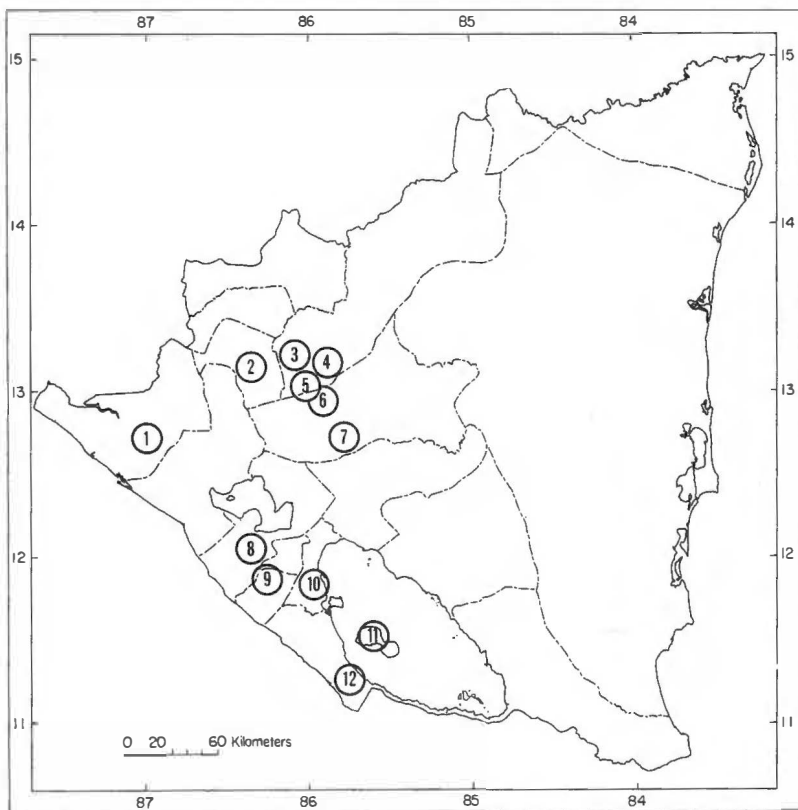


FIG. 1.—Geographic localities of samples included in multivariate analysis of populations of *P. gymnotis* and *P. mexicanus*: 1) Volcán Casita, Chinandega; 2) 9 mi. NNW Estelí, Estelí; 3) specimens labeled with reference to San Rafael del Norte, Jinotega; 4) Hda. la Trampa, Jinotega; 5) specimens labeled with reference to Jinotega, Jinotega; 6) Hda. Tepeyac and Santa María de Ostuma, Matagalpa; 7) specimens labeled with reference to Esquipulas, Matagalpa; 8) south-central Managua; 9) vicinity Diriamba, Carazo; 10) specimens labeled with reference to Guanacaste, Granada; 11) Isla de Ometepe, Rivas; 12) southern Rivas.

Measurements.—Average and extreme external measurements of 30 adults (17 males, 13 females) from southeast of Guanacaste, Granada, are: total length, 231.4 (217-254); length of tail, 115.8 (104-129); length of hind foot, 25.0 (24-26); length of ear, 20.5 (19-21). Males in this series averaged 42.8 (37.0-50.2) grams in weight and 11 nonpregnant females averaged 41.9 (31.4-46.7). Cranial measurements are given in Tables 1 and 3.

Remarks.—*P. gymnotis* is here reported for the first time from Nicaragua, where it evidently occurs the length of the western

