A Systematic Revision of the Marsupial Genus Marmosa

By G. H. H. Tate

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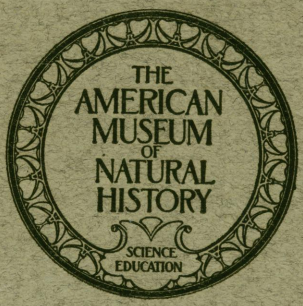
ARTICLE I



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Article I.—A SYSTEMATIC REVISION OF THE MARSUPIAL GENUS *MARMOSA*, WITH A DISCUSSION OF THE ADAPTIVE RADIATION OF THE MURINE OPOSSUMS (*MARMOSA*)

BY G. H. H. TATE

PLATES I TO XXVI; TEXT FIGURES 1 TO 29; TABLES 1 TO 9

CONTENTS

INTRODUCTION, ACKNOWLEDGMENTS, AND METHODS

The genus *Marmosa* has hitherto consisted of a very large number of "species" whose relationships to one another have rarely been expressed. In view of the desirability of working out as nearly as possible the phylogeny of the genus and because of the scarcity of most of the forms in museum collections, it soon became evident that not only the types, but as nearly as possible ALL material had to be examined. The principal European museums were visited, the authorities in every instance generously permitting the material in their collections to be studied and photographed, while, without exception, the museums of America have loaned their collections of *Marmosa* to The American Museum of Natural History for purposes of study.

Thanks are especially offered to Dr. G. M. Allen, Museum of Comparative Zoölogy, for much help, advice, and notes; to Mr. H. E. Anthony, The American Museum of Natural History, not only for valuable recommendations made while the paper was in the course of preparation, but also for allowing me access to the large collections upon which he would otherwise have worked himself; to Dr. W. H. Osgood, Field Museum of Natural History, for counsel and notes, particularly with regard to the notes on *M. elegans soricina;* and to Dr. H. Pohle, Zoologisches Museum der Universität, Berlin, for a number of useful suggestions. Finally Dr. Otto Fuhrmann, Neuchâtel, Switzerland, kindly loaned a specimen of *Marmosa* collected by Tschudi.

I would repeat here my indebtedness to Mr. H. E. Anthony, The American Museum of Natural History, Mr. M. A. C. Hinton, British Museum, Mr. Gerrit S. Miller, Jr., U. S. National Museum, Dr. W. H. Osgood, Field Museum of Natural History, Dr. H. Pohle, Berlin Museum, and Mr. P. G. Redington, U. S. Biological Survey, for their permission to publish descriptions[1] of apparently new forms of *Marmosa.*

To Dr. M. Degerbøl, Copenhagen, I am indebted for the photographs from which figures 74, 121, 122, 243, and 244 were made; and to Dr. H. Pohle for figures 30, 62, 76, 152, 184, and 197.

I wish especially to express appreciation of the generosity of Mr. Adolph Klein, New York, in donating his time and skill to the delicate and laborious task of making uniform backgrounds for the plates. This was considered necessary because of the diverse nature of the conditions under which the photographs were made. It is my belief that the retouching has neither added nor removed any characters of material

[1]Amer. Mus. Novitates, No. 493, September, 1931.

importance. In a few cases errors, readily distinguishable as such, have crept in, but these are due to defects in my original photographs rather than to misconception on the part of Mr. Klein. The photographs of the skulls are slightly less than life-sized.

Marmosa falls naturally into five principal groups which correspond in part with the subgenera erected or used by Matschie (1916). Within each group from two to four minor groups are discernible, the species of which possess common characteristics. The terms "group" and "section" are employed in this paper to show these major and minor aggregates of species.

TABLES OF MEASUREMENTS

So far as possible the dimensions shown in the accompanying tables (1–9 in attached pocket) are adequately defined, but a few definitions have been supplemented by insertion of the line cut (Fig. 29, p. 236) from which the exact points of measurement can easily be noted. Thomas's system of cranial measurements (1905) has been adhered to as much as possible, only such alterations as are made necessary by the substitution of a marsupial for a rodent skull having been made.

Unless otherwise stated, the length of tail and of head and body are measurements made by the collector in the field. The hind feet (c.u.) and ears have been remeasured in every case. All other measurements have been prepared especially for this paper.

The information contained in the tables of measurements has contributed largely to the present arrangement of the genus. Although, generally speaking, the dimensions expressed therein represent average fluctuations in size and proportion of males and females of each species, nevertheless occasional individuals, as for example the unusually large *simonsi* (B. M. 99.9.9.140), transgress the dimensional range of the tables, and in this case they must be considered as abnormalities.

The colors of most of the specimens described have been compared with R. Ridgeway's 'Color Standards and Nomenclature.' When this has been done the name of the color is followed by (R.); otherwise the description of the color is based upon the writer's opinion.

The general impression produced by the blending of color tones rather than distinction of the color bands of individual hairs has been described. In a few cases, however, when unusual effects result from the influence of basal or subterminal colors of hairs, such have been indicated.

Although in the keys the contrasted steps are based whenever possible upon philogenetic characters, in the case of the *cinerea* group, the

arrangement is definitely artificial, while in the keys to *murina* species, *microtarsus* section and the *elegans* and *venusta* sections this is also true to a certain extent.

Most of the species and subspecies are felt to be rather sharply delineated. Certain forms and species remain, however, which require further analysis. The status of each of the several forms mentioned is particularly unsatisfactory, and additional efforts should be directed toward arriving at a proper understanding of their relationships. They are: the members of the *cinerea* group in the Amazon basin east of the Rio Purus (here brought together under the name *domina*); the species *cinerea;* the species *microtarsus*; western and pampean members of *agilis;* the *lepida* section (particularly); the species *marmota*, *pusilla*, and *velutina*. These are the MOST obscure portions of this complex genus, but much light yet remains to be thrown even upon those forms and sections which appear best understood.

Approximately 1580 specimens, 250 of the *cinerea* group, 700 *murina*, 220 *noctivaga*, 120 *microtarsus*, and 290 of the *elegans* group, have been used in the present analysis.

Abbreviations used for names of museums or other owners of collections of *Marmosa* in lists of material, etc.

A. M. N. H.—American Museum of Natural History, New York.
Basle— Musée d'Histoire Naturelle, Basle, Switzerland.
Berlin— Zoologisches Museum der Universität, Berlin.
Bern— Musée d'Histoire Naturelle, Bern, Switzerland.
Bogotá— Instituto de La Salle, Bogotá, Colombia.
B. M.— British Museum (Natural History), London, England.
Copenh.— Universitets, Zoologiske Museum, Copenhagen.
Dickey— Collection of Donald R. Dickey, California Institute of Technology, Pasadena, California.
F. M. N. H.—Field Museum of Natural History, Chicago, Illinois.
Halle— Natürhistorisches Museum, Halle, Germany.
Hamburg— Natürhistorisches Museum, Hamburg, Germany.
Madrid— Museo Nacional de Ciencias Naturales, Madrid.
München— Zoologische Sammlung, München, Germany.
M. C. Z.— Museum of Comparative Zoölogy, Cambridge, Massachusetts.
Neuchâtel— Laboratoire de Zoologie et d'Anatomie Comparée, Université de Neuchâtel, Switzerland.
Paris— Musée d'Histoire Naturelle, Paris.
Pittsburgh— Carnegie Museum, Pittsburgh, Pennsylvania.
Stockholm— Natürhistoriska Riksmuseum, Stockholm, Sweden.
Stuttgart— Württemberg Naturaliensammlung, Stuttgart, Germany.
U. M.— University of Michigan, Ann Arbor, Michigan.
U. S. B. S.— United States Bureau of Biological Survey, Washington, D. C.
U. S. N. M.—United States National Museum, Washington, D. C.
Vienna— Natürhistorisches Museum, Wien.

GEOGRAPHICAL DISTRIBUTION

It is almost safe to say that *Marmosa* in one form or another occurs throughout Central and South America from Central Mexico to Patagonia. Vertically it commonly reaches from sea level at least to 8,000 feet and may attain 11,000 feet (*aceramarcæ*).

In regard to distribution, each group must be thought of as though it were a separate genus. So distinct in structure and behavior are these groups that, although three or four may be present in a given region, their relations are no closer than those of other geographically overlapping full genera.

Some forms, whose ranges include mountainous country, irrespective of the group to which they belong, are sufficiently hardy to withstand considerable environmental variation without particularly noticeable changes appearing in their pelage. Such are *demararæ esmeraldæ*, ranging from 300 feet at the foot to 6,000 feet on the plateau of Mt. Duida; *mitis mitis*, extending from nearly sea level to 8,000 feet in the Sta. Marta region of Colombia; *fuscata;* a number of subspecies of *caucæ*, reaching from 2,000 to 8,000 feet on the slopes of the equatorial Andes; and *pallidior*, with vertical distribution very similar to the last, in the Andes of southern Bolivia and Argentina. Others are far less adaptable, being (apparently) closely confined by environmental boundaries. *Tyleriana*, *aceramarcæ*, and *dryas*, living in the mountains, *simonsi* and *canescens*, semidesert dwellers, are examples which more or less demonstrate this point and furnish fairly reliable indexes of the climatic zones in which they live.

In general terms the distribution of the groups, later given in detail, is as follows: *elegans*, southern part of South America; *microtarsus*, widely distributed through the equatorial and subequatorial parts of South America, but not reaching Central America; *noctivaga*, somewhat as *microtarsus*, but primarily an Andean subtropical forest group; *murina* and *cinerea* groups, with nearly identical ranges—middle and northern South America and Central America. *Murina* ascends the mountains less, but reaches farther north than *cinerea* (to Mexico instead of Honduras).

No fossil evidence exists to show that the range of the genus ever extended beyond its present boundaries.

BIOLOGY AND ADAPTATIONS

So little is known concerning the life history of *Marmosa* that it is unsafe to generalize from scattered data which are often derived from widely distinct species. For this reason care has been taken to give the name of species upon which various observations have been made.

HABITS.—Primarily nocturnal, arboreal creatures, and fitted with perfectly adapted organs—grasping hands and feet and a prehensile tail—for this mode of life; certain forms are apparently becoming once more secondarily modified for a more terrestrial existence. This is most apparent in the *elegans* group, in which the feet are small, the claws reduced, tail shortened, and in most species the vibrissæ diminished in length. The *fuscata* section of the *noctivaga* group living in wet forest, where it is usually trapped under logs, appears also to be rather more terrestrial than the others. *Microtarsus*, to judge by Goeldi's remarks, is somewhat terrestrial, and its claws and feet are small. *Murina* and *cinerea* groups, particularly the latter, are essentially arboreal, being as a rule more easily taken in traps tied to "sipos" and vines than in those placed on the ground.

RELATION OF COLOR TO ENVIRONMENT.—Species and groups of species must be considered separately in this respect. Members of the *cinerea* group are abundant in forest and particularly in gallery woods bordering rivers. They are usually gray, but may be tinged with brown. The *murina* group, while primarily comprising cinnamon-colored scandent forms living in tropical forest, has offshoots which have acquired color modifications in response to desert or semidesert environments. Thus the *canescens* section of Yucatan and western Mexico and *simonsi* of the dry parts of Ecuador and northwestern Peru are gray animals. The latter species is very common among the xerophytic shrubbery of the island of Puna and makes well-marked runways among the fringing herbage of the brackish water "esteros" near Guayaquil. Among the mountains of eastern Peru the small *quichua* is grayer when taken from dry valleys than it is when taken from humid. However, forms of *mitis*, when they occur in dry regions, merely present a paler color than the parent species and have whiter underparts (*mitis casta*).

The headquarters of the *noctivaga* group is without question in the humid Andean subtropics and tropics. Here the various species are nearly all dark brown, but *leucastra* and *ocellata* of Peru and Bolivia and *incana*, the representative of the group in eastern Brazil, are gray and apparently live in considerably drier climates.

The *microtarsus* group, too, has representatives with grayish pelage living under relatively dry conditions. These are *agilis beatrix* and *buenavistæ*.

The members of the *elegans* group of the southern half of South America are rarely colored other than gray, while accompanying the gray of their upperparts is a strong tendency to develop white underparts. A brown color appears in *venusta* and in *janetta*, but the ranges of these enter the forested slopes of eastern Bolivia; *velutina*, from Lagoa Santa, is apparently brownish also. The greater part of the country over which members of the *elegans* group range is pampa and chaco.

Food.—Beyond the general statement that *Marmosa* is insectivorous and frugivorous little can be said. Goeldi (1894) in his account of the "*pusillus*" (*microtarsus*), which he kept in captivity, says that he found the excrement composed "principally of hard remnants of insects and small Arthropoda,—elytra of beetles, legs and scales of butterflies and wings of flies." He taught his captives to eat meal worms.

In eastern Ecuador a large specimen of *noctivaga* was seen at night descending a vine in the forest head downward, carrying a very large *Phrynus* in its mouth. The attraction of ripe bananas for *Marmosa* is well known; and all forms (except perhaps the *microtarsus* group) come readily to traps baited with the "combination bait" used by collectors from the American Museum—a mixture of small particles of rolled oats, raisins, bacon, and peanut butter.

A specimen of *demararæ esmeraldæ* kept for a few days in a cage ate small pieces of meat and lapped up gravy from stews. It also drank condensed milk which had been thinned with water.

Breeding Season.—From one to three times a year. For convenience the available information has been tabulated, the month given being the month of capture of the specimen and the number in parenthesis representing the number of specimens. Unless a locality is stated, the region of characteristic distribution is implied.

Table to Show Breeding Seasons in *Marmosa*

	Breeding or Nursing	
	Females	Juveniles
Cinerea Group:		
demararæ demararæ	Sept. (1)	June (1), July (2) Aug. (1), Sept. (2) Jan. (1)
demararæ esmeraldæ	Oct. (1), Nov. (1), Jan. (1) Feb. (1), March (1)	Jan. (1)

demararæ meridæ	Sept. (2), Oct. (1), Jan. (1)	Jan. (1), July (1) Aug. (1)
alstoni alstoni		Aug. (1), Oct. (1)
alstoni nicaraguæ		June (1)
constantiæ constantiæ	Jan. (2)	April (1)
mapiriensis		April (5)
rapposa	Nov. (2), Dec. (1)	
germana germana	March (1)	
germana parda	Sept. (2), Oct. (2), Jan. (2) April (2)	Dec. (1)
phæa	May (1)	Aug. (1, Ecuador)
MURINA GROUP:		
murina murina	Feb. (1, Marajó)	Feb. (2, Marajó), July (2, Pernambuco)
murina muscula	June (2), Aug. (2)	March (1, Cayenne) June (1), Sept. (1)
murina klagesi	May (1)	June (2), Nov. (1)
murina duidæ	March (2)	Dec. (1)
murina maranii	Oct. (1)	
murina waterhousei	April (1, Zulia, Venezuela)	
rubra	March (2, San José), April (1, San José), Dec. (1, Curaray)	
tyleriana	Feb. (1)	Jan. (1)
quichua (northern)	July (2), Oct. (1)	Jan. (1), Feb. (1), May (2) June (1), July (1)
mitis mitis (Sta. Marta Mountains)	May (4), June (3), July (2)	May (1), June (1)
mitis mitis (Sta. Marta lowlands)	May (1), June (3), July (1), Aug. (1), Sept. (1)	Jan. (1), Aug. (8), Sept. (3)
mitis mitis (Mérida)		Jan. (1), Feb. (1), March (1), Dec. (3)
mitis fulviventer	May (1)	
mitis robinsoni	April (1, Sucre) July (1, Margarita)	July (1)
chapmani	April (3)	July (3)
ruatanica isthmica	Dec. (2), April (3) March (1)	Dec. (1, Darien) April (1, Gatun)
ruatanica mimetra		May (1), June (1) Sept. (1)
simonsi		April (1)
mexicana mexicana		Nov. (1), May (1)
mexicana mayensis		Nov. (1)
canescens canescens	Oct. (2)	Sept. (1)
canescens oaxacæ	Aug. (1)	

NOCTIVAGA GROUP:		
noctivaga noctivaga		Feb. (1, Ecuador), March (1, Ecuador), July (1), Jan. (1), June (5), Sept. (1)
noctivaga neglecta	Oct. (1)	
noctivaga polita	April (1, Ecuador) Jan. (1, Mánaos)	Oct. (1), Nov. (1), Dec. (2)
noctivaga keaysi	Jan. (1)	
yungasensis		May (2)
ocellata	Oct. (1)	
caucæ sobrina		March (2), April (1) Sept. (1)
caucæ caucæ		Dec. (1)
caucæ oroensis	Aug. (1)	Aug. (1)
caucæ madescens		June (3), Aug. (1)
fuscata	Oct. (1)	Jan. (1, Colombia)
MICROTARSUS GROUP:		
agilis buenavistæ		April (1), Dec. (1)
marica	Feb. (1), July (1)	Nov. (1), Dec. (1)
lepida lepida	March (1, Ecuador)	
lepida grandis	Jan. (1)	
juninensis	Nov. (1)	
ELEGANS GROUP:		
elegans elegans	Sept. (1)	Dec. (2)
janetta	March (1)	
venusta venusta	Feb. (1), Oct. (1)	Feb. (2), May (1, Lima)
venusta cinderella		March (15)

In most cases the information available is too scanty to form a basis for opinions regarding the times of breeding; but in a few species, such as *mitis mitis* and *noctivaga noctivaga*, the records are numerous enough to warrant some conclusions. In the former species there appear to be two seasons: one from May to September, with its peak in August; the other, probably a minor season, from December to March. *Noctivaga*, judging by the dates of capture of juveniles, has two well-marked seasons, from January to March, and again in June and July. Again, the dates of *quichua* suggest three broods a year. Most forms, however, especially those living in equatorial regions, do not have a definite period, but seem to breed more or less the year round, with perhaps two peaks, a greater and a lesser. In Mexico and Argentina and Chile, the northern and southern limits of the genus, the reproductive seasons tend to be more fixed. Thus *canescens* seems to breed from August to October, and *elegans* during the Argentine summer from September to March.

NUMBER OF YOUNG.—The number of young normally born is unknown. Very possibly a single ovulation may consist of many more

ova—and thus many more feti may be produced than can be nursed, as shown for *Didelphis* by Hartmann. In view of the fusion of tissues which is reported to occur between the lips of the young and the teat of the mother, it follows that the number of young nursed is strictly limited by the number of teats the mother possesses. The maximum number of teats, 9–1–9, is seen both in the *mitis* (*mitis robinsoni*) and *elegans* (*pallidior*) groups. All teats do not invariably become functional in *Marmosa*,—although all do so with fair frequency,—proving either that births in some cases comprise fewer embryos than there are teats, or that a number of the newborn are lost in journeying through the mother's fur in search of the mammæ. The fact that in some specimens all mammæ are functioning and each has a young one attached to it rather suggests that more than the mammary number of blind, seeking creatures may be born.

NESTS.—Few nests of *Marmosa* have been recorded. The animals have occasionally been discovered in disused birds' nests, but they probably construct domiciles for themselves of whatever soft and suitable material they can find. Briceño records on the labels of *mitis mitis*, *demararæ meridæ*, and *marica*, that they make nests "in trees." Thomas's collector, Sr. Budin, states of the "achocayas" of the Tucuman region that they live in holes in hillsides. The forest dwellers of the *noctivaga* group probably make their homes in cavities in old logs and under rocks.

Alfaro (1897) says of "*cinerea*" (*alstoni*) that it nests in the branches of trees near gullies. He describes the nest as an "agglomeration of green leaves." Of *mexicana* he says that it makes its nest by preference "in racemes of bananas . . . of leaves and dried skins of the same plant."

Gaumer (1917), speaking of *gaumeri*, states that it nests in trees and lines the nest with its own fur. Of *mayensis* he declares, "it does not build its own nest, but occupies those of birds and other animals. . . ."

Bruch (1917) describes nest-making by *pallidior* in captivity.

NATURAL ENEMIES.—Information in this respect is meager. Apart from possible parasitic disease, the principal agents controlling the numbers of *Marmosa* are probably owls. The predacious habits of these opossums and their behavior as nocturnal climbers probably protect them to a considerable extent from other predacious mammalians. Dr. G. M. Allen informs me that casts of owls of the genus *Pulsatrix* sometimes contain remains of *isthmica*. In Yucatan, Hatt found numerous fragments of *canescens* (*gaumeri*) in owl casts; and a specimen of

elegans from Concepcion, Chile, was discovered under similar circumstances.

ECONOMIC RELATIONS.—Although they have little effect on man and his activities, the species of *Marmosa* are probably to be considered beneficial. It is true that they will eat ripe fruit—bananas, etc., but they are primarily insectivorous. Briceño says on the labels of specimens of *demararæ meridæ* that it is readily tamed, and is frequently kept in cottages in the Mérida region where it "fills the office of a house-cat," killing off mice, cockroaches, etc.

Records are fairly numerous of *Marmosa*—apparently always the Central American *alstoni* and *mexicana*—discovered in shipments of bananas to the United States. The animals, which not infrequently have young attached to them, probably become comatose during their confinement in the cold storage rooms of ships where the bananas are green and insect food must naturally be torpid.

DIAGNOSIS OF THE GENUS

Size compared with most other *Didelphidæ* small. Fur soft and thick, short to rather long, or sometimes slightly woolly. Color cinnamon, fuscous, gray, or brown; a black ring around each eye, rarely almost absent. Ear large to moderate or small, rounded and nearly bare, the spina helicis and antitragus variously developed. Tail long or rather short, prehensile, the underside of the tip modified for grasping, a varying amount of the base clothed with body hair; scales of tail arranged either in spirals or in rings. Hind feet with fourth digit longest, and the shortest ones either the first and second or the first and fifth. Pads of hind feet six in number: two exterior, two interior, and two at the bases of the fingers between d.2 and d.3, and d.3 and d.4. The external pads may be united or separate. Almost no trace of syndactyly. Claws strong or quite small. No pouch. Mammæ either abdominal or abdominal and pectoral; not exceeding 9–1–9 = 19 in number.

Skull with brain case large and rounded; the maximum constriction, when developed, directly behind the postorbital process. Face relatively short, compared with *Didelphis*, long compared with *Notodelphis*. Interorbital region short. Sagittal crest rarely developed; supraorbital ridges and lambdoidal crest developed or absent. A postorbital process usually developed on zygoma. Palate posteriorly fenestrated, or almost entire; widest part of palate at posterior corner of M^3. Least breadth across pterygoid wings of alisphenoid narrow to rather wide; never so wide as in *Philander*. Glenoid fossæ well forward

on skull. Bullæ better developed than in *Didelphis;* no trace of inflation of petrosal as in *Dromiciops.* Paroccipital process incipient. Mandible with long symphysis; neither so slender as in *Glironia* nor so short and deep as in *Philander.*

Incisors small, subequal, the rows tending to be antero-posterior rather than transverse; canines small to moderate. Premolars sectorial, differentiated, the first small to very small, the second commonly larger than or rarely equal to the third. Molars of tuberculo-sectorial type—the primitive didelphid tooth form. In the mandible the incisors somewhat procumbent; canines of moderate size; premolars cutting; molars of characteristic didelphid form, with high, three-cusped trigonids in front and low talonids behind.

PHYLOGENY AND RELATION TO ALLIED GENERA

It is proposed to restrict the present brief discussion to the Didelphidæ proper. Attempts to reconstruct the history of the family must be based almost entirely upon evidence offered by structure and function in living genera, supplemented slightly by that supplied by the comparatively few known fossils. Quite reasonable inferences, based on analogy with other animals, may, however, be drawn from this same evidence—inferences as to methods of locomotion, as to the kind of food eaten and way of obtaining it, even as to temperament and psychology.

For practical purposes we may assume that evolution comes about through the operation of environment upon large or small mutations (natural selection or rejection). And also in the last analysis we must seek in environmental changes (climatic, etc.), no matter what the mechanism of mutation may be, the factors causing these same mutations. Thus environment must be thought of as the agent which not only induces evolutionary changes but guides and limits them. Perhaps if we could reconstruct past environments we would have in large part an answer to our problem, but what environmental vicissitudes the Didelphidæ have undergone in the various portions of their total range since Mesozoic time is largely problematical.

Viewing the Didelphidæ one is compelled to admit that some such thing as orthogenesis seems to have operated, even though he is unable to comprehend HOW. Certain definite trends, apparently developed in earliest times, seem to crop out repeatedly throughout didelphid history. Thus there appears to be a well-established tendency for the pouch to disappear, this sometimes accompanied by extension of the mammæ forward to the pectoral region; for the primitive arboreal (?) habitus to

give way to terrestrial or aquatic habitus, together with diminution of the prehensile nature of hands, feet, and tail; for development of a food-storage mechanism, seen in the incrassated tails of several southern genera. Whether such are parallelisms or indicate actual affinity between genera in which they occur is uncertain; but they may often be accompanied by seemingly unrelated changes in feeding habits (due to modification of jaw, teeth, palate, masticatory muscles, and general psychological disposition of the animals). Changes like the above go hand in hand with changes of environment and these in turn with alternations in the receptor organs, such as modification of the vibrissæ, external and internal ear, eye, etc.

As already stated, evolution seems to have worked on the Didelphidæ in certain well-defined directions. We do not definitely know that the earliest didelphids were pouched animals with the mammæ restricted to the inguinal region, but since living pouched forms are without pectoral mammæ and the incomplete marsupia of *Monodelphis*, *Marmosa*, and others seem to be relict structures, such may well have been the case. Similar inferences have been made when considering modifications seen in the hands, feet, and prehensile tail, the ear, eye, and vibrissæ, the skull, and dentition. Thus inferring, I have formulated the ancestral didelphid form shown at the base of the phylogenetic tree beyond.

Outstanding characters of some recent genera may now be briefly reviewed: In the Didelphidæ the relatively great size and weight of the genera *Didelphis*, *Metachirus*, *Chironectes*, and *Lutreolina*, coupled with retention of the pouch, are conceivably factors of importance in phylogeny. In addition the teeth, compared with those of *Glironia* and *Philander*, appear to be relatively primitive in structure. The specializations in *Chironectes* may all be considered to be associated with transference to an aquatic habitat and a changed diet; while in response to different stimuli the body and limbs of *Lutreolina* have become musteliform and its tail thickened at the base.

Turning now to animals in which the pouch has become rudimentary, one notes a general tendency to reduction in size and weight. *Marmosa*, by reason of its primitive dentition and other characters and arboreal habitat, appears to be least specialized, but, as will be seen in the course of the paper, it is really strongly differentiated, certain of its "groups" (*noctivaga*, *elegans*) being much more progressive than others (*cinerea*, *murina*). The five groups of *Marmosa*, in fact, would seem to have separated from each other back in late Tertiary time and, with the

exception perhaps of part of the *microtarsus* group, seem to be undergoing active speciation.

When Dr. J. A. Allen (1900*a*) united *Marmosa cinerea* with the smaller philandrine opossums under the name *Caluromys*, he outlined the following common characters: "*cinerea* agrees with the former (*Philander*) not only in external characters, as notably in the heavily furred basal portion of the tail, but also in the well-developed postorbital processes and in the absence of large vacuities in the posterior palate. . . ." Apparently, as pointed out by Thomas (American Naturalist, 1901, XXXV, p. 145), he did not take into consideration the highly modified jaw, short face, and specialized teeth of *Philander*, already indicated by Winge, characters which are not to be seen in the *cinerea* group of *Marmosa*. Disregarding size, there is admittedly a superficial likeness between *Philander* and *cinerea*, but the features mentioned above serve to separate them widely.

Glironia, which in certain respects resembles *Marmosa cinerea* even more closely than *Philander* does, is probably almost as widely separated from the *Marmosa* line. Among its peculiarities are the narrowed palate and subparallel tooth rows coupled with very widely expanded arches, secondary (?) enlargement of M^4, unusually great exposure of the lachrymal bone on the face, and shortening of the brain, expressed by the much shortened parietal bones. Its dentition is generally weak, an exceptional feature being the presence of a small diastema between i^4 and i^5. As to external features, the black ocular areas (of *Marmosa*) are enormously developed in *Glironia* to include all of the face but a narrow stripe; and the tail, although the distal inch or so of its underside is bare, bears body fur on its dorsal surface to the tip. The presence of fur on the tails of both *Glironia* and *Dromiciops* is probably to be regarded as secondary rather than primitive, being perhaps correlated with decrease in the use of the tail as a prehensile organ.

Dromiciops appears to be an exceedingly specialized form derived from ancestral *Marmosa* stock, in which the teeth are weak, reduced in size, the lower incisors procumbent in front, and the auditory region of the skull abnormally developed. In compensation for the very large middle ear region the external ear is quite small.

Notodelphis may have arisen from the same ancestral stock as the *elegans* group of *Marmosa* to which it conforms in general rather closely. The tail becomes similarly swollen in the winter. The animal has, however, become specialized with regard to food getting and food consumption, the skull and jaws being short and massive.

