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MAMMALS OF NORTHERN COLOMBIA

PRELIMINARY REPORT No. 2: SPINY RATS (ECHIMYIDAE), WITH
SUPPLEMENTAL NOTES ON RELATED FORMS

By PHILIP HERSHKOVITZ

The echimyid rodents collected by the author in northern Colombia during his tenure of the Walter Rathbone Bacon Traveling Scholarship¹ include 5 specimens of *Echimyus semivillosus* (I. Geoffroy) and 150 specimens representing *Proechimyus guyannensis* E. Geoffroy² and *P. canicollis* (Allen). The only other echimyid rodent previously recorded from the region under study is *Diplomys rufodorsalis* Allen from Onaca, near Santa Marta. Possibly a form of *Hoplomys* occurs somewhere in the lowlands of northern Colombia, and a representative of *Thrinacodus*, perhaps *T. edax*, in the highest levels of that part of the Cordillera Oriental visited by the author.

In the following account some of the taxonomic problems presented by the species collected are discussed, involving a more extensive treatment of the genus *Proechimyus* than is implied by the geographical limitations of the title of this report. For this the author has drawn information from his notes on the type specimens of *Proechimyus* in the British Museum and in the various American institutions, as well as from considerable supplementary material. Thanks are expressed

¹ The northern Colombian and western Venezuelan localities mentioned in the text are shown on the map accompanying the first preliminary report on the mammals of northern Colombia, Proc. U. S. Nat. Mus., vol. 97, pp. 1-46, fig. 1, 1947. In this report the symbol combinations for contrasting color patterns of squirrels given on page 9, subheading 4c, next to last line, as 4ab and 4ac should read 4ac and 4bc, respectively. Corresponding changes in the text are as follows: Page 17, line 3 for 4a read 4b, line 22 for 4ac read 4bc, page 24, line 23 for 4ab and 4ac read 4ac and 4bc, respectively, line 38 for 4ab read 4ac, line 40 for 4ac read 4bc. The symbols in table 1, page 34, are correct. On pages 9 and 36 read *candelsensis* for *candalensis*; page 36 line 6, read *versicolor* for *inconstans*; on pages 6, 7, 10, 21, 22, 29, 32, 33, and 36 read *chrysuross* for *chrysurus*.

² Antedates *cayennensis* Desmarest.

to Dr. W. H. Burt, of the University of Michigan Museum of Zoology, for the loan of material and permission to describe one of the specimens as a new species. Grateful acknowledgment is made to Karl P. Schmidt, chief curator of zoology of the Chicago Natural History Museum, and to Dr. João Moojen, curator of mammals of the Museu Nacional, Rio de Janeiro, Brazil, for the loan of specimens.

All capitalized color terms are from Ridgway ("Color Standards and Color Nomenclature," Washington, 1912).

ECHIMYS SEMIVILLOSUS SEMIVILLOSUS (I. Geoffroy)

Nelomys semivillosus I. GEOFFROY, Ann. Sci. Nat., ser. 2, vol. 10, p. 125, 1838 (abstract of description); Mag. Zool., Paris, 1840, pp. 42, 50, pls. 23, 28, figs. 7-9.

Type locality.—Cartagena, Department of Bolívar, Colombia.

Distribution.—Lowlands of northern Colombia. As yet known only from the lower Río Magdalena drainage system.

Coloration.—Hairs of upper surface of body Ochraceous-Buff to Ochraceous-Orange medially, becoming paler laterally; sides grayish to Light Buff or Warm Buff; dorsum and sides with a mixture of wholly black or brown spines, spines punctulated with white to buffy, the punctulated spines most conspicuous on posterior half of back and base of tail; crown grizzled, nape and interscapular region blacker; white to buffy postauricular patches present; rostrum, sides of face below dark orbital rings whitish to buffy; outer sides of fore and hind legs like sides; fore and hind feet above gray with dark patches, toes gray. Underside of head, body, and limbs white lightly washed with buff. Base of tail like back, remainder light brown thinly covered with short hairs, the hairs brown proximally, becoming paler to gray terminally.

Measurements (in millimeters, of three adults).—Head and body, 207, 227, 220; tail, 218, 222, —; hind foot, 38, 39, 37; ear, 19, 18, 17; condylobasal length, —, 46.6, 48.9; zygomatic breadth, —, 24.2, 25.6; length of nasals, 17.7, 16.2, 17.5; least interorbital width, 14.2, 16.2, 17.5; braincase, width, —, 19.7, 19.7; bullae, —, 7.7 by 12.6, 8.1 by 12.9; alveolar length of molar row, 12.0, 12.1, 11.6.