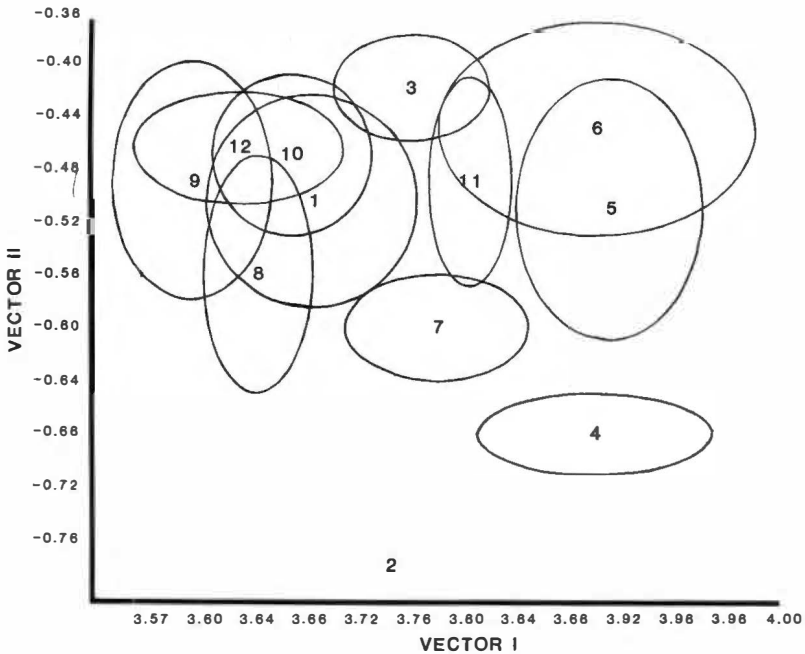


FIG. 2.—Projection of sample means (\pm one standard deviation) for the first two canonical variates in 12 samples of *Peromyscus* from Nicaragua. Numbers represent samples used to analyze geographic variation (see legend Fig. 1). The number lacking an ellipsis represents a sample containing only one specimen.

part of the country. Previously, this species was known only from southeastern Chiapas and southern Guatemala (Huckaby, 1980). The specimens reported here suggest that *gymnotis* also will be found in El Salvador, southern Honduras, and probably into northwestern Costa Rica.

P. gymnotis long was considered a subspecies of *P. mexicanus* and, as noted above, the relationships between the two remain somewhat uncertain. They differ mainly in size (*mexicanus* is the larger) and type of habitat. *P. gymnotis* occupies lowland habitats along the Pacific coast of Middle America from eastern Chiapas to southern Nicaragua. Where the range of *mexicanus* approaches that of *gymnotis*, the former is found at higher (inland) localities. The two species are not known to occur sympatrically in Nicaragua or elsewhere, and morphological intergradation between them has not been demonstrated (but see previous discussion).

P. gymnotis also differs from *mexicanus* in that few specimens have any degree of blotching on the underside of the tail as is

TABLE 2.—Eigenvalues of selected canonical variates showing the percentage influence of each character in comparative measurements of *Peromyscus mexicanus* (seven samples) and *P. gymnotis* (five samples). Eigenvalues shown represent the normalized vector coefficient of each character. The median is a value in millimeters that reflects an approximate midpoint between the largest and smallest actual measurement of each character.

Character	Median	Vector I		Vector II	
		Eigenvalue	Per cent influence	Eigenvalue	Per cent influence
Greatest length of skull	31.29	0.0408	22.20	0.0115	5.85
Interorbital breadth	4.98	-0.0434	3.76	-0.1781	14.37
Breadth of braincase	13.48	0.0790	18.55	-0.0571	6.17
Depth of braincase	10.21	0.0718	12.76	0.0151	2.50
Length of rostrum	12.41	0.0109	2.35	-0.0228	4.58
Length of palate	4.60	0.0386	3.09	0.1900	14.16
Length of maxillary toothrow	4.69	0.1737	14.19	0.3095	23.49
Length of incisive foramen	6.22	0.0853	9.23	-0.0540	5.44
Breadth of rostrum	5.50	-0.1423	13.63	-0.0802	7.15
Breadth of zygomatic plate	2.41	-0.0046	0.19	0.2548	9.95

common in populations of the latter. In more than 150 museum skins of *gymnotis* examined by us from Nicaragua, only 21 specimens had any blotching ventrally on the tail, and in most cases even this was minimal. Thus the tail of typical *gymnotis* is more or less unicolored in contrast to the typically heavily blotched tail in *mexicanus*.

We assume that *P. gymnotis* once was distributed throughout most of the dry deciduous forest and semievergreen rain forest that was typical of western Nicaragua but now has been mostly destroyed as a result of agricultural practices. The species evidently still occurs sparingly in riparian situations in this region where some forest remains, such as at San Antonio, Chinandega (see Genoways and Jones, 1972), and in the wooded areas bordering Lake Nicaragua in southern Rivas. It is abundant, however, on the forested sides of isolated volcanos (Volcán Casita and Volcán Mombacho in our collections, for example), and on the hills (Meseta de los Pueblas) to the south of Lake Managua. In such situations, mice typically were trapped in forest, some second growth, and along the wooded borders of cafetals, especially around fallen logs and the large roots of trees.