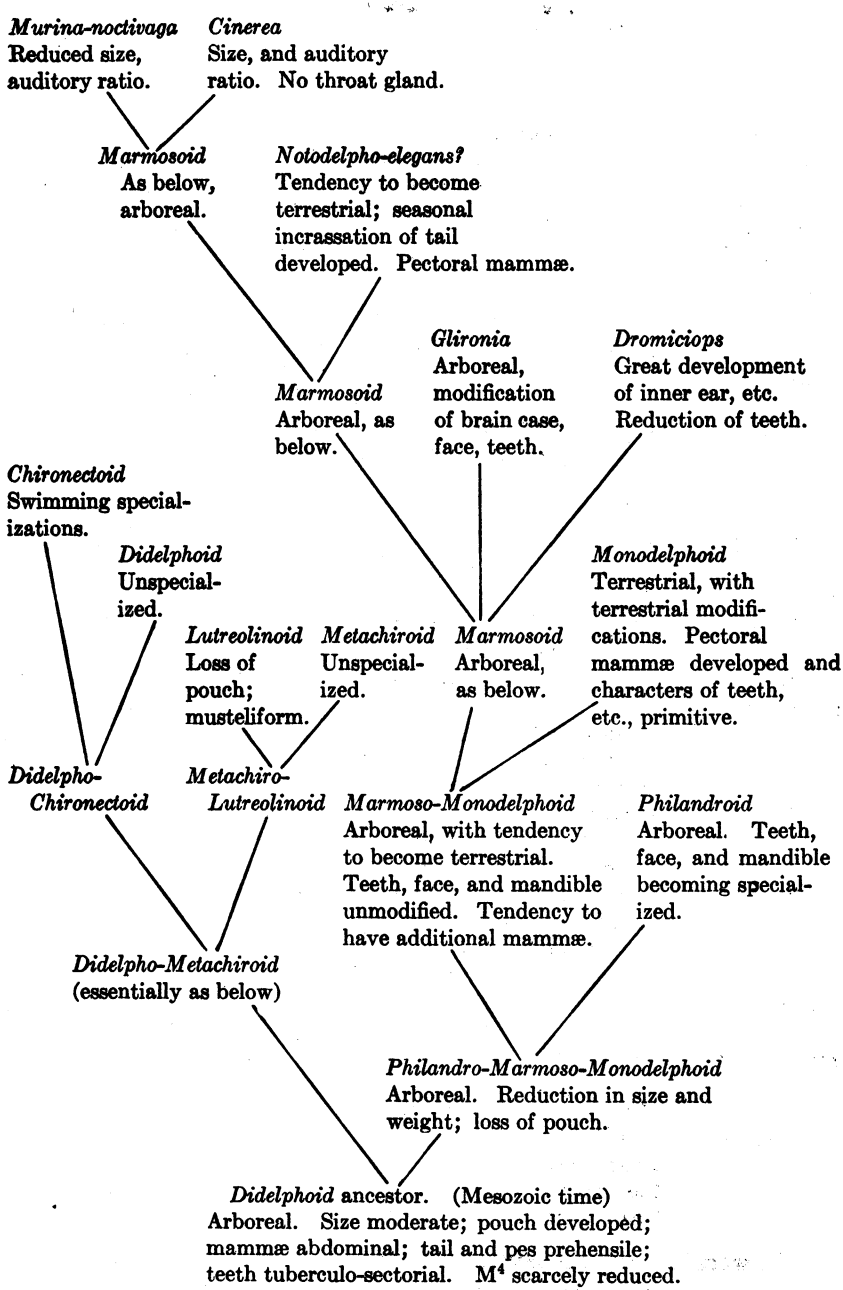
In cranial characters *Monodelphis* is, like *Marmosa*, very primitive; but the brain case is more tubular. It suggests a very old line which has long been made over for terrestrial instead of arboreal life.

Attempts to work out the phylogeny of the family have been numerous and were well summed up by Bensley (1903). Since that time further opinions have been expressed by Bensley (1906), based on upper stylar cusp patterns, and general reviews of the subject have been made by Gregory (1910 and 1920). These authors conclude with Winge (1893, 1923) that *Marmosa* is in general the most primitive living form of didelphid. Hill and Fraser (1925), after examining the female urogenital tracts of a number of opossums, remark (p. 209) on "the extremes of modification . . . . encountered within the limits of one genus, viz., *Marmosa*," suggesting *Marmosa murina*, as the most primitive species, which fact perhaps may be added to the diagnostic distinctions between the two groups of *Marmosa*, *cinerea*, and *murina*. In conclusion they find that *Marmosa* and *Monodelphis* are the most primitive genera of the Didelphidæ.

In offering the following phylogenetic tree of the Didelphidæ it will be seen that I have merely indicated the Mesozoic as the time when the hypothetical ancestor of the family lived, leaving out all suggestions of the horizons of succeeding changes. As regards the fossil Didelphidæ of Europe and America, I have gone over the descriptions, and it is my opinion that they can all be fitted into this classification. Finally it will be seen that I have placed principal emphasis upon

(1) Size of body and presence of pouch with restriction of mammæ to inguinal region, or the reverse
(2) Dental and mandibular changes in *Philander*
(3) Tendency of *Monodelphis* to become terrestrial
(4) The changes leading, respectively, to *Gironia* and *Dromiciops*
(5) A second radiation of semi-terrestrial forms resulting in the *elegans* group of *Marmosa* and (?) *Notodelphis*.

Perhaps the point should be made that, although I separate the heavy-bodied pouched genera very far down the tree, I do not suggest that their modern representatives are less advanced than are the recent species of *Marmosa* and *Monodelphis*. On the contrary, as already pointed out by many students, these last genera show proportionately many more primitive characters than do *Didelphis* and its allies.



Note.—*Microtarsus* group is omitted, but is derived from either *Murina-noctivaga* or *Notodelpho-elegans* branch.

FOSSIL MATERIAL

Fossil material attributable with certainty to the genus is known from only two regions: the caves of Lagoa Santa, Minas Geraes, where Lund secured the specimens upon which he and Winge based their well-known work; and the limestone caverns in Yucatan, recently (1929) visited by Mr. and Mrs. R. T. Hatt of The American Museum of Natural History.

Mr. Hatt's material, of all which appears referable to the living form *canescens* (*gaumeri* Osgood), together with the names of the caves in which it was found with approximate horizon, is listed as follows:

Hatt No. 2.—Actun Lara, Yocat. Surface pickings.
3 pairs mandibular rami.
2 left maxillæ showing characteristic palatal vacuities of *canescens*.
1 right frontal with supraorbital ridge.

Hatt No. 5.—Actun Lara, Yocat. 16″ to 20″ below surface. Potsherds present.
11 left mandibular rami.
7 right mandibular rami.

Hatt No. 7.—Actun Has, Yocat. Very recent, 2″ to 19″ below surface.
2 pairs mandibular rami (juvenile).

Hatt No. 11.—Loltun, 10 miles south of Oxcutzcab. Surface pickings. Nothing more than 4″ deep.
2 pieces of left mandibular ramus.
1 piece of right mandibular ramus.
1 piece left maxilla.

Hatt No. 12.—Actun Coyok, Oxcutzcab. All very recent. 2″ to 9″ below surface.
4 pairs mandibular rami.
1 fragment of right ramus.

Hatt No. 13.—As No. 12, but 10″ to 18″ below surface.
3 left mandibular rami.
2 right mandibular rami.

Hatt No. 15.—Actun Spukil, Calcehtok. 100 feet to 125 feet underground. Material taken from more or less solid breccia on and near surface. This was once a deep deposit. It contained no human midden and doubtless antedated the human occupation of Yucutan.
11 left mandibular rami.
7 right mandibular rami.

Hatt No. 16.—As No. 15, but surface sweepings.
2 right maxillæ.
1 left maxilla (broken).
1 pair mandibular rami.

In working out this cave material further comparisons, particularly with regard to the mandibular and maxillary parts of the skull, were made between *canescens* and *mexicana* and the following additional distinctive characters brought out:

Both upper and lower incisors are larger and the crowns more spatulate in *canescens* than in *mexicana*.

A small diastema between I_4 and C is often present in *canescens* but absent in *mexicana*.

The lower canine is relatively low and thick in *canescens* but higher and more slender in *mexicana*.

P_3 in *mexicana* is relatively long (antero-posteriorly) and low, in *canescens* shorter and higher. This is a rather uncertain character.

The crown of M^1 in *mexicana* forms a proportionately long narrow triangle, in *canescens* it is short and wide. A good character.

Posterior margin of ascending ramus excavated in *canescens* to a greater degree than in *mexicana*.

Palate in *canescens* with additional vacuities described under the *canescens* section beyond, in *mexicana* lacking such openings.

Just as in the case of the Yucatan caverns, those of Minas Geraes contain recent deposits, including *cinerea*, *incana*, and probably *microtarsus* and *agilis*. In naming the fossil forms Lund employed the prefix *affinis*, i.e., *affinis-incanæ*. Lund's material has not been examined for the present paper.

Search through Ameghino's descriptions of Didelphidæ from Argentina reveals only three species which may possibly be referred to *Marmosa*. These are *incerta*, *juga*, and *grandæva*, all of which come from the Pampean of Cordoba in the heart of the present distributional area of the *elegans* group. Each species is based upon a single mandibular ramus (two imperfect), so that practically no characters distinctive of the groups of *Marmosa* can be compared. Even though his descriptions do not tally with living specimens and though his figures are not sufficiently detailed for visual comparison to be of value, since the Pampean is by general concensus of opinion held to be Pleistocene rather than Pliocene, as stated by Ameghino, it seems not unreasonable to suppose that of these remains *incerta* may be directly ancestral to the present *elegans* group. Describing *incerta* Ameghino says, "P_3 is no smaller than P_2 (translation)—an *elegans* character. And in his enlarged drawing, Pl. I, fig. 24a, P_1 is proportionately far too large, but this may be an inaccuracy. *Juga* and *grandæva* are both larger than *marmota*, the largest living member of the group. They may be more nearly related to the *cinerea* group or to *Monodelphis*.

HISTORY AND NOMENCLATURE

MARMOSA Gray

1758. *Didelphis* LINNÆUS, 'Syst. Nat.,' 10th Ed., p. 54 (part).
1821. *Marmosa* GRAY, 'Lond. Med. Rep.,' p. 308. *Murina* shown as genotype.
1842. *Asagis* GLOGER, 'Handb. Naturg.,' I, p. 82.
1842. *Notagogus* GLOGER, 'Handb. Naturg.,' I, p. 82.
1842. *Micoureus* LESSON, 'Nouv. Tabl. Règne Anim., Mamm.,' p. 186 (part). Various Didelphidæ.
1843. *Thylamys* GRAY, 'List Mamm. Brit. Mus.,' p. 101. *Elegans* type by monotypy.
1854. *Grymæomys* BURMEISTER, 'Thiere Brasil,' I, p. 138. Brazilian forms of *Marmosa*.
1856. *Microdelphis* BURMEISTER, 'Erläut. zur Fauna Brasiliens,' p. 83. Includes *velutina*.
1900. *Caluromys* ALLEN, Bull. Amer. Mus. Nat. Hist., XIII, p. 189 (part). Combines the *cinerea* group with *Philander*.
1916. *Marmosops* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde Berlin, p. 262. Proposed to include part of the present *noctivaga* group. Type species *incana*.

The origin of the name *Marmosa* is obscure. Seba (1734) states, "les habitans du Brésil le nomment Marmosa." Earliest references to any *Marmosa* were probably: "Tai-ibi" (Marcgrave, 1648); "Cayopollin" (Hernandez, 1651); Merian, 1719.

As a generic name distinct from *Didelphis*, *Marmosa* dates from 1821, when J. E. Gray listed it as the second of the three genera which he admitted in his family Didelphidæ. The species, *Didelphis murina* Linnæus, placed by him after *Marmosa*, being the only species mentioned, is type of the genus by monotypy.

In 1842 appeared Gloger's two names, *Asagis* and *Notagogus*, for the "Cayopollin or back-bearers" (translation); later, in 1856 Burmeister erected the name *Grymæomys*, listing a number of species, including *murina*, as belonging in the genus. Thomas in 1888 effectively relegated the last three names to synonymy by designating *murina* as type for each.

Micoureus Lesson 1842, a generic name beneath which various didelphid species are listed (including *cinerea*), was accepted as a subgenus in 1888 by Thomas, who, apparently unaware at that date of Gray's *Marmosa*, 1821, designated *cinerea* as type and included in it also the species *murina*, *lepida*, *pusilla*, *grisea*, *velutina*, and *elegans*. However, in his discussion of Gloger's names (1895) he admits the priority of *Marmosa*.

Burmeister's inclusion in 1856 of *velutina* in his *Microdelphys* was obviously actuated by his belief that *velutina* was a member of the *Monodelphys* portion of the Didelphidæ rather than allied to *Marmosa*. In

1900 Allen stated the generic name *Philander* to be a synonym of *Didelphis* and renamed the genus *Caluromys*, with *Didelphis philander* Linnæus as type. His inclusion in *Caluromys* of *cinerea* and its allies seems not to have been justified (see p. 15).

Up to that date then only two names remain: *Marmosa*, for which characters were first given by Burmeister (1856) under its synonym *Grymæomys;* and *Micoureus*, rather briefly described by Thomas in 1888. Not only are the characters descriptive of one and the same genus, but the species listed under each are essentially the same:

Grymæomys Burmeister	*Micoureus*, Thomas
cinereus	*cinerea*
scapulatus	(treated as synonym of *cinerea*)
dorsiger	(treated as synonym of *murina*)
murinus	*murina*
impavidus	(treated as synonym of *murina*)
agilis	(treated as synonym of *pusilla* Thomas[1])
elegans	*elegans*
pusillus	
griseus	
incanus	*grisea*[2]

This shows rather clearly then that *Grymæomys* and *Micoureus* are synonyms and, since the former is a synonym of *Marmosa*, that both are synonyms of that genus.

Matschie (1916) attempts to revive *Micoureus*, with *laniger* as type, and adopts Allen's *Caluromys* with type *philander*. How he reaches this conclusion is not clear. His own words are: "In 1900 Allen [reference] proposed the name *Caluromys* for *Philander* [used in Burmeister's sense] of Thomas in his 'Catalogue of the Marsupialia'; this includes only animals either like *philander* or *lanigera*. Since the name *Micoureus* can only be used for the *lanigera* group, the name *Caluromys* remains for the *philander* group." (Translation.)

As has already been shown, *Micoureus* Lesson is a synonym of *Marmosa*. How then, can Matschie impute to it an entirely new significance, and propose *laniger* as its type (*op. cit.*, p. 269)?

Unfortunately he goes even further with *Caluromys* than Allen himself does, importing into it such unquestionably *murina*-like species as the first six of his list (*sinaloæ* to *gaumeri*), *simonsi*, *waterhousei*, and *musicola*.

He typifies his subgenus *Marmosa* by *murina* Linnæus, but includes therein *microtarsus* and also a number of animals which should have been referred to his subgenus *Marmosops*.

[1]*Pusilla* Thomas is shown now to have been *microtarsus*.
[2]Thomas's *grisea* is actually *incana* of Brazil.

Thomas's (1888) designated type *murina* for *Grymæomys* is ignored, and *pusilla* Desmarest (probably meaning *microtarsus*) is proposed instead. Obviously, from the identity of the six small species admitted, Matschie is attempting to use *Grymæomys* to contain the smaller cinnamon or grayish species corresponding to the "*microtarsus* group" of this paper.

In his subgenus *Marmosops* with designated type *incana* (p. 271) Matschie has included two forms, *chloe* and *klagesi*, which do not belong there and nine which do. On the other hand he has omitted several which ought to be included—*polita*, *impavida*, *neglecta*, *carri*, *keaysi*, and *purui*.

Finally he has expanded *Thylamys* just as Allen did to include a number of members of the *noctivaga* group. This misconception seems to have commenced with Allen's association in 1897 of *carri* from the island of Trinidad with *elegans* of Chile under the name *Thylamys*. Subsequently Allen referred *keaysi* and *caucæ* also to *Thylamys*.

Latterly Cabrera (1919) has treated *Marmosa* in 'Genera Mammalium.' He admits two subgenera, *Marmosa* and *Thylamys*. His species are compiled from literature and arranged in alphabetical order. Like Allen and Matschie he lists *carri* and *keaysi* under *Thylamys*, but he has returned *caucæ* to *Marmosa* (subgenus).

In conclusion, then, names valid for use as subgenera are *Marmosa* and *Thylamys*. *Marmosops* Matschie, with type *incana*, might be used for the *noctivaga* group. *Micoureus* Lesson, with type by subsequent designation (Thomas, 1888) *cinerea*, might reasonably be employed for the *cinerea* group. But *Grymaeomys*, due to the designation by Thomas (1888) of *murina* as type could not serve for the *microtarsus* group, which in any case is only doubtfully monophyletic. In the present instance the reason for avoiding subgeneric names and for the use of "groups" instead is found in the still rather uncertain relationships of the principal divisions of *Marmosa* and in the writer's conjecture that in spite of certain structural divergence *Marmosa* is a "good," natural genus of didelphids. And there is always a chance that subgenera may be later converted into full genera, and thus, in the case of *Marmosa* the undoubted unity of the genus be obscured.

Not less than 100 specific or subspecific names have been applied to animals referable to the genus *Marmosa*. A brief statement of the history and present status of each follows. Forty-two names of animals previously treated as full species are reduced to subspecies, synonyms, *nomina nuda* or *nomina indeterminata*. Nine new species and 17 new

subspecies have been erected.[1] The total number of full species now recognized is 49, which comprises a total of 100 named and recognizable forms as follows:

cinerea group	11	species,	19	subspecies
murina group	10	"	27	"
microtarsus group	10	"	16	"
noctivaga group	10	"	24	"
elegans group	8	"	14	"

Agilis (*Grymæomys*) BURMEISTER, 1854, 'Thiere Brasil,' I, p. 139. This is the first valid name applied to the dull brownish members of the *microtarsus* group from eastern Paraguay, Minas Geraes, and southeast Brazil (Ypanema).

Alstoni (*Caluromys*) ALLEN, 1900, Bull. Amer. Mus. Nat. Hist., XIII, p. 189. Applied to the long-haired gray *Marmosa* of Costa Rican and northwestern Colombian subtropics. These were formerly referred to *cinerea*.

Beatrix (*Marmosa*) THOMAS, (1910*a*), Ann. Mag. Nat. Hist., (8) VI, p. 502. The only name applied to the small, long-tailed member of the *microtarsus* group from *Ceará*.

Bombascaræ (*Marmosa*) ANTHONY, March, 1922, Amer. Mus. Novitates, No. 32, p. 5. Type locality, Zamora, near Gualaquiza, Ecuador. Considered here synonymous with *murina waterhousei*.

Bruchi (*Marmosa*) THOMAS, 1921, Ann. Mag. Nat. Hist., (9) VII, p. 519. The only name applied to one of the smaller members of the *elegans* group. From San Luis, Argentina.

Budini (*Marmosa*) THOMAS, 1919*a*, Ann. Mag. Nat. Hist., (9) V, p. 195. The only name for a specimen of the gray, or *cinerea* group of *Marmosa* from northern Argentina. Now treated as subspecies of *constantiæ*.

Canescens (*Didelphis* (*Micoureus*)) ALLEN, 1893, Bull. Amer. Mus. Nat. Hist., V, p. 235. Small gray species of the *murina* group, from Tehuantepec, Mexico. Earlier referred by Allen to *murina*.

Carri (*Thylamys*) ALLEN AND CHAPMAN, 1897, Bull. Amer. Mus. Nat. Hist., IX, Art. 11, p. 27. The only name of this member of the *fuscata* section of the *noctivaga* group. Known only from *Trinidad*. Included by Allen in *Thylamys* because of similarly narrowed skull and unexpanded nasals.

Casta (*Marmosa mitis*) THOMAS, 1911*a*, Ann. Mag. Nat. Hist., (8) VII, p. 516. A name applied to members of *murina* group, with clear, creamy white underparts. From Carabobo, Venezuela. Osgood refers to two specimens from farther west (Zulia) as *pallidiventris*.

Caucæ (*Marmosa*) THOMAS, 1900, Ann. Mag. Nat. Hist., (7) V, p. 221. The name of the member of the full species to which its name is now applied which occurs farthest north. A number of subspecies extend as far as Peru. Type of *caucæ caucæ* from Rio Cauca region, Colombia. Belongs in *noctivaga* group.

Cayopollin (*Didelphis*) SCHREBER, 1778, 'Säugeth.,' III, p. 544. A name used by Hernandez (Mexico). Not identifiable, but probably a member of the *murina* group (possibly *mexicana*).

Celicæ (*Marmosa*) ANTHONY, 1922, Amer. Mus. Novitates, No. 32, p. 4. Subspecies of the species *caucæ*. Not distinguishable in series from *caucæ oroensis*, with which it is here synonymized. *Oroensis* from relatively high (6700 feet), *celicæ* from

[1]Published in 1932 (Tate, Amer. Mus. Novit. No. 493). Not included in the list which follows.

relatively low (2000 feet upward) on the Andean slopes of the Provinces of El Oro and Loja, Ecuador. Member of *noctivaga* group.

Chapmani (*Marmosa*) ALLEN, 1900*a*, Bull. Amer. Mus. Nat. Hist., VIII, p. 197. A name for the Trinidad animal allied to *mitis*, and member of *murina* group. Includes *grenadæ* and *tobagi* as synonyms. Formerly referred to *murina*.

Chloe (*Marmosa*) THOMAS, 1907, Ann. Mag. Nat. Hist., (7) XX, p. 167. Name of form from Rio Demarara considered here to be synonymous with *muscula* CABANIS of British Guiana which is a subspecies of *murina*.

Cinderella (*Marmosa elegans*) THOMAS, 1902*a*, Ann. Mag. Nat. Hist., (7) X, pp. 159, 161. The name of a lowland representative from Tucuman of the full species *venusta*.

Cinerea (*Didelphis*) TEMMINCK, 1824, 'Monogr. Mamm.,' I, p. 46. Name based upon specimen collected by Wied at the Rio Mucuri. Considered now to be that member of the *cinerea* group which occurs in eastern Brazil from Rio de Janeiro northward. *Cinerea* was formerly applied indiscriminately to almost any member of the group.

Citella (*Marmosa*) THOMAS, 1912, Ann. Mag. Nat. Hist., (8) IX, p. 409. A name proposed to include the form occurring in Goya, Corrientes, Argentina, and nearby. Here treated as a synonym of *pusilla*.

Collega (*Marmosa*) THOMAS, 1920, Ann. Mag. Nat. Hist., (9) VI, p. 281. A name applied to a single specimen collected by Fraulein Snethlage at Villa Braga, on the Rio Tapajoz, Brazil. Very nearly allied to *noctivaga* and *polita*. Represents the farthest known extent eastward of the species *noctivaga*.

Constantiæ (*Marmosa*) THOMAS, 1904*a*, Proc. Zool. Soc. London, II, p. 243. Name given to the (at that time) unique specimen from Chapada, Matto Grosso. A member of the *cinerea* group inhabiting Matto Grosso and the foothills of eastern Bolivia (Sta. Cruz). Only subspecifically distinct from *budini*.

Demararæ (*Marmosa cinerea*) THOMAS, 1905, Ann. Mag. Nat. Hist., (7) XVI, p. 313. Name applied by Thomas to Guiana member of the *cinerea* group from Comaccka. Raised now to full species and contains four subspecies. Nearest ally *cinerea*.

Domina (*Marmosa*) THOMAS, 1920, Ann. Mag. Nat. Hist., (9) VI, p. 280. A name given to the two specimens collected by Miss Snethlage from the Rio Tapajoz. Treated as a full species whose nearest ally is *germana*. It is the form with short tail-base, occupying Middle and Lower Amazonia. Member of *cinerea* group.

Dorothea (*Marmosa*) THOMAS, 1911*a*, Ann. Mag. Nat. Hist., (8) VII, p. 516. Described from two females from 2000 feet and 7000 feet, respectively, on the eastern slopes of the Cordillera Real, Bolivia. Type from Solocame, 7000 feet. Probably a red phase of *keaysi*. Member of the *noctivaga* group.

Dorsigera (*Didelphis*) LINNÆUS, (1758), 'Syst. Nat.,' 10th Ed., p. 55. Unidentifiable. The so-called type is a mounted specimen in the British Museum. It was prepared from alcohol, having been formerly one of the Lidth de Jeude collection from Holland. Probably a synonym of *murina*.

Dryas (*Marmosa*) THOMAS, 1898, Ann. Mag. Nat. Hist., (7) I, p. 456. Name applied to a small temperate forest form from near Mérida, belonging to the *microtarsus* group.

Elegans (*Didelphis*) WATERHOUSE, (1839), 'Zool. Voy. Beagle,' p. 95. The Chilean member of the group to which its name is applied. All forms from the high-

lands of Bolivia and Peru or east of the Andes are treated as specifically distinct. The *elegans* of Lund from eastern Brazil may have been *incana* or else *velutina*.

Emiliæ (*Marmosa*) THOMAS, 1909, Ann. Mag. Nat. Hist., (8) III, p. 379. Name applied to the long-tailed member of the *microtarsus* group from Pará.

Formosa (*Marmosa*) SHAMEL, 1930*a*, Journ. Mammalogy, XI, p. 311. Name proposed by Shamel to replace his name *muscula* preoccupied by *musculus* Cabanis. Type from Formosa, Argentina.

Fulviventer (*Marmosa*) BANGS, 1901, American Naturalist, XXXV, No. 416, p. 632. Only name applied to the form from Saboga Island, now thought a subspecies of *mitis*, member of *murina* group.

Fuscata (*Marmosa*) THOMAS, 1896, Ann. Mag. Nat. Hist., (7) XIV, p. 313. Name of species inhabiting the rain forests of the north Columbian and Venezuelan Andes, between 3500 feet and about 8000 feet. Type from the Rio Albarregas, near Mérida. Member of *noctivaga* group. The Colombian specimens were distinguished by Thomas as *perfusca*.

Gaumeri (*Marmosa*) OSGOOD, 1913, Proc. Biol. Soc. Washington, XXVI, p. 175. Name applied to Yucatan animals now considered inseparable from *canescens canescens*, member of *murina* group.

Germana (*Marmosa*) THOMAS, 1904, Ann. Mag. Nat. Hist., (7) XIII, p. 143. Name of a species, belonging to the *cinerea* group, extending from middle eastern Peru to northeastern Ecuador. Specimens of *germana* have often been determined as *waterhousei*, owing to a misconception as to what the animal described by Tomes really was. The subspecies, *germana germana*, is local in eastern Ecuador.

Grenadæ (*Marmosa*) THOMAS, 1911*a*, Ann. Mag. Nat. Hist., (8) VII, p. 514. Name applied to members of *murina* group in Grenada. Synonym of *chapmani*.

Grisea (*Didelphis*) DESMAREST, (1827), 'Dict. Science Natur.,' XLVII, p. 393. Name applied to the "micouré quatrième" or "micouré à longue queue" of Azara. Antedated by *marmota* of Oken. The *grisea* of Winge and other authors whose specimens came from Minas Geraes and southeast Brazil is *incana*.

Guianensis (*Didelphis*) KERR, (1792), 'Linn. Animal Kingdom,' p. 194. Unidentifiable. Probably some form of *murina*.

Hortensis (*Didelphys*) REID, 1837, Proc. Zool. Soc. London, p. 4. *Nomen nudum* based upon a specimen of *elegans*.

Impavida (*Didelphis*) TSCHUDI, 1844–1846, 'Fauna Peruana,' p. 148. What Tschudi meant by *impavida* cannot now be determined with certainty. F.M.N.H. 20782, young male with permanent $P\frac{3}{3}$ not yet fully in place, which was taken at San Ramon, 2900 feet, near the Rio Vitoc, is suggested by Osgood as representing *impavida*. It seems, however, to be a young *n. noctivaga* with rather more white on the underparts than usual. The teeth match *n. noctivaga* exactly. Tschudi's description also suggests *yungasensis* from Bolivia, which has broadly white underparts, and it serves equally well for M.C.Z. 17056 from near Perico, here referred to *leucastra*, Marañón Valley.

Incana (*Didelphis*) LUND, 1841, Det. K. Danske, Vidensk. Selskabs. Abs. Afh., VIII, p. 237. Name given by Lund to the gray member of the *noctivaga* group in eastern Brazil. Two skins collected by Lund, Copenhagen 224 and 223, are still in existence. Neither is marked with a locality, but Lund's name is on each as the collector. The large male (224) is here proposed lectotype for the species.

Insularis (*Marmosa*) MERRIAM, 1898, Proc. Biol. Soc. Washington, XII, p. 14. Only name given to the *Marmosa* of Tres Marias Islands. Closely allied to and here treated as a subspecies of *canescens* of the mainland.

Invicta (*Marmosa*) GOLDMAN, Feb., 1912, Smithsonian Mis. Coll., LVI, No. 36, p. 1. Name of a member of the *fuscata* section, known from only two specimens, male and female, from the Darien of Panama, collected by the describer.