Remarks.—The foregoing description is based on three adults taken in the Río Cesar and Río Guaimaral region. Two immature individuals of the same series have the following external measurements: Head and body, 145, 153; tail, 154, 173; hind foot, 33, 34; ear, 16, 16. Although the tail is longer than the combined head and body length in the young, it may become proportionately shorter as growth of the individual continues. In adults, tail length is subequal to, or shorter than, combined head and body length. Spines are completely lacking in the two young individuals; otherwise their pelage and coloration are as in adults.

The present series is quite typical and represents the first record of true *semivillosus* since the types were sent from Cartagena by the former French consul, M. Pavageau, more than a hundred years ago.

A NOTE ON *ECHIMYS ARMATUS* (I. GEOFFROY)

A specimen of *Echimys armatus*, collected on April 20, 1945, in Caparrapí, a municipality in the Magdalena Valley, Cundinamarca, and received from the Rockefeller Foundation, is of special interest. This individual, an adult male, not only confirms the occurrence of the species west of the eastern slopes of the Andes but also indicates that the range of *E. armatus* overlaps that of *E. semivillosus* in Venezuela and Colombia. The correctness of the type locality of *E. armatus occasius*, Gualea, on the western slope of the Ecuadorian Andes, has been questioned (Tate, 1935, p. 428). The present specimen shows, however, that the distributional pattern of the species conforms, at least in part, to that of many other Brazilian or Amazonian species of mammals that have rounded the northern flanks of the Andes and pushed into the coastal lowlands and mountain valleys of western Colombia and Ecuador. The genus *Echimys* has not been recorded from Central America.

The species *armatus* is readily distinguished from *E. semivillosus* by redder coloration and black spines not punctulated with whitish. Ellerman (1940, p. 112) included *longirostris*, *obscura*, *punctatus*, *flavidus*, and *carrikeri* in the *E. armatus* group; *guianae* and *castaneus* were regarded as strictly synonymous with *armatus*, while *occasius* was listed as a subspecies of it. Tate (1939, p. 180) added *longirostris* to the synonymy of *armatus* but listed *castaneus* (with *flavidus* a synonym!) as a valid subspecies. The type specimens of the above-named forms, which have been examined by the writer, may be classified as follows:

- Echimys armatus armatus* (I. Geoffroy), Cayenne
(*guianae* Thomas and *longirostris* Anthony, synonyms)
- Echimys armatus castaneus* Allen and Chapman, Trinidad
- Echimys armatus occasius* Thomas, Gualea, western Ecuador (type an immature)
- Echimys semivillosus semivillosus* (I. Geoffroy), Cartagena, Colombia
- Echimys semivillosus punctatus* Thomas, Caicara, Venezuela
- Echimys semivillosus flavidus* Hollister, Margarita Island
(*carrikeri* Allen, a synonym)

SPECIES OF THE SUBGENUS PROECHIMYS

The highly variable assortment of individuals composing the species of the genus *Proechimys* has rendered their classification difficult. This difficulty has been further aggravated by the host of described forms based mainly on individually variable characters or on characters that have only a limited and local constancy. The classification

of the subgenus *Proechimys* presented by Ellerman (1940, pp. 115-122) in his monumental treatise of the rodents of the world shows a sharp reduction in the number of species. In typical *Proechimys*, Ellerman listed six species in the "*cayennensis* [= *guyannensis*] group" and one, *P. iheringi*, in the "*iheringi* group." The subgenus *Trinomys* consisted of *albispinus* and *setosus*. Reasons for making the above divisions of the genus were given. The discussion here is limited mainly to the species of the *guyannensis* group and to the species of the subgenus *Proechimys* listed by Ellerman as not seen and not allocated to group.

The six species of Ellerman's "*cayennensis* group" are *guyannensis*, *vacillator*, *hendeei*, *rattinus*, *canicollis*, and *dimidiatus*. The species *guyannensis*, as constituted by Ellerman, will doubtlessly prove to be composite. He admitted the possibility of error in listing under *guyannensis* the *Proechimys* described from Central America, in this following the tendency among authors to assign these forms to a single species. However, there are at least two kinds of spiny rats common to Central America and northwestern South America. To determine what names are applicable to them would require a more careful examination of the type specimens in the British Museum than the present author has been able to make. It remains a moot point which ones, if any, of the described Central American forms are indeed referable to *P. guyannensis*. Under the circumstances it is best to accept provisionally Ellerman's classification and to continue treating *P. guyannensis* as a composite species. Possibilities for its ultimate subdivision into natural entities will be pointed out in following discussions. *P. canicollis* differs in important characters and appears to be annectant between *P. guyannensis* and the subgenus *Trinomys*. *P. vacillator* may prove to be a race of *canicollis*. *P. hendeei* is very nearly related to *guyannensis* but distinct specifically. The type of *P. rattinus*, a skull only, is that of a race of *guyannensis*. *P. dimidiatus* is, according to the writer's notes, an immature individual and presents no special peculiarities other than the very deep incision of the posterior palatal notch, on a plane with M². It is certainly a member of the group, but it cannot now be determined whether it is a local form of the common species or whether it replaces the name of a more recently described species, possibly *hendeei*.