In our material there are pregnant females taken in the months of March, April, and June through August; lactating animals were obtained in April and August, and juveniles were trapped in March, June, July, and August. Sixteen gravid females carried an

TABLE 3.—Cranial measurements of adults of three species of *Peromyscus* from Nicaragua.

Specimens or samples	Greatest length of skull	Zygomatic breadth	Interorbital breadth	Breadth of braincase	Depth of braincase	Length of rostrum	Length of palate	Length of maxillary toothrow	Length of incisive foramen	Breadth of rostrum	Breadth of zygomatic plate
<i>Peromyscus stirtoni</i>											
KU 71541, ♀	29.7	13.8	5.0	13.2	10.5	11.0	4.5	4.2	5.3	5.0	2.4
KU 71542, ♂	29.5	14.2	5.2	13.7	10.2	11.6	4.4	4.3	5.4	5.4	2.4
KU 106797, ♀	28.5	12.9	4.9	12.8	9.3	12.1	4.3	3.9	4.9	4.6	2.6
KU 106798, ♀	30.2	13.8	4.7	12.6	9.7	12.0	4.6	4.2	5.8	5.0	2.4
KU 115570, ♂	30.3	14.3	5.0	13.1	9.9	11.9	4.3	4.3	5.9	5.1	2.7
KU 115571, ♀	28.9	14.0	5.0	12.9	10.2	11.1	4.6	4.2	5.5	5.0	2.4
KU 115572, ♂	29.7	14.2	4.8	13.1	10.0	11.5	4.6	4.2	5.8	5.0	2.3
<i>Peromyscus gymnotis</i> vicinity Guanacaste, Granada											
Sample size	30	20	30	30	29	28	30	30	30	30	30
Mean	31.1	15.2	5.0	13.3	10.0	12.3	4.5	4.7	6.2	5.5	2.3
Minimum	29.8	14.3	4.6	12.5	9.5	11.6	4.2	4.4	5.8	5.1	1.9
Maximum	32.5	16.2	5.3	14.0	10.5	13.3	4.9	5.0	6.7	6.0	2.6
1 SE	0.11	0.12	0.03	0.07	0.05	0.08	0.04	0.03	0.05	0.04	0.03
CV	2.0	3.4	3.4	2.8	2.8	3.2	4.7	3.4	4.5	4.3	6.2
<i>Peromyscus mexicanus</i> northern Matagalpa											
Sample size	33	24	37	37	37	30	37	37	37	37	37
Mean	32.5	15.6	5.0	13.9	10.5	12.9	4.8	4.9	6.5	5.5	2.5
Minimum	30.6	14.2	4.7	13.2	10.0	11.9	4.3	4.4	5.9	4.7	2.1
Maximum	34.8	16.6	5.4	14.8	11.4	14.0	5.5	5.4	7.1	6.0	2.9
1 SE	0.16	0.11	0.03	0.06	0.06	0.09	0.04	0.04	0.05	0.04	0.03
CV	2.8	3.5	3.3	2.8	3.3	3.8	5.0	4.9	4.3	4.7	7.5

average of 2.7 (2-4) fetuses (mode 3). Ranges of length of testes in adult males were: March, 15 (one animal); April, 13-18; June, 12-20; July, 12-18; August, 13-18. Maturational molt patterns on juveniles are typical of those described for other species of the genus.

Specimens examined (248).—CARAZO: 3 mi. NW Diriamba, ca. 660 m., 59 (71479-526, 71956-66); 3 km. N, 4 km. W Diriamba, 600 m., 54 (110541-63, 115531-61). CHINANDEGA: Hda. Bellavista, Volcán Casita, 720 m., 32 (106764-95); San Antonio, 35 m., 1 (106796). GRANADA: Finca Santa Cecilia, 6.5 km. SE Guanacaste, 660 m., 45 (106799-843); Finca El Progreso, 10 km. SE Guanacaste, 1000 m., 10 (106844-53). MANAGUA: 3 mi. SE El Crucero, 2 (71478, 71543); 6 mi. WSW Managua, 1 (71477); 13 km. S Managua, 2 (104603-04). RIVAS: Hda. Amayo, 13 km. S, 14 km. E Rivas, 40 m., 6 (98088-93); Río Javillo, 3 km. N, 4 km. W Sapoá, 40 m., 2 (106854-55).