Isthmica (*Marmosa*) GOLDMAN, 1912, Smithsonian Misc. Coll., LVI, No. 36, p. 1. Name proposed for the large, cinnamon *Marmosa* of Gatun. Considered only subspecifically distinct from *ruatanica* and *mimetra*. The name now stands as *ruatanica isthmica*. Although somewhat intermediate, *ruatanica* is considered a member of the *mitis* section rather than of *mexicana* (Goldman placed *isthmica* as a subspecies of *mexicana*).

Klagesi (*Marmosa*) ALLEN, 1900, Bull. Amer. Mus. Nat. Hist., VIII, p. 198. Name of a subspecies of *murina* from Lower Orinoco.

Keaysi (*Thylamys*) J. A. ALLEN, 1900*a*, Bull. Amer. Mus. Nat. Hist., VIII, p. 198. Name given to the southern representative of *noctivaga* in Peru. Distinguished chiefly by its smaller molar teeth.

Janetta (*Marmosa*) THOMAS, 1926, Ann. Mag. Nat. Hist., (9) XVII, p. 327. Name of a Bolivian member of the *elegans* group closely allied to *marmota* of Paraguay.

Lepida (*Didelphis*) THOMAS, 1888, Ann. Mag. Nat. Hist., (6) I, p. 158. Name of a member of *microtarsus* group found in the eastern parts of Peru, Bolivia, and Ecuador, and, with no intervening record, in Dutch Guiana.

Leucastra (*Marmosa*) THOMAS, 1927*b*, Ann. Mag. Nat. Hist., (9) XX, p. 607. Name of a pale-colored member of the *noctivaga* section, apparently confined to the dry valley of the Marañón, Peru.

Limæ (*Marmosa*) THOMAS, 1920, Ann. Mag. Nat. Hist., (9) VI, p. 282. Name of a small member of the *cinerea* group allied to *cinerea* and *demararæ* from Ceará.

Lugenda (*Marmosa noctivaga*) THOMAS, 1927, Ann. Mag. Nat. Hist., (9) XIX, p. 373. Name applied to an unusually dark phase of *noctivaga* apparently peculiar to the rain forests of the eastern Andes of northern Peru and southern Ecuador.

Macrotarsus (*Didelphis*) WAGNER, (1842), Archiv für Naturgeschichte, VIII, p. 359. Name given to the *murina*-like specimen collected by Natterer at the Rio Madeira. Shown by Cabrera to be a preoccupied name, and *madeirensis* proposed instead.

Madeirensis (*Marmosa*) CABRERA, (1913), Trab. Mus. Nac. de Cien. Nat., Madrid., Zool. Ser., No. 9., p. 12. New name proposed for *macrotarsus* of Wagner. A subspecies of *murina* from the region of the Rio Madeira.

Madescens (*Marmosa*) OSGOOD, 1913*a*, Field Mus. Nat. Hist., X, p. 94. Name of the Peruvian mountain-inhabiting representative of the species *caucæ* of Colombia and northern Ecuador. Member of the *noctivaga* group.

Maranii (*Marmosa*) THOMAS, 1924*a*, Ann. Mag. Nat. Hist., (9) XIII, p. 537. Name of a *Marmosa* from Rio Marañón, considered at first by Thomas to be allied to *germana*. It was later referred by him to *waterhousei* and synonymized with that form. The name is revived here as *murina maranii* to contain the tropical gray-brown forms from the lowlands of eastern Ecuador, while *waterhousei* expresses the more cinnamon-colored dwellers of the foothills.

Marmota (*Didelphis*) OKEN, 1816, Lehrbuch d. Naturg. Zool., II, p. 1140. Name given by Oken to Azara's micouré à queue longue. Antedates *grisea* Desmarest, which was applied to the same animal. Member of the *elegans* group.

Marica (*Marmosa*) THOMAS, 1898, Ann. Mag. Nat. Hist., (7) I, p. 455. Name of a member of the *microtarsus* group from the subtropics of Venezuela near Mérida.

Mayensis (*Marmosa*) OSGOOD, 1913, Proc. Biol. Soc. Washington, XXVI, p. 176. Only name of the form of *mexicana* occurring in Yucatan. Retained somewhat doubtfully as a subspecies of *mexicana*.

Mexicana (*Marmosa murina*) MERRIAM, 1897, Proc. Biol. Soc. Washington, II, p. 44. Name of the small, cinnamon member of the *murina* group found from Mexico southward through most of Central America. Formerly referred to *murina*. Possibly the original *cayopollin*.

Microtarsus (*Didelphis*) WAGNER, (1842), Archiv für Naturgeschichte, VIII, p. 359. Name of the small cinnamon opossum with long, soft, shaggy fur and long overhairs from southeastern Brazil. Type locality Ypanema. Collected by Natterer.

Mimetra (*Marmosa*) THOMAS, 1921, Ann. Mag. Nat. Hist., (9) VII, p. 521. Name of a member of the *murina* group in western Ecuador, closely allied to *isthmica* and *ruatanica* and here considered a subspecies of the latter.

Mitis (*Marmosa*) BANGS, 1898*a*, Proc. Biol. Soc. Washington, XII, p. 162. Name of member of *murina* group described from Pueblo Viejo, Sta. Marta, which includes numerous subspecies and ranges along the northern mountainous parts of Venezuela and westward into Colombia.

Murina (*Didelphis*) LINNÆUS, (1758), 'Syst. Nat.,' 10th Ed., p. 55. Name originated by Seba. Genotype of *Marmosa* GRAY. The cinnamon to grayish-brown, medium-sized *murina* of the Amazonian and southern Orinoco regions. Various places have been suggested as type locality for *murina*.

Musculus (*Didelphis*) CABANIS, 1848, Schomburgk: 'Reisen British Guiana,' III, p. 778. Name of a juvenile skin and skull collected by Schomburgk. In the Berlin Museum. It is a subspecies of *murina* and here held to be synonymous with *chloe*.

Muscula (*Marmosa*) SHAMEL, 1930, Journ. Wash. Acad. of Sci., XX, p. 83. New name proposed for a very small member of *elegans* group from Formosa, Argentina, but found to be preoccupied by Cabanis's *Didelphis musculus*. Subsequently the name *formosa* proposed instead.

Musicola (*Marmosa*) OSGOOD, 1913*a*, Field Mus. Nat. Hist., X, p. 95. Name given to the northern representatives of *quichua* in Peru. Considered now synonymous with *quichua*.

Nana (*Didelphis*) ILLIGER, 1811 (1815), Abhandl. Akad. Berlin, p. 107. A *nomen nudum*. But *nana* OKEN, Lehrbuch d. Naturg. Zool., 1816, II, p. 1140 is based upon Azara's micouré nain, and consequently is a direct synonym of *pusillus* DESMAREST, which was applied to the same description.

Neglecta (*Marmosa impavida*) OSGOOD, 1915, Field Mus. Nat. Hist., X, p. 187. Name of a reddish form based upon three females from Yurimaguas, Rio Huallaga. Provisionally retained here as a subspecies of *noctivaga*.

Nesaea (*Marmosa*) THOMAS, 1911*a*, Ann. Mag. Nat. Hist., (8) VII, p. 515. Name of the *murina*-like species in Trinidad. A synonym of *chapmani*.

Nicaraguæ (*Marmosa cinerea*) THOMAS, Sept., 1905, Ann. Mag. Nat. Hist., (7) XVI, p. 313. Name given to a member of *cinerea* group from lowlands of Nicaragua, treated here as subspecies and lowland representative of *alstoni*.

Noctivaga (*Didelphis*) TSCHUDI, 1844–1846, 'Fauna Peruana,' p. 148. Name proposed by Tschudi accompanied by description and illustration. At first considered

by Thomas to be a member of the *cinerea* group, but later found by that authority to be the narrow-skulled species discussed in this paper.

Oaxacæ (*Marmosa*) MERRIAM, 1897, Proc. Biol. Soc. Washington, II, p. 43. Name of mountain form belonging in *murina* group, treated here as subspecies of *canescens*.

Oroensis (*Marmosa*) ANTHONY, 1922, Amer. Mus. Novitates, No. 32, p. 3. Name proposed for a rather pale member of the species *caucæ* from southern Ecuador, Pacific side of the Andes.

Pallidior (*Marmosa elegans*) THOMAS, 1902*a*, Ann. Mag. Nat. Hist., (7) X, p. 161. Name of the white-bellied member of the *elegans* group in Bolivia and Argentina. Originally described as a subspecies of *elegans*. Here treated as a full species.

Pallidiventris (*Marmosa mitis*) OSGOOD, 1912, Field Mus. Nat. Hist., X, p. 39. Name given to pallid forms of *mitis* in Prov. of Zulia. Considered synonymous with *Marmosa mitis casta* THOMAS.

Parata (*Marmosa*) THOMAS, 1911*a*, Ann. Mag. Nat. Hist., (8) VII, p. 517. Name of a member of *murina* group, now made synonym of *murina murina*.

Perfusca (*Marmosa*) THOMAS, 1924, Ann. Mag. Nat. Hist., (9) XIII, p. 236. Name of the representative of *fuscata* in the Bogotá region of Colombia. Not considered sufficiently distinct to be retained as a subspecies.

Perplexa (*Marmosa*) ANTHONY, 1922, Amer. Mus. Novitates, No. 32, p. 3. Name of a specimen of the *cinerea* group from southwest Ecuador. Considered pathological and not distinct from *phæa*.

Phæa (*Marmosa*) THOMAS, 1899, Ann. Mag. Nat. Hist., (7) III, p. 44. Name of small, subtropical member of *cinerea* group of western Colombia and western Ecuador. Specimens from southern part of range named *perplexa* Anthony.

Pimelura (*Didelphis*) REINHARDT, (1849), Vidensk. Medd., p. 5. A synonym of *velutina* LUND.

Polita (*Marmosa*) CABRERA, 1913, Trab. Mus. Cien. Nat., Madrid, Zool. Ser., No. 9, p. 10. Cabrera's animal from the Rio Coca, eastern Ecuador, is unquestionably the same as the long series in the collection of the American Museum from various places on the Napo drainage. It is only subspecifically distinct from *noctivaga*.

Purui (*Marmosa*) MILLER, 1913, Proc. Biol. Soc. Wash., XXVI, p. 31. A name given to a subspecies of *caucæ*, member of *noctivaga* group, from the Rio Purus.

Pusilla (*Didelphis*) DESMAREST, (1804), 'Nouv. Dict. d'Hist. Nat., XXIV, p. 19. A name created for Azara's micouré nain, which from the description must have been a gray animal allied to *marmota*. For some time applied to the small brown members of *microtarsus* group. *Citella* is here considered a synonym of *pusilla*.

Quichua (*Marmosa*) THOMAS, 1899, Ann. Mag. Nat. Hist., (7) III, p. 43. Name of the small grayish member of the *murina* group occurring in the subtropics of eastern Peru. *Musicola* Osgood is held to be a synonym of *quichua*.

Rapposa (*Marmosa*) THOMAS, 1899, Ann. Mag. Nat. Hist., (7) III, p. 42. Name of a member of the *cinerea* group found in the mountains of eastern Peru, nearly allied to *germana* and *constantiæ*.

Regina (*Marmosa*) THOMAS, 1898*a*, Ann. Mag. Nat. Hist., (7) II, p. 274. Name given to a member of the *cinerea* group allied to *germana*, found in Cundinamarca, Colombia.

Robinsoni (*Marmosa*) BANGS, 1898, Proc. Biol. Soc. Washington, XII, p. 95. Originally described as a full species from Margarita Island. Specimens from the

nearby mainland (Prov. Sucre, Venezuela) are now referred to it, and the form is considered a subspecies of *mitis* and of the *murina* group.

Ruatanica (*Marmosa*) GOLDMAN, 1911, Proc. Biol. Soc. Washington, XXIV, p. 237. Name of a form closely allied to *isthmica* and *mimetra*, the two latter being considered subspecies of it. A member of the *murina* group.

Rutteri (*Marmosa*) THOMAS, 1924*a*, Ann. Mag. Nat. Hist., (9) XIII, p. 536. Name of a *Marmosa* described from the lower Rio Marañón, Peru. Ranges through the lowlands as subspecies of *germana*, member of the *cinerea* group.

Savannarum (*Marmosa murina*) GOLDMAN, 1917, Proc. Biol. Soc. Washington, XXX, p. 108. Considered by Goldman to be distinct from *mexicana*, but other animals from the same region lack the sharply defined white breast patch, upon which it is based. Here made a synonym of *mexicana*.

Scapulatus (*Grymæomys*) BURMEISTER, (1856), 'Erläut. zur Fauna Brasiliens,' Berlin, p. 79. The type alone represents this rather specialized animal from Minas Geraes. Member of the *incana* section of the *noctivaga* group.

Simonsi (*Marmosa*) THOMAS, Ann. Mag. Nat. Hist., 1899*b*, (7) IV, p. 287. Name of a member of the *murina* group from arid western Ecuador, allied to *mitis*.

Sinaloæ (*Marmosa*) ALLEN, 1898, Bull. Amer. Mus. Nat. Hist., X, p. 143. Name of a member of the *murina* group from *Sinaloa*, Mexico, now considered a subspecies of *canescens*.

Sobrina (*Marmosa*) THOMAS, 1913*a*, Ann. Mag. Nat. Hist., (8) XII, p. 573. Name based upon two specimens from the rain forests of western Ecuador. Treated now as a subspecies of *caucæ*, member of *noctivaga* group.

Soricina (*Didelphis*) R. A. PHILIPPI, (1894), Arch. für Naturg., LX, 1, p. 36. Name of a form from Valdivia, Chile, referred variously to *Peramys* by Trouessart, and to *Dromiciops* by Matschie. *Soricina* is considered by Osgood to be a subspecies of *elegans*.

Sponsoria (*Marmosa elegans*) THOMAS, 1921*a*, Ann. Mag. Nat. Hist., (9) VII, p. 186. Name of a member of the *elegans* group, now treated as a subspecies of *venusta*, which is raised to full specific rank.

Tobagi (*Marmosa*) THOMAS, 1911*a*, Ann. Mag. Nat. Hist., (8) VII, p. 515. Name of a *murina*-like form from Tobago. Synonym of *chapmani*.

Velutina (*Didelphis*) WAGNER, (1842), Archiv für Naturgeschichte, VIII, p. 360. Name of the short-tailed member of the *elegans* group from Ypanema and Minas Geraes. Has been synonymized with *incana* Lund (=*grisea* Winge), but the form is very distinct and unquestionably belongs in the *elegans* group.

Venusta (*Marmosa elegans*) THOMAS, 1902*a*, Ann. Mag. Nat. Hist., (7) X, pp. 159, 160. Name applied to grayish-bellied form from the mountains of eastern Bolivia, allied to *elegans*. Raised to full specific rank in the present paper.

Verax (*Marmosa*) THOMAS, 1921, Ann. Mag. Nat. Hist., (9) VII, p. 520. Used by Thomas to designate the smaller form of *marmota*-like opossum from west of the Rio Paraguay. Treated here as a subspecies of *marmota*.

Waterhousei (*Didelphis*) TOMES, (1860), Proc. Zool. Soc. London, p. 58. Name of subspecies of *murina* from east Andean foothills of Ecuador. For many years applied to *germana*, a member of the *cinerea* group. The *waterhousei* type is shown by a study of its skull to be really a member of the *murina* group. It is treated as a subspecies of *murina*.

Zeledoni (*Marmosa*) GOLDMAN, 1911, Proc. Biol. Soc. Washington, XXIV, p. 238. Name proposed for two specimens of *murina*-like *Marmosa* from Navarro, Costa Rica. Subsequently reduced by Goldman to a subspecies of *mexicana*, and so retained in this paper.

REMARKS CONCERNING PARTICULAR ORGANS OR STRUCTURES, WITH EXPLANATIONS OF TERMS

PELAGE.—Very few distinctions of major value are provided by the fur. The kinky appearance of the hair in the case of some members of the *cinerea* group and its often great extent along the basal part of the tail are relatively characteristic. In the *elegans* group the tricolor pattern is diagnostic. Color, too, can only be considered in generalities: thus, forms of *murina* and *microtarsus* are usually dull cinnamon; most members of the *noctivaga* group are dark fuscous-brown; while gray in various shades is the chief color present in both the *cinerea* and the *elegans* groups.

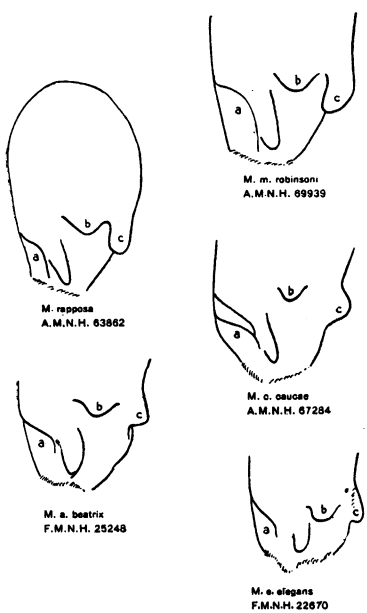


Fig. 1. Diagram of base of external ear in principal groups to show variation of spina helicis.
a, tragus; *b*, antihelix; *c*, spina helicis.

THROAT GLAND OR NECK GLAND.—A modified area reaching a length of 1 cm. and a width of 3 or 4 mm. on the median ventral surface of the neck, almost devoid of body hair and with the skin sometimes somewhat pigmented. It secretes a fluid which often discolors the surrounding hairs, the odor of which may have a recognition significance. Not always developed; absent in *canescens* section, *fuscata*, *incana*, and certain members of *cinerea*, *elegans*, and *microtarsus* groups; commonly present in *murina*, *mitis*, *mexicana*, *microtarsus*, *noctivaga*, *elegans*, and *cinerea* sections.

EAR.—Helix generally large and leafy, or somewhat reduced in a few species; produced at its basal anterior part into a recurved more or less developed process, the spina helicis. Antihelix crest short and prominent, produced as a lobelike process. This process is strongly developed in the *cinerea* and *murina* groups, but less apparent in the rest. Tragus very small, characterless. Antitragus variably developed, generally rather large in *murina* groups, and reduced in *cinerea*. See diagram (Fig. 1).

In *Marmosa* enlarged bullæ are usually accompanied by enlarged external ears. Examples are *mitis* and many members of the *elegans* group. The reverse seems to be the case with *cinerea*, in which, although the ears are large, the bullæ are small, and with *velutina* which has small ears but rather well-developed bullæ.

The term "auditory ratio" is the ratio of "greatest breadth across bullæ" to "greatest length from anterior wall of bulla to posterior border of petrosal." See Tables of Measurements and Fig. 29.

HIND FOOT.—The size of the foot, judged by the dimensions in the genus as a whole, is indicative of certain groups or sections. Thus, hind feet of adult animals 28 mm. or more in length exclude all but the *cinerea* group and large members of the *mitis* section such as *chapmani*, *ruatanica*, and occasionally *mitis robinsoni*. Extremely small feet, 17 mm. or less, eliminate all but the *microtarsus* group and small members of the *elegans* group. The toes are proportionately short in *velutina*. Claws in *microtarsus* and *elegans* groups are almost always very small, a fact suggesting that animals belonging in these divisions are less highly arboreal than the long-clawed *murina* and *cinerea* groups. Species in the *noctivaga* group occupy an intermediate position. Feet of members of the *fuscata* section of the *noctivaga* group are much smaller and shorter than those of species of similar size belonging in the *murina* group.

PADS OF HIND FOOT.—Of the six pads appearing on the under surface of the foot, the anterior and posterior internal pads (adjoining the great toe) are always united. The exterior pair are united, or almost so, in the *cinerea* group, but more or less widely separated in other groups. The posterior pad of this pair is considerably reduced in *murina* and *noctivaga* groups, and of nearly equal size to the anterior pad in the *microtarsus* and *elegans* groups. The two remaining pads are situated at the bases of the toes between the second and third, and the third and fourth toes, respectively. They are subequal in all groups but the *noctivaga* group, in which the second is materially smaller than the first. The tips of all toes are furnished with cushion-like pads without distinctive character.

Syndactyly, except in an incipient stage, does not appear in the group. Digit 4 of the hind foot is the longest, digits 3 and 2 becoming progressively shorter. According to my observations the interdigital web between D_2 and D_3 extends only to half the length of the first phalanges. However, it must be granted that the arrangement of the toes in *Marmosa* and particularly in the *microtarsus* group, in which D_2 and D_3 are subequal, is favorable for this condition to develop.

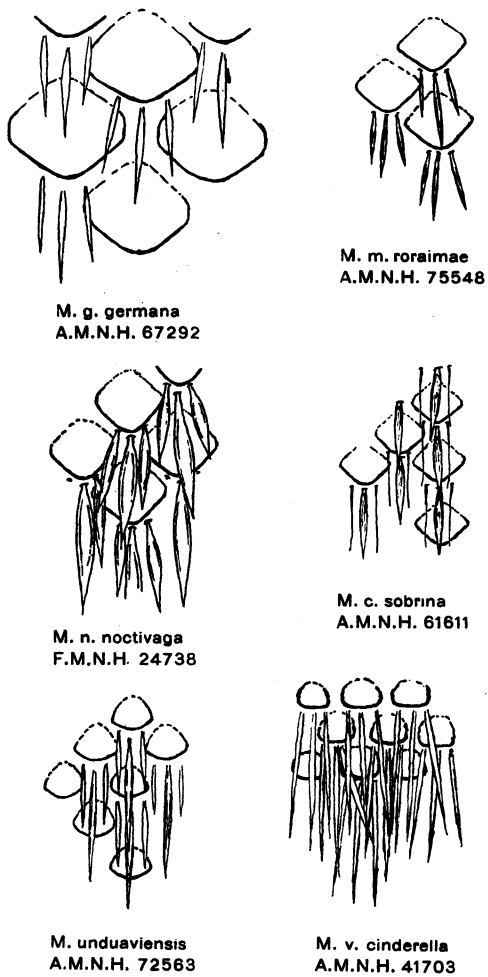


Fig. 2. Patterns of scales and scale hairs of tail in forms representative of principal groups.

TAIL.—This organ is long, bare-appearing, and has the terminal inch or less prehensile, the epidermis beneath its tip being modified as a tactile and adhesive surface. Tails of unusually great length are generally found among the more highly arboreal groups, *cinerea*, *murina*, and, to a less degree, *noctivaga;* no forms of the *elegans* group, and of the *microtarsus* group only *emiliæ*, in which the tail is nearly twice as long as the body, have very long tails. The basal part close to the body is clothed to a greater or less extent with body fur. In *alstoni* of the *cinerea* group this may extend down the tail for as far as 50 mm. On the other hand, it is scarcely noticeable in the *elegans* group. Distal to the body fur the tail is covered with a layer of scales, each with three spinelike hairs in front, one median and one on either side of it. In *cinerea*, *murina*, *noctivaga*, and *lepida*, the scales are distinctly rhombic, but in the *elegans* group and most members of the *microtarsus*, they are more rounded. In those forms with the scales in annular arrangement, the posterior margin is nearly straight. This annular arrangement is present in all forms where the tails are subject to incrassation (*elegans* group). On the contrary, a spiral arrangement is seen in the *cinerea*, *murina*, and *noctivaga* groups, and transitional conditions which are easily comprehensible from the drawings are noticeable in the *microtarsus* group (Fig. 2, p. 32).

The three spinous hairs accompanying each scale vary considerably in structure according to the group and sometimes the section of *Marmosa* under consideration. It should be stated at once that in most museum specimens the skin of the tail is stretched, so that as a rule the connecting skin between scales and the roots of the hairs are exposed. Normally the scales and hairs may be slightly imbricated. In the *cinerea* group the hairs are nearly equal, slightly flattened, provided with a small thickened midrib, and except in *constantiæ*, do not exceed the scale immediately distal. The *murina* section of the *murina* group presents a very similar condition of the scales and hairs, but the median hair is relatively longer and the lateral rather short. In the *mitis* section, however, the scales are smaller while the hairs, which are white, are of much greater length. The *mexicana* and *canescens* sections are intermediate in state. In the *noctivaga* group the hairs are usually black and the median hair is definitely larger than the lateral. Two very distinct types appear in the group: all three hairs in *noctivaga* are broad and flattened, being shaped rather like a grass blade with thickened midrib region; the lateral hairs are definitely smaller than the median. In *ocellata*, however, they are much longer, narrower, and white instead of black. *Yungasensis* is intermediate. The *fuscata* section has the median hair only moderately

broadened, but the midrib very thick, rounded, and shining black; while the lateral hairs are reduced to slender, but long filaments. The *incana* section, while somewhat intermediate, is closer to *noctivaga* in structure.

In the *microtarsus* group the species fall into two camps: the *microtarsus* section and the *lepida* section. The former tends toward an annular arrangement of the scales and the hairs are usually long, extending distally at least two scale-lengths, though, as shown for *unduaviensis*, the lateral hairs may be short. The *lepida* section has spirally arranged scales, with the hairs quite short—about one and a half scale-lengths. In *juninensis* the median hair is thickened and the lateral hairs are thin, much as in the *fuscata* section. *Beatrix* has in some cases black, swollen medial hairs and white, rather flat lateral; but the pigment may be lacking from the dark hairs. *Marica* possesses long, subequal median, and lateral hairs, all of which are white. In the *elegans* group the hairs are three to four scale-lengths in extent and are subequal. In most cases they are white at the base and more or less pigmented at the tip. The seasonal incrassation of the tails of *elegans* and its allies is noticed under that group.

The terms "bicolor" and "particolor" used in descriptions of the tail signify in the first instance distinction between dorsal and ventral color; in the latter case different proximal and distal colors.

MAMMÆ.—The number and arrangement of mammæ seems to be constant for a given species, and to a considerable degree for any given section. However, two definite and distinct types of mammary arrangement, which are probably of significance in its phylogeny, appear in the genus. In the groups *cinerea*, *murina*, *noctivaga*, and the *lepida* section of *microtarsus* the mammæ are confined to the abdominal and inguinal part of the body, and the surrounding hair is strongly modified in growth and in color. In *elegans* and the remainder of the *microtarsus* group pectoral mammæ are also present which, with the abdominal mammæ, form two rows, one at each side of the body interior to the limbs, and the hairs are but little changed in form or color. In the *cinerea* group the number is apparently 5–1–5 in the *cinerea* section, 4–1–4 in the *germana* division, and 7–1–7 in the *constantiæ* division of the *regina* section. The *murina* group, with all mammæ abdominal, comprises: *murina* section, 5–1–5; *mitis* section, 9–1–9 (some possibly less); *mexicana* section, 7–1–7 (at least in some); and *canescens* section, uncertain but apparently 4–1–4. In the *noctivaga* group the present evidence points to a formula of 4–1–4 abdominal mammæ, some of which may not become functional. The *microtarsus* group comprises two sections: the one with abdominal

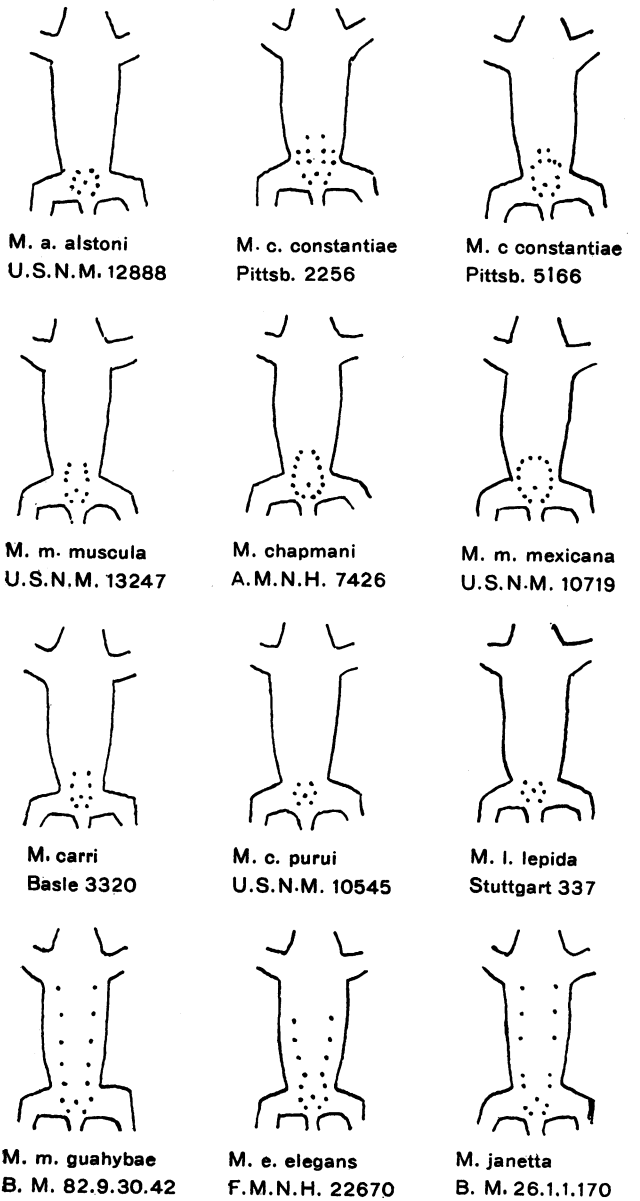


Fig. 3. Diagram to show mammary arrangement in functional females representing principal groups.

mammæ (*lepida*, etc.) numbering not in excess of 5–1–5; the other (*microtarsus*) with both pectoral and abdominal teats up to 7–1–7. Finally in the *elegans* group the combined pectoral and abdominal arrangement seems to prevail throughout, the formula, so far as known, being either 7–1–7 or 9–1–9. Modification of hair is probably brought about by the activity of hormones. In the *murina* group the shade of color produced is sometimes of considerable systematic value, both orange-brown and purplish-brown shading are developed, but in the *cinerea* group, although these variations also occur, they seem to be less fixed. The distinction between the purple-brown and orange-brown of the *murina* group is imporant, the former including all members of the *murina* section, the latter the *mitis*, *mexicana*, and *canescens* sections (Fig. 3, p. 35).