Of the 12 species listed by Ellerman as not seen and not allocated to group, the present author has been able to examine *ochraceus*, *poliopus*, *oconnelli*, *steerei*, *boimensis*, and *kermiti*. These are all referable to *guyannensis* and are discussed under that specific heading. *P. leucomystax* Miranda Ribeiro, as described and figured, is also a representative of the common species. According to Thomas (1921, p. 141), *myosurus*, *leptosoma*, *cinnamomeus*, *elegans*, and *fuliginosa* are all synonyms of *setosus*, a *Trinomys*. This opinion may

be questioned, at least with respect to *elegans* Lund, but unless the types, if still in existence, show anything to the contrary, these conclusions must be accepted. On the basis of the original description, *Echimys macrourus* Jentink cannot be identified with *Proechimys*. The type is a skin only from Surinam with the following measurements: Head and body, 221; tail, 320; ear, 25; hind foot, 41 mm. The tail is too long, both actually and in proportion to combined head and body length, for *Proechimys* as known; the hind foot is too small for any *Proechimys* of comparable head and body length. These measurements may have been taken from the dried skin; hence they are not really comparable. Tate (1939, p. 180) admitted the possibility of *macrourus* being a form of *Echimys armatus*. This opinion is probably correct.

Leaving to one side the nomenclatorial problems that may arise once the exact status of each of such forms as *dimidiatus* and *vacillator* is entirely clarified, we find the subgenus *Proechimys* to consist of four recognizably distinct species. These are *iheringi*, *canicollis*, *hendeei*, and the composite *P. guyannensis*. To these are added two more species, one described as new, which form a group distinguishable by the enamel pattern of the molariform teeth.

CHARACTERS OF THE SPECIES

It has been found that external characters are not wholly reliable in distinguishing the species of typical *Proechimys* from one another. Differences in coloration are evident when comparing representatives of two or more species from the same or nearby localities. In other localities the differences between the same species may be reversed! The character of the spines is important in distinguishing super-specific categories of the Echimyinae, but in *Proechimys (sensu stricto)* it is at best only of some slight relative diagnostic value. Size differences between the species cannot easily be demonstrated. There may be some evidence of gradients in size within any one species, as well as some proportional differences, particularly in the length of the tail to the combined head and body length. Taken as a whole, however, no significant differences in size exist between any of the species. Most cranial characters, which are absolute for distinguishing two or more species from each other when these species are from the same or nearby localities, break down or reverse themselves when applied to representatives of these same species from widely separated localities. Of all the characters studied and of those described as diagnostic, only three or four seem to be of some value. In *canicollis* the walls of the mesopterygoid fossa are considerably fenestrated, more so than in the other species where the tendency is for no fenestration at all. In *hendeei*, *dimidiatus*, and *iheringi* the palatal notch extends anteriorly beyond the plane of M^3 ; in the other species it does not

extend beyond M^3 . It is possible that proportional differences in cranial parts exist between the species, but this cannot be demonstrated on the basis of present material and would be most difficult to show with any amount of specimens. The individual and local variation among these rats is so great that it is practically impossible to select a sufficient number of truly comparable skulls for determining proportional differences.

The enamel pattern of the molariform teeth offers a reliable means for classifying the species of *Proechimys*, but even here the variations frequently introduce difficulties into any attempt to interpret correctly the nature of the structures concerned. Nevertheless, the species of typical *Proechimys*, and annectant forms, may be classified primarily according to the following formulae, which show the number of outer enamel folds in each of the upper molariform teeth and the inner folds of the lower teeth:

- A. $\frac{2-2-2-2}{2-2-2-2}$ to $\frac{3-2-2-2}{3-2-2-2}$
1. Spines soft.....*P. canicollis*
 2. Spines stiff.....*Trinomys* (subg.)
- B. $\frac{3-3-3-2}{3-2-2-2}$ to $\frac{3-3-4-4}{4-3-3-3}$
1. Palatal notch extending forward beyond anterior plane of M^3
 a. Zygoma broad, outer surface of jugal nearly plane, the ridge almost obsolete.....*P. iheringi*
 b. Zygoma normal, outer surface of jugal crossed by a well-developed ridge.....*P. hendeei* (and *dimidiatus*, type)
 2. Palatal notch not extending forward as far as posterior plane of M^2*P. guyannensis* (composite)
- C. $\frac{4-4-4-4}{4-3-3-3}$*Quadruplicatus* group
 (*P. ignotus*, *P. quadruplicatus*, n. sp.)
- D. $\frac{4-4-4-4}{4-4-4-4}$*Hoplomys* (genus)

Four folds, as in the *Quadruplicatus* group, appear to be the maximum if not the original number in the upper molariform teeth. This has been pointed out by Winge (1888, p. 86) in his description of the teeth of *P. guyannensis* from Lagôa Santa. In this species a fourth fold may be evident on the crown of the last two upper molars. It usually appears as a complication or branch of the third fold. With wear, the point of union between the two folds may be erased, with the result that the fourth fold becomes an enamel island. On the other hand, in some populations of *guyannensis* there is a tendency for the loss of even the third fold of the last upper molar and in each of the lower molars. In *canicollis* this is carried to an extreme. Here the third fold is found in the lower premolar only in certain populations. Throughout the genus the general trend is toward a greater simplifi-

cation of the enamel pattern of the molariform teeth. Given the "normal" number of folds for each species, as outlined in the key, and beyond, the greater tendency is for the elimination of one of the "normal" number of folds than for the reappearance of an additional fold.

A satisfactory determination can be made of the "normal" pattern and the significant deviations therefrom only in a large series that includes individuals with unworn and fully formed but unerupted teeth. With wear, an enamel fold becomes isolated from the margin of the crown and appears as an enamel island. Because of inequalities in the depth along its base the fold may break up into two islands. Furthermore, a sinuous curve in the original fold may result in one of the subsequently formed islands assuming a position such as to appear as a distinct enamel fold. Frequently any two adjacent folds may be united in the form of a single fold with two branches. With wear, one of the branches becomes isolated from the other, thus restoring, in appearance, the "normal" pattern of the tooth. As a consequence of the order of dental succession, the premolar and first molar are considerably more worn, their patterns more modified and divergent from the "normal" pattern than the remaining molars. Though many instances of mechanically induced types of variation may be cited, the foregoing formulae are sufficiently broad to facilitate the specific identity of most of the spiny rats of the genus.

PROECHIMYS CANICOLLIS (Allen)

*Echimy*s *canicollis* ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 12, p. 200, 1899.

Type locality.—Bonda, near Santa Marta, northwestern base of the Sierra Nevada de Santa Marta, Department of Magdalena, Colombia.

Distribution.—Northern Colombia. Known from the Río Cesar Valley and the northwestern and eastern bases of the Sierra Nevada de Santa Marta, Department of Magdalena, and from the Ciénaga de Guájaro, about midway between Barranquilla and Cartagena, Department of Atlántico.

Characters.—A pale spiny rat, upperparts buffy to ochraceous mixed with black, no well-defined median dorsal band present; spines soft and mostly hidden by the soft annulated hairs. Underparts with gray lateral lines, which may extend mesially over the whole ventral surface or, more commonly, over neck and throat only. Upper surface of fore and hind feet well covered with whitish hairs. Tail thickly covered with comparatively long hairs. Walls of mesopterygoid fossa extremely fenestrated. Molariform teeth as described.

Comparisons.—Distinguished externally from *P. guyannensis mincae*, the only other representative of the genus found in the same general region, by hairier tail, softer spines, and slightly shorter ear and hind

foot; cranially, by extremely large fenestrations of the mesopterygoid fossa, larger, more inflated bullae, elongated, rather than broad, hamular processes, broad jugal with a distinct spinous process, narrower basioccipital, and by the enamel pattern of the molariform teeth.

Remarks.—Only the typical form of the species is known. Judged by the original description and remarks by Ellerman (1940, p. 117), *P. vacillator* is most probably either a race of *canicollis* or a very nearly related species.

P. canicollis was based on specimens from Bonda, Santa Marta, Mamatoco, and other nearby localities ranging in altitude, according to Allen (*op. cit.*), from sea level to 500 feet. Specimens were taken by the writer in the heavy deciduous forest of the Río Cesar and the Río Guaimaral, a channel of the Cesar. They were taken also in a nearby savanna (Palmarito) and from an intermediate site (Aguas Verdes) between the savanna and the forest. These rats were most abundant under decaying logs in the forest, and in the thick, spiny brush bordering the grasslands. Additional specimens were taken in the semiarid grass and scrub country about the town of Villanueva and in the similarly deforested region of the Ciénaga de Guájaro. All series agree closely with topotypes of *canicollis*. No other species of *Proechimys* was found in these localities.

According to Herbert H. Smith (*in* Allen, 1904, p. 440), who collected the type series of *P. guyannensis mincae* and of *P. canicollis*, "the latter is the common rat below 1,000 feet; the former takes its place in open lands, dry forests and thickets from about 1,000 to about 2,500 feet; but it does not extend far into the true mountain forest. Some *mincae* are found nearly to sea level, and *canicollis* occurs, rarely to 2,000 feet." All present specimens of *canicollis* from the department of Magdalena are from the lowland areas surrounding the Sierra Nevada de Santa Marta. In the mountain mass itself, only specimens of *mincae* were taken. Apparently the two species have different habitat preferences where Smith collected.

Specimens examined.—A total of 111, all in the collection of the United States National Museum: Bonda, 7; Santa Marta, 1; Ciénaga de Guájaro, Atlántico, 15 meters altitude, 13; Río Guaimaral, Río Cesar, 140 meters, 13; Aguas Verdes, near Río Guaimaral, 26; Palmarito, near Aguas Blancas and Río Guaimaral, 3; El Orinoco, Río Cesar, 158 meters, 15; Villanueva, 274 meters, 33.

PROECHIMYS GUYANNENSIS (E. Geoffroy)

Mus guyannensis E. GEOFFROY, Catalogue des mammifères du Muséum National d'Histoire Naturelle, Paris, p. 194, 1803.

Echimyus cayennensis DESMAREST, Nouv. Dict. Hist. Nat., ed. 2, vol. 10, p. 58, 1817

Type locality.—Cayenne, French Guiana.

Distribution (of the species).—Tropical parts of South and Central America from Nicaragua to southern Brazil and Paraguay.

Characters (of the species).—Upperparts from buffy, almost grayish, to tawny mixed with black, the median dorsal area when conspicuously darker, not sharply defined as a black band; spines stiffer, less tendent, and generally more prominent in middorsal region than in *canicollis*. Underparts white or with a drab to pale brown lateral line, which may extend midventrally as in *canicollis*. Upper surface of fore and hind feet with whitish to dark brown hairs. Tail sparsely haired. Point of palatal notch on a level with or behind plane across middle of last molars. Enamel pattern of molariform teeth as described.

Comparisons.—Cranial characters other than those cited are not diagnostic except in comparisons with species occurring in the same or nearby localities. Comparisons have already been made between *P. canicollis* and the form of *guyannensis* found in northern Colombia. Further comparisons are made in the descriptions of the other species.

Remarks.—If we accept provisionally as subspecies of *guyannensis* all the forms so treated by Ellerman as well as others listed below, the races of the composite species are divisible into two geographical groups on the basis of the dental patterns. The first group, which includes typical *guyannensis*, occupies northern South America in the areas east of the Río Magdalena and north of the Orinoco. The majority of the spiny rats here show the following formula for the enamel pattern of the molariform teeth: $\frac{3-3-3-(2-3)}{3-2-2-2}$.

Of the forms not seen and not assigned to group by Ellerman, the following belong here: *poliopus*, *ochraceus*, and *oconnelli*. The occurrence of the geographically restricted *P. canicollis* within the range of this group of *guyannensis* indicates a probably recent origin from it. Some eastern Brazilian spiny rats, including *P. g. arescens* Osgood, from Maranhão, conform to the characters of this group but are widely separated geographically.

In Central America, western Colombia west of the Magdalena, western Ecuador, and in the Amazonian region the populations of *P. guyannensis* show, generally, the less simplified formulae

$$\frac{3-3-3-3}{3-3-3-3} \text{ to } \frac{3-3-4-4^3}{4-3-3-3}$$

The latter formula approaches that of the *Quadruplicatus* group, but present material does not indicate that it grades into it. The holotype and an adult topotype of *steerei* are characterized by that dental pattern. A series of topotypes of *calidior* in the U. S. National Museum also show the pattern with four folds in the last two upper molars and the lower premolar. The type skull of *semispinosus* has four folds in only the last upper molar, as well as in the lower premolar. The very clear description given by Winge (1888, p. 86)

³ All formulae given and all references made to enamel folds are based on the number of outer folds in the upper and the number of inner folds in the lower molariform teeth.

shows that his *guyannensis* specimens have the formula of the dental pattern $\frac{3-3-3-(3-4)}{4-3-3-3}$. Allen's *boimensis* and *kermîti* belong here too, according to the pattern of their molariform teeth. *P. leucomystax* is also a member of this group, though the published figures of the upper and lower jaws of the type are not sufficiently clear to permit an exact determination of the dental pattern. The type specimen of *classops* Osgood, described from Santo Domingo, Río Inambari, Peru, as a subspecies of *P. hendeei* shows the cranial and dental characters of this group of *P. guyannensis*. Throughout this geographical group there is a strong tendency for retention, to a greater or lesser degree, of the fourth fold in the third and often in the second upper molars. In all such cases the lower premolar has four folds. This pattern is very common among the Central American *Proechimys*, and it is questionable whether the name *guyannensis* should apply to them. Other Central American and Amazonian spiny rats show the complete quadruplicate pattern in the upper molariform teeth and cannot be included in this group. Nevertheless, these may have been regarded, in some cases, as "topotypes" of described forms of the group of *guyannensis* in question. As is shown, two and even three species of spiny rats may be found in the same habitat.

Pending a revision of the genus, it is recommended that the above-named forms be treated as subspecies of *P. guyannensis*.

The forms of *guyannensis* (composite) collected by the author in northern Colombia represent the two principal dental types that follow geographical lines.

PROECHIMYS GUYANNENSIS MINCAE (Allen)

Echimys mincae ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 12, p. 198, 1899.

Type locality.—Minca, near Santa Marta, Magdalena, Colombia.

Distribution.—Base and lower levels of the Sierra Nevada de Santa Marta, from near sea level to approximately 500 meters above, Department of Magdalena, Colombia.

Characters.—Palest of the Colombian and Central American races of *guyannensis*; color as in *guairae* and *ochraceus* of the Venezuelan coast, feet whitish, underparts white with or without a gray gular band or patch. Formula of enamel pattern of molariform teeth as in northeastern South American *guyannensis*, $\frac{3-3-3-3}{3-2-2-2}$.

Remarks.—Allen recorded 87 specimens of *mincae* from Minca and Bonda. At the same time he described *P. canicollis* from specimens taken at Bonda, Santa Marta, Mamatoco, and other nearby points, all situated on the northwestern foot and base of the Sierra Nevada. Apparently, in that region, the two species occur in the same general area, if not in the same habitat. The present author took one adult

male in the deciduous forest of the Colonia Agrícola de Caracolicito, on the southern slope of the Sierra Nevada, and five males, only one fully adult, on the high wooded banks of a stream at El Salado, on the eastern slope of the same mountain mass. No specimens of *canicollis* were found at these localities.

P. g. mincae is most nearly related to the northern Venezuelan and Guianan races of the species. It differs widely in external characters and, especially, in the enamel pattern of the molariform teeth, from the forms of *guyannensis* in Central America and western Colombia. From these latter it is completely isolated geographically by the Río Magdalena. It is probable that it has, or had, before wide deforestation took place, a continuous range to the north and east, intergrading with the pale races of northern Venezuela. At present, so far as known, only *P. canicollis* occupies the Río Cesar Valley to the east. In the Sierra de Perijá the distinctly darker *P. guyannensis poliopus* occurs.

Specimens examined.—Fourteen, all in the collection of the United States National Museum: Minca, 4; Manzanares, between Minca and Santa Marta, 2; Bonda, near Santa Marta, 2; Colonia Agrícola de Caracolicito, Río Ariguani, 335 meters altitude, 1; El Salado, between Pueblo Bello (Pueblo Viejo Sur) and Valencia, 430 meters, 5.

PROECHIMYS GUYANNENSIS POLIOPUS Osgood

Echimys chrysaecolus THOMAS, Ann. Mag. Nat. Hist., ser. 7, vol. 1, p. 245, 1898 (part; specimen from San Cristóbal, Táchira, Venezuela, only).

Proechimys poliopus OSGOOD, Publ. Field Mus. Nat. Hist., zool. ser., vol. 10, p. 141, 1914.

Type locality.—San Juan de Colón, altitude 797 meters, on the northern slope of the Sierra de Mérida near the angle it forms with the Sierra de Perijá, State of Táchira, Venezuela.

Distribution.—In the Sierra de Mérida and the Sierra de Perijá, the Ríos Zulia and Catatumbo drainage basins, northeastern Colombia and western Venezuela.

Characters.—Darker throughout than *mincae*, *guairae*, and *ochraceus*; upperparts Ochraceous-Tawny mixed with black, underparts from nearly uniformly white to nearly wholly Drab; fore and hind feet Drab with or without white markings. Dental characters as formulated for *mincae*.

Remarks.—The original description was based on a subadult, sex unknown. The present series (10 males, 7 females) from Tarra, upper Río Catatumbo, Norte de Santander, Colombia, agrees with *poliopus* in the important characters, though it may prove to average darker than comparable adult specimens from the type locality. However, the series is near enough geographically to be confidently assigned to *poliopus*. The subspecies as now constituted more nearly

resembles the eastern Andean races of Colombia than the coastal forms of Venezuela.

Specimens examined.—Nineteen. The type, collection of the Chicago Natural History Museum; Río Tarra, 18, collection of the United States National Museum.

PROECHIMYS GUYANNENSIS CHRYSÆOLUS (Thomas)

Echimy's chrysaëolus THOMAS, Ann. Mag. Nat. Hist., ser. 7, vol. 1, p. 244, 1898.

Type locality.—Muzo, a town in the Minero Valley of the Río Carare, western slope of the Cordillera Oriental, Department of Boyacá, Colombia.

Distribution.—Western slopes of the Cordillera Oriental in the departments of Boyacá, the Santanders, and southern Magdalena, Colombia.

Characters.—As in *poliopus* but with underparts sharply defined white, the hind feet whitish, slightly marked with brown.

Remarks.—The type was "collected by a native." It is certain that it was not taken at an altitude of that of Muzo itself (1,240 meters) but must have come from somewhere farther down the valley. Four females and one male from Guamalito, near El Carmen, Norte de Santander, collected by the author, agree with the description of *chrysaëolus*. This race is distinguished from *poliopus*, and *oconnelli* of Villavicencio, east of Bogotá, by the absence of dark markings on the white underparts and by its paler hind feet.

Specimens examined.—Five, from Guamalito, Norte de Santander, all in the collection of the United States National Museum.

PROECHIMYS GUYANNENSIS MAGDALENÆ, new subspecies

Holotype.—Adult male, skin and skull, U. S. N. M. No. 280170; collected June 20, 1943, by Philip Hershkovitz; original No. 2098.

Type locality.—Río San Pedro, a small stream in the northern foothills of the Cordillera Central, above the village of Norosí, altitude 178 meters, department of Bolívar, Colombia.

Distribution.—Known only from the type locality and the lowlands west of the Río Magdalena near Norosí.

Characters.—Most nearly related to *panamensis* of Panama, and *colombianus* of the Chocó; distinguished from them by coarser mixture of black and ochraceous of back, fore and hind feet white with brown markings, not nearly uniformly brown; hamular processes narrower.

Formula of enamel pattern $\frac{3-3-3-3}{(3-4)3-3-3}$.

Description of holotype.—Back Ochraceous-Orange mixed with black, sides of body Ochraceous-Buff, under surface sharply defined white; outer and inner sides of hind legs dark brown punctulated with ochraceous, hind feet white marked with brown; the brown line of outer sides of foreleg extending onto white forefoot; rostrum dark

brown mixed with buffy, cheeks buffy, eyes ringed with dark brown. Tail black above, white beneath.

Measurements (in millimeters).—Those of the holotype followed by the means and extremes of the adults of the type series, including the holotype. Head and body, 239, 243 (217–278, ten specimens); tail, 164, 173 (150–192, seven specimens); hind foot, 51, 50.6 (45–53, ten specimens); ear, 24, 25 (22–28, nine specimens); greatest length of skull, 59.2, 57.3 (52.3–63.4, eleven specimens); zygomatic breadth, 26.4, 26.3 (24.7–28.4, eight specimens); length of nasals, 22.0, 21.5 (20.0–23.5, eleven specimens); alveolar length of molar row, 8.7, 8.3 (7.8–8.9, twelve specimens).

Coloration of the paratypes.—More brightly colored than any of the Colombian races of *guyannensis* found east of the Río Magdalena. As usual in the species, the individual becomes paler as it becomes older. Subadults acquiring the spiny pelage show more black on the back. With the establishment of the adult pelage, the black terminal portions of the spines become less prominent as the ochraceous bands of the soft hairs become broader, the hairs themselves, longer. In all specimens the underparts are sharply defined white, the hind feet white more or less marked with brown.

Remarks.—Of the races of *guyannensis* found west of the Río Magdalena in Colombia, and in western Ecuador and Central America, only the extremely pale *decumanus* of Ecuador is markedly different in external characters. Cranially there is little basis for making distinctions. In the enamel pattern they all agree in having three folds in the lower molars, while some of the Central American forms including *panamensis*, and *calidior* of western Ecuador, tend to retain the fourth fold in the last two upper molars, and in the lower premolar. In dental characters, *magdalenae* shows its nearer relationship to the western forms than to *mincae* and *chrysaolus* which are much nearer geographically, but on the opposite side of the Río Magdalena.

Specimens examined.—Nineteen (13 males, 6 females) all in the collection of the United States National Museum. Río San Pedro, 17 (one with skull only); Norosí, 2 (one with skull only).

PROECHIMYS HENDEEI Thomas

Proechimys hendeei THOMAS, Ann. Mag. Nat. Hist., ser. 9, vol. 18, p. 162, 1926.

Type locality.—Puca Tambo, Chachapoyas district, Amazonas, Peru.

Distribution (of the species).—Known only from the Amazonian region of Ecuador and Peru.

Characters (of the species).—Upperparts ochraceous to tawny with a mixture of black, the median dorsal area more or less as in *guyannensis* but with spines weaker, less prominent. Underparts, in

the few known adult specimens, sharply defined white. Fore and hind feet thinly haired, white to brown. Tail sparsely haired, the large scales plainly visible. Palatal notch extends anteriorly to a plane on level with middle of M^2 . Enamel pattern of molariform teeth, $\frac{3-3-3-3}{4-3-3-3}$.

Comparisons.—Distinguished from western Amazonian representatives of *P. guyannensis* by consistently sharply defined white underparts (more specimens may void this character), relatively longer tail, deeper incision of palatal notch, flatter, less inflated audital bullae, elongate, not squarely formed, hamular processes, and posterior ends of lips of incisive foramina converging toward midline.

Remarks.—Within the range of *hendeei* a large number of forms of *Proechimys* have been described. Among them the following are subspecies of *P. guyannensis* (composite): *semispinosus*, *brevicauda*, *gularis*, *pachita*, *rattinus*, and *hilda*. The author took specimens of *P. hendeei*, probably assignable to *P. h. nigrofulvus* Osgood, together with specimens of *P. guyannensis gularis* from the same trap lines on the banks of the Río Napo, Ecuador. The type of *nigrofulvus* comes from the typical region of *gularis*, on the Río Bobonaza. *P. "hendeei" elassops* Osgood from southeastern Peru is a *guyannensis* with a superficial resemblance to *hendeei*. The description of *P. rattinus* from the Río Ucayali, Peru, was based on the skull of an adult female (designated as the type) and the skin of an immature female. As already indicated, the type skull is referable to the species *guyannensis*. The skin, on the other hand, agrees closely with that of the type of *P. hendeei* and either represents that species or a parallelism akin to that noted in *elassops*.

PROECHIMYS QUADRUPPLICATUS, new species

Holotype.—Adult female, Univ. Michigan Mus. Zool. No. 80080; collected October 21, 1936, by Philip Hershkovitz; original number M635.

Type locality.—Llunchi, an island in the Río Napo, about 18 kilometers below the mouth of the Río Coca, eastern Ecuador.

Distribution.—Amazonian region of Ecuador and northern Peru.

Characters.—Upperparts Ochraceous-Orange mixed with black, the median dorsal area entirely black, the black tipped spines overlaying the soft annulated hairs. Underparts sharply defined white; upper surface of fore and hind feet dark brown with a sparse covering of minute silvery hairs. Tail almost naked. Skull as in *P. guyannensis*; enamel pattern of molariform teeth, $\frac{4-4-4-4}{4-3-3-3}$.

Comparisons.—Distinguished from *P. ignotus*, the only other described form of the *Quadruplicatus* group, by richer coloration and by the well-defined median dorsal band.

Description of holotype.—Back and head Ochraceous-Orange mixed with black, a broad band of stiff black-tipped spines on middle of back extending as a line of softer spines over rump to base of tail; crown and rostrum heavily lined with black; sides like back but with a lighter mixture of black and becoming paler toward the sharply defined white underparts. Inner side of thigh Cinnamon-Brown, hind foot brown; foreleg and forefoot paler. Tail above dark brown, beneath sharply defined flesh color.

Measurements (in millimeters).—Those of the holotype followed by the means and extremes of the adults, including the holotype, of the type series. Head and body, 220, 228 (224–234, seven specimens); tail, 162, 158 (152–171, five specimens); hind foot, without claw, 48, 48 (46–51, seven specimens); ear, 22, 24 (22–26, seven specimens); greatest length of skull, in two paratypes, 54.4, 60.0; zygomatic breadth, 26.5, in three paratypes, 27.2, 27.6, 28.5; length of nasals, in four paratypes, 20.4, 23.0, 23.3, 25.0; alveolar length of molar row, 9.3, 9.2 (8.7–9.6, seven specimens).

Remarks.—Specimens of *P. guyannensis gularis* and *P. hendeei* were taken in the same localities as those of *P. quadruplicatus*. The individuals representing the three species are quite readily distinguished from one another. However, most of the characters that separate *P. quadruplicatus* from them lose their value when comparisons are extended to members of the same species from outlying regions. The composite nature of *P. guyannensis* contributes considerably to this difficulty. Nevertheless, *quadruplicatus* is always distinguishable from both *guyannensis* and *hendeei* by the pattern of its molariform teeth.

The dental characters upon which specific distinction is based are not limited to *P. quadruplicatus*. Isolated populations of the *quadruplicatus* group occur in the Amazonian region and in Central America. As noted, the spiny rat recently described by Kellogg as *P. "semispinosus" ignotus*, from Pearl Island, off the coast of Panama, is referable to this group. The *Proechimys* with the quadruplicate pattern of the molariform teeth occurring on the mainland of Central America cannot be properly identified without comparing specimens with the types of all previously described forms from that region. The teeth of the type of the Costa Rican *rubellus* are too worn for exact determination of their pattern. The writer's notes on the types of *centralis* and *chiriquensis* lack this data, and it is to be presumed that these rats, like *panamensis*, do not show the complete quadruplicate pattern. Reliance cannot be placed upon "topotypes," or even "paratypes," for dental determinations, as two or more species of very similar appearing spiny rats may occur in the same locality.

No doubt additional specimens of *P. quadruplicatus* are represented in museum collections. Osgood (1944, p. 200) has given a description

of the enamel pattern of a series of spiny rats from Lagunas, eastern Peru, which agrees with this species. These Peruvian rats were assumed to be representatives of *P. semispinosus*.

Specimens examined.—Fourteen (5 males, 9 females, of which only 7 are adult), all specimens in the collection of the University of Michigan Museum of Zoology, Nos. 80068–80081, inclusive.

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