Additional record.—CHINANDEGA: Volcán de Chinandega (Allen, 1908:659).

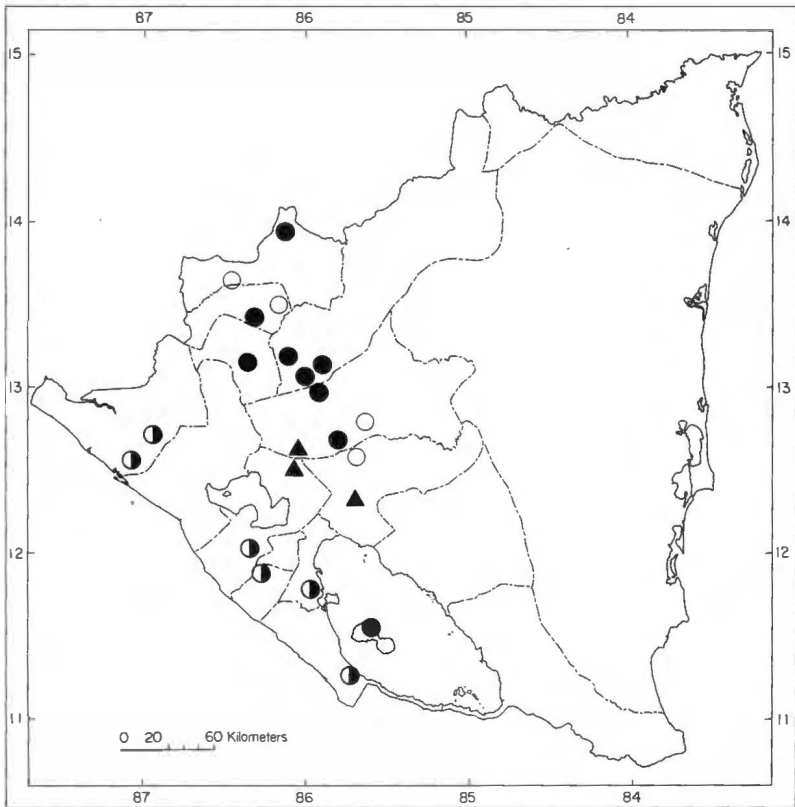


FIG. 3.—Distribution in Nicaragua of *Peromyscus gymnotis* (half solid circle), *P. mexicanus* (solid or open circle), and *P. stirtoni* (triangle). The open symbols represent records from the literature.

Peromyscus mexicanus saxatilis Merriam, 1898

Distribution in Nicaragua.—Forested areas of Cordillera Central and associated highlands probably south at least to northern Boaco; also on isolated volcanos of Isla de Ometepe in Lake Nicaragua (Fig. 3).

Measurements.—Average and extreme external measurements of 29 adults (16 males, 13 females) from Santa María de Ostuma, Matagalpa, are: total length, 251.2 (230-269); length of tail, 125.6 (112-143); length of hind foot, 25.7 (24-28); length of ear, 21.3 (18-23). Fourteen males in this series averaged 48.1 (38.9-55.1) grams in weight and eight nonpregnant females averaged 46.8 (40.0-51.5). See Table 3 for cranial measurements.

Remarks.—This mouse is a common inhabitant of wooded areas in the mountains of north-central Nicaragua, south at least to the southern part of Matagalpa and probably into northern Boaco. At Santa María de Ostuma, for example, *P. mexicanus* was abundant in cloud forest partially cleared for the planting of coffee. Specimens were taken there in traps set along logs and around stumps and the roots of living trees, most often in association with *Reithrodontomys brevirostris*.

Because *P. mexicanus* occurs in the mountains of Costa Rica and western Panamá, the species once may have been more or less continuously distributed from north to south through the area now known as the Nicaraguan Gap. Its presence on the volcanos of Isla de Ometepe, in Lake Nicaragua, may be a relictual reflection of this once broader distributional pattern. Little collecting has been done in southern Nicaragua to the east of the Lake, however, and it is possible that *mexicanus* is present on some of the few "highlands" (mostly low hills) in that area.

Some relationships between *P. mexicanus* and *P. gymnotis* are discussed in the account of the latter species. Mice from Isla de Ometepe are of interest in this context because their insular habitat is much nearer the known range of *gymnotis* in Nicaragua than that of *mexicanus*. Our specimens from Ometepe were taken on the lower slope of Volcán Concepción in a cafetal having a good canopy of mature trees and containing many fallen logs and some rocks. The individuals from Ometepe resemble *gymnotis* in that their tails lack the blotching characteristic of *mexicanus*. However, they have the large external dimensions typical of *mexicanus* and cluster with that species (Fig. 2) in cranial size. Moreover, all but one of eight specimens have a clearly divided anterocone on the first upper molar, a condition typically lacking in *gymnotis* (Huckaby, 1980) and in all specimens assigned by us to that taxon from the adjacent mainland of Rivas.

Juveniles in our sample are represented by mice taken in the months of January, March through July, November, and December. Pregnant females were obtained in March, April, June, and July; nine carried an average of 2.4 (1-4) fetuses. Lactating females are at hand from March, April, and July. Testes of adult males measured 10-16 in length in March, 15-17 in April, 15-17 in June, and 15 (three specimens) in July.

Some of J. A. Allen's (1908, 1910) localities where W. B. Richardson collected are difficult to find on modern maps. The one labeled as "Rio Coco" was discussed by Jones and Genoways

(1970). Another that is important to us, because *P. mexicanus* was listed from there, is "Chontales." Allen (1908:647) erroneously located this place in the "lowlands east of Lake Nicaragua, altitude about 500 to 1000 feet." Subsequently, he (1910:87-88) corrected the location of this site by listing it as on the "east slope of the highlands" and indicating that it actually was at an altitude of 1000 to 1500 feet and in the general vicinity of other localities in Matagalpa at which Richardson collected. Allen (p. 87) further corrected his earlier designation for "Chontales" by noting that Richardson made no collections in "the lowlands, including the borders of Lakes Managua and Nicaragua and the southern and coast regions below 500 feet."

We have been unable to locate any specific place bearing the name "Chontales" on Nicaraguan maps available to us. The modern departamento by that name is too far south to have been visited by Richardson. However, the present-day Departamento de Boaco, which borders Matagalpa on the south, was part of Chontales in the early 1900's when Richardson worked in Nicaragua. We think it likely that his locality "Chontales" was within the border of the old departamento by that name, just to the south of places in Matagalpa such as Uluse, Río Grande, and Muy Muy where he is known to have collected mammals. This would place it in the general vicinity of Tierra Azul, about 30 km. NNE Boaco and at the approximate coordinates of 12° 41' N, 85° 30' W.

Specimens examined (149).—ESTELI: 9 mi. NNW Estelí, ca. 910 m., 1 (71424). JINOTEGA: 1 mi. NW San Rafael del Norte, 5 (71425-29); Hda. la Trampa (5.5 km. N, 16 km. E Jinotega, ca. 1100 m.), 10 (99490-99); 1 mi. NW Jinotega, 1 (71430); 5 mi. S, 2 mi. E Jinotega, 15 (71431-46). MADRIZ: Daraili, 5 km. N, 14 km. E Condega, 490 m., 1 (98086). MATAGALPA: Santa María de Ostuma, 1250 m., 53 (106733-63, 110525-40, 115498-503); Hda. Tepeyac (10.5 km. N, 9 km. E Matagalpa), ca. 960 m., 23 (104602, 104605-26); 2 km. N, 6 km. E Esquipulas, 960 m., 22 (115504-25); La Danta, 1 km. N, 5 km. E Esquipulas, 780 m., 6 (115526-30, 115633). NUEVA SEGOVIA: 1.5 km. N, 1 km. E Jalapa, 660 m., 4 (110521-24). RIVAS: 2 km. N, 3 km. E Mérida, 200 m., Isla de Ometepe, 8 (115562-69).

Additional records (Allen, 1908:659, 1910:100).—BOACO: Chontales (see text). JINOTEGA: *Peña Blanca*; *San Rafael del Norte*. MADRIZ: Río COCO (see Jones and Genoways, 1970:8, 10). MATAGALPA: *Matagalpa*; Uluse. NUEVA SEGOVIA: *Ocotal*.

Peromyscus stirtoni Dickey, 1928

Distribution in Nicaragua.—Known only from west-central part of country in departments of Boaco, Managua, and Matagalpa; probably occurring elsewhere in relatively low and dry interior habitats northward to Honduran-Salvadorian border (see Fig. 3).

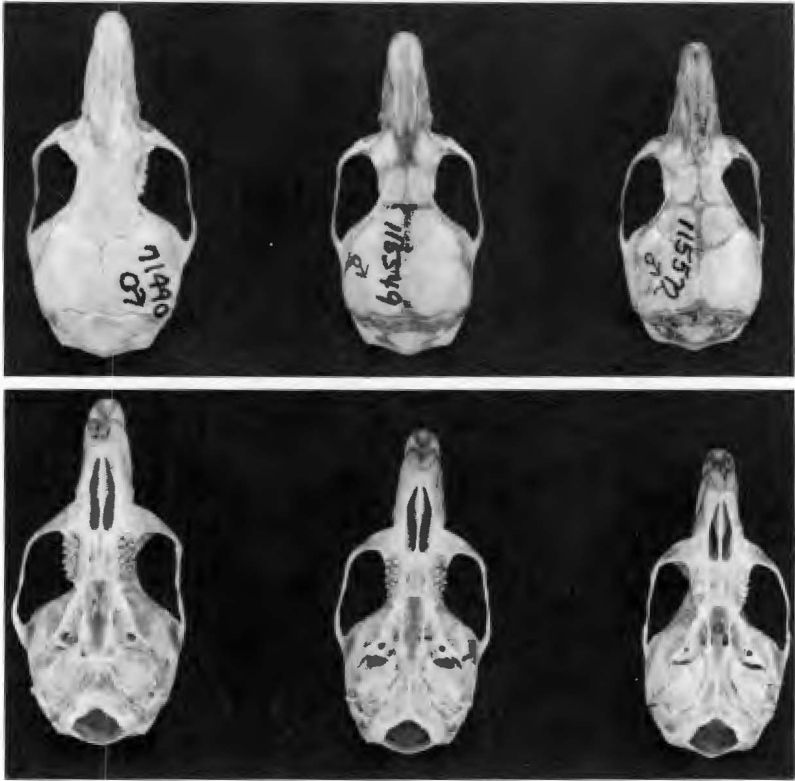


FIG. 4.—Dorsal and ventral views of typical skulls of *P. mexicanus* (KU 71440, ♂, left), *P. gymnotis* (KU 115549, ♂, center), and *P. stirtoni* (KU 115572, ♂, right).

Measurements.—External measurements of three males and three females, respectively, are: total length, 195, 200, 195, 191, 204, 207; length of tail, 96, 95, 86, 94, 95, 107; length of hind foot, 24, 23, 22, 23, 23, 22; length of ear, 19, 19, 18, 19, —, 21. Two males and a nonpregnant female weighed 31.3, 28.1, and 28.2 grams. Cranial measurements are given in Table 3.

Remarks.—This species has not been reported previously from Nicaragua, but is known from nearby localities in southern Honduras and eastern El Salvador (Huckaby, 1980). It is noticeably smaller than *P. gymnotis* and *P. mexicanus* (see Fig. 4 and Table 3) and differs also in having beaded supraorbital ridges, a well-haired and bicolored tail, and somewhat paler dorsal pelage. A buffy pectoral patch is moderately to well developed in five of the six museum skins we examined.

Specimens from Los Cocos were trapped in dry forest and brush adjacent to a rocky river bed. The two from north of Las Maderas were taken along a small rocky ridge above a steep slope that supported a weedy cornfield. Testes of two April-taken males measured 18 and 20 in length. A female captured on April 4 carried three fetuses measuring 24 in crown-rump length; one taken in March and two from August evinced no detectable reproductive activity.

Specimens examined (7).—BOACO: Los Cocos, 14 km. S Boaco, 220 m., 3 (115570-72). MANAGUA: 8 km. (by road) N Las Maderas, 380 m., 2 (106797-98). MATAGALPA: 11 km. SE Dario, 2 (71541-42).

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