The significance of this linear arrangement of the mammæ in a family so ancient as the Didelphidæ is doubtful. Pectoral mammæ are also found in the genus *Monodelphis* and probably in *Notodelphis;* but in a female of *Dromiciops* the mammæ are distinctly inguinal, and the surrounding hairs are modified. Presence of mammæ in the regions of the supposed primitive milk streaks may represent an unbroken descent from ancestors, all of which possessed a linear mammary arrangement, or more probably it may signify the possession throughout the ancestry of merely a potentiality to produce pectoral mammæ. In this latter case the condition in *elegans*, *microtarsus*, and *Monodelphis* means that the tendency has independently reasserted itself.

Nasal Bones.—Comparatively few distinctions are to be drawn from the nasal bones. In the *noctivaga* group they are narrow and very long in front, while relatively little broadened behind. Those of the *elegans* group resemble the nasals of *noctivaga* in being scarcely widened posteriorly, but the ratio of their length to the length of the frontal is very different. In the *murina*, *cinerea*, and *microtarsus* groups the combined nasals are generally considerably expanded at the maxillo-frontal suture, the expanded parts having as a rule parallel sides, giving a rectangular effect. In some forms the expanded parts may appear diamond-shaped instead. At their junction with the frontals, the nasals are commonly pointed behind. They may form a single point, or be slightly separated (*zeledoni*), or their proximal ends may be rounded (Fig. 4, p. 37).

Supraorbital Ridges and Processes.—The frontal bone, at the place where it bends from the horizontal crown of the skull to the vertical position or side wall within the orbit, undergoes various modifications. In the simplest form there is a smoothly rounded curve from horizontal to vertical with little or no tendency to any angular bend. This is seen

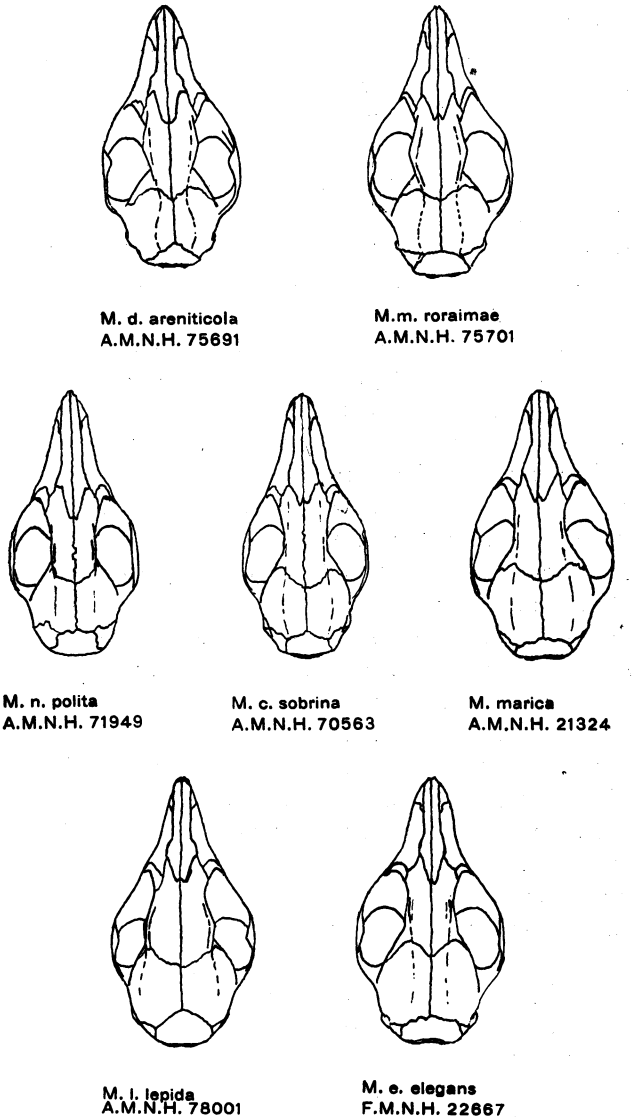


Fig. 4. Representative crania of principal groups showing variation in nasals, supraorbital regions, and temporal ridges.

Brought to a common length.

in *elegans* and many of its smaller allies, in the smaller members of the *noctivaga* group, in certain of the *microtarsus* group, and in nearly all juvenile specimens of these three groups. The next stage appears when the dorsal and lateral faces meet at a more or less sharp angle which may be emphasized as a faintly raised ridge or "beading" (Thomas). The beading is undeveloped in juvenile specimens. Beaded skulls are highly characteristic of the *noctivaga* section of the group of the same name; they appear in varying degrees in the *fuscata* and *incana* sections, in *limæ*, and also in the *elegans* group. The third and most specialized condition is reached when the beading becomes strongly produced into a pointed prominence or process. This process may be restricted to a quite small point as in most juveniles and many females of the *murina* and *cinerea* groups, or it may develop into a comparatively large, triangular eminence which may become minutely denticulate on its edges—seen well in old males of *ruatanica mimetra* and *demararæ esmeraldæ*. Supraorbital processes are commonly present in the *microtarsus*, *murina*, and *cinerea* groups (Fig. 4, p. 37).

Postorbital Constriction.—The term "postorbital constriction" in this paper requires explanation. Postorbital constriction refers not to the width of the brain case, but to the width across the connecting ridges between the supraorbital ridges and temporal ridges, a character which in *Marmosa* appears more diagnostic. The exact place antero-posteriorly at which the measurement is taken can be readily located on semitransparent skulls. It is at the junction of the olfactory bulbs with the cerebral hemispheres and is often distinguishable on the skull by a grayish transverse line. The parieto-frontal sutures lie slightly posterior to this line. Practically no trace of constriction is seen in the *fuscata*, *venusta*, and *murina* sections, where the temporal ridges remain widely separated. Moreover, even in groups or sections in which it develops characteristically, the character is not seen in juvenile specimens. Paradoxically, most juveniles in such characteristically constricted divisions as the *mitis*, *cinerea*, and *canescens* sections have the brain case either actually or proportionately very much wider at this point than in the adult. Coupled with the constricting of this region of the brain case comes a pronounced bony deposition in advance of the attachment of the temporal muscles. This develops to such an extent that the bone tissue partly overrides the posterior part of the supraorbital ridge, causing a narrow groove, which appears in old males of *demararæ*, *mitis*, and *ruatanica*, on the dorsal surface of the ridge (Fig. 4, p. 37). The bony crest is exceptionally high in *canescens*.

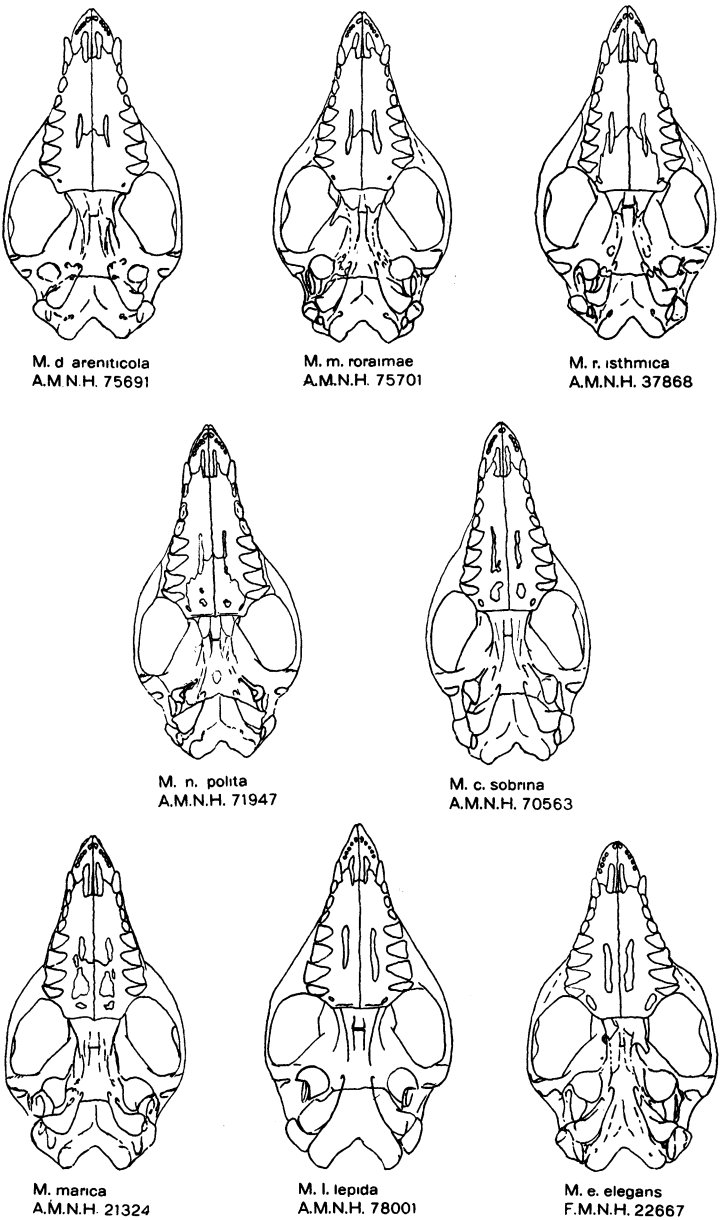


Fig. 5. Selected skulls of principal groups to show palatal and basicranial regions.
Brought to a common length.

PALATAL FORAMINA AND FENESTRÆ.—Apart from the normally present anterior, posterior, and lateral posterior foramina, other openings may exist in the palate. In *canescens*, a pair of these are found exterior to the posterior palatal openings, between them and the molars. In the *elegans* group and in part of the *microtarsus* group, a pair of accessory openings which are enlarged, appears behind the posterior palatal openings, resulting in a very complete fenestration of the palate. In *elegans*, too, the lateral posterior foramina are unusually large. Accessory openings as above may appear in members of the *cinerea* and *murina* groups, although they are never large as in *elegans*. It seems probable that additional palatal openings are due to resorption of osseous tissue (Fig. 5, p. 39).

"BRIDGE," OR ALISPHENOID-ETHMOID PART OF THE BASIS CRANII.—Seen from beneath, the bridge represents the narrow portion of the brain case connecting the front of the skull with the auditory regions. It is formed by the ethmoid, flanked by the basal portions of the alisphenoid upon which are seated the small, delicate pterygoids. Its significance from the systematic standpoint is not great. It may be short and wide (most groups), or narrow and long (*elegans* group). Its least width, defined in the tables of measurements as "least width across pterygoid wings of alisphenoids," is abbreviated in the text to "bridge" or "breadth of bridge." (Fig. 5, p. 39 and Fig. 29 p. 236.)

PROCESS OF BULLA.—Refers to the bracket or buttress of bone extending from the anterior wall of the bulla upward and forward to the floor or basicranial part of the alisphenoid. It is most strongly developed in the *noctivaga* group, proportionately slenderer in the *elegans* group, and may be present or absent or represented by a small spine on the bulla in the *microtarsus* group (Fig. 5, p. 39).

MEDIAN DORSAL SUTURES OF SKULL.—Matschie's (1916) discussion of sutures has prompted the preparation of a brief analysis based upon examples taken from each group. Examination of the figures reveals little of significance beyond the definite setting off of the *noctivaga* group through the proportionately great length of the nasals and characteristic dimensional ranges (Fig. 4, p. 37).

Median Dorsal Sutures

Group and Species Museum No.	Length Nasal Suture	Length Frontal Suture	Length Parietal Suture	Dist. Lambd. Crest to Front of Supra-occipital
cinerea group:				
alstoni				
AMNH 10059	20.6	12.4	8.5	5.3
constantiæ				
PITTSB 4941	18.1	13.4	8.3	4.7
germana				
AMNH 71958	19.6	14.4	7.1	4.6
murina group:				
klagesi				
AMNH 16121	15.3	12.5	6.2	3.9
mitis				
MCZ 8117	16.6	11.1	6.8	4.1
isthmica				
AMNH 37873	16.6	12.9	7.7	4.4
mexicana				
AMNH 10763–12454	15.3	10.6	6.8	3.3
noctivaga group:				
polita				
AMNH 71949	19.2	10.0	7.5	4.0
oroensis				
AMNH 61384	15.3	9.6	6.0	4.1
fuscata				
FMNH 22174	15.8	8.4	6.8	4.2
incana paulensis				
FMNH 26576	15.6	9.6	6.2	4.1
microtarsus group:				
microtarsus				
FMNH 26575	12.3	9.0	5.6	3.9
lepida				
AMNH 78001	11.4	8.1	4.6	3.7
elegans group:				
elegans				
FMNH 23858	12.7	9.3	5.4	3.5
marmota				
FMNH 26760	15 (approx.)	10.7	7.0	4.0
formosa				
USNM 236330	8.2	7.0	4.9	2.3

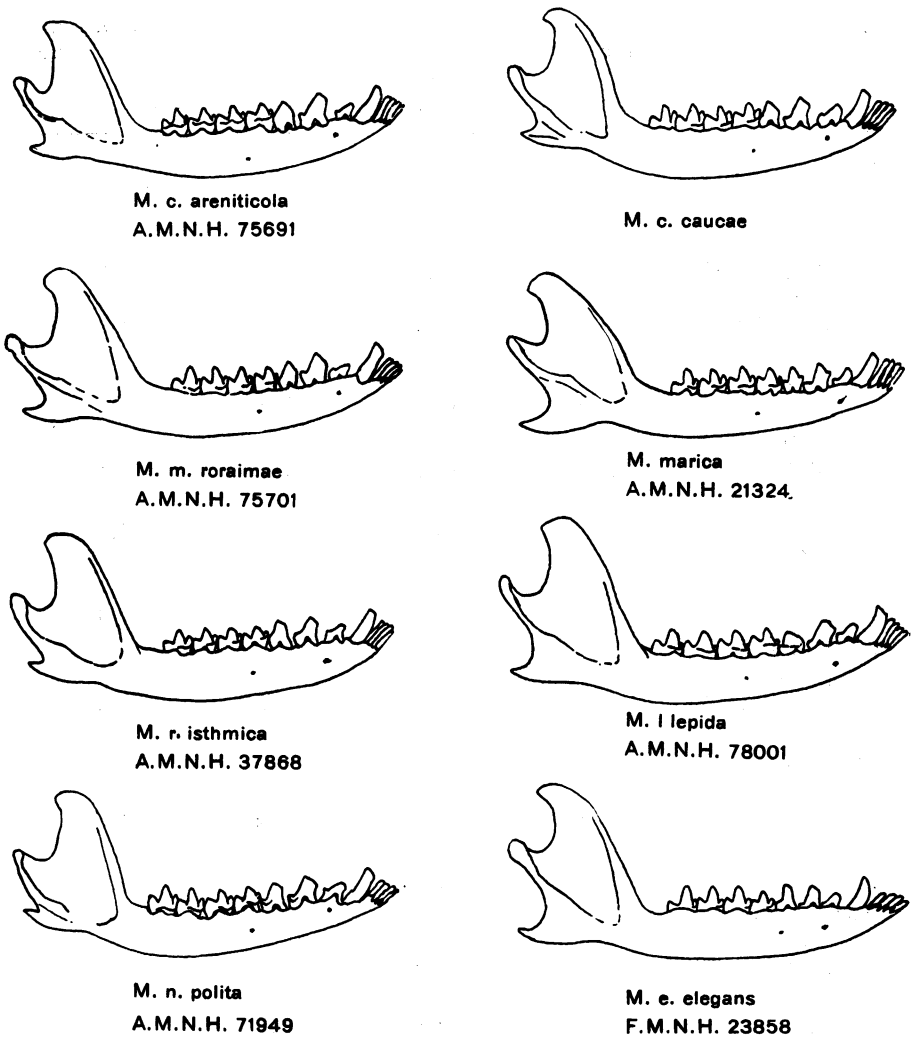


Fig. 6. Mandibular rami of species representative of principal groups brought to a common length to show depth of ramus, details of teeth, sizes of diastemata, and positions of mandibular foramina. The degree of reflection and position of the angular process is also indicated.

MENTAL FORAMINA.—Examination of fifty specimens shows the position of the foramina to be quite variable, not only between specimens of a species, but between the two rami of a single skull. The following degree of variability of position, which may perhaps be exceeded in some cases, appears within the groups:—

cinerea group:	
Anterior foramen from beneath middle of P_1 to diastema between P_1 and P_2.	Posterior foramen from beneath anterior root of M_1 to posterior root of of M_1.
murina group:	
Anterior foramen from beneath middle of P_1 to anterior root of P_2.	Posterior foramen from beneath posterior root of P_3 to between M_1 and M_2.
microtarsus group:	
Anterior foramen from beneath middle of P_1 to posterior root of P_1.	Posterior foramen from beneath anterior root of M_1 to posterior root of M_1.
noctivaga group:	
Anterior foramen from beneath posterior root of P_1 to diastema between P_1 and P_2.	Posterior foramen from between P_3 and M_1 to posterior root of M_1.
elegans group:	
Anterior foramen from beneath posterior root of P_1 to anterior root of P_2.	Posterior foramen from between P_3 and M_1 to between M_1 and M_2.

The anterior foramen in the *elegans* and *noctivaga* groups apparently never appears farther forward than beneath the posterior root of P_1, and only in the *murina* and *elegans* group is it shown so far back as beneath the anterior root of P_2. The posterior foramen seems very fixed in *cinerea* and *microtarsus*, varying only from the anterior to the posterior root of M_1, but greater range is seen in the other three groups. In conclusion, the positions of the foramina are of little diagnostic value (Fig. 6, p. 42).

DENTITION.—Teeth very uniform throughout the genus, and in a general way throughout the *Didelphidæ*. Within *Marmosa* the teeth most subject to variation appear to be the canines, P^1 and M^4. Little variation can be noted in the dentition of the mandible.

INCISORS.—Very constant in form. A slight diastema between I^1 and I^2 in the upper jaw. I^5 always slightly larger, sometimes separated from I^4 by a very slight space. Those of mandible semirecumbent, closely appressed. All with slightly spatulate crowns.

CANINES.—Uppers normally rather long and sharp, but in certain groups,—notably *elegans*, *fuscata*, and *microtarsus*,—they may become short and often compressed,

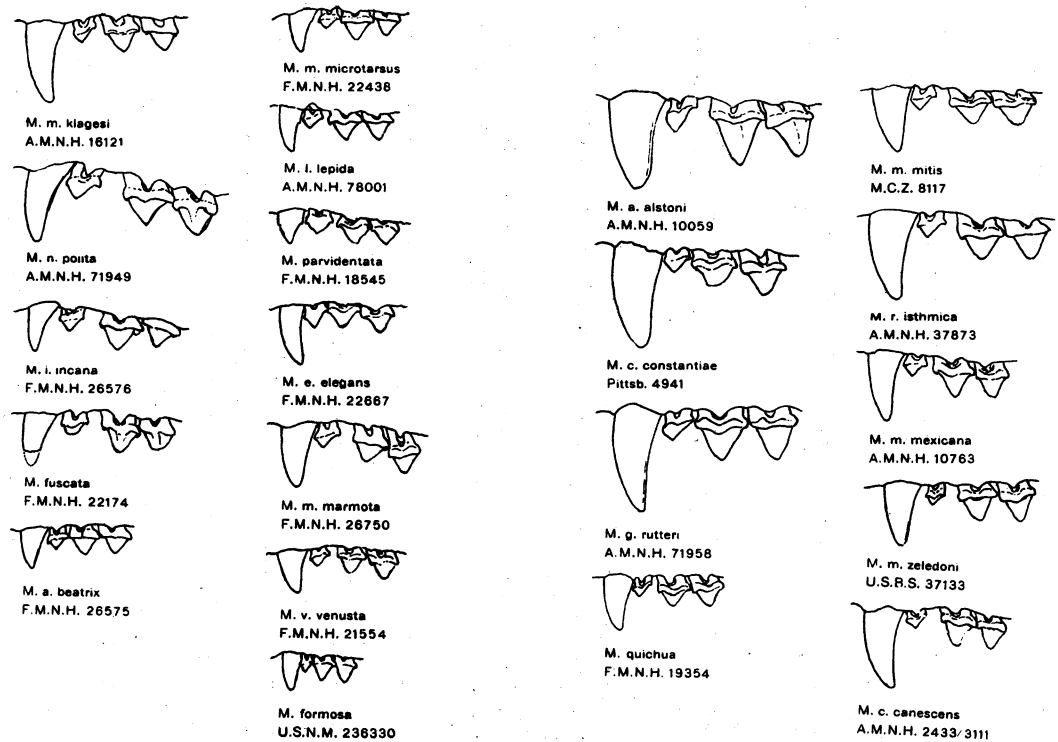


Fig. 7. Lateral views of upper premolars and canines of selected forms.

sometimes developing a faint posterior cupsule. In an extreme case, *parvidens*, the tooth appears almost premolariform and possesses small anterior and posterior cusps at the level of the cingulum (Fig. 7, p. 44).

The lower canines, like the incisors, are semiprocumbent and rarely as sharp as the upper ones. In *parvidens* they are strongly premolariform, but single-rooted.

PREMOLARS.—(Fig. 6, p. 42 and Fig. 7, p. 44).

$P\frac{1}{1}$.—Usually very small teeth. The upper moderately to very closely appressed to the canine and in the *cinerea* group separated by slight diastema from P^2; in the *murina*, *microtarsus*, and *noctivaga* groups this space is much less. In the *elegans* group it may be closed up (*formosa*) or merely much narrowed. In *parvidens* the first P is unusually enlarged, being not greatly smaller than P^2.

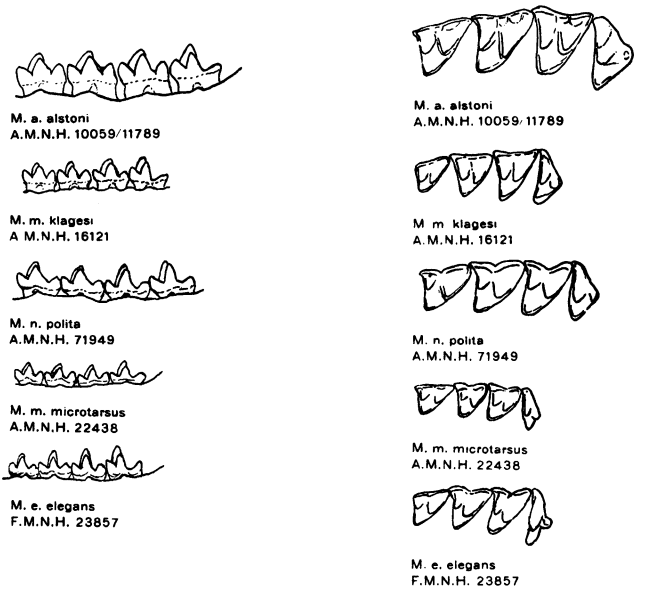


Fig. 8. Lateral views of lower and crown views of upper molar teeth.

The corresponding lower tooth becomes greatly worn early in life and probably functions little after adulthood is reached.

$P\frac{2}{2}$.—The maxillary tooth which exceeds P^3 in size in all groups but *elegans*, in which they may be subequal, is high, sharp, and triangular. A well-developed cingulum is usually present, but in many members of the *noctivaga* and *elegans* groups the cingula are so slightly developed that they have no sharp edges. A small cusp is found in *i. incana* at the posterior part of the internal cingulum; and in *cinerea*, etc., both anterior and posterior cuspules occur. The lower tooth becomes much worn and has a small low heel. It is inclined forward in the ramus.

$P\frac{3}{3}$.—Essentially similar to $P\frac{2}{2}$ but, except in some species of the *elegans* group, rather smaller.

MOLARS.—(Fig. 6, p. 42, Fig. 7, p. 44, and Fig. 8, above).

$M\frac{1}{1}-\frac{3}{3}$.—Very uniform molars which, however, show a tendency to become successively shorter and broader in form from front to back. No definite variation in these teeth between one group and another is to be detected, except in the *elegans* group, which exhibits generally greater antero-posterior compressions and a very slight tendency for the paracone of M^1 to be nearer to outer border of the tooth. In the lower teeth M_2 and M_3 equal one another in breadth, but are very slightly wider than M_1. All three are characteristically didelphid in form.

$M\frac{4}{4}$.—The lower tooth is essentially like M_3, but slightly narrower and with a narrower talonid. That of the upper jaw, however, shows greater variation. In the *cinerea* group the tooth is moderately long, its posterior portion bearing the metacone being moderately prominent, but the stylar part extending to the outer margin relatively little developed. In *venusta* of the *elegans* group, the tooth is almost as long, the stylar portion still more constricted and the metacone strongly set off behind the tooth, while both paracone and protocone are well developed; but in *formosa* of the same group the extreme of shortening is reached, and the ridge which commonly joins the metacone to the outer edge of the tooth is undeveloped. In the *murina* section the metacone is much less separated from the body of the tooth, while the stylar part is altogether heavier and larger. In *incana* of the *noctivaga* group the tooth is proportionately longer than in *cinerea* and on the ridge connecting the metacone to the parastyle a small additional cuspule is found. The same tooth in *microtarsus* is like that of *murina*.

Sexes.—Males are generally quite markedly larger than females. Very old females, at least in some cases, become as large as normal males. The unusually old specimen, type of *rapposa*, is a female. Accompanying the normally greater size of the male is the greater size and strength of jaws and teeth, feet and claws, and almost always the ridges for attachment of the temporal muscles are better developed.

Age and Growth Characters.—Determination of the age of a specimen by the degree of wear of the teeth is generally but not invariably conclusive. Apart from dental wear, quite a number of additional features may be noted, which in combination serve to establish the age of a given specimen yet more closely:

1. Length and general size of skull, including particularly basal length, length of nasals, length of mandible, and other mandibular measurements shown in the tables.
2. Condition of the sutures and degree of ossification.
3. State of development of supraorbital processes in those species possessing them.
4. Postorbital constriction. In young animals the region of the constriction is not only proportionately wider than in the adult, but in a number of cases, in which the constriction is very marked in adulthood, the measurement of the juvenile skull actually exceeds that of the adult.
5. In the maxillary teeth, permanent P^3 when first erupted is strongly inclined inward and backward. Later it gradually assumes an upright position. Frequently, too, M^4 is seen to be rather low and not fully in place.

6. In the mandibular tooth row, even when the last premolar appears completely in position, immaturity is indicated when the tooth is in very close proximity to the base of the ascending ramus.[1]

Terms used in relation to the ages of specimens may be defined as follows:

JUVENILE.—At least one of the milk teeth still in place or $M\frac{4}{4}$ not yet erupted.

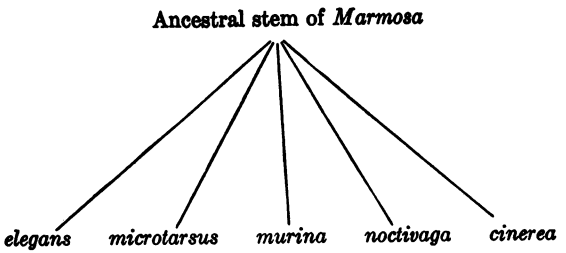
YOUNG ADULT.—Sexually or almost sexually mature (a condition reached very early in *Marmosa*); size still small; milk teeth shed, but M_4 still approximated to ascending ramus; dental wear negligible.

ADULT.—Average adult size attained; M_4 well removed from ascending ramus; usually noticeable dental wear.

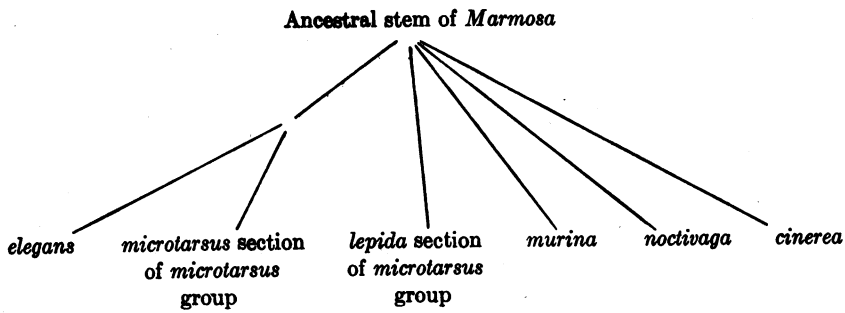
OLD ADULT.—Sometimes exceptionally large size reached; much wear of teeth visible; general extreme development of muscle ridges on skull.

CLASSIFICATION AND PHYLOGENY OF THE PRINCIPAL GROUPS OF *MARMOSA*

Of the five groups of *Marmosa*, four seem unquestionably to be natural and the fifth, the *microtarsus* group, perhaps artificial. Two of the groups, *murina* and *noctivaga*, appear more closely allied to each other than they do to two of the others, *cinerea* and *elegans;* while *microtarsus*, composed of two distinct sections, has affinities on the one hand with *elegans* and on the other with *murina*. *Cinerea* and *elegans* represent, not only the most distinct groups of the genus anatomically, but are definitely divergent from one another. Two diagrams below suggest alternatives in the classification of the genus, the former of which, although convenient, is only doubtfully correct, the latter possibly shows a more accurate interpretation of the conflicting evidence presented by the mammary regions in the *microtarsus* group.



[1]Ameghino separated his genus *Dimerodon* from *Didelphis* upon this character.



Until many more specimens—and especially nursing females preserved in alcohol—of most of the species of the *microtarsus* group are secured, its status will have to remain open to question. It is treated provisionally as a unit, although its small size rather than a set of characteristics shared by all its species is the common character distinguishing it from certain forms of other groups.

Diagnostic and general characters of each group are given fully under the group headings. The key which follows serves to distinguish them, comparisons of size being determined from the tables of measurement.[1]

Key to Groups of *Marmosa*

1.—Tricolor pattern of pelage usually visible; tail short, incrassated during colder part of year, its scales in annular arrangement; ears proportionately very large (except *velutina* and *formosa*); feet proportionately very small; mammæ both pectoral and abdominal; bullæ proportionately exceedingly large, bridge very narrow; palate highly fenestrated; lateral posterior palatal foramina very large.....*elegans* group.

No tricolor pattern of pelage developed (except in *canescens oaxacæ*); tail variable in length, never incrassated, with scales spiral in arrangement (annular in *microtarsus* section); ears smaller; feet larger; mammæ abdominal (pectoral mammæ in *microtarsus* section only); bullæ smaller; bridge broader; palate less fenestrated (except in *microtarsus* section); lateral posterior palatal foramina smaller.....2.

2.—Size very large to moderate; fur grayish, often rather woolly; feet and claws very large and strong; external anterior and posterior pads of hind foot united; tail often extremely long, its scale spirals from 9 to 14 per cm. of tail length; skull very strongly ossified; bullæ proportionately very small; bridge very short and broad; ratio of greatest breadth of bullæ to greatest length from bulla to petrosal normally very high; teeth exceedingly large (except *regina*).....*cinerea* group.

[1]In pocket at end of paper.

Size moderate to small (except *ruatanica* and *chapmani* of the *mitis* section); fur rarely gray, never woolly; feet and claws smaller (except *ruatanica* and *chapmani*); external anterior and posterior pads of hind foot separate; tail seldom very long; scale spirals not less than 16 per cm. of tail length; skull strongly or slightly ossified; bullæ proportionately larger; bridge less shortened and broadened; ratio of tympanic region (see above) lower; teeth smaller.....3.

3.—Feet relatively small, never very broad; pad at base of digits 3 and 4 of hind foot considerably smaller than that of digits 2 and 3; the three minute hairs accompanying each scale of the tail flattened, appressed, provided with a median dorsal keel, somewhat petiolate at the insertion, and often black, or as described for *fuscata* section, p. 32; skull narrowed; nasals exceeding premaxillæ with skull in norma verticalis; base of nasals at maxillo-frontal suture very little or not at all expanded; no pointed supraorbital processes; bulla showing various degrees of three-sided compression, or tendency to become pyramidiform; bullæ always with strongly developed intero-anterior process and proportionately close together; teeth often small. *noctivaga* group.

Feet proportionately larger, or if short, then rather broad (*mitis* section); pads at base of digits 2 and 3, and 3 and 4 subequal; scale hairs of tail without the specialized form seen in *noctivaga* group, rarely black; skull usually broader; nasals never exceeding premaxillæ with skull in norma verticalis; base of nasals at maxillo-frontal suture abruptly expanded; pointed supra-orbital processes present (sometimes small); bulla rounded (sometimes rather compressed in *lepida* section); process of bulla absent, or represented occasionally by a minute spine (often present, however, in *microtarsus* group); bullæ usually rather widely separated; teeth proportionately larger.....4.

4.—Size moderate to large; ear with large, lobate, reflected spina helicis; scales of tail spirally arranged; mammæ abdominal; premaxillæ rarely strongly produced in a point; palate never much fenestrated; bullæ never with process, rarely with minute spine; teeth: M^{1-3}, 5.4 mm. or more in length. (Note. Examples of *mexicana* and *canescens* are found with M^{1-3} only 5.1–5.3).....*murina* group.

Size small (except *lepida grandis*); ear with spina helicis scarcely at all lobed; scales of tail with either spiral or annular arrangement; mammæ abdominal only, or also pectoral; premaxillæ commonly pointed in front; palate highly or not at all fenestrated; bullæ rarely lacking a process, which, however, is much slenderer than that of *noctivaga*; teeth: M^{1-3} not exceeding 5.3 mm. in length, (except *lepida grandis*).....*microtarsus* group.

The possible artificiality of the last group is emphasized by the very different structural character of its two subdivisions, the *lepida* and *microtarsus* sections. The contrasts shown with the *murina* group apply very distinctly to the *microtarsus* section, but the *lepida* section, except for its difference in size, is distinguished only by the difference in the spina helicis and the pointed premaxilla (to a limited extent).

Cinerea Group

Size large to very large (length of head and body in adults from about 130 mm. in *phæa* to 215 mm. in *alstoni* and *demararæ*). Texture and length of fur variable, but fur often woolly. Dorsal color gray to brownish gray, rarely rusty (*regina*), or with a touch of cinnamon on the middle of the back (some specimens of *demararæ meridæ*). Ventral color pale grayish, buffy yellowish, or ochreous yellow. Self-colored hair variously developed. Vibrissæ 24 to 37 mm. in length. Ears of moderate size, never proportionately very large. Feet large and strong; claws stout. Tail moderate in length, the basal body hair often extensive; scales large and coarse (9 to 16 spirals per cm.). Mammæ abdominal, from 4–1–4 to 7–1–7, not necessarily all becoming functional. Inguinal hairs in females becoming strongly modified and colored between ochreous and purplish brown.

Skull.—Large to very large; stoutly built. Zygomata moderately broad to very broad; seldom slightly narrowed (*cinerea*). Nasals usually well broadened at the maxillo-frontal suture, with skull in norma verticalis never exceeding the premaxillæ anteriorly. Interorbital region rather broad in front, but often strongly narrowed behind. Supraorbital processes, which are developed in all forms except *limæ*, usually subtriangular and somewhat pointed; dorsal surface of supraorbital processes flat in some species (*alstoni*), in others (*demararæ*) with a posterior dorsal groove formed by upward growth of the bony tissue of the attachment area of the temporal muscles. Temporal ridges either widely separated or closely approximated, even forming in some specimens of *demararæ esmeraldæ* a small sagittal crest.[1] Lambdoidal crest often well developed. Palate usually broad; never very highly fenestrated as in the *microtarsus* section, but sometimes with a pair of round accessory fenestræ behind the posterior palatal vacuities.

Teeth.—Large and strong; canines long. Minimum lengths of molar tooth rows, M^{1-3} and M_{1-4} 6.5 (*phæa*) and 8.3 (*phæa*), respectively; in the majority of species much longer.

Basicranial region short; bridge short and broad; auditory region relatively approximated to back of palate; ratio of width across bullæ to distance from bulla to tympanic bone very high (2.13 to 2.54). Bullæ proportionately small, either rounded, or conic-pointed beneath; lacking anterior process.

Two sections as shown hereafter are recognized; the one with 30 mm. or more of the base of the tail clothed with body hair and occupy-

[1]An incipient crest may also occur in males of *marmota marmota*.

ing eastern and northern South America and Central America; the other with less than 30 mm. of tail clothed with body hair and found in

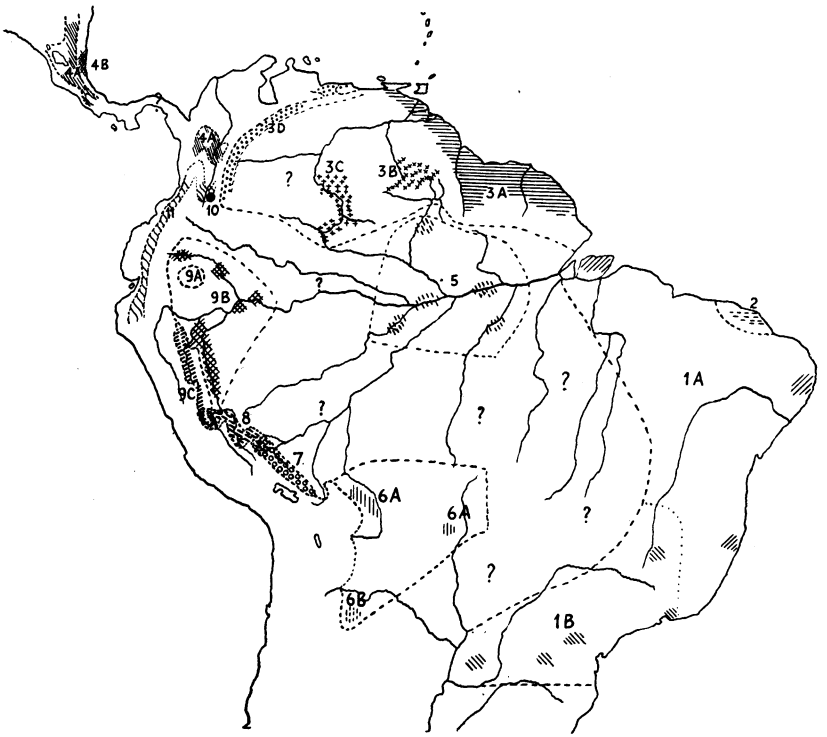


Fig. 9. Distribution of species and subspecies of *M. cinerea* group.

1	A.	*M. cinerea cinerea*
1	B.	*M. cinerea paraguayana*
2		*M. limæ*
3	A.	*M. demararæ demararæ*
3	B.	*M. demararæ areniticola*
3	C.	*M. demararæ esmeraldæ*
3	D.	*M. demararæ meridæ*
4	A.	*M. alstoni alstoni*
4	B.	*M. alstoni nicaraguæ*
5		*M. domina*
6	A.	*M. constantiæ constantiæ*
6	B.	*M. constantiæ budini*
7		*M. mapiriensis*
8		*M. rapposa*
9	A.	*M. germana germana*
9	B.	*M. germana rutteri*
9	C.	*M. germana parda*
10		*M. regina*
11		*M. phæa*

western and central South America only. (Map, Fig. 9.) These are here termed:

cinerea section
regina section.

Note, however, that these sections are much less distinct than sections in some of the other groups are.

Artificial Key to *Cinerea* Group

1.—Size large to medium (skull attaining a greatest total length of 46 mm. in adult).....2.
Size small (skull not exceeding 39 mm. in total length in adult).....*phæa.*

2.—Basal part of tail clothed with body hair 30 mm. or more in length.....3.
Basal part of tail clothed with body hair less than 30 mm. in length.....10.

3.—Supraorbital ridges without pronounced pointed processes in adults, or, if with incipient processes, the processes well forward and slightly anterior to ascending process of zygoma; anterior edge of process, compared with posterior edge, comparatively short.....4.
Supraorbital ridges with pronounced pointed processes which are behind the ascending process of the zygoma and expand rather abruptly from the anterior parts of the temporal ridges; anterior edge of process, compared with posterior edge, comparatively long.....6.

4.—Zygomata converging anteriorly; palate long.....5.
Zygomata widely expanded and evenly arched, palate shorter. *cinerea paraguayana.*

5.—Size relatively large; tail particolored.....*cinerea cinerea.*
Size relatively small; tail brown (the tip spotted).....*limæ.*

6.—No marked postorbital constriction; body hairs of tail often extremely long (as much as 18 mm.).....*alstoni alstoni.*
A marked postorbital constriction; body hairs of tail never extremely long (*demararæ*).....7.

7.—Pelage short; body fur on tail short; size of ears moderate.....8.
Pelage long; body fur on tail long; size of ears large.....9.

8.—Hind foot not exceeding 28 mm.; parietal ridges never forming sagittal crest in old males.....*demararæ demararæ.*
Hind foot reaching as much as 32 mm.; parietal ridges sometimes uniting to form distinct sagittal crest in old males.....*demararæ esmeraldæ.*

9.—Pelage proportionately short and harsh; eye-ring reduced..*demararæ meridæ.*
Pelage proportionately long and soft; eye-ring strongly marked. *demararæ roraimæ.*

10.—Tail brown throughout (except some specimens of *domina*).....11.
Tail particolored—brown and white.....15.

11.—Color dorsally with a rusty or cinnamon overwash near pinkish cinnamon (R.). *regina.*
Color dorsally of the gray or brownish gray customary in group.....12.

12.—Skull with zygomata convergent anteriorly (as in *cinerea*) and with rather marked postorbital constriction.....*domina.*
Skull with zygomata evenly arched and without marked postorbital constriction (*germana*).....13.

13.—Fur strongly crisped or waved; bullæ often small and compressed, pointed beneath.....*germana germana.*
Fur little or not at all crisped; bullæ less compressed and less pointed beneath.....14.

14.—Underparts yellowish to warm buff (R.); fur relatively short...*germana rutteri.*
Underparts ochraceous tawny to amber brown (R.); fur relatively long. *germana parda.*

15.—Tail short to very short, rarely brown throughout.....16.
Tail of normal length or more for group, always particolored.....18.
16.—Tail very short, but little exceeding head and body in length; pelage long and somewhat waved; brownish gray, ventral hair mainly gray-based. *mapiriensis.*
Tail only moderately short; pelage shorter, straighter, and containing less brown color. Ventral color yellow-buff, with relatively few gray-based hairs (*constantiæ*).....17.
17.—Size relatively large, eastern Bolivia and Matto Grosso... *constantiæ constantiæ.*
Size relatively small. Province of Jujuy.....*constantiæ budini.*
18.—Pelage long, 15 to 17 mm., soft and fluffy, not appressed; skull with accessory palatal openings; tail of moderate length.....*rapposa.*
Pelage shorter, appressed to body. Skull large, lacking rounded accessory palatal openings; tail very long and with terminal third white. *alstoni nicaraguæ.*

Cinerea Section

In this division are placed the forms which have the furred basal portion of the tail more than 30 mm. in length. The exception is *nicaraguæ*, which is included because of its affinity to *alstoni*. All but *limæ* have the tail whitened terminally. Species included are *cinerea*, *limæ*, *demararæ*, and *alstoni*, the three former characterized by having the skull narrow waisted, i.e., the postorbital region constricted to a greater or less degree (5.7 to 8.0); whereas in *alstoni* it is not narrowed (7.9 to 9.0). *Limæ* lacks the supraorbital processes altogether, the supraorbital ridges being represented merely by beadings. In *demararæ* the temporal ridges are often greatly approximated; in *alstoni*, on the contrary, they are invariably separated. *Cinerea* and *limæ* occupy intermediate positions between these extremes. Females belonging in this section have the mammary number 5–1–5, but in *alstoni* frequently only 4–1–4 become functional. The bullæ are in general somewhat larger than in the next section. They show little or no tendency to become conical or pointed beneath. Teeth, even in the small form *limæ*, large: M^{1-3} from 7.1 to 8.0; M_{1-4} from 9.2 to 10.8.

Demararæ and *cinerea* are more closely related to each other than either is to *alstoni*. The abundant caudal pelage often developed by the last, its flattened supraorbital ridges, remarkably broad postorbital region, and small posterior palatal foramina separate it unmistakably from the two former.

This section is found mainly in the eastern and northern parts of the total range of the *cinerea* group: *cinerea* in Paraguay and eastern Brazil; *limæ* in Ceará; *demararæ* throughout most of the northern part of South America; and *alstoni* in Central America and northwest Colombia.

Marmosa cinerea (Temminck)

Synonymy under subspecies

Marmosa cinerea was the first of the group bearing its name to be discovered and described. Found by Wied during his travels in Brazil at the Rio Mucuri, boundary between the provinces of Bahia and Espirito Santo, the type was later sent by him from Vienna to Temminck at Paris, and the latter embodied it in the description in his 'Monographies de Mammalogie.' The specimen was apparently returned to Vienna, and The American Museum of Natural History, New York, purchased it, together with much other material, under the name of the "Maximilian Collection."

Size of the species *cinerea* moderately large. Fur long to only moderately long. Color some shade of gray dorsally, with underparts varying from buff to yellowish; quantity of self-colored hairs variable. Eye-rings usually rather broad. Ears large to moderate in size. Tail particolored; always with basal furred portion 30 mm. or more in extent.

SKULL.—Skull very similar to that of *demararæ*, but usually rather smaller; besides, except in *c. paraguayana*, showing a distinct tendency for the zygomata to converge anteriorly, i.e., for the greatest width of the zygomata to be near the junction with the squamosals. In the supraorbital region the slightly pointed supraorbital processes are usually distinguishable from those of *demararæ* by their position relatively far foward on the ridges. Thus, in *cinerea* the anterior edge of the supraorbital process (distance from the angle of the process to the place where it merges with the flat surface of the frons) is short as compared with the posterior edge (from the angle to where it joins the temporal ridge). In *demararæ* the contrary is found, and the processes are comparatively far back. Temporal ridges never very closely approximated. Postorbital constriction never pronounced, often moderate in degree. Palate variable in length. Teeth large. Bullæ large and well rounded.

DISTRIBUTION.—Eastern Brazil and Paraguay.

Two subspecies are recognized:

1.—Skull relatively long; zygomata convergent anteriorly; palate long, and strongly produced behind M^4 ..... *cinerea cinerea.*

2.—Skull short and broad; zygomata evenly arched and broadly expanded; palate short ..... *cinerea paraguayana.*

Marmosa cinerea cinerea (Temminck)

Plate I, Figure 1; Plate XIV, Figure 123

1824.[1] *Didelphis cinerea* TEMMINCK, 'Monogr. Mamm.,' I, p. 46. Type description.
1826. *Didelphis cinerea* WIED, Beiträge Nat. Brasil, II, p. 406. Description, quoting Temminck.
1842. *Micoureus cinerea* LESSON, 'Tabl. Règne Animal,' p. 186.
1843. *Philander cinerea* GRAY, 'List Mamm. Brit. Mus.,' p. 101.
1888*a*. *Didelphis cinerea* THOMAS, 'Cat. Marsup. Monotr. Brit. Mus.,' p. 342. A generalized description applicable to the group as a whole.
1900. *Didelphis cinerea* ALLEN, Bull. Amer. Mus. Nat. Hist., XIII, p. 189. Type of *cinerea* discussed under *Caluromys alstoni*.
1905. *Marmosa cinerea* TROUESSART, 'Cat. Mamm. viv. foss.,' Suppl., p. 855. Listed.
1916. *Caluromys cinerea* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 269. Listed.
1919. *Marmosa cinerea cinerea* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 36. Listed.
1927. *Marmosa* (*Micoureus*) *cinerea* POHLE, Abh. Senckenber. Naturforsch. Gesellsch., XL, p. 241. Recorded with brief remarks.

TYPE LOCALITY.—Rio Mucuri, northern boundary of Province of Espirito Santo, Brazil; probably at Morro de Arara.

TYPE SPECIMEN.—A. M. N. H. 845. Adult male in poor condition and without skull. Coll. Prince of Neuwied, between 1815 and 1817. (See remarks upon species.) Type in A.M.N.H.

MATERIAL EXAMINED (5 specimens)

BRAZIL.—Rio Mucuri, Espirito Santo (A.M.N.H. 845, type, adult male); Dois Irmãos, Pernambuco (Berlin 36177, juv. male; Berlin 36176, adult female); Rio de Janeiro (Berlin 36178, old female);. Marajó, Pará, (B.M. 26.1.2.18, old female).

A medium-sized, long-furred form with long, particolored tail, of which the basal 30 mm. or more bear body fur. Distinguishable from *cinerea paraguayana* by its longer palate and anteriorly convergent zygomata; from the various members of the *demararæ* division by the supraorbital ridges being rounded instead of strongly produced into processes; from *limæ* by its larger size and possession of supraorbital ridges; and from its neighbor to the west, *domina*, by the greater extent of body fur on its tail and larger, more rounded bullæ.

Color above, as in *cinerea paraguayana*, a clear, soft mouse-gray practically lacking the brownish shade often to be seen in members of the group from the northern and western parts of South America. Underparts a pale grayish-buff, much less striking than the strong yellowish shade of *cinerea paraguayana*. Gray-based hairs throughout except on chin and throat. Ears moderate in size. Eye-ring rather reduced.

[1]Title-page dated 1826. Published in 12 parts; pp. 1–156, in 1824. See 'Cat. Library British Museum.'

Tail with varying proportions of brown and white—in the type the distal four-fifths are white, but in Berlin 36716 from Pernambuco only the terminal 60 mm. are so, and then mostly beneath.

SKULL.—Skull rather long and narrow, broadest at the posterior part of the zygoma near the zygomatic process of the squamosal. Nasals relatively narrow basally, strongly produced behind and their posterior tips slightly rounded. Supraorbital ridges with processes but slightly developed, and these anterior to the postorbital process of the zygoma; the ridges converging gradually backward from these processes and losing themselves in the temporal ridges. (Contrast with the posteriorly placed processes of *demararæ* and the abrupt contraction of the supraorbital ridges posteriorly to meet the temporal ridges in that species.) A slight postorbital constriction only. Palate long and rather narrow; strongly produced backward behind the molars. Teeth large. Bridge moderately broad. Bullæ large and smoothly rounded.

This description of skin and cranium is based upon Berlin 36176 from Dois Irmãos, Pernambuco. A second specimen, Berlin 36178, labeled Rio de Janeiro, conforms almost exactly to the above description of the skull, but the skin differs slightly in having two-thirds of the tail white and self-colored hair on chin, throat, and lower costal region. It is a female, with the abdomen dark golden-buff.

A description of skin of type as seen today is as follows. Dorsal fur rather long. Color generally faded to a brownish gray. Ventral fur of body gray-based throughout, but chin and throat appearing clothed with self-colored hairs. Ears rather small. Tail long, with terminal four-fifths of its naked part white. Hairs of the basal part moderately long and extending down tail for about 35 mm. Eye-ring somewhat reduced. Vibrissæ long. See table of measurements.

B.M. 26.1.2.18, collected by Ehrhardt at Marajó Island, has the amount of self-colored hairs of the ventral surface greatly increased; gray-based hairs occur only at the lower costal region where the unicolorous pelage is narrowed to 13 mm. The eye-ring is scarcely developed at all, being extremely narrow. A slight over-shade near cinnamon-buff (R.) surrounds the ears and spreads along the sides (but not across the back). The length of the furry basal part of the tail is 35 mm. Cranially the specimen is very like the above. Although distinguished by its color, its smooth, dense pelage and broad skull from what may be called typical *cinerea*, it agrees with that species in general cranial measurements and in having very large teeth.

DISTRIBUTION.—From Marajó to Pernambuco and Rio de Janeiro, Brazil; extent inland unknown.

REMARKS.—No topotypes of *cinerea* are to be found in museums, and the skin of the type is in a condition too poor to be properly compared with other material. Yet, based mainly on geographical evidence, the specimen is provisionally held to be the same as the Pernambuco animals and the long-skulled specimen from Rio de Janeiro. Possibly it comes nearest to the Rio animal, to judge by the great amount of white on the tail of each. The point cannot be cleared up conclusively until a good series of *cinerea* has been collected from the Rio Mucuri.

Since upon the satisfactory establishment of the type specimen and type locality of *cinerea* depends the working out of the whole group, some discussion of the history and present status of this important species is necessary. Two distinct problems have presented themselves: the settling of the actual type of the species from two individuals which are claimed to be types; and the determination as to which of the two forms occurring in eastern Brazil, the narrow-skulled *c. cinerea* and the broad-skulled *c. paraguayana*, is identical with the type specimen finally selected.

Animals claimed as types of *cinerea* Temminck are Vienna 169A and A.M.N.H. 845. The former, alluded to by Pohle (1927) in his report upon Professor Breslau's collection from Brazil, was probably not collected by Wied, for it bears an old label inscribed as follows:

Didelphis cinerea, Temm.
Pur(u)s
graue Beutelratte Schupati

The parenthesis in the word Purus marks where a metal eyelet has been punched through the paper. Even if the Rio Purus label is wrongly attached, no evidence is extant to show that the animal is really from Bahia, as Pohle claims. The great extent of hair on the base of the tail proves it to belong to either *cinerea* or *demararæ*, and the cranium, it must be admitted, is nearer to the former.

A.M.N.H. 845 appears to be the actual type which Wied collected and from which Temminck drew up his description of the male of *cinerea*. [See remarks by J. A. Allen, (1900).] It is labeled:

No. 33. Mas Jupati,

and on the back of the label in another handwriting:

Didelphis nudicaudatus.

In addition it bears the regular A.M.N.H. label No. 845 and a red type label. Under No. 845 in the catalogue is the following: "*Didelphis nudicaudatus.* No. 33, Mas Jupati.—Max. label '*D. myosurus.*' Max. Col. p. 32." The following information is furnished by Wied (Beitr. z.

Naturg. von Brasilien, II, p. 410). "I took it in the woods of the Mucuri (river) at Morro d'Arara, where under the name Jupati it is confounded with other kinds." Again he says ('Travels in Brazil,' p. 216), "The place chosen for the fazenda . . . lies about a day and a half's journey up the Mucuri, and is named Morro d'Arara from the number of macaws (Araras) found there."

Obviously the word "Jupati" provides the key to the problem, since it was the term employed for these animals in the local dialect of the Mucuri region.

The type locality may then be considered to be the Rio Mucuri, probably at or near Morro d'Arara (see Wied's map in 'Travels in Brazil').

Identification of A.M.N.H. 845, which lacks a skull and is in an extremely worn and faded condition, with one of either of the eastern Brazilian forms is attended with considerable doubt. Yet on the basis of its place of origin and the fact that its tail is white for the terminal four-fifths, it seems probable that it may be the same as the narrow-skulled subspecies, and in this paper that assumption is acted upon. Winge's elaborate analysis of *cinerea* was in all probability based upon the animals from Lagoa Santa now to be found at Copenhagen. These appear to be *c. paraguayana* rather than true *c. cinerea*, and therefore his observations are directly applicable to that form. Much of his description is suitable to the entire *cinerea* group, having group value rather than specific value.

Marmosa cinerea paraguayana Tate

Plate I, Figure 2; Plate XIV, Figure 124

1893. *Grymæomys cinerea* WINGE, E. Mus. Lundii, II, p. 46. A detailed description of the group based upon this form.

1901*a*. *Marmosa cinerea* THOMAS, Ann. Mag. Nat. Hist., (7) VIII, p. 536. One female recorded.

1927. *Marmosa Micoureus cinerea* subsp. POHLE, Abh. Senckenber. Naturforsch. Gesellsch., XL, p. 241. Recorded, with brief remarks.

1931. *Marmosa cinerea paraguayana* TATE, Amer. Mus. Novitates, No. 493, p. 1. Type description.

TYPE LOCALITY.—Villa Rica, Paraguay.

TYPE SPECIMEN.—B.M. 25.5.1.15. Adult male. Coll. Schade. Type in B.M.

MATERIAL EXAMINED (16 specimens)

PARAGUAY.—Villa Rica (B.M. 25.5.1.15, type, adult male); Sapucay, (B.M. 2.11.7.17, adult female); "Paraguay" (Berlin 35671, adult female).

BRAZIL.—Rio Jordão, Parana (B.M. 1.11.3.106, juv. female); Hansa, Santa Catharina (Berlin F. No. 243, old adult male); "Sta. Catharina" (Berlin 36188,

skull only, adult male; B.M. 14.1.27.8, y. adult male); Rio de Janeiro, São Paulo (Berlin 36179, old adult female); Piquete, São Paulo (B.M. 1.6.6.97, juv. female); Lagoa Santa, Minas Geraes (Copenhagen 110–115, 2 males, 4 females; Copenhagen L (Lund) 13, old male; Copenhagen 116, old male).

A subspecies with strongly yellowish underparts, short palate, and well-expanded zygomata which are not markedly convergent anteriorly.

Color dorsally as in true *cinerea*—a very clear mouse-gray with no admixture of brownish; ventrally with the tips of the hairs a deep yellow-buff through which very little of the gray of the lateral gray-based hairs shows. Inguinal and gular regions self-colored and connected by a narrow median self-colored stripe. Ears moderate, about 26×18. Eye-ring rather reduced. Tail nearly half as long again as head and body, particolored.

SKULL.—Skull with broadly expanded zygomata which are evenly arched, nasals rather broad at the base, and strongly developed supraorbital ridges which tend to form angular processes; these processes, however, are placed well forward as in *c. cinerea*. No marked postorbital constriction of brain case. Palate short and broad. Teeth large to moderate. Bridge often rather broad. Bullæ large and smooth.

DISTRIBUTION.—Paraguay, Minas Geraes (Lagoa Santa), Rio de Janeiro southward to Santa Catharina and probably Rio Grande do Sul.

REMARKS.—This form seems to vary considerably in size according to locality, but with the insufficient material at hand nothing very definite can be established regarding it. Paraguayan animals and those from São Paulo provide the mean size; the Lagoa Santa specimens (in Copenhagen) are very large; and individuals from Santa Catharina in the south seem to be rather uniformly small.

Marmosa limæ Thomas

Plate I, Figure 3; Plate XIV, Figure 125

1920. *Marmosa limæ* THOMAS, Ann. Mag. Nat. Hist., (9) VI, p. 282. Type description.

TYPE LOCALITY.—Ceará, Brazil.

TYPE SPECIMEN.—B.M. 20.7.14.41. Young adult female (not male, as stated by describer). Coll. Sr. F. Lima, No. 85, 1915 or 1916. Lived for some time in Pará Zoölogical gardens. Type in B.M.

MATERIAL EXAMINED

The type only.

A small form allied to *cinerea* very little larger than *phæa*, easily distinguishable by its crisped fur, the great length of the fur-clothed basal portion of the tail, and the scarcely at all expanded supraorbital ridges of the skull.

Appearance of fur dorsally, owing to its kinky texture, very like that of *germana*, but less brown—between drab (R.) and hair brown (R.). Base of tail above slightly suffused with brownish. Body beneath ochraceous buff (R.), gray-based, except the hairs of chin, throat, and abdomen, and to a slight extent of the inside of the limbs. Tail brown, with few white spots near tip; furred portion 35 mm. in length.

SKULL.—Skull resembling a small examplé of *cinerea cinerea*, but differing in the rather more expanded nasals, shorter palate (especially its extent behind the molar teeth), and in the reduction of the supraorbital processes to parallel beadings. The zygomata converge as in *cinerea* and the bullæ are similarly large and rounded.

DISTRIBUTION.—Ceará.

REMARKS.—Judging from the single specimen, *limæ* seems to be a very distinct species. It is desirable that more collecting be done in the region about Ceará where such remarkable types as *emiliæ*, *limæ*, and *beatrix* have originated.

Marmosa demararæ Thomas

(Synonymy under subspecies)

Size large; fur long or short, fine or coarse. Color some shade of brownish gray dorsally; ventrally some tone of yellowish buff with a gray admixture. Self-colored hairs usually limited to chin, cheeks, and neck, but sometimes extending as a median stripe to tail. Body fur on tail never less than 30 mm. in extent. Tail long, always with more or less white terminally. Eye-rings variable. Ears moderate to large. Feet and claws large and strong. Mammæ believed to be always 5–1–5, although not all may become functional.

SKULL.—Large and strong, with zygomata, as a rule, widely and evenly arched when looked at from above (in specimens from Maturin they are rather convergent anteriorly, as in *cinerea*). Nasals rarely much widened at the maxillo-frontal suture. Supraorbital ridges and processes strongly developed, the latter rather far back, and converging abruptly behind the postorbital constriction to meet the usually closely approximated temporal ridges. (In young animals these characters of the supraorbital region are much less apparent, or even not appreciable at all.) Skull beneath with palate of moderate proportions and variably developed vacuities. Bridge moderate to rather narrow. Bullæ rather small, although usually well rounded.

TEETH.—M^{1-3} and M_{1-4} never less than 7.0 and 9.0, respectively.

The distinctive features of the species are: its generally large size; the well-pointed supraorbital processes which narrow abruptly behind

at the very marked postorbital constriction of the brain case (less clearly observable in subadults than in very old animals); the moderately large (smaller than in *cinerea*), well-rounded bullæ; elongate basal portion of the tail which is covered with fur; and the more or less whitened terminal portion. The above characters are only exclusive when considered together, and, coupled with the place of origin, will distinguish *demararæ* from other species.

DISTRIBUTION.—*Demararæ*, represented by one or other of its subspecies, is here considered as extending over most of the northern part of South America. In the Guianas it is found typically; and it probably extends northwest across the delta of the Orinoco to Maturin, where specimens have been taken. At Mount Roraima the form *areniticola* represents it, and still farther west, in the Parima Mountains and at Mount Duida this is replaced by *esmeraldæ*, which extends southwest through the Casiquiare Canal. A single specimen (the supposed type of *cinerea* in the Vienna Museum—Vienna 169A) is labeled as coming from the Rio Purus. Since this has the haired basal portion of the tail very long, it must perforce be referred either to *demararæ* or to *cinerea;* but the labeling is perhaps to be distrusted, for the specimen is exceedingly old and looks very like *c. cinerea*. If, however, the label is correct, then the range of *demararæ* must be greatly extended to the southward.

Demararæ appears to be absent from the forests south of the Rio Branco savannas and along the northern side of the Amazon, and, if the very scanty evidence is correctly interpreted here, is replaced by *domina*. In the Mérida Andes and the eastern Andes of Colombia it appears as the coarsely haired form *meridæ*, this subspecies extending down toward the central savanna region of the Upper Orinoco, and probably penetrating the gallery woods of the streams of all the northern Orinoco region. The boundaries and transition areas of the varieties of *demararæ* are virtually unknown. It is unrecorded from northwest Colombia (where *alstoni* occurs), and appears to be absent from Trinidad and other islands.

The four subspecies may be distinguished with sufficient ease when the specimens originate from near their type localities or well within their distribution areas, but with additional collecting from new regions they will probably be found to intergrade. As the situation stands today, they appear to be separable as follows:

1.—Size never exceedingly large; pelage relatively sparse, never very short; eye-ring usually much narrowed (except specimens from Colombia); sides of face and neck usually light gray-buff; skull without sagittal crest in age. *demararæ meridæ*.

2.—Size never exceedingly large; pelage normally softer than in *meridæ*, and often much shorter; ventral pelage always short; eye-ring moderately narrowed; sides of face and neck usually deep yellow-buff; no sagittal crest.
demararæ demararæ.

3.—Size proportionately small; pelage very long, very soft, straight and lax; ventral pelage long; hairs of tail-base very long and soft; eye-ring very black and broad; sides of face deep buff; skull without sagittal crest.
demararæ areniticola.

4.—Size large (in age)—the largest form of *Marmosa* known; pelage variable in length, never very short and never so coarse as in *meridæ*; underparts usually washed with brownish buff; hairs of base of tail usually much shorter than in *areniticola*, skull in age (males) may have distinct sagittal crest; attains the extreme of postorbital constriction of brain case.
demararæ esmeraldæ.

The use of quality of fur as a diagnostic character among these subspecies is open to criticism, since little is known of the period of moulting or of its effect upon the appearance of the animals. Yet in the case of *demararæ* an unusually large number of specimens have been available for study, the dates of whose capture cover considerable periods of the year, and it is believed that the characters of the furs used in diagnosis are valid.

Marmosa demararæ demararæ Thomas

Plate I, Figure 4; Plate XIV, Figure 126

1905. *Marmosa cinerea demararæ* THOMAS, Ann. Mag. Nat. Hist., (7) XVI, p. 313. Type description.

1916. *Caluromys demararæ* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 269. Listed.

1919. *Marmosa cinerea demararæ* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 36. Listed.

1921. *Marmosa cinerea demararæ* ANTHONY, Zoologica, III, No. 13, p. 267. Brief record.

TYPE LOCALITY.—Comaccka, 80 miles up Demarara River, British Guiana.

TYPE SPECIMEN.—B.M. 5.11.1.25, adult female, coll. S. B. Warren, No. 16. Type in B. M.

MATERIAL EXAMINED (24 specimens)

BRITISH GUIANA.—Comaccka (B.M. 5.11.1.25, type, adult female; B.M. 5.11.1.24, 5.11.1.26–27, young of type, juveniles; F.M.N.H. 18544, juv. female); Kartabo (A.M.N.H. 42889, 42911, 40905, 64158, juv. males; A.M.N.H. 48389, 64155, juv. females; A.M.N.H. 42879, ad. male; A.M.N.H. 64154, 64156, young adult males); Bartica Grove (B.M. 10.11.10.17, juv. male); Kalacoon (A.M.N.H. 42890, young adult male; A.M.N.H. 41902, adult female); Hyde Park (B.M. 7.6.20.14, adult male); Potaro District (B.M. not reg., y.ad.male); Ireng Valley, [B.M. 3.4.6.10, (Alc.), adult male.]

DUTCH GUIANA.—"Surinam," Stuttgart 288/141½ (with 2 young), adult female

No Locality.—Amsterdam, juv. male.

Venezuela (northeast).—Maturin, Sucre (Berlin 8544, adult male; Berlin 6927, adult female).

Pelage of somewhat sparse character. General dorsal color gray, with a brownish wash suggesting something between hair brown (R.) and a brownish shade of mouse gray (R.). Ventrally color approaching cinnamon-buff (R.); hairs of chin, throat, and a rather narrow median ventral stripe self-colored. Ears moderately large. Tail long; the basal, furred part 35 mm. in length; its terminal 65 mm. white.

Skull.—Skull of type, being that of a small female, lacks outstanding character. Normally broadened across zygomata. Nasals only moderately broad at maxillo-frontal suture, and separately pointed behind. Supraorbital processes moderately developed. Palate short, broad, with rather large posterior palatal foramina and lacking accessory openings. Bullæ moderately large and well rounded.

The above description is scarcely adequate for the subspecies, and specimens other than the type show definite variations. A large male from the Demarara River, B.M. 7.6.20.14, possesses accessory openings in the palate, very large supraorbital processes, approximated temporal ridges, strong postorbital constriction of brain case, and dorsal fur 15 mm. in length.

Distribution.—Typically from the lowlands of the Guianas. The two specimens from Maturin, although the fur is coarser than in type *demararæ*, are classed here because their pelage is very short. Their place of origin is about equally accessible either for *d. demararæ* or for *d. meridæ*.

Marmosa demararæ areniticola Tate

Plate I, Figure 5; Plate XIV, Figure 127

1931. *Marmosa demararæ areniticola* Tate, Amer. Mus. Novitates, No. 493, p. 2. Type description.

Type Locality.—Arabupu, foot of Mt. Roraima, Venezuela, 4200 feet.

Type Specimen.—A.M.N.H. 75691. Adult male. Coll. Tate and Carter, December 29, 1927. Type in A.M.N.H.

Material Examined (8 specimens)

Venezuela.—Arabupu, Mt. Roraima (A.M.N.H. 75691, type, adult male; A.M.N.H. 75690, 75694, adult males; A.M.N.H. 75688, 75695, y.ad.males; A.M.N.H. 75692–93, 75689, adult females.

Type with very soft, long, lax pelage throughout. Color of back browner than hair brown (R.), and darker and grayer than sepia (R.)—the shade being occasioned by the cinnamon-yellow tips of hairs resting upon their gray or slaty basal parts. Face lighter, buffy gray; sides

becoming suffused with cinnamon. Underparts between cartridge buff (R.) and cream-buff (R.), darkening on neck, throat, chin, and cheeks to chamois (R.). All hairs gray-based, except cheeks, chin, and immediate vicinity of scrotum. Ears of medium size, fuscous. Eye-rings broad and very black; only very slightly narrowed beneath eye. Hands and feet in dried condition between cartridge buff (R.) and chamois (R.). Tail long; the distal half white; its junction with the brown portion irregular; the basal furry part 33 mm. in length. The individual hairs of this portion of the tail very long and fluffy (rather after the condition seen in *alstoni*), but to a less extent, and not frizzy as in that species.

SKULL.—Of moderate size and with moderately broadened zygomata. Nasals broad at the maxillo-frontal suture, and each prolonged as a small, sharp point between maxilla and frontal bones; posterior parts of nasals narrow and separately round-pointed. Supraorbital processes only moderately prominent, and temporal ridges only moderately approximated. Palate of normal proportions; without palatal vacuities. Bullæ fairly large and smoothly rounded.

The topotypes agree very closely with the skin of the type in coloration, but the amount of white on the tail may be reduced to terminal blotches or marblings. The basal fur of the tail is characteristically long and erect-standing. In the skulls also, the lateral projection between maxilla and frontal may be obsolete, but the bones are always strongly widened at this point.

DISTRIBUTION.—*Areniticola* is only known from the foot of Mt. Roraima. It will probably be found to extend southeast along the high ridges bordering the Rio Cotinga and southward on to the Pacaraima Range. To the northwest also it ought to occur following the mountains around the western edges of Mazaruni basin.

Marmosa demararæ esmeraldæ Tate

Plate I, Figure 6; Plate XIV, Figure 128

1931. *Marmosa demararæ esmeraldæ* TATE, Amer. Mus. Novitates, No. 493, p. 2. Type description.

TYPE LOCALITY.—Esmeralda, near foot of Mt. Duida, Upper Rio Orinoco, Venezuela, 325 feet.

TYPE SPECIMEN.—A.M.N.H. 76964. Old adult male. Coll. G. H. H. Tate, No. 5035, October 7, 1928. Type in A.M.N.H.

MATERIAL EXAMINED (17 specimens)

VENEZUELA.—Esmeralda, 325 ft., Mt. Duida and Upper Rio Orinoco (A.M.N.H. 76964, type, o.ad.male; A.M.N.H 76967, 76972, o.ad.males; A.M.N.H. 76963, 76965, y.ad.males; A.M.N.H. 76966, ad.female; A.M.N.H. 76968, y.ad.female);

Rio Ocamo, southwest of Esmeralda (A.M.N.H. 78102, y.ad.female; A.M.N.H. 78104, ad.female); Mt. Duida (350 ft., A.M.N.H. 76974, o.ad. male; 750 ft., A.M.N.H. 76985, y.ad.female; 4500 ft., A.M.N.H. 76973, 76978–79, ad.females; 6200 ft., A.M.N.H. 76982, ad.female); six miles from Orinoco, Casiquiare Canal (A.M.N.H. 76962, y.ad.female); Quemapure, Casiquiare Canal (A.M.N.H. 76961, y.ad.female).

The largest known form of *Marmosa*, the hind foot in some individuals reaching 32 mm. Pelage dense, lax, generally slightly wavy. Above mouse gray (R.) with a brownish suffusion. Face and sides lighter, tinged with rusty. Underparts pale rusty buff, near cinnamon-buff (R.); the hairs of chin, throat, neck, inguinal parts and inner sides of legs self-colored; remainder gray-based. Eye-ring fairly broad. Ear light fuscous, moderately large to very large. Tail long and particolored; the distal half creamy. Basal 40 mm. of tail with moderately long body hairs.

SKULL.—Very strongly constructed, with well-expanded zygomata. Nasals separately pointed behind, the portion adjoining the maxillo-frontal suture moderately broad. Supraorbital processes large, and strongly pointed, abruptly narrowed behind at the very pronounced postorbital constriction, and passing into the temporal ridges, which, although closely adjoining one another, do not actually form a crest in the type. Strong lambdoidal ridges. Palate long and broad, with long posterior foramina. Bridge of moderate breadth. Bullæ moderately large and smoothly rounded.

Divergence from the type is due mainly to immaturity in many specimens, and females never develop the cranial characters to the same extent as males. The specimen with distinct sagittal crest is A. M. N. H. 76974. The color of the mammary region in functioning females approaches honey yellow (R.).

DISTRIBUTION.—Upper Rio Orinoco, Casiquiare Canal, and adjoining mountainous regions.

REMARKS.—A.M.N.H. 78104 had ten young attached to it.

Marmosa demararæ meridæ Tate

Plate I, Figure 7; Plate XIV, Figure 129

1931. *Marmosa demararæ meridæ* TATE, Amer. Mus. Novitates, No. 493, p. 3. Type description.

TYPE LOCALITY.—"Cafetos de Mérida," Mérida. 1630 m.

TYPE SPECIMEN.—U.S.B.S. 137510. Old adult male. Coll. Briceño Gabaldon, June 14, 1904. Type in U.S.B.S.

MATERIAL EXAMINED (32 specimens)

VENEZUELA.—Cafetal de Chama, Mérida Region (A.M.N.H. 21322, female ?; U.S.N.M. 123317, male; A.M.N.H. 24317, female ?; A.M.N.H. 24316, 33157, 21321, females; A.M.N.H. 21323, juv. female; B.M. 5.1.1.5, ad.female); Rio Chama,

Mérida Region (B.M. 98.7.1.15–16, ad.males; B.M. 98.7.1.18, ad.female); Cafetal de Hama ?; Mérida Region (U.S.N.M. 172955, ad.female); Cafetal de Llano, Mérida Region (A.M.N.H. 33158, male; B.M. 3.12.5.7, ad.female); Cafetal Fuente, Mérida Region (B.M. 98.7.1.17, ad.female ?); Cafetal de Mérida, Mérida Region (A.M.N.H. 24319, ad.female; U.S.N.M. 137510, type, o.ad.male); Cafetal de Milla, Mérida Region (U.S.N.M. 123318, ad.female); Platanales de los Campos (A.M.N.H. 24318, female ?); "Mérida," (F.M.N.H. 18904, male; Hamburg 38300, juv.male; U.S.N.M. 123319, juv.male; Berlin, no number, 2 females; B.M. 10.12.3.9, male); "Venezuela" (F.M.N.H. 7052, female; U.S.N.M. 115314, male); San Esteban, Carabobo (B.M. 11.5.25.176–177, ad.males).

Colombia.—S. Domingo de Bogotá (B.M. 98.5.15.6, ad.female); Villavicencio (A.M.N.H. 63895, ad. ?); Miraflores, Boyaca, Bogotá (5, juv. ?).

Type with moderately long hair of a quality decidedly coarser and harsher than any of the other three subspecies. Color above a brownish gray, near bister (R.) and sepia (R.), the caudal fur becoming more strongly brownish. Face light, drabby gray. Sides slightly paler than dorsum. Underparts a dirty, grayish shade of cream-buff (R.), deepening on neck, chin, and cheeks to chamois (R.). Hairs of chin and cheeks only unicolorous. Ears a light brownish-fuscous (perhaps faded). Eye-rings not intensely black (as in *roraimæ*); greatly narrowed beneath eyes. Tail fuscous, with greater part of terminal half blotched with white. Basal hair of tail of only moderate length, becoming much shorter distally.

Skull.—With characters of the species. That of type with rather broad zygomata; nasals abruptly broadened at the maxillo-frontal suture, narrowing posteriorly to points; well-developed and pointed supraorbital processes with dorsal groove on the posterior portion caused by the folding over of bony tissue from the sides in advance of the temporal muscles. Moderately approximated temporal ridges. Considerable postorbital constriction. Palate broad, rather short, without accessory vacuities. Posterior palatal vacuities long and well developed. Bridge moderate. Bullæ moderate, with slight tendency to become pointed beneath.

Other specimens, most of which are younger than the type, agree closely in coloration of the body, but nearly all have the terminal half or more of the tail white. In the skulls the supraorbital condition described may be much less pronounced, and posterior circular vacuities may be present in the palate.

Distribution.—Most of the large number of *meridæ* scattered among the world's museums have been collected by Briceño Gabaldon near Mérida, but the subspecies appears to range, perhaps interruptedly, for a considerable distance westward, and to follow the eastern Andes

for an undetermined distance down into Colombia. In the Magdalena Valley it is replaced by a form of the Central American *alstoni*, and by the anomalous *regina*. Its extension into the Orinoco basin is not ascertained.

Marmosa alstoni (Allen)

(Synonymy under subspecies)

Alstoni is here considered to include the short-haired form *nicaraguæ* as a subspecies. The former is subtropical in distribution, the latter apparently restricted to the torrid coastal parts of southern Central America, and northern Colombia.

The species is not always certainly distinguishable by the skin alone from *cinerea* and *demararæ*, but whenever *a. alstoni* has developed the very long, frizzy basal hair of the tail it is at once recognizable. Besides the flatter supraorbital processes and smaller posterior palatal foramina, *alstoni* has the postorbital region markedly broader than have the above-mentioned species.

The two subspecies are very closely allied in skull characters, but *nicaraguæ* is slightly smaller in size; its teeth are very slightly smaller and its bullæ more compressed and pointed than in *alstoni* proper. The skin of *nicaraguæ* has shorter, straighter fur, much self-colored ventral pelage, and proportionately less white on the tail.

Apparently the moult in this species is more abrupt than in its South American kindred. At least, the caudal region is seen to be very variably clothed, the old hairs being completely shed by the time the new pelage has attained about half its growth. As yet the time of year of moulting cannot be definitely stated. Specimens with fully developed caudal fur were caught in August and in January; those with shorter fur are undated.

Marmosa alstoni alstoni (Allen)

Plate I, Figure 8; Plate XIV, Figure 130

1880. *Didelphis cinerea* ALSTON, 'Biol. Centr. Amer. Mamm.,' p. 199, Pl. XXI. Reference specimens collected by Carmiol in Costa Rica.

1885. *Didelphis cinerea* TRUE, Proc. U.S.N.M., VII, p. 587. Listed.

1891. *Didelphys* (*Micoureus*) *cinerea* ALLEN, Bull. Amer. Mus. Nat. Hist., III, p. 218. Record from San José.

1897. *Marmosa cinerea* ALLEN, Bull. Amer. Mus. Nat. Hist., IX, p. 43. Record from Tres Rios.

1900. *Caluromys alstoni*, ALLEN, Bull. Amer. Mus. Nat. Hist., XIII, p. 189. Type description. Records presence of type of *cinerea* in Amer. Mus. Nat. Hist.

1905. *Marmosa alstoni* TROUESSART, 'Cat. Mamm. viv. foss.,' Suppl., p. 855. Listed.

1904. *Marmosa cinerea* ELLIOT, Field Columbian Mus. Publ. 95, Zoöl. Ser., IV, part 1, p. 9. Brief description.

1904. *Caluromys alstoni* ELLIOT, Field Columbian Mus. Publ. 95, Zoöl. Ser., IV, part 1, p. 9. Brief description.

1905. *Caluromys alstoni* ELLIOT, Field Columbian Mus. Publ. Zoöl. Ser., VI, p. 4. Listed.

1905. *Marmosa cinerea* ELLIOT, 'Checklist Mamm. N. Amer.,' Field Columbian Mus. Publ. 105, Zoöl. Ser., VI, p. 3. Listed.

1916. *Caluromys alstoni* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 269. Listed.

1919. *Marmosa cinerea alstoni* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 36. Listed.

TYPE LOCALITY.—Tres Rios, subtropics, east of divide, Costa Rica.

TYPE SPECIMEN.—A.M.N.H. 11790/16210, adult male, coll. G. K. Cherrie, August, 1893. Type in A.M.N.H.

MATERIAL EXAMINED (30 specimens)

COSTA RICA.—Tres Rios (A.M.N.H. 11790/16210, type, ad.male; A.M.N.H. 11789/10059, ad.female; A.M.N.H. 11792/10061, young of 11789/10059, juv. male; A.M.N.H. 11793/10062, juv.male; A.M.N.H. 11791/10060, juv.female); San José (A.M.N.H. 3655/2804, juv. ?; U.S.N.M. 8809, female); San Juan [U.S.N.M. 12879/37716, y.ad. ?; U.S.N.M. 12887 (Alc.) ad.female]; Cuba (U.S.N.M. 14629, juv.); "Costa Rica" (U.S.N.M. 8417/37701, v.y.ad.?; B.M. 69.7.19.4, y.male; Berlin 3376, 3740, 35670, males); Escazu, 1178 m., west of San José, Pacific Slope (B.M. 98.10.9.11–12 males; B.M. 99.4.3.21, y.ad.?; B.M. 99.4.3.22–23, juv. females) "Pacific Coast" [U.S.N.M. 12888 (Alc.), ad.female].

NICARAGUA.—No Locality (U.S.N.M. 15646/22544, v.y.ad.male; Berlin 7364, ad.female).

HONDURAS.—Segovia R. = Rio Coco (U.S.N.M. 15940/37731, juv. ?); "E. Honduras" (U.S.N.M. 22831, juv. ?).

WESTERN COLOMBIA.—Jerico, Antioquia, Bogotá (1, ad.male; A.M.N.H. 61578, juv.); Calarca, Caldas (A.M.N.H. 62796, ad.male ?); Cundinamarca (B.M. 98.5.15.6, o.ad.female); no locality [A.M.N.H. 42682, 11 young attached (Alc.), ad.female].

A form often at once recognizable by the great length and generally frizzy appearance of the hairs on the base of the tail, down which they may extend for 40 mm. or so.

Type with long, somewhat coarse hair as in *meridæ*. Color dorsally gray-washed with brownish, somewhat more vivid than clove brown (R.). Face very pale, near cream-buff (R.). Fur of tail more strongly colored than that of body with a distinct purplish cast suggesting deep brownish drab (R.). Underparts with hairs terminally cream buff on chest and body, but the gray under-color shows through to such an extent that thorax and abdomen look more gray than buff; chin and cheeks chamois (R.). Self-colored hairs found only on chin, cheeks, and scrotal region. Eye-rings only moderately developed. Size of

ears moderate. Feet light grayish. Tail only moderately long, the terminal 110 mm. white.

SKULL.—Stout and broad. Zygomata flaring and muzzle short. Nasals not abruptly expanding from the front backward, but moderately broad at the maxillo-frontal suture. Supraorbital processes very strongly developed and pointed, without dorsal grooves, and merging, without postorbital constriction of brain case, into the widely separated temporal ridges. Palate broad and rather short, lacking accessory posterior openings. Bullæ small, and fairly smoothly rounded.

DISTRIBUTION.—Subtropics of Costa Rica, Nicaragua, and Honduras, and, missing the lowlands of Panama, reappearing in the Colombian subtropics (Departments of Antioquia, 5,000 feet, and Caldas).

REMARKS.—This interesting example of discontinuous distribution is in direct confirmation of Dr. F. M. Chapman's "Panama 'fault'" ('Distr. Bird Life of Colombia,' Bull. Amer. Mus. Nat. Hist., XXXVI, 1917, p. 151). The identification of Colombian with Costa Rican animals is furnished by the extent of body pelage on the tail; by the great breadth of the brain case; the unconstricted postorbital region; the quite small posterior palatal vacuities and by the large, pointed, flat supraorbital processes without dorsal grooves.

A.M.N.H. 42682 without locality, obtained from the Bureau of Animal Industry, is an alcoholic specimen with eleven young attached to the teats. Its broad interorbital region, tail with 40 mm. of body fur, and ears 25×17, shows that it is a specimen of *alstoni*, and the number of young demonstrates the mammary formula to be 5–1–5. Usually only 4–1–4 of the mammæ become everted and visible.

Marmosa alstoni nicaraguæ Thomas

Plate I, Figure 9; Plate XIV, Figure 131

1905. *Marmosa nicaraguæ* THOMAS, Ann. Mag. Nat. Hist., (7) XVI, p. 313. Type description.

1916. *Caluromys nicaraguæ* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 269. Listed.

1919. *Marmosa cinerea nicaraguæ* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 36. Listed.

TYPE LOCALITY.—Bluefields, Nicaragua. Sea level.

TYPE SPECIMEN.—B.M. 5.10.31.5. Old adult male. Coll. G. Palmer, No. 5, January 9, 1905. Type in B.M.

MATERIAL EXAMINED (3 specimens)

NICARAGUA.—Bluefields, (B.M. 5.10.31.5, type, o.ad.male).

COSTA RICA.—Siquierres, Rio Pacuaré (Stockholm, Coll. no. 39, male).

UNITED STATES.—Caught in New Orleans (U.S.N.M. 222887, ad.male).

Fur of type short and close. Color above brownish gray, between hair brown (R.) and mummy brown (R.), but somewhat grayer. Underparts a light shade of cream-buff (R.); throat, chin, chest, a ventral stripe 8 mm. in width, abdomen and insides of limbs with unicolorous hairs. Hands and feet grayish white. Tail long, fuscous, with terminal two-fifths white. Fur of tail base short, and extending only 27 mm. from body.

SKULL.—Closely matches that of *alstoni;* moderately broad, with nasals not greatly widened at suture. Supraorbital processes, although large and stout, rounded rather than pointed. Temporal ridges average 5 mm. apart. Palate slightly narrower than that of *alstoni.* Bullæ slightly compressed and pointed, with minute anterior processes.

DISTRIBUTION.—Uncertain, but probably the Caribbean coasts of Nicaragua, Costa Rica, and Honduras. In the subtropical hinterland it is replaced by *a. alstoni.*

The specimen, U.S.N.M. 222887, of unknown origin, appears to agree exactly with *nicaraguæ.* It has the short pelage and ⅗ brown tail of the type; and the skull, although badly broken, has the broadened and flattened postorbital processes and nasals similar to the species *alstoni.* Its small, slightly conic bullæ and the shortness of its fur suggest that it is *nicaraguæ* of the tropical lowlands. The length of the furred part of the tail is 28 mm., and the hairs on that part are very short, only 3–4 mm.

Regina Section

So named, not because *regina* is the central form, but because among the species belonging here it was described first. In this division of *cinerea*-like animals the furry basal part of the tail never attains 30 mm. in length; moreover, the hairs composing it are generally short. (Strictly speaking, *alstoni nicaraguæ* comes under this category, but belongs in the *cinerea* section.)

Species classed under the *regina* section are: *regina, domina, constantiæ, mapiriensis, rapposa, germana,* and *phæa.* Throughout this division a distinct tendency for the bullæ to be small and rather pointed appears. The development of the supraorbital processes and the degree of postorbital constriction vary with the species. Nasals, too, vary in the form of their basal parts. The tails, depending upon the species, may be either wholly brown or particolored. Size of animals from medium to small, but never extremely large. Ears often proportionately small. Teeth never so large as in the largest in the *cinerea* group;

generally rather small M^{1-3} and M_{1-4} varying from 6.5 to 8.1 and 8.7 to 10.5, respectively. Females, depending upon the species, have the mammary formula 4–1–4, 5–1–5, or 7–1–7: *domina*, 5–1–5; *constantiæ*, 7–1–7; *germana*, 4–1–4; others not definitely ascertained.

DISTRIBUTION.—Essentially the counterpart of that of the *cinerea* group, i.e., the western, central, and southwestern parts of South America—from the extreme north of Argentina to the llanos of western Colombia, and ascending the eastern slope of the Andes as high as the lower edge of the temperate zone. Eastward, it ranges out across Matto Grosso and down the valley of the Amazon at least as far as the Rio Tapajoz. Its northern limit east of the Andes is probably more or less a line drawn from the Rio Negro to the headwaters of the Guaviare or Uaupes rivers. In the subtropics of Ecuador and Colombia west of the Andes it also occurs, having reached that side of the mountains, perhaps through the Huancabamba pass, northern Peru, or by way of some relatively low pass in the Bogotá region.

The *regina* section contains within itself at least three rather well-marked forms which probably indicate definite evolutionary trends: southern forms typified by *constantiæ*, with more or less yellowish underparts, numerous mammæ, and skulls more or less constricted at the postorbital region; central ones, such as *germana* of Peru and Ecuador, with (usually) grayer underparts, few mammæ, and relatively unconstricted skulls whose bullæ are rather characteristically small and pointed. Both the above comprise animals of moderate to rather large size. The third type, whose mammary formula is not yet determined, is the small-sized *phæa* of the Pacific and Magdalena watersheds of Ecuador and Colombia. It is apparently quite closely allied to the *germana* series.

Because their mammary formulæ are not known in most cases, some uncertainty is felt in assigning the remaining species to one or other of the divisions mentioned. *Mapiriensis* comes nearer to *constantiæ* than to *germana* on account of its short, particolored tail and similar skull characters. *Rapposa*, notwithstanding its particolored tail and the rather broadly rounded posterior parts of the nasals, seems, on the whole, to go with *germana*. Its skull shows comparatively little constriction, and the temporal ridges are far apart. *Domina* is also assigned to the *germana* series on account of the compressed bullæ (in the type) and unconstricted skull. *Regina* of West Cundinamarca is a large animal, appearing also most nearly allied to the *germana* division. It probably reached the western side of the main Andean divide much as *phæa* did. Conical pointed bullæ and very small teeth characterize its skull.

The supposed relationships discussed above are shown as follows:

1.—Southern forms	
constantiæ constantiæ	Matto Grosso and Bolivia
constantiæ budini	Northern Argentina
mapiriensis	Bolivian mountains
2.—Central Andean and Amazonian forms	
rapposa	Southern Peruvian mountains
germana rutteri	Peru and Ecuador (foothills)
germana parda	Northern Peruvian mountains
germana germana	Eastern Ecuador (local form)
domina	Amazonia (except northwest)
regina	Colombia (West Cundinamarca)
3.—West of Andes	
phæa	Ecuador and Colombia (western)

Marmosa domina Thomas

Plate II, Figure 10; Plate XV, Figure 132

1920. *Marmosa domina* THOMAS, Ann. Mag. Nat. Hist., (9) VI, p. 280. Type description.

TYPE LOCALITY.—Villa Braga, Rio Tapajoz, Brazil.

TYPE SPECIMEN.—B.M. 20.7.14.39. Adult female. Coll. E. Snethlage, June 19, 1917. Type in B.M.

MATERIAL EXAMINED (9 specimens)

BRAZIL, "Amazonia."—Villa Braga, Rio Tapajoz (B.M. 20.7.14.39, type, ad. female; B.M. 20.7.14.38, y.ad.male); Serra da Lua, near Boa Vista, Rio Branco (F.M.N.H. 20035, ad. male); Lago do Capiranga, Amazonas [B.M. 26.7.10.42, (Alc.), ad.male]; Lago da Arara, Amazonas [B.M. 26.7.10.41, (Alc.) ad.male]; "Brazil" [Basle 5013–1069 (dissected), ad.female]; Ayapua, Rio Purus (Berlin 35830, ad.male); Villa Bella Imperatrix (A.M.N.H. 62874, o.ad.male); Rio Andira (mouth), (A.M.N.H. 62875, y.ad.female).

Type with short pelage. Dorsal color gray; ventral hue nearest to buff-yellow (R.), with chin, throat, chest, and median ventral stripe 15 mm. in width clothed with unicolorous hairs—the remainder slaty-based. Abdomen in female dark yellow ocher (R.). Tail with furry portion only 24 mm. in length and colored brown to the tip (without white terminally), giving the type a close resemblance to *germana*.

SKULL.—Skull with posterior part of zygomatic arch rather broad, but anterior portion narrower, the arches converging anteriorly after the manner of *cinerea cinerea*. Nasals with rather well-developed projecting points at maxillo-frontal sutures. Postorbital processes moderately pointed, and placed fairly well back on supraorbital ridges. A rather pronounced postorbital constriction. Palate rather elongate. Bridge moderately broad. Bullæ rather small, not strongly inflated.

Although the young male, B.M. 20.7.14.38, also from the type locality, does not conform very exactly with the type, it undoubtedly belongs to the same species. Its ears are rather larger than those of the female.

F.M.N.H. 20035, from Serra da Lua, Rio Branco, is another short-furred animal with pale cinnamon over-wash on the sides. The eye-rings are narrowed beneath, but well broadened above. Self-colored hair is found only on chin and belly, with a suggestion of a narrow median stripe. Ventral color near warm buff (R.). Tail brown, with few white terminal marks. Skull with well-rounded zygomata, well-developed supraorbital processes placed well back, and a rather short palate. Bullæ moderate.

Berlin 35830, from Ayapua, Rio Purus, is a rather young male with all-brown tail. Hair of the sides rather cinnamon at junction with belly hair. Eye-ring well broadened above. Ventral color buffy, and entirely self-colored from chin to abdomen and out on to limbs. Skull rather short, with broad supraorbital processes. Nasals with small-pointed lateral processes thrust between the maxillæ and fronals. A moderate postorbital constriction. Short, broad palate. Rather small bullæ.

The animal in the Basle Museum from "Brazil" comes probably from the Amazon. Tail apparently unicolorous (brown) and the basal, furred part short. Mammæ 5–1–5.

Two specimens just received from Villa Bella Imperatrix on the southern bank of the Amazon have black tails and conform closely to the type.

From the foregoing remarks the great variation of *domina* is readily gathered. Such is the plasticity of the species that only the short pelage and short basal part of the tail serve to bring the individuals together. Probably further collecting and study of the gray *Marmosa* of the Middle and Lower Amazon region will result in modification of the present arrangement. The above specimens are held to represent a variable, but apparently distinct species, most nearly related to *germana*, and marked off from the forms of *cinerea* to the east and south, and from the subspecies of *demararæ* to north and northwest, by its short pelage and the small extent of body hair on the base of the tail (less than 30 mm. in length). The only forms with which it might be confused in these respects are *constantiæ* of Matto Grosso and the lowlands of Bolivia and *rutteri*, the subspecies of *germana* of the Andean foothills. The former has the ventral parts deep yellow to clear buffy yellow; the latter always lacks white on the tail. Notwithstanding, *domina* is so variable that it is not easily defined.

DISTRIBUTION (suggested).—Middle and Lower Amazon, both north and south banks.

Marmosa constantiæ (Thomas)

(Synonymy under subspecies)

Constantiæ represents the *cinerea* group through an area stretching from Matto Grosso through the eastern Bolivian lowlands (Santa Cruz region) to the extreme northwest of Argentina (Jujuy). Probably it also extends eastward for a short way into the Chaco.

Its outstanding character is the development in females of 15 inguinal mammæ (7–1–7), as compared to the 9 or 11 of other species.

The gray dorsal color is often paler than in most of its allies; and ventrally some shade of yellow varying from straw to chamois gives the dominant hue. The hairs of most of the central area of the underparts are unicolorous, while those of the margins have such a large proportion of their lengths yellow that their gray bases are usually quite obscured.

In youth the ventral color has a distinct tinge approaching pinkish buff (R.), or pale pinkish buff (R.); and while yet nursing or extremely young the color is more nearly salmon-buff (R.).

The vibrissæ show a slight tendency to be shorter than is the case with strictly forest-dwelling forms like *germana*, and the eye-rings to be narrower and less developed. Often too the tail is proportionately rather short, while the amount of white it bears is subject to wide variation.

SKULL.—The cranium is stoutly formed, with wide zygomata and with round accessory orifices almost always present behind the large posterior palatal foramina. Nasals broad at the maxillo-frontal suture, and behind broadly rounded instead of pointed. Supraorbital processes in old animals very large and pointed, and narrowing abruptly behind to a postorbital constriction.

DISTRIBUTION.—The range of *constantiæ* can be only indefinitely indicated. In Argentina it apparently represents the most southern limit of the *cinerea* group; west of Santa Cruz in the mountains it is replaced by the long-haired *mapiriensis;* a little farther north, probably near the Rio Beni it meets the southernmost extension of *germana rutteri;* north and northeast it probably comes in contact with *domina;* and due east and southeast its place is taken by the long-haired *c. cinerea* and *c. paraguayana.*

Marmosa constantiæ constantiæ Thomas

Plate II, Figures 11, 12; Plate XV, Figures 133, 134

1904*a*. *Marmosa constantiæ* THOMAS, Proc. Zool. Soc., London, II, p. 243. Type description.

1905. *Marmosa constantiæ* TROUESSART, 'Cat. Mamm. viv. foss.,' Suppl. p. 856. Listed.

1916. *Caluromys constantiæ* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 270. Listed.

1919. *Marmosa constantiæ* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 36. Listed.

TYPE LOCALITY.—Chapada, Matto Grosso, Brazil.

TYPE SPECIMEN.—B.M. 3.7.7.157. Adult male. Coll. A. Robert, No. 1110, August 27, 1902. Type in B.M.

MATERIAL EXAMINED (32 specimens)

BRAZIL.—Chapada, Matto Grosso (B.M. 3.7.7.157, type, ad.male).

BOLIVIA.—Buenavista Sta. Cruz [Pittsburgh, 2754, 5028, y.ad.males; B.M. 28.2.9.86, 26.1.5.23, o.ad.males; B.M. 26.12.4.85, 28.2.9.88, ad.males; B.M. 26.12.4.84, juv. male; Pittsburgh 5166 (Alc.), (7 young), ad.female; Pittsburgh 5049, ad.female; Pittsburgh 5048, y.ad.female; F.M.N.H. 25266, B.M. 26.12.4.86–88, 26.12.4.102, 26.1.5.24, ad.females]; Rio Sara, near Buenavista, Sta. Cruz [Berlin 36179, B.M. 8.4.4.3, o.ad.females; Pittsburgh 2199, y.ad.male?; Pittsburgh 2781 (Alc.) juv.female]; Cerro Hosana, Sta. Cruz (Pittsburgh 4941, ad.male; Pittsburgh 4947, 4951, y.ad.males); Rio Surutu, Sta. Cruz (Pittsburgh 5040, y.ad.?); "Bolivia" (B.M. 51.5.3.4, juv. ?; B.M. 47.11.22.17, juv. ?; B.M. 46.8.24.17, ad. ?; B.M. 7.1.1.185, ad.female); Sta. Cruz [Pittsburgh 2256 (Alc.), (9 young), ad.female; Pittsburgh 2255 (Alc.), ad.male; Pittsburgh 5170 (Alc.), juv.male].

A large to medium-sized species with rather short, appressed hairs and broadly yellowish underparts which often consist mainly of self-colored hairs. Color a rather pale gray with slightly yellowish cast, becoming suffused with yellowish on the face and sides; ventrally varying from as pale as maize yellow (R.) to as deep and rich as light orange-yellow (R.). The type is intermediate, and colored buff-yellow (R.). Eye-rings often narrowed. Mammary region of females, when functional, rather deeper than yellow ocher (R.). Ears moderate in size. Tail variable, but never very long—in the type only 15 mm. longer than combined head and body; its color brown with the terminal half variably blotched with white, which is mostly beneath. Basal fur of tail of brief extent (20 to 25 mm.) and the individual hairs short. A distinct whitish down composed of intersquamal hairs nearly 1 mm. in length usually gives the bare part of the tail a whitish appearance. Mammæ 7–1–7.

SKULL.—Stoutly built, with well-rounded, well-expanded arches. Nasals, as a rule, broadly expanded at the maxillo-frontal suture. Supra-

orbital ridges strongly developed, and the processes stout and pointed. In the type and other old specimens a rather pronounced postorbital constriction is seen, and moderate approximation of temporal ridges. Interorbital region anterior to the processes, rather broad. Palate short and broad, usually with rounded fenestræ behind the posterior palatal foramina (closed in type). Bullæ variable, rather small, less inflated than in *demararæ*, yet larger and less conic-pointed than in *germana*.

DISTRIBUTION.—Matto Grosso and the Santa Cruz region of Bolivia, and (by inference) the land between them. Extent to north and south not known.

Marmosa constantiæ budini Thomas

Plate II, Figure 13; Plate XV, Figure 135

1919*a*. *Marmosa budini* THOMAS, Ann. Mag. Nat. Hist., (9) V, p. 195. Type description.

TYPE LOCALITY.—Altura de Yuto, Rio San Francisco, Jujuy, Argentina, 500 m.

TYPE SPECIMEN.—B.M. 20.1.7.134, young adult male, coll. E. Budin, No. 714, July 3, 1919. Type in B.M.

MATERIAL EXAMINED

The type only.

This animal is very closely related to *constantiæ* and may ultimately be merged with it. It is distinguished from that form by its small size, proportionately longer tail, and smaller teeth.

Color of type gray, with slight brownish to yellowish cast due to yellowing of tips of gray hairs. Under surface near light ochraceous-buff (R.). Eye-rings fairly well marked. Basal 15 mm. of tail furry, its terminal part becoming white.

SKULL.—Essentially like that of *constantiæ*, but smaller and possessing shorter molar tooth rows and less produced supraorbital processes. Accessory palatal openings present. Bullæ as in *constantiæ*.

DISTRIBUTION.—Known only from type locality in Jujuy.

Marmosa mapiriensis Tate

Plate II, Figure 14; Plate XV, Figure 136

1931. *Marmosa mapiriensis* TATE, Amer. Mus. Novitates, No. 493, p. 3. Type description.

TYPE LOCALITY.—Ticunhuaya, Sorata—Guanay Road, Rio Tipuani, Prov. de la Paz, Bolivia. 4800 ft.

TYPE SPECIMEN.—A.M.N.H. 72555, old male, coll. G. H. H. Tate, No. 3963, April 23, 1926. Type in A.M.N.H.

MATERIAL EXAMINED (6 specimens)

BOLIVIA.—Ticunhuaya, Rio Tipuani, Yungas, (Rio Beni drainage), (A.M.N.H. 72555, type, ad.male); Nequejahuira, Rio Unduavi, 8000 ft., Yungas, (Rio Beni

drainage), (A.M.N.H. 72569, juv.female); Mapiri, Rio Mapiri, 2000 feet, Yungas, (Rio Beni drainage), (A.M.N.H. 72554, juv.male); Guanay, Rio Mapiri, 1700 feet, Yungas, (Rio Beni drainage), (A.M.N.H. 72556, juv.female).

SOUTHEASTERN PERU.—Santo Domingo, W. 70° 11′, S. 14°, Rio Inambari drainage (A.M.N.H. 42399, juv.male); Rio Tavara, W. 70° 20′, S. 13° 25′, Rio Inambari drainage (A.M.N.H. 37192, juv.female).

Allied to *constantiæ*, but with longer, browner fur and still shorter tail.

Fur close and slightly waved (12 to 14 mm.). General color above near hair brown (R.) face very little paler; underparts near cinnamon-buff (R.), washed with vinaceous cinnamon at throat and chin. [In the young specimen from 8000 feet the underparts are suffused with vinaceous (R.)]. Hairs principally gray-based; self-colored hairs found only in a narrow 4 mm.-strip from throat to lower chest. Eye-ring moderately broad, somewhat narrower at lower lid. Ears rather dark fuscous. Forefeet cinnamon-gray; hind feet cinnamon-buff (R.). Tail very short, indistinctly particolored, the basal brown extending in blotches well toward the tip. (The specimen from 8000 feet is strongly particolor; the lowland ones almost without the pale color.)

SKULL.—Broad and blunt, with well-developed supraorbital processes. Bullæ small and strongly conical (in type; less so in young). Nasals with the abrupt expansion at the maxillo-frontal suture seen in *constantiæ*. Temporal ridges not approximated. Palate broad and short, possessing accessory openings.

DISTRIBUTION.—Apparently limited to the eastern and northern sides of the Cordillera Real, Bolivia, 1700 to 8000 feet. Farther north in the Peruvian mountains it is replaced by *rapposa* which has much white on the tail and coarser; frizzier hair; eastward by *constantiæ*.

REMARKS.—From *rapposa*, in addition to characters mentioned, *mapiriensis* differs in having a distinct over-wash of cinnamon or vinaceous ventrally, the former being colored a rather clear yellow, between cream-buff (R.) and chamois (R.). It is also smaller and the tail is shorter.

As in *constantiæ* the color of the ventral parts of young specimens tends to be deeper than that of adults. In juvenile *mapiriensis*, the color is a deep-cinnamon wash instead of the markedly pinkish or salmon tinge of *constantiæ*. The two lowland juveniles are nearly without this color, which is best developed in typically mountain specimens.

Marmosa rapposa Thomas

Plate II, Figure 15; Plate XV, Figure 137

1899. *Marmosa rapposa* THOMAS, Ann. Mag. Nat. Hist., (7) III, p. 42. Type description.

1905. *Marmosa rapposa* TROUESSART, 'Cat. Mamm. viv. foss.,' Suppl., p. 855. Listed.

1916. *Caluromys rapposa* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 269. Listed.

1919. *Marmosa rapposa* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 39. Listed.

1920. *Marmosa rapposa* THOMAS, Proc. U.S.N.M., LVIII, p. 247. Record of type material.

TYPE LOCALITY.—"Vilcanota River, just north of Cuzco, Peru" (Thomas).

TYPE SPECIMEN.—B.M. 98.11.6.13, very large, old female, coll. Otto Garlepp. Tail broken at base. Type in B.M.

MATERIAL EXAMINED (10 specimens)

PERU.—Rio Vilcanota, 1500 m., Urubamba drainage (B.M. 98.11.6.13, type, o.ad.female; B.M. 98.11.6.14–17, young of type ?, 4 juveniles); Sta. Domingo, 6000 ft., Inambari drainage (A.M.N.H. 42400, y.ad.male); Utcuyacu, 4800 ft., Perené drainage (A.M.N.H. 63860–63, y.ad.females).

The type is the only known specimen which is very old and very large, the remainder being subadult and considerably smaller. The difference in the molar tooth rows between the Perené animals and the type may be questioned, but provisionally the former are treated as identical with *rapposa*.

The species is characterized by a combination of short fur-bearing basal part of tail; particolored tail; pelage long, rather frizzy and suberect; underparts colored rather clear yellow, varying from yellow ocher (R.) to mustard yellow (R.).

Dorsal color of type a brownish gray, between benzo brown (R.) and hair brown (R.); ventral color near yellow ocher (R.). Fur long and fluffy, slightly frizzy and tending to stand erect. Chin, neck, and a median ventral fascia clothed with self-colored hairs. Mammary region dark rusty-brown (in females from Utcuyacu it is a lighter, more golden brown). Base of tail broken, but extent of body pelage originally short; terminal half of tail white.

SKULL.—Skull of type large and stoutly formed. Nasals conforming with those of *mapiriensis* and *constantiæ* in their broadly rounded posterior tips which are not greatly prolonged backward between the frontals. Supraorbital ridges with strong, pointed processes. Palate moderately long, with asymmetrically placed accessory openings (in Utcuyacu material these are symmetrical). Bullæ as in *constantiæ*, neither very large, nor very small and pointed, but deep, tending somewhat toward the conic form of *germana* and *mapiriensis*.

Other specimens differ from the type mainly in their smaller size and shorter molar tooth rows. More material is badly needed from southern Peru.

DISTRIBUTION.—Southeastern Peru and northeastern Bolivia between 1700 and 8000 feet. *Rapposa* is here recorded from three principal river drainages: Inambari, Urubamba, and Perené. A.M.N.H. 42400, collected by H. Watkins, together with the young *mapiriensis*, 42399, has no skull. The characters of their pelages are very different, the *rapposa* being much coarser. It is supposed that for these two species the Upper Inambari serves as a zone of intergradation. Tschudi's specimen, kindly lent by Dr. Fuhrmann of Neuchâtel, although very faded and still containing the skull, is referred provisionally to the form next farther north, *germana parda*, the basis for this being its fuscous tail and the chocolate-colored hair on the inner surface of the hind shank, features common in *parda* but unknown in any of the six specimens of *rapposa*. In turn, this suggests that the Chanchamayo Valley on the Upper Perené forms the meeting place for *germana parda* and *rapposa*. The eastern extent of *rapposa* is probably more or less coincident with the 1000 or 2000-foot contour, its place below that being perhaps taken by *germana rutteri*, or even *constantiæ*.

The identity of Stockholm 29, obtained through L. Söderström, Quito, and labeled "Gualea and Nanegal" is uncertain. The locality is open to question, since it is well known that Söderström obtained almost all his material through Indians. It has coarse fur, cinnamon-buff underparts, the chin only being self-colored, a long, particolored tail, with only the basal 15 mm. haired, and small ears. The skull is narrow-waisted, with pointed supraorbital processes which are ungrooved dorsally, strongly conical bullæ and nasals moderately broadened and elongate-pointed behind.

The animal is far too large for *phæa*, having the following dimensions: h. and b. 170; t. 255; h.ft. 28; d.fur 7:8; gr. l. skull 45.9; z.b. 25.1; p.o.con. 5.5; p. l. 24.8; M^{1-3} 7.4; M_{1-4} 9.6. Under the circumstances, it seems desirable to await further evidence, stating simply that the animal appears nearest to *rapposa*.

Marmosa germana Thomas

(Synonymy under subspecies)

Germana is the representative of the *cinerea* group found along the lower Andean foothills between the Urubamba Valley in Peru and the Napo drainage of Ecuador, and probably still farther north to the commencement of the savannas of eastern Colombia. Its extent eastward is undetermined.

Three fairly distinct, but probably intergrading subspecies are here admitted: *germana germana* of the Rio Bobonaza in the Province of

Oriente, Ecuador; *germana rutteri*, generally distributed through the lowlands immediately east of the Andes and eastward to the mouth of Rio Napo; and *germana parda*, the long-haired mountain form found up to nearly 4000 feet in eastern Peru.

In the Upper Napo region near Mt. Sumaco a form occurs with fur intermediate between the crisped fur of true *germana* and the straight pelage of the southern and eastern animals. This is treated as *rutteri*.

Germana is normally a forest-inhabiting species with rather dark-gray or brownish-gray hair, the underparts varying from buff to yellowish; self-colored areas are variable in extent, finding their maximum in the Rio Curaray series, but they never reach the condition of *constantiæ* in which most of the underparts are unicolored. Ears rather small. Tail completely dark brown or fuscous, unspotted. Mammæ 4–1–4.

SKULL.—Moderately broad, having fairly well-developed supraorbital processes, no undue postorbital constriction, a fairly broad and short palate, and small bullæ showing varying degrees of compression and pointing beneath.

Marmosa germana germana Thomas

Plate II, Figure 16; Plate XV, Figure 138

1880. *Marmosa cinerea* THOMAS, Proc. Zool. Soc. London, p. 403. Remarks on Buckley's specimens.

1904. *Marmosa germana* THOMAS, Ann. Mag. Nat. Hist., (7) XIII, p. 143. Type description.

1905. *Marmosa germana* TROUESSART, 'Cat. Mamm. viv. foss.,' Suppl., p. 855. Listed.

1916. *Caluromys germana* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 269. Listed.

1919. *Marmosa waterhousei* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 39. Listed.

1921. *Marmosa germana* THOMAS, Ann. Mag. Nat. Hist., (9) VII, p. 522. On the confusion of *germana* with *waterhousei*.

1924*a*. *Marmosa germana* THOMAS, Ann. Mag. Nat. Hist., (9) XIII, p. 536. Referred to under *rutteri*.

TYPE LOCALITY.—Sarayacu, Rio Bobonaza, Oriente, Ecuador. About 2500 ft.

TYPE SPECIMEN.—B.M. 80.5.6.77, adult female, coll. C. Buckley. Type in B.M.

MATERIAL EXAMINED (7 specimens)

ECUADOR.—Sarayacu, Rio Bobonaza, Oriente (B.M. 80.5.6.77, type, ad.female; B.M. 80.5.6.76, ad.male; A.M.N.H. 67292, ad.female; A.M.N.H. 67276–77, 67281, juv.females, young of 67292); Canelos, Rio Bobonaza, Oriente (B.M. 11.7.19.20, female).

Apparently a local form of the generally wide-spread *rutteri*, distinguished by markedly kinky, crisped dorsal fur, deep russet color of developed mammary region, and small, pointed, subconical bullæ.

Type with long, kinky fur between mummy brown (R.) and bister (R.) dorsally; beneath, a yellowish shade of light drab (R.). Size of ears moderate to small. Eye-ring often broader than in *rutteri*, scarcely at all narrowed beneath. Tail fuscous; entirely without white markings.

SKULL.—Skull with well-broadened zygomata and muzzle tending to be somewhat narrow and pointed. Nasals with moderate expansion at the maxillo-frontal suture, but unbroadened at the posterior tips. Supraorbital ridges well developed and with strongly pointed processes. Temporal ridges widely separated. Palate short and broad, without accessory openings, and with the posterior palatal vacuities small. Bullæ small, rather compressed, and conic-pointed beneath.

DISTRIBUTION.—Known only from the Rio Bobonaza, eastern Ecuador. This subspecies appears restricted to the Bobonaza area, with *rutteri* to the east and south, and animals which in some respects are intermediate to the northwest. Its prior discovery necessitates that *rutteri* be treated as a subspecies of *germana* rather than the reverse.

This is the form that has been confused for so long with Tomes's *waterhousei* of the *murina* group. As recently as 1919, Cabrera listed it as a synonym of *waterhousei*.

Marmosa germana rutteri Thomas

Plate II, Figure 17; Plate XV, Figure 139

1924*a*. *Marmosa rutteri* THOMAS, Ann. Mag. Nat. Hist., (9) XIII, p. 536. Type description and remark on *waterhousei*.

1927. *Marmosa germana* THOMAS, Ann. Mag. Nat. Hist., (9) XIX, p. 373. Records from Yurac Yacu.

1928*a*. *Marmosa rutteri* THOMAS, Ann. Mag. Nat. Hist., (10) II, p. 294. Record from Pebas.

1928. *Marmosa rutteri* THOMAS, Ann. Mag. Nat. Hist., (10) II, p. 265. Records and brief remarks.

TYPE LOCALITY.—"Tushemo, near Masisea, Rio Ucayali, Peru," about 600 feet.

TYPE SPECIMEN.—B.M. 24.2.22.67, adult male, Coll. L. Rutter, September 10, 1923. Type in B.M.

MATERIAL EXAMINED (32 specimens)

PERU.—Tushemo, near Masisea, Rio Ucayali (B.M. 24.2.22.67, type, ad.male); San Jeronimo, Rio Ucayali (B.M. 28.5.2.231–240, males; B.M. 28.5.2.241, female); Contamana, Rio Ucayali (B.M. 28.5.2.246, ad.male); Sarayacu, Rio Ucayali (A.M.N.H. 76302, ad.male; A.M.N.H. 76303, juv.female); Yurimaguas, Rio Huallaga (F.M.N.H. 19635, y.ad.female); Pebas, Rio Marañón (B.M. 28.7.21.110, ad.male); Orosa, mouth Rio Napo (A.M.N.H. 74087, ad.female).

ECUADOR.—Mouth of Rio Curaray, Rio Napo (lower), (A.M.N.H. 71956, 71958, ad.males; A.M.N.H. 71975, 71951, 72010, ad.females; A.M.N.H. 71964, 71966, 71968, juv.females); Lagarto Cocha, Rio Napo (lower), (A.M.N.H. 72008–09;

ad.females); Rio Suno, Rio Napo (upper), (A.M.N.H. 64025, 68142, ad.females), San José (abajo), Rio Napo (upper), (A.M.N.H. 68140, ad.male; A.M.N.H. 68141, ad.female).

A medium-sized, predominantly lowland form not recorded above 1000 feet (except the Upper Napo animals, which have the hair slightly kinky as in *g. germana*), with wholly brown tail, straight, short hair, not exceeding 10 mm., pale gray-buff underparts (more yellowish in some Curaray specimens), and small, rather conical bullæ.

Dorsal color of type dark mouse gray (R.), with a tint of brown; ventral color warm buff (R.), with self-colored pelage on throat and on the inner sides of limbs.

SKULL.—The skull as in *g. germana*, the bullæ somewhat less conic-pointed below. Zygomata well arched. Posterior points of the nasals very little broadened. Supraorbital processes moderately developed. Only a slight postorbital constriction. Palate somewhat narrow.

Other specimens, especially those from the Curaray, have a median ventral stripe of unicolorous hairs along the under surface reaching a width of 20 mm., and the whole ventral area much more strongly yellowish than in typical animals. In the skull also the supraorbital processes are often more strongly developed and the palate rather broader than in the type.

DISTRIBUTION.—Known from the lower parts of the Ucayali, Huallaga, and Marañón rivers northward to the Napo and Curaray rivers in Ecuador (except the *g. germana* region about Canelos and Sarayacu). Its extension eastward is not ascertained.

Marmosa germana parda Tate

Plate II, Figure 18; Plate XV, Figure 140

1882. *Marmosa cinerea* THOMAS, Proc. Zool. Soc. London, p. 111. A Stolzmann record from the Rio Huayabamba, probably referable to this subspecies.

1927*b*. *Marmosa germana* THOMAS, Ann. Mag. Nat. Hist., (9) XX, p. 606. Record from Chinchavita.

1931. *Marmosa germana parda* TATE, Amer. Mus. Novitates, No. 493, p. 4. Type description.

TYPE LOCALITY.—Huachipa, Mouth of Rio Cayumba, Upper Rio Huallaga, Peru, about 3000 feet.

TYPE SPECIMEN.—F.M.N.H. 24140, adult male, coll. J. T. Zimmer, No. 297, September 28, 1922. Type in F.M.N.H.

MATERIAL EXAMINED (16 specimens)

PERU.—San Antonio, Lamas, Rio Mayo (upper), (B.M. 24.8.1.11, ad.female); Yurac Yacu, Rio Mayo (upper), (B.M. 27.1.1.174–175, ad.males; B.M. 27.1.1.177, ad.female; B.M. 27.1.1.176, y.ad.female); Moyabamba, Rio Mayo (upper), (F.M.N.H. 19348, ad.male); Huachipa, Rio Huallaga (upper), (F.M.N.H. 24140,

type, ad.male); Rio Cayumba, Hda. Porvenir, 3000 feet, Rio Huallaga (upper), (F.M.N.H. 24139, ad.male); Rio Chinchao, Rio Huallaga (upper), (F.M.N.H. 24137–38, ad.females); Chinchavita, Rio Huallaga (upper), [B.M. 27.11.1.245–247, ad. females; B.M. 27.11.1.291 (alc.), ad.female].

No Locality.—Tschudi coll., Rio Perené (upper)?, (Neuchâtel, y.ad.male); Pozuzu, Rio Pachitea (upper), (B.M. 12.1.15.8, y.ad.male).

The mountain representative of *germana rutteri*, distinguished by its longer pelage (12 to 13 mm.) and the strong yellowish to ochreous shade of the underparts (animals from Chinchavita are rather less yellow, but the pelage is long).

Skin of type brownish gray dorsally, becoming browner on face and sides. Ventral color nearest to cinnamon-buff (R.); chin, throat, cheeks, neck, and an extremely narrow median line unicolorous; remaining hairs gray-based. Feet (in dried condition) buffy brown. Ears moderately large, fuscous. Tail fuscous. A self-colored ventral stripe may occur in this form.

Skull.—Not distinguishable from that of *germana rutteri*.

Distribution.—Upper parts of Perené, Pachitea, Huallaga, and Mayo rivers. As stated under *rapposa* the Perené probably serves as the transition region in the mountains for *rapposa* and *parda*.

Marmosa regina Thomas

Plate III, Figure 19; Plate XVI, Figure 141

1898*a*. *Marmosa regina* Thomas, Ann. Mag. Nat. Hist., (7) II, p. 274. Type description.

1905. *Marmosa regina* Trouessart, 'Cat. Mamm. viv. foss.,' Suppl., p. 855. Listed.

1916. *Caluromys regina* Matschie, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 269. Listed.

1919. *Marmosa regina* Cabrera, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 39. Listed.

Type Locality.—"West Cundinamarca (Bogotá region)." Probably west of Bogotá and on the Magdalena drainage.

Type Specimen.—B.M. 98.5.15.4, old adult male, coll. G. D. Child, November 1, 1895. Type in B.M.

Material Examined

The type only.

The only large member of the *cinerea* group with a distinctively cinnamon rather than grayish dorsal color. Size very large; tail uniformly fuscous; molars proportionately very small (6.8 mm.).

Fur rather crisp, of moderate length. Color above, taken as a whole, near Prout's brown (R.), produced by a combination of the yellowish-rusty tips overlying the gray basal portions of the hairs. Color beneath, a rusty shade of pinkish cinnamon (R.). Line of demarcation or transi-

tion, as usual in the group, fairly distinct. Self-colored pelage, clothing chin, throat, chest, abdomen, and a median ventral band 20 mm. in breadth. Ears rather small. Eye-rings moderately broad. Tail fuscous, the basal portion with body fur for only 15 mm. of its length.

SKULL.—Large, with zygomata only moderately expanded. Nasals only slightly broadened at the maxillo-frontal suture, and running backward to a common point. Well-developed, pointed supraorbital processes on supraorbital ridges which converge backward and merge with the rather closely approximated temporal ridges. A moderate postorbital constriction. Palate of moderate breadth, the part posterior to the molars rather extended. Posterior palatal vacuities rather large; no accessory openings. Teeth unusually small. Bridge narrow. Bullæ moderate in size, rather conic-pointed.

DISTRIBUTION.—Known only from type locality.

Regina, although its body fur extends only 15 mm. down the tail, shows certain affinities with the *demararæ* section, suggested by the general contour of the skull, large supraorbital processes, distinct postorbital constriction, and approximated temporal ridges. Its remarkably small teeth and the color of the pelage, however, mark it off as quite distinct.

Marmosa phæa Thomas

Plate III, Figures 20, 21; Plate XVI, Figures 142, 143

1899. *Marmosa phæa* THOMAS, Ann. Mag. Nat. Hist., (7) III, p. 44. Type description and mention of *waterhousei*.

1905. *Marmosa phæa* TROUESSART, 'Cat. Mamm. viv. foss.,' Suppl. p 855. Listed.

1912. *Marmosa phæa* ALLEN, Bull. Amer. Mus. Nat. Hist., XXXI, p. 73. Record from Las Lomitas.

1916. *Marmosa phæa* ALLEN, Bull. Amer. Mus. Nat. Hist., XXXV, p. 201. Records from Ricaurte and La Candela.

1916. *Marmosa phæa* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 270. Listed.

1919. *Marmosa phæa* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 38. Listed.

1922. *Marmosa perplexa* ANTHONY, Amer. Mus. Novitates, No. 32, p. 3. Type description of *perplexa* from southern Ecuador.

TYPE LOCALITY.—San Pablo, southwestern Colombia, 1500 m.

TYPE SPECIMEN.—B.M. 98.9.5.2, young adult female, coll. G. Hopke, March 29, 1897. Type in B.M.

MATERIAL EXAMINED (17 specimens)

SOUTHWESTERN COLOMBIA.—San Pablo (B.M. 98.9.5.2, type, ad.female; B.M. 98.9.5.1, ad.female; Berlin 10425, ad.male; Berlin 10424, ad.female); Ricuarte, 5000 feet (A.M.N.H. 34201, ad.male); La Candela, 6000 feet [A.M.N.H. 33919, ad.

female; A.M.N.H. 33849–51, (young of 33919), juv.females]; Chacarcito, Itoco, near Bogotá (B.M. 95.8.1.35, female).

NORTHWESTERN ECUADOR.—Ojo Negro, road from Nanegal to Anca (Paris 1904/790, male); Nanegal (Stockholm 24, o.ad.male); Mindo (Stockholm 20, juv.male).

SOUTHWESTERN ECUADOR.—Sta. Ana (A.M.N.H. 47188, type of *perplexa*, y.ad.female); Piñas (A.M.N.H. 61382, ad.female; A.M.N.H. 61391, y.ad.female); Guainche (A.M.N.H. 61390, juv. female).

The smallest species of the *cinerea* group.

Type with long, lax, soft fur, furnished with rather copious overhairs. Color of back a dark gray, nearest to hair brown (R.); face and sides paler, the latter washed with dull cinnamon. Underparts a dull-grayish shade of ochraceous buff (R.); self-colored hairs occurring only on chin and abdomen. Eye-rings well broadened and blackened. Ears moderate to small, fuscous. Tail with basal hair extending only 18 mm. from body; its terminal fourth white.

SKULL.—Small, but zygomata proportionately well broadened. Nasals broad at maxillo-frontal suture, and rounded rather than pointed behind. Supraorbital processes not very strongly developed, and only slightly pointed. No postorbital constriction. Temporal ridges far apart. Palate long and rather narrow. Teeth small. Bridge moderate. Bullæ small, somewhat conic pointed beneath.

In other material the skins conform very closely to type, excepting in the degree of white on the tail. This may occupy as much as one half of the total length or, particularly in animals from the southern part of the range, may be so nearly suppressed as to leave only a few terminal spots or blotches.

In the skulls the depressed frontal region in the type of *perplexa* is thought to be a pathological character, since the skull is asymmetrically distorted, and an older specimen from nearby, A.M.N.H. 61382, agrees with the normal configuration of *phæa*. The bullæ in some specimens are somewhat larger than in the type.

DISTRIBUTION.—Region of the Colombian Andes between 3000 and 6000 feet, and southward along the western slope to the Province of El Oro in Ecuador. Apparently absent from the eastern side of the Andes.

MURINA GROUP

Large to rather small animals (length of head and body varying from 170 to 190 in *ruatanica* to about 120 in adult *quichua*). Texture and length of pelage very variable; fur never woolly. Dominant dorsal colors dull or bright cinnamon and brownish fuscous; more rarely gray

or brownish gray (*canescens*, *simonsi*, some *quichua*). Underparts from whitish, through buffy, to pale cinnamon; the self-colored hairs developed variably according to subspecies. Eye-ring usually well developed. Vibrissæ variable: in *murina* section, long (25 to 35 mm.); in *mitis* section, in spite of the large size of the animals, rarely exceeding 30 mm.; and in *mexicana* and *canescens* sections, scarcely ever exceeding 25 mm. in length. Ears from small to rather large: in *mitis* section varying around 24×16 mm.; in *murina* and *canescens* sections around 21×14, or smaller, although a few are larger; in *mexicana* section, still smaller, near 20×15. Feet generally relatively long and narrow in *murina* and *mexicana* sections; broader and shorter in *mitis* and *canescens* sections. Both feet and claws proportionately large and strong in relation to the size of the animals. (Compared with the *noctivaga* group, members of the *murina* group are large-footed animals.) Tail moderately long to long, the part with body hair never of greater extent than 25 mm.; rarely particolored, and then usually in grayish forms like *simonsi*, *canescens*, and *quichua* (*tyleriana*, a dark cinnamon form from the rainy top of Mt. Duida, is an exception to this generality). Tail thin and slender in *murina* section; thicker and shorter in *mitis*, *canescens*, and *mexicana* sections. Coupled with this last, tails of *murina* section have proportionately large, smooth scales and extremely minute hairs between them; while in *mitis* section, and to a lesser degree, in the *canescens* and *mexicana* sections, the scales are much smaller and the tail rather densely clothed with fine white down. This down is very distinct from the broad, black, flat hairs in *noctivaga*. The mammæ, although numerous in certain sections, are without exception confined to the abdominal and inguinal region. Here again appear sectional correlations: members of *murina* section have 5–1–5 mammæ; *mexicana* section (based upon 2 females) 7–1–7; and *mitis* section 9–1–9, of which all, or only a few, may become functional. The hair of the mammary region becomes strongly modified and shortened; while its color in functional females is deep purplish-brown in the case of *murina*, and in the other three sections nearer orange-brown.

Skull in the *murina* group heavily or moderately ossified; the zygomata strongly or only moderately widened. Nasals nearly always well broadened at the maxillo-frontal suture; with skull in norma verticalis, never exceeding the premaxillæ anteriorly. Interorbital region somewhat as in *cinerea* group: broad in front, and either unconstricted (*mexicana*) behind the supraorbital processes, or strongly constricted in that place (*mitis*). Supraorbital processes usually well developed; only slightly so

in *mexicana* section; and in one member of the *murina* group (*tyleriana*) almost entirely suppressed. In *mitis* and *canescens* they are well developed and have a dorsal groove similar in appearance and development to that found in certain members of the *cinerea* group. Probably the most specialized section of *murina* in respect to the supraorbital processes and temporal ridges is *canescens*, in which in old adults the united supraorbital processes and temporal ridges are seen as a pair of sharp-edged, elevated flanges converging toward the back of the skull, being highest in the front and lower as they pass backward. Temporal ridges are approximated in *mitis* and *canescens* sections and in a few members of the *murina* section, but in *mexicana* and the greater part of *murina* they

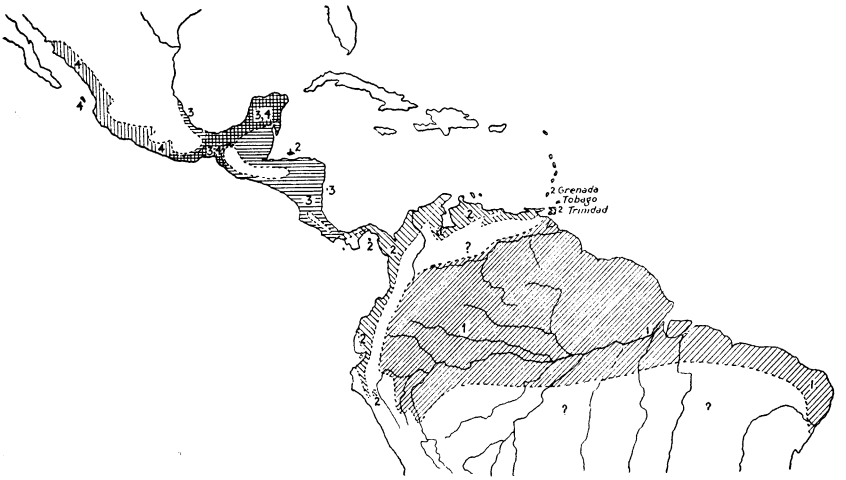


Fig. 10. Approximate distribution of *murina* group.
1, *M. murina* section; 2, *M. mitis* section; 3, *M. mexicana* section; 4, *M. canescens* section.

remain widely separated. Palate wide in *mitis* and forms of the *murina* section such as *rubra;* narrower generally in *murina* and *mexicana.* Palatal foramina large in *mitis* and *murina;* generally smaller and narrower in *mexicana* section. Palate rather abnormally fenestrated in *canescens,* accessory lateral openings appearing as described under that species. The ratio of breadth across bullæ to length from bulla to petrosal bone is smaller than that of the auditory region in the *cinerea* group. Bullæ generally rounded, without any true process, but occasionally furnished with a minute spine in the position of the process. Bulla of moderate size in *murina* section (2.6 to 3.3 mm.); unusually large in the *mitis* section (2.8 to 3.8); much smaller than *murina* in the

mexicana section (2.6 to 3.0), and often rather pointed beneath; in *canescens* 2.7 to 3.1.

The group comprises four sections which are separable both anatomically and geographically (map, Fig. 10, p. 87):

murina section	Amazonia, Orinoco, and subtropics of eastern side of Rio Magdalena extending into Zulia.
mitis section	Northern Venezuela, western Colombia, western Ecuador and Panama.
mexicana section	Central American tropics and subtropics.
canescens section	Western portions of Mexico, and Yucatan.

Key to Sections of *murina* Group

1.—Palate with small openings between posterior palatal foramina and tooth rows; supraorbital—temporal ridges commonly high and sharp-edged; fur usually gray.....*canescens* section.

Palate and temporal regions not as above; fur usually brownish or cinnamon..2.

2.—Mammary formula 5–1–5; inguinal color of female, when developed, purplish brown; tail generally appearing smooth and rather shiny; supraorbital processes generally well developed, ungrooved; only slight postorbital constriction.....*murina* section.

Mammary formula 7–1–7 or higher, inguinal color of female, when developed, orange-brown; tail clothed with short, fine hair; supraorbital processes well or very slightly developed, grooved or ungrooved; postorbital constriction variable.....3.

3.—Size generally large; feet broad and heavy; large grooved supraorbital processes; marked postorbital constriction; temporal ridges often approximated. *mitis* section.

Size generally small; feet slighter in build; supraorbital processes reduced, scarcely pointed; no trace of postorbital constriction; temporal ridges widely separated.....*mexicana* section.

Murina Section

Animals usually smaller in size than those of the *mitis* section and equal to or smaller than those of *mexicana* and *canescens* sections.

Size, compared to *murina* group as a whole, medium to small, one member, *quichua*, being the smallest *Marmosa* of the *murina* group. Pelage usually rather short, since most members of the section are tropical. Color dorsally from brownish fuscous to rather clear cinnamon-brown; ventrally from whitish to cinnamon-buff (deep cinnamon in *tyleriana*). Amount of unicolorous hair very variable. Size of ears moderate to small; only large in *m. duidæ*. Tail long, smooth (lacking any suggestion of down), and often rather glossy or shining.

Skull with variable specific characters. Supraorbital processes always more or less developed, usually quite strongly pointed; post-

orbital constriction never pronounced as in *mitis;* on the contrary, in *rubra* this region is very broad. Temporal ridges never very closely approximated. Palate variable. Teeth usually small. Bullæ rather small (generally larger than in *mexicana* section), smoothly rounded, rarely very slightly ovoid (the pointed part downward).

Functional mammary region in females purplish brown, compared with the orange-brown of the *mitis* section. Mammæ seemingly always 5–1–5.

The *murina* section covers the greater part of the Amazonian lowlands. One of the subspecies, *M. m. waterhousei*, a subtropical form,

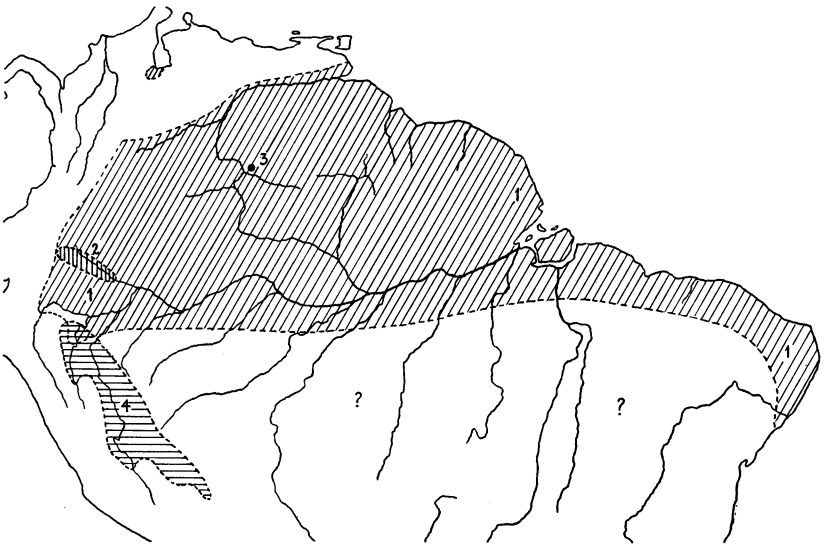


Fig. 11. Distribution of *M. murina* section.
1, *M. murina;* 2, *M. rubra;* 3, *M. tyleriana;* 4, *M. quichua.*

ranges from the northern side of the Rio Marañón along the Andean slopes to Colombia where near Bogotá it crosses to the east Magdalenan drainage, and continues thence along the western slope of the Andes into Venezuela as far as near Lake Maracaibo (F.M.N.H. 22176). *Rubra,* the largest member of the section, is apparently local in the lowlands of eastern Ecuador. The small species, *quichua,* inhabits mountainous country primarily. Its range extends from the Moyabamba region of eastern Peru as far south as the Inambari drainage. Eastward it reaches at least to the lowlands of the Rio Huallaga. *Tyleriana* of the subtropics of Mt. Duida, deep dull cinnamon, only slightly

paler beneath and with distal half of tail white, is known from no other locality (Map, Fig. 11, p. 89).

KEY TO SPECIES OF *murina* SECTION

1.—Pelage long, dull dark cinnamon above and below, distal three-fifths of tail white. *tyleriana.*

Pelage shorter, not so colored; tail without white except in southern forms of *quichua*.....2.

2.—Size small; greatest length of skull not reaching 35 mm.; tail very long. Peru. *quichua.*

Size larger; skull usually exceeding 35 mm. in greatest length in adults; tail of moderate length (see tables).....3.

3.—Size large; M^{1-3}, 6.0 to 6.4; palate very broad; color warm cinnamon. Eastern Ecuador.....*rubra.*

Size variable; M^{1-3} not exceeding 6.1; palate never unusually broad; color rarely warm cinnamon (only in *m. waterhousei*)[1].....*murina.*

Marmosa murina (Linnæus)

(Synonymy under subspecies)

Fur lax and long in forms inhabiting rain forest to short and crisp in those living in regions which are drier or have well-marked dry seasons. Dorsal color varying from sepia to cinnamon; ventral shade from cinnamon to straw color or white. Species with sepia-colored dorsal pelage usually having white underparts; those with cinnamon upperparts usually with straw-colored to cinnamon-buff ventral fur. Self-colored area of under surface varying from almost the entire under surface in straw color or cream to a very narrow median whitish line, or even to the restriction of unicolorous hair to chin and throat. Ears moderate, never so large as in the *mitis* section (except *m. duidæ*), their color sometimes very dark fuscous. Face paler than body color. Distance between eye-rings on frons usually less than in *mitis* section. Eye-rings rather broad. Inguinal areas in females purplish cinnamon. Feet whitish gray or whitish brown, rather small in most species. Tail brown, slightly bicolor. Mammæ 5–1–5; frequently, fewer are functional.

SKULL.—Stoutly built, with widely flaring zygomata. Nasals well broadened at maxillo-frontal suture. Supraorbital ridges usually well developed, pointed, "triangular" (Thomas), their dorsal surfaces smooth, flat, or slightly undulating. A moderate degree of postorbital constriction, less than in *mitis*, greater than in *rubra*. Bullæ small, but well rounded, without any trace of a process. Teeth variable, but M^{1-3}

[1] *M. madeirensis, m. klagesi,* and certain phases of *m. murina* are brown but lack the vivid coloration of *rubra.*

never exceeding 7.1; canines well developed. Tooth rows well convergent. Palate never extremely wide as in *rubra*.

Murina occurs in a great number of phases throughout most of the Amazonian region and up into the lower parts of the Andes. The general structural uniformity and the inconstancy of such characters as do appear make separation of the subspecies one of great difficulty. The following regional forms, based in many cases upon small lots of from one to half a dozen specimens, can, as a rule, be recognized, although they are not always considered sufficiently distinct from one another to be worth subspecific separation:

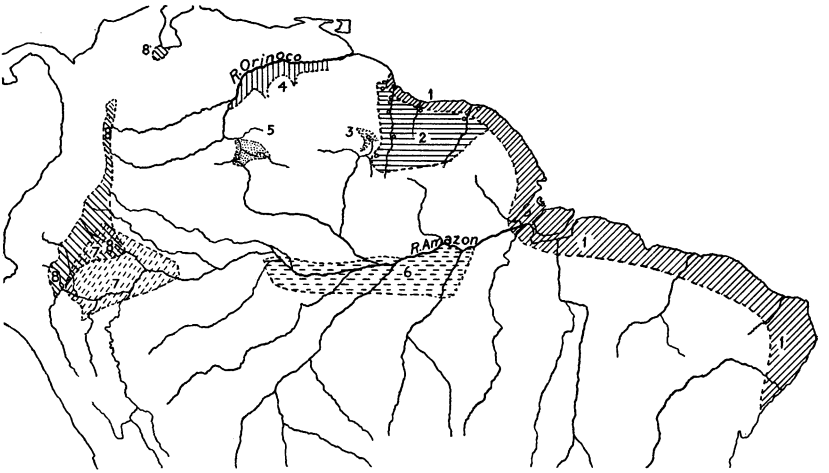


Fig. 12. Distribution of *M. murina*.

1. *M. murina murina*
2. *M. murina muscula*
3. *M. murina roraimæ*
4. *M. murina klagesi*
5. *M. murina duidæ*
6. *M. murina madeirensis*
7. *M. murina maranii*
8. *M. murina waterhousei*

1.—Mouth of the Amazon, Marajó, Pará, Brazilian and Dutch Guiana. Large gray forms with a cinnamon cast of the pelage..... (*m. murina = parata*).

2.—Ceará-Bahia region. Redder than preceding, with smaller ears; underparts creamy white..... (*m. murina*).

3.—Lowlands rain forest of Guiana region. Deep fuscous with very little reddish shade. Underparts creamy white..... (*m. muscula*).

4.—Foothills of Mt. Roraima. Long, close, soft gray fur; with pinkish-buff underparts..... (*m. roraimæ*).

5.—Rio Tapajoz. Small; dull cinnamon-brown, with buff underparts (perhaps due to fading). Provisionally referred to ..... (*m. madeirensis*).

6.—Lower Orinoco. Light brown with self-colored straw underparts.. (*m. klagesi*).

7.—Manacaparú, near mouth of Rio Negro. Dull gray-brown form. (Provisionally referred to..... *m. madeirensis*.)

8.—Rio Madeira. Brown, with straw underparts.... (*m. madeirensis* = *macrotarsus*).
9.—Mouth of Rio Napo. Small brownish-gray form with narrow, creamy self-colored ventral band referred to..... (*m. maranii*).
10.—Oriente, Ecuador, lowlands. Rather larger, dark brownish-gray, with whitish self-colored fascia..... (*m. maranii*).
11.—Upper Orinoco and Mt. Duida. Large, fuscous-brown form, with buff underparts. Skull and palate very long and narrow..... (*m. duidæ*).
12.—Andean slopes subtropical. Rufous to cinnamon dorsally; ventral self-colored hairs mainly absent..... (*m. waterhousei*).

Of these twelve more or less distinguishable phases of *murina* eight are here recognized subspecifically.

DISTRIBUTION.—Southern half of the Orinoco basin southward as far as a line passing through Pernambuco, the northern edge of Matto Grosso, and the Rio Marañón; westward to the subtropics of the Andes, with an extension over on to the eastern subtropical slopes of the Magdalena Valley which continues northward into Venezuela. (See *m. waterhousei*). (Map, Fig. 12, p. 91.)

ARTIFICIAL KEY TO *M. murina*

1.—Palate elongate and narrow. Upper Rio Orinoco..... *m. duidæ.*
Palate not elongate and narrow..... 2.
2.—Self-colored ventral area considerably narrowed by gray-based hairs. Dorsal color fuscous to cinnamon..... 3.
Self-colored ventral area little or not at all narrowed by gray-based hairs. Dorsal color dull cinnamon..... 7.
3.—Color from bright to dull cinnamon, with long fur and (in males) large feet. Andean subtropics..... *m. waterhousei.*
Color brown to brownish fuscous..... 4.
4.—Size proportionately small; skull with greatest length not in excess of 35 mm.. 5.
Size larger; skull may exceed 35 mm. in length..... 6.
5.—Dorsal fur deep fuscous. Guiana rain forests..... *m. muscula.*
Dorsal fur thick, evenly gray. Mt. Roraima..... *m. roraimæ.*
6.—Supraorbital processes rather small. Oriente, Ecuador..... *m. maranii.*
Supraorbital processes large. Region about mouth of Amazon.... *m. murina.*
7.—Fur close and velvety, moderately long; skull with ungrooved supraorbital ridges. Lower Rio Orinoco..... *m. klagesi.*
Fur laxer; skull in type with small grooves on dorsal surface of supraorbital ridges. Rio Madeira and south bank of Amazon..... *m. madeirensis.*

Marmosa murina murina (Linnæus)

Plate III, Figures 22, 23, 24; Plate XVI, Figures 144, 145, 146

1734. *Mus sylvestris americanus* SEBA, Museum, I, Pl. XXXI. Under No. 4 Seba says, "This is the third species from Surinam," implying that Nos. 1 and 2 (No. 3 was supposedly from Africa) came from that country—although under No. 1 he states, "the Brasilians call it *Marmosa.*"

1758. *Didelphis murina* LINNÆUS, 'Syst. Nat.,' 10th Ed., p. 55. Type description. Based upon Seba's 'Thesaurus,' Pl. XXXI, figs. 1, 2, 3, 6. Locality, "Asia, