

American Museum Novitates

PUBLISHED BY THE AMERICAN MUSEUM OF NATURAL HISTORY
CENTRAL PARK WEST AT 79TH STREET, NEW YORK, N. Y. 10024

NUMBER 2537

APRIL 24, 1974

A New Species of the Ichthyomyine *Daptomys* from Perú

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ABSTRACT

The cricetine genus *Daptomys* is a South American amphibious mouse known by four specimens, three from eastern and southern Venezuela and one from east-central Perú. The three from Venezuela are examples of *D. venezuelae*, a species described by Anthony in 1929. The specimen from Perú represents a new species which we name and describe. We also report on morphological variation among the three examples of *D. venezuelae*, compare them with the Peruvian specimen, and provide information about habitat.

Amphibious mice of the genus *Daptomys* were first discovered in 1925 when George H. H. Tate trapped two in northeastern Venezuela while he was a member of an American Museum of Natural History expedition to that region. The two specimens, described in 1929 by Harold E. Anthony, were regarded by him as representatives of a new genus and species, *Daptomys venezuelae*.

Daptomys is one of the less specialized members in the ichthyomyine group of amphibious mice, an assemblage of Mexican, Central American, and South American species in the genera *Ichthyomys*, *Neusticomys*, *Anotomys*,

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and *Rheomys*. When Anthony described *Daptomys* he compared it with species in the other four genera and pointed out that its external features resembled species of *Rheomys* and *Neusticomys*, but its cranial characteristics were like those of *Ichthyomys*. He characterized the genus *Daptomys* as (1929, pp. 1-2), "A small rat of the so-called fish-eating group typified by *Ichthyomys* to which it is closely related. External form not highly modified for an aquatic habit; hindfeet of normal proportions, not developed into broad swimming organs, marginal fringe of hairs scarcely discernible; ear small but noticeable; upper lip narrowly cleft (judging from dried skins); tail densely haired; pelage showing moderate aquatic specialization, composed of close underfur and hard, glistening guard-hairs. Skull most like that of *Ichthyomys*; rostrum broad and heavy; zygomatic arch incomplete; brain-case but slightly inflated; superior outline essentially a straight line; interparietal a very narrow strap-shaped element; supraorbital foramen opening laterally; incisors sharp and predatory in type, anterior faces of incisors slightly inclined toward each other; molar dentition very much as in *Ichthyomys* except for last molar which is somewhat smaller in upper jaw, decidedly smaller in the lower, and with only a rudiment of the posterior half of the pattern shown by *Ichthyomys*; bullae inflated."

From 1925 until 1967 the only known specimens of *Daptomys* in collections of museums were the two examples of *D. venezuelae* in the American Museum of Natural History. In 1967 a field party under the direction of Charles O. Handley, Jr. of the National Museum of Natural History, Smithsonian Institution, collected a specimen of *Daptomys* from Cerro Duida in southern Venezuela, and in the following year Alfred L. Gardner caught a specimen in east-central Perú. To our knowledge these four are the only specimens of *Daptomys* in existence. The specimen from Cerro Duida is an example of *D. venezuelae* and the mouse from Perú is distinctive and apparently represents a different species. Our identifications, comparisons of the four specimens, description of the Peruvian form, and notes on habitat are the substance of this report.

Responsibilities for the contents of this paper are divided. Gardner collected the specimen from Perú and furnished information about locality and habitat. Musser compared it with the Venezuelan examples of *Daptomys* and with more than 160 specimens of other ichthyomyines, including holotypes; he has assembled almost all specimens of ichthyomyines that are in museum collections for an intended taxonomic revision of the group, a revision that is progressing slowly but is still far from complete.

ABBREVIATIONS AND MEASUREMENTS

Specimens we discuss in the present paper are in collections of the

American Museum of Natural History, New York (AMNH); the Louisiana State University Museum of Zoology, Baton Rouge (LSUMZ); and the National Museum of Natural History, Smithsonian Institution, Washington, D. C. (USNM).

Measurements of length of head and body and length of tail are those of the collectors and were taken from labels attached to study skins. Musser measured length of hind foot (including the claw) and length of ear (from the notch) of all specimens. To obtain these last two measurements, specimens were relaxed in a humid chamber until the skins became soft and pliable.

Most cranial measurements were taken with Anderson's (1968) craniometer attached to a Wild M5 stereomicroscope; a few were taken with dial calipers (graduated in tenths of millimeters). Of the 29 cranial, dental, and mandibular measurements listed in table 1, the limits of 19 (greatest length of skull; zygomatic and interorbital breadths; length of nasals; breadth and depth of braincase; breadth of zygomatic plate; breadth across incisor tips; length of diastema; length and breadth of incisive foramina; palatal length; palatilar length; length of palatal bridge; breadth of mesopterygoid fossa; length, breadth, and height of bulla; and alveolar length of maxillary tooththrow) have been explained elsewhere (Musser, 1970) but the following 10 require definition here.

Length of Rostrum: From tip of nasal bones to anterior edge of ventral maxillary root of zygomatic plate.

Breadth of Rostrum: In dorsal view, breadth of rostrum taken between each premaxillary-maxillary suture.

Breadth of Palatal Bridge at First and Third Molars: Least distance between lingual edge of alveolus of first and third upper molars, respectively, and lingual edge of alveolus of respective opposite molars.

Postpalatal Length: Least distance from posterior edge of palatal bridge to posterior edge of basioccipital between occipital condyles.

Length and Breadth of First Upper Molar: Greatest length and breadth of first upper molar.

Greatest Length of Mandible: With each mandible positioned as shown in figure 5—greatest distance, parallel to horizontal plane, from anterior edge of lower incisor to posterior margin of condyle.

Height of Mandible: With each mandible positioned as shown in figure 5—greatest distance from dorsal edge of coronoid process to plane directly below and even with ventral edge of angular process.

Alveolar Length of Mandibular Tooththrow: Distance from anterior edge of alveolus of first molar to posterior edge of alveolus of third molar.

THE SPECIMENS FROM VENEZUELA

The three specimens from Venezuela are morphologically similar to each other and apparently represent one species. Two of these were the basis for Anthony's (1929) description of *Daptomys venezuelae*, the holotype (AMNH 69907) and another specimen (AMNH 69908). Both examples were collected by George H. H. Tate in 1925 from Neverí, 24 kilometers west of Cumanacoa in northeastern Venezuela at an elevation of 728 meters. Neverí is in a region of forested highlands 30 to 40 airline kilometers south of the coastal city of Cumana. The holotype of *D. venezuelae*, an adult male, was obtained on March 8 and the other specimen, an adult female, was collected on March 14. Judged by wear of teeth the holotype is slightly older than the other specimen. Their measurements are listed in table 1, and the cranium, a mandible, and teeth of AMNH 69908 are illustrated in figures 3 to 6. Many external, cranial, and dental features of the two specimens have been described by Anthony (1929).

There is little information about habitat in which the two specimens were caught. What is known comes from Tate's published itinerary of the expedition and his unpublished field notes and photographs. The two mice were collected in humid, tropical forest at the headwaters of the Río Neverí (fig. 1). In a brief description of those headwaters Tate (1931a, p. 541) wrote that "the valley is rough and irregular, bounded by high hills, and clothed with heavy tropical forest. Camp was built at 2400 feet in a woodcutter's clearing, where yams and Irish potatoes were growing." In his field notes (filed in the Department of Mammalogy, the American Museum of Natural History) Tate recorded that one of the specimens "was taken in a river-side trap which had been set among the water-washed roots of a large tree. Bait was rolled-oats, but the trap was set, as is my custom when possible, with the business end flush against a vertical rock face. When set in this way the trap is tripped by an animal which may try and squeeze between the trap and the inside wall, even though not at all attracted by the bait."

The third specimen from Venezuela (USNM 406123) was collected by Merlin D. Tuttle and F. Harder on February 15, 1967, from Amazonas, Cerro Duida, Cabecera del Caño Negro, 32 km. northwest of Esmeralda (3° 26' N, 65° 43' W), at an elevation of 1400 meters. Cerro Duida lies 700 to 800 airline kilometers south of Neverí on the southern margin of the Guyana Highlands. This great highland mass is separated from the northern coastal mountains in which the headwaters of the Río Neverí begin by the lowland river plain of the Río Orinoco.

Dr. Charles O. Handley, Jr. generously provided the following information about habitat where the mouse was taken: "The Cerro Duida

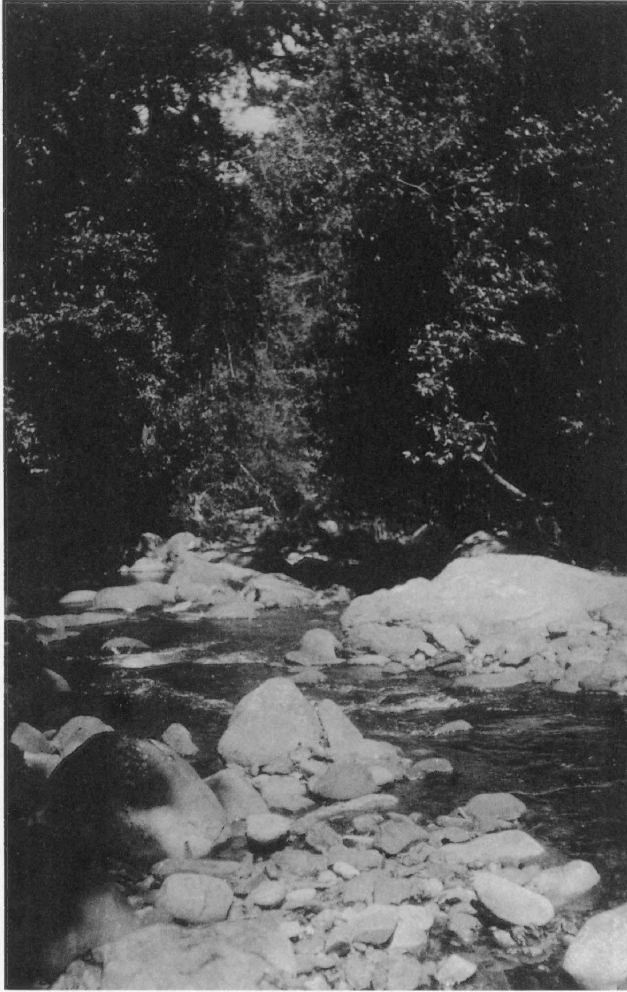


FIG. 1. Habitat of *Daptomys venezuelae*. Headwaters of Río Neverí, elevation 728 meters, northeastern Venezuela. Photographed by George H. H. Tate.

plateau is uninhabited, trailless, and undisturbed. It is steep sided, often palisaded with high cliffs, and is highest on its southern rim. It is drained mostly by Caño Culebra and Caño Negro, flowing northward to the Río Cunucunuma, and its complex system of valleys and ridges increase in elevation toward the south." Handley characterized the area in the vicinity of Cabecera del Caño Negro as follows: "Dense ground cover of a large heavy-leaved plant that holds quantities of water in its leaf bracts.

Scattered trees up to 40 ft. high, have large leaves and branches all along their trunks. Footing was so treacherous here that Indians refused to work and the camp had to be abandoned." The mouse was caught in a snap-trap beside the stream.

The mouse from Cerro Duida is an adult female and was lactating when captured. It has three pair of mammae: one postaxillary, one abdominal, and one inguinal. The specimen is in prime unworn adult pelage. There is no indication of molt anywhere on the head and body. The specimen is older than the two from Neverí, as judged by wear of teeth. Its measurements are listed in table 1 and the cranium, a mandible, and teeth are illustrated in figures 3 to 6.

The specimen closely resembles the two from Neverí in general aspects of external, cranial, mandibular, and dental morphology but differs slightly in details. It has a shorter body but its tail is longer relative to length of head and body. Pelage of the upper parts is rich and glossy, highly burnished, and blackish brown. The two specimens from Neverí have duller pelage with less burnished highlights. The mouse from Cerro Duida also has slightly shorter and less dense pelage than in those from Neverí.

There is variation among the three specimens in tone of pelage covering the underparts. Of the two mice from Neverí, AMNH 69907 has slate gray underparts laced with silver and buffy silver, and AMNH 69908 is darker, with a slate-gray belly broken by a midventral strip of glossy, burnished, rust-brown hairs similar in color to the upper parts. Overhairs on the specimen from Cerro Duida have slate-gray bases and rust-brown tips—the overall color is a burnished, dark brown mixed with slate-gray, a paler version of the upper parts.

Length of tail and density and extent of hair covering it are similar in all three specimens, but the mouse from Cerro Duida has a darker tail than that of the others, blackish brown rather than dark brown.

Front and hind feet of the specimen from Cerro Duida are structurally similar to those from Neverí but conspicuously smaller (table 1). Also, the fringe of hairs along edges of the hind feet and digits is brownish black and contrasts sharply with the paler, silvery brown fringes on feet of the two mice from Neverí.

At first glance, the crania, mandibles, and teeth of the three specimens appear to be closely similar, but there are slight differences between the specimen from Cerro Duida and those from Neverí, mostly in dimensions (table 1) that may be related to age, individual, and sex variation. The most conspicuous cranial difference between the two samples is size of bullae. The mouse from Cerro Duida has smaller and less inflated bullae

than those of the two specimens from Neverí. This aspect is best seen in figure 4 where side views of crania are compared.

A dental difference we found between the two samples that may be significant is shape of the anterior cusp of the first lower molar (fig. 6). This cusp is triangle-shaped in the specimen from Cerro Duida but square in the two from Neverí.

External, cranial, and dental differences between the specimen of *Daptomys venezuelae* from Cerro Duida and those from Neverí are slight. With only three specimens from two widely separated geographic localities, we cannot determine whether the observed differences between the samples are a reflection of age and individual variation or geographic variation. More specimens of different ages and sex from other localities are needed before we can understand the significance of the differences we observed between our small samples.

Although there are some differences between available samples of *D. venezuelae* from Neverí and Cerro Duida, the three specimens still comprise one distinct morphological type of amphibious mouse that lives in highlands of northeastern and southern Venezuela. The two samples are clearly more like each other than either is like the specimen from Perú, which is described below.

THE SPECIMEN FROM PERÚ

The fourth known specimen of the genus *Daptomys* is an adult male obtained from east-central Perú in 1968. It represents a population that is morphologically distinct from those in Venezuela. Below we describe the Peruvian form and name it.

Daptomys peruviansis, NEW SPECIES

HOLOTYPE: An adult male, LSUMZ 14407, collected July 28, 1968, by Alfred L. Gardner, original field number 10994. A study skin, cranium, and mandibles comprise the holotype; all elements are in good condition.

TYPE LOCALITY: Balta ($10^{\circ} 08' S$, $17^{\circ} 13' W$), at the point where the streams known to the local Cashinahua Indians as the Inuya and the Xumuya enter the Río Curanja, elevation 300 meters, Departamento de Loreto, Perú. Balta is mapped in Patton and Gardner (1972, p. 3).

DISTRIBUTION: Known only from the type locality.

MEASUREMENTS: External, cranial, mandibular, and dental measurements are listed in table 1.

DEFINITION: A buffy brown mouse with sleek fur. In these external features it superficially resembles species in the genus *Oryzomys*, especially *O. concolor* for example, and is unlike the blackish mice with woolly fur

TABLE 1

EXTERNAL, CRANIAL, DENTAL, AND MANDIBULAR MEASUREMENTS (IN MILLIMETERS)
OF ADULT SPECIMENS OF *Daptomys* FROM VENEZUELA AND PERU

Measurement	<i>D. venezuelae</i> Venezuela			<i>D. peruviansis</i> Peru
	Neverí AMNH 69907	Neverí AMNH 69908	Cerro Duida USNM 406123	Balta LSUMZ 14407
	♂	♀	♀	♂
Length of head and body	131	111	100	128
Length of tail	105	111	109	108
Length of hind foot	28	29	25	30
Length of ear	10	11	10	12
Greatest length of skull	27.1	27.4	26.9	28.2
Zygomatic breadth	13.4	12.8	—	14.6
Interorbital breadth	5.1	5.3	5.0	5.1
Length of nasals	10.5	10.9	10.2	11.1
Length of rostrum	7.4	7.8	7.5	7.6
Breadth of rostrum	5.5	5.5	5.1	5.8
Breadth of braincase	12.5	12.3	12.4	12.8
Depth of braincase	7.7	7.7	8.1	8.0
Breadth of zygomatic plate	1.1	1.1	1.2	1.3
Breadth across incisor tips	1.9	1.8	1.8	2.2
Length of diastema	6.8	6.8	6.4	7.1
Length of incisive foramina	4.9	4.9	5.2	5.7
Breadth of incisive foramina	2.3	2.2	2.2	2.0
Palatal length	13.8	13.5	13.5	14.4
Palatilar length	12.2	11.8	11.7	12.4
Length of palatal bridge	5.9	5.6	5.5	5.4
Breadth of palatal bridge at first molar	2.3	2.4	2.2	2.7
Breadth of palatal bridge at third molar	2.8	2.7	2.7	3.1
Breadth of mesopterygoid fossa	1.7	1.8	1.8	2.0
Postpalatal length	10.8	10.6	10.4	11.5
Length of bulla	4.6	4.6	4.1	4.4
Breadth of bulla	4.0	4.0	3.7	4.5
Height of bulla	3.4	3.1	2.4	3.4
Alveolar length of maxillary toothrow	4.1	4.2	4.3	4.2
Length of first upper molar	2.2	2.3	2.1	2.1
Breadth of first upper molar	1.5	1.5	1.4	1.3
Length of mandible	17.8	17.7	16.8	18.4
Height of mandible	7.7	7.7	7.8	8.9
Alveolar length of mandibular toothrow	3.8	3.8	3.7	3.5

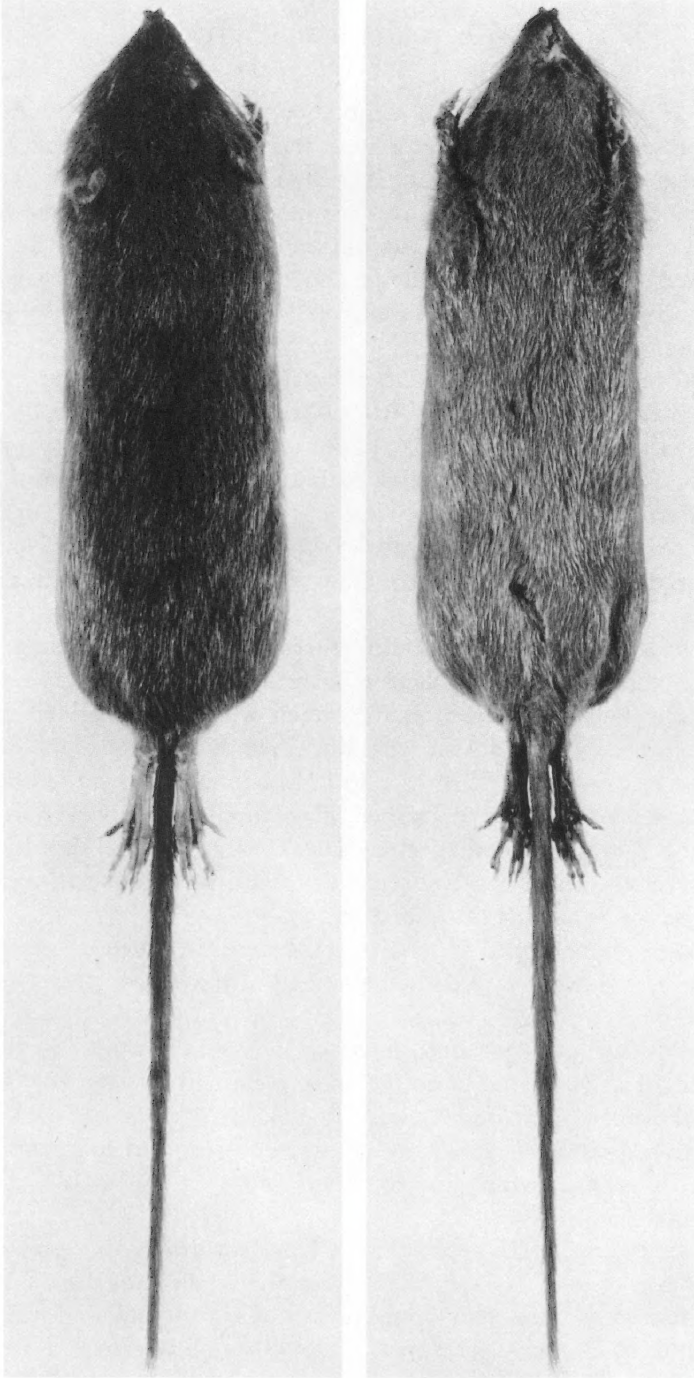


FIG. 2. Holotype of *Daptomys peruviansis*, new species. Approximately $\times 2/3$. Photographed by Robert E. Logan.

that are *D. venezuelae*. The head and body of *D. peruviensis* are compact, the tail is densely haired and shorter than the head and body, and the eyes and ears are small (fig. 2). Pelage is sleek and thick. Upper parts are buffy brown, underparts are buffy gray, the tail is blackish brown, and feet and ears are cream-colored. The cranium and mandibles are strongly built, upper and lower incisors are large and appear robust and strong, and upper and lower molars are small relative to size of the cranium and mandibles.

DIAGNOSIS: *Daptomys peruviensis* is related to *D. venezuelae*, known by two specimens from Neverí and one from Cerro Duida in Venezuela. Judged by wear of teeth, *D. peruviensis* is about the same age as the example of *D. venezuelae* from Cerro Duida and slightly older than the two from Neverí. Basic external structure of *D. peruviensis* is like that of the three specimens from Venezuela. It is similar in size to the two specimens from Neverí and has a larger body, feet, and ears than those of the example from Cerro Duida.

The most striking external differences between the holotype of *D. peruviensis* and the three specimens of *D. venezuelae* are color and texture of pelage. *Daptomys peruviensis* is buffy brown with cream-colored feet and ears; *D. venezuelae* is blackish with dark brown feet and ears. *Daptomys peruviensis* has rich, buffy brown upper parts and buffy gray underparts. The pelage does not have burnished, glistening highlights over the upper parts. In contrast, the three specimens of *D. venezuelae* have blackish brown upper parts and slate-gray underparts suffused with pale buff and silver. The upper parts appear burnished and glistening.

Although the pelage of *D. peruviensis* is dense and short, it appears sleek to the eye, not woolly as does the pelage of the three specimens of *D. venezuelae*.

Shape of feet and ears of *D. peruviensis* is similar to those in the three specimens of *D. venezuelae*, but different in color and pilosity. Feet and ears of *D. peruviensis* are cream-colored, those of *D. venezuelae* are dark brown. In addition, ears of the latter are densely covered with hair, both inside and out. Ears of *D. peruviensis* are sparsely covered with hair and appear almost naked.

Hairs of the tail of *D. peruviensis* are blackish brown, the same color as hairs on tails of the three specimens from Venezuela, but the tail is not so densely haired as those examples, giving it a slightly paler appearance.

Cranium of *D. peruviensis* is similar to that of *D. venezuelae* in structural configuration, but is larger and more robust. Dorsal, ventral, and lateral views of the cranium are illustrated in figures 3 to 6 where it is compared with two examples of *D. venezuelae*, the specimen from Cerro Duida and

one from Neverí. *Daptomys peruviansis* has a longer cranium, diastema, incisive foramina, and a greater palatal and postpalatal length than any of the three specimens of *D. venezuelae* (table 1). It also has a greater zygomatic breadth, a wider rostrum, braincase, palatal bridge (measured at the levels of first and third upper molars), and mesopterygoid fossa. These dimensions of cranial lengths and breadths all express the larger size of the cranium of *D. peruviansis* as compared with the three examples of *D. venezuelae*.

The difference in size between *D. peruviansis* and the three specimens of *D. venezuelae* is also seen in the mandibles. Although similar in shape, each mandible of *D. peruviansis* is conspicuously longer, higher (table 1), and more robust (fig. 5) than those of *D. venezuelae*.

Like the cranium and mandibles, the upper and lower incisors of *D. peruviansis* are also large and strongly built. They are conspicuously wider and deeper than incisors of any one of the other three specimens. Unlike the incisors, large size does not characterize the maxillary and mandibular teeth of *D. peruviansis*. The molars resemble those in the three examples of *D. venezuelae* in shape and occlusal topography, but they are actually and relatively smaller. Alveolar length of the maxillary toothrow does not differ greatly in the four specimens and ranges from 4.1 to 4.3 mm.; that of *D. peruviansis* is 4.2 mm. The individual teeth of *D. peruviansis*, however, are actually narrower (table 1). Thus, its upper molars are significantly smaller relative to size of the skull than in the three examples of *D. venezuelae*, an aspect that is clearly illustrated in figure 3. The narrow teeth are reflected by the width of the palatal bridge, which is actually wider in *D. peruviansis* and much wider relative to such a dimension as width of the incisive foramina than in the examples of *D. venezuelae*.

Alveolar length of the mandibular toothrow in *D. peruviansis* is actually shorter than toothrows in the three specimens from Venezuela and the individual teeth are shorter and narrower. Again, relative to size of each mandible, the teeth are significantly smaller in *D. peruviansis* than in the three specimens of *D. venezuelae*, a proportional difference that can be seen in figure 5.

DESCRIPTION OF THE HOLOTYPE: An adult (testes not scrotal) in mostly full pelage. Here and there along sides of the body are small areas where new hair is coming in. The head and body are clothed with dense, short fur that is soft and sleek to the touch. Pelage of upper parts consists of dense and woolly underfur, sleek overfur, and short guard hairs. Hairs of the underfur are fine, short (up to 5 mm. long), and curly. Most are gray for their entire lengths, a few are tipped with buff. Hairs of the overfur are longer (up to 10 mm. long); their basal two-thirds are silver or gray



FIG. 3. Dorsal (top) and ventral (bottom) views of crania. *Left to right*: holotype of *Daptomys peruviansis*, new species (LSUMZ 14407), *D. venezuelae* from Cerro Duida (USNM 406123), and *D. venezuelae* from Río Neverí (AMNH 69908). Approximately $\times 2.5$. Photographed by Robert E. Logan.



FIG. 4. Lateral views of crania illustrated in figure 3. *Top to bottom*: holotype of *Daptomys peruvianus*, new species, *D. venezuelae* from Cerro Duida, and *D. venezuelae* from Río Neverí. Approximately $\times 2.5$. Photographed by Robert E. Logan.

and the distal third is bright, buffy brown. Guard hairs are inconspicuous, either as long as the overfur or extending a few millimeters beyond it; their bases are gray and their distal halves dark brown; a few are tipped with buff. Overall the upper parts are a sleek and rich buffy brown that is slightly darker along the middle of the back but grayer along the sides.

Underparts are paler than the upper parts but the difference in tone is not striking. The chin, neck, upper chest, and inguinal area are gray and slightly suffused with buff, and the lower chest and belly are a rich, buffy gray. Pelage covering the underparts is shorter and does not seem so dense as that clothing the upper parts. It consists of short (up to 3 mm. long), fine, and curly underfur and longer (up to 8 mm. long) overfur. Hairs of the underfur are pale gray for most of their lengths and tipped with pale buff. Hairs of the overfur have either silver or pale gray basal halves and buffy distal portions.



FIG. 5. Lingual (left) and labial (right) views of right mandibles from same specimens illustrated in figure 3. *Top to bottom*: holotype of *Daptomys peruviansis*, new species, *D. venezuelae* from Cerro Duida, and *D. venezuelae* from Río Neverí. Approximately $\times 2.5$. Photographed by Robert E. Logan.

The ears are small and rounded. They are cream-colored and thinly covered, inside and out, with short, fine buffy brown hairs. Eyes are small (3 mm. wide as measured on the stuffed skin) and the eyelids are blackish brown. A triangle of blackish brown hair flares out directly behind each eye. Hairs along the top of the muzzle are short and increase toward the middle where they form a blackish brown ridge that extends 5 mm. back from the nose pad. There is a prominent, hairless groove 0.5 mm. long connecting the upper lip to the nose pad, a feature also present in the three specimens of *D. venezuelae*.

Facial vibrissae along the lower sides of the muzzle are silver, and those higher up on the muzzle are either silver or dark brown tipped with silver. The longest extends up to 50 mm. and reaches 12 to 15 mm. beyond the ear when laid back against the head of the stuffed skin.

Front and hind feet of *D. peruviansis* resemble those of *D. venezuelae* in configuration. The front feet are not noticeably modified for aquatic life



FIG. 6. Occlusal views of right maxillary (top) and mandibular (bottom) tooth-rows from same specimens illustrated in figure 3. *Left to right*: holotype of *Daptomys peruviansis*, new species, *D. venezuelae* from Cerro Duida, and *D. venezuelae* from Río Neverí. Approximately $\times 15$. Photographed by Robert E. Logan.

and are structurally similar to those in a terrestrial species like *Oryzomys capito*, for example. The palms and digits of each foot are cream-colored and the claws are unpigmented. The palms are naked but the digits are covered with short, fine, silvery hairs. Upper surface of each foot is thickly covered with dark brown hairs that extend to bases of the cream-colored digits.

The hind feet are long and broad, broader than in an individual of *Oryzomys capito* of comparable size, but not so broad as those in amphibious mice in the genus *Ichthyomys* that are more highly specialized for aquatic life (see the illustration of *Ichthyomys* in de Winton, 1896, for example). Bases of the digits are joined by conspicuous webbing, although it is not extensive (fig. 2). Upper and lateral surfaces of each hind foot are cream-colored and covered with short, fine silky hairs, which are either silver or pale brown. Claws are unpigmented. Plantar surfaces are pale brown and almost naked. Sides of each hind foot and sides of each digit are margined by fringes of hair (0.5 to 1 mm. long) that are silvery, pale brown.

The tail is shorter than the head and body. It is densely covered with blackish brown hairs (up to 5 mm. long) that form a brush 10 mm. long beyond the tip of the tail.

Cranium and mandibles are strongly built, the upper and lower incisors are wide and deep and appear very strong, and the upper and lower molars are simple in occlusal pattern and small. Shapes of these structures can be seen in figures 3 to 6 where the cranium, a mandible, and teeth of *D. peruviansis* are illustrated. Those figures are clear and there is no need for further elaboration except to note that each zygomatic arch is incompletely ossified, a condition characteristic also of the three specimens of *D. venezuelae*. Bone occurs only at the anterior end where the jugal is attached to the zygomatic process of the maxillary. The remainder of the element is formed by a strand of connective tissue.

HABITAT: Gardner collected the holotype of *Daptomys peruviansis*. He extracted the following information about the habitat from his field notes. The specimen was taken in a live-trap that had been placed in 10 to 15 cm. of water on a small sand bar in a shallow and narrow permanent forest stream. Known locally as the Inuya, the stream enters the Río Curanja on the south side at the western edge of the Indian village of Balta (fig. 7). Bait was yuca (manioc) and banana. Because the bait had not been eaten, Gardner suspected that the mouse entered the trap out of curiosity and not for the bait. The animal died after a day in captivity during which time it would not eat.

The water opossum, *Chironectes minimus*, the rat *Nectomys squamipes*, and the otter *Lutra incarum* were also collected in the Inuya.



FIG. 7. Habitat of *Daptomys peruviansis*, new species. The Inuya, a narrow, shallow, and permanent tributary of Río Curanja at Balta, elevation 300 meters, Departamento de Loreto, Perú. Dry tropical forest canopies stream. Photographed in July, 1963, by John P. O'Neill.

The major habitat in the vicinity of Balta is designated Bosque Seco Tropical by Tosi (1960). There is a dry season from about June to September with intervals between rains as long as two weeks. Cold fronts from the south are not uncommon during the dry season. Temperatures recorded by Gardner ranged from a low of 51° F. (during a cold front) to 88° F. in shade (afternoon temperature after a period of two weeks without rain). Daily temperatures during June, July, and August usually varied from 70° to 75° F. (relative humidity 95 to 98%) at 6 A.M. to 7 A.M. from 83° to 85° F. (relative humidity 66 to 71%) at 3 P.M. to 5 P.M. Temperatures and relative humidity were recorded inside a thatch-roofed house in a forest clearing. Afternoon temperatures within the forest, although not measured, were noticeably cooler.

The local habitat in the vicinity of the stream where the holotype of *D. peruviansis* was caught is tall mature forest with an open understory at the approximate juncture or interface between the hilly interfluve and the flood plain of the Río Curanja.

DISCUSSION

To describe a new species on the basis of only one specimen as we have done is not wise and we would be happier if we had more examples in hand. Unfortunately, we know of no other specimens. Only three from Venezuela and one from Perú have been collected in the last 48 years and the prospect of obtaining additional examples in the near future seems dim. The rarity of *Daptomys* in collections of museums certainly does not reflect population densities in their natural habitat. Nor does it indicate the amount of collecting by mammalogists who have worked in the Neotropics. From 1925, when the American Museum of Natural History sent an expedition to Venezuela and Tate caught the first specimens of *Daptomys*, until now, many institutions have sponsored expeditions to South America and to regions where *Daptomys* might be expected to live.

The paucity of specimens available for study is probably an indication of trapping techniques as much as anything else. Mice of the genus *Daptomys* in particular, and individuals of *Ichthyomys*, *Neusticomys*, *Anotomys*, and *Rheomys* in general, apparently are not attracted by baits collectors usually employ, baits such as rolled oats, peanut butter, yuca, banana, raisins, and a variety of other fruits, nuts, and vegetables. When specimens of these mice were taken in snap-traps or live-traps the traps were usually set in such a way as to force the mouse into them (see, for example, Tate, 1931b; Stirton, 1944). A few recently collected specimens of *Rheomys* have been successfully trapped using a combination of oily bits of sardines and either rolled oats or peanut butter (Hooper, 1968; Starrett and Fisler, 1970).

Most specimens of ichthyomyines, however, have been obtained either by hand, by shooting, or in fish nets.

The population of *Daptomys* in east-central Perú appears to be no exception to the rule that ichthyomyines are difficult to trap. When Gardner first saw the specimen of *D. peruiensis* in the live-trap he thought it was an immature *Nectomys squamipes*. After looking closer and realizing it was not *Nectomys* but a unique mouse not encountered before, he made many attempts, using different baits, traps, and trapping techniques to obtain more specimens. Gardner has returned to Balta since 1968 and made repeated efforts to collect additional specimens but was unsuccessful.

His failure was doubly frustrating because fresh rodent tracks the size of *Daptomys* were consistently found mixed with the distinctively larger tracks of *Nectomys* along the banks and on the small island-like sandbars of the Inuya. Indian women and children who washed clothes, gathered clay for pottery, and caught small fish and crabs along this and other small streams in the area often saw rats and mice in and near the water. Children would occasionally chase rodents into the water. The animals would flee from nests situated at ground level under flood-piled debris. The children were initially attracted to the nest sites by the cries of young rats and mice. When Gardner was able to check these rodents, they invariably proved to be examples of *Nectomys squamipes*. We do not know if any of the mice seen by the Indians were actually *Daptomys peruiensis*. The Cashinahua word for *Nectomys* and presumably for any rat or mouse with similar habits associated with water is *ubin* (pronounced u-bi, with the last syllable nasalized). The Indians distinguish *ubin* from *maka* and *xuya* (pronounced mak-a and shu-ya, respectively); *maka* refers to the four species of *Proechimys* known to occur in the vicinity of Balta (Patton and Gardner, 1972), all of which are hunted for food, and *xuya* to any terrestrial mouse of small to medium size living in the area (*Neacomys spinosus* and several species of *Oryzomys*).

Daptomys peruiensis is morphologically very different from the three Venezuelan specimens. We interpret these differences to be distinctions that likely characterize species in the genus *Daptomys*. Of course this hypothesis can only be tested by studying additional specimens from the same and other localities. In the absence of such material we have tried to test our interpretation by comparing the kind and degree of morphologic and geographic variation in our sample of *Daptomys* with the type and magnitude of variation in species of other ichthyomyines that are represented in museum collections by many more specimens than is *Daptomys*.

Our comparisons have not helped us understand the significance of the

external and cranial differences we described between the sample of *Daptomys venezuelae* from Neverí and the individual from Cerro Duida. Differences in color of pelage and certain external and cranial dimensions are the primary distinctions between those samples. Similar degrees of differences are found in other ichthyomyines only in certain samples of *Ichthyomys* and *Rheomys*. In these genera such differences may characterize the variation found between geographic samples of one species or it may be typical of individual variation within a sample of one species from one locality.

Nor do we have any more relevant information about the significance of the cranial distinctions we recorded between the holotype of *Daptomys peruviansis* and the three specimens of *D. venezuelae*. The larger and more robust cranium, mandibles, and incisors of *D. peruviansis*, and its relatively much smaller molars set this form conspicuously apart from any of the three examples of *D. venezuelae*. Cranial and dental distinctions between some species of *Ichthyomys* (*I. tweedii* and *I. stolzmanni*, for example) or *Rheomys* (*R. hartmanni* and *R. thomasi* are examples) also involve size and proportions and the magnitude of difference is similar to, although not so great as, that between the two forms of *Daptomys*. On the other hand, the cranial and dental differences between such species as *Rheomys hartmanni* and *R. mexicanus* are far greater in degree and number than those we observed between *D. venezuelae* and *D. peruviansis*.

Our comparisons have shown that coloration of *Daptomys peruviansis* is not only very different from *D. venezuelae*, but it is also unusual among ichthyomyines in general. With its sleek pelage, buffy brown upper parts, and buffy gray underparts the holotype of *D. peruviansis* stands in striking contrast to specimens of other ichthyomyines. For example, species of *Anotomys* (Thomas, 1906a), *Neusticomys* (Anthony, 1921), and *Daptomys venezuelae* (Anthony, 1929) have blackish brown upper parts and either slate-gray or gray underparts. Species of *Ichthyomys* have dark brown upper parts and silvery or gray underparts. The upper parts of various taxa in *Ichthyomys* have been described as "grizzled brown" (Anthony, 1921), "grizzled black and buff" (Anthony, 1923), "grizzled blackish" (Thomas, 1924), "dark olive-brown" (de Winton, 1896), "mouse-grey, strongly grizzled with fulvous" (Thomas, 1893), and "dark, rich chocolate-brown" (Handley and Mondolfi, 1963).

Range of variation in color is greater in *Rheomys*. In all the forms so far described the underparts are gray. Upper parts, however, range from a dark brown as in *R. raptor* and *R. hartmanni* (the latter was described by Enders, 1939, as "mixed black and cinnamon very finely grizzled") and "mummy-brown" in *R. underwoodi* (Thomas, 1906b) and "rich dark

brown" in *R. thomasi* (Burt and Stirton, 1961), to a pale brown in *R. mexicanus* (Goodwin, 1959).

The difference between the blackish brown pelage of *Anotomys*, *Neusticomys*, and *Daptomys venezuelae* on one hand and species of *Ichthyomys* and *Rheomys* on the other is comparable to the kind of difference in color between *D. venezuelae* and *D. peruviansis*. At the same time, the degree of color difference between the species within *Rheomys*—between, for example, the dark brown *R. hartmanni* and the pale brown *R. mexicanus*—is comparable, but not nearly so great, as that between *Daptomys venezuelae* and *D. peruviansis*.

The coloration of *Daptomys peruviansis*, in combination with the cranial and dental features we have described, characterize a form of Peruvian *Daptomys* that is morphologically strikingly different from the Venezuelan sample. Each may also be characterized by a different habitat. The Venezuelan populations, if the three specimens are reliable samples, live in highlands, between elevations of 700 to 1400 meters. The Peruvian specimen was obtained at an elevation of 300 meters and apparently represents a lowland population. Of course the elevational limits of each may overlap, but we can report only what we now know about the four specimens. The nature of the elevational distribution of each species, as well as their geographic distributions and virtually every aspect of their biology, remains to be learned.

ACKNOWLEDGMENTS

Dr. Charles O. Handley, Jr. of the National Museum of Natural History, Smithsonian Institution, lent the specimen of *Daptomys venezuelae* from Cerro Duida to Musser. We are grateful to him for allowing us to study and report on this important example. Dr. George H. Lowery, Jr. of the Louisiana State University Museum of Zoology kindly permitted us to borrow and describe the Peruvian specimen.

The excellent photographs of the study skin, crania, mandibles, and teeth are the talented work of Mr. Robert E. Logan, a staff photographer for the American Museum of Natural History. Patricia Welch Levitt helped prepare the final manuscript.

Gardner's field work in Perú during the summer of 1968 was conducted as a member of an expedition to that country sponsored by the Louisiana State University Museum of Zoology, Baton Rouge. Messrs. John S. McIlhenny and Eugene du Pont III and a Louisiana State University Graduate Research Council grant to George H. Lowery, Jr. provided financial support for the 1968 Peruvian expedition.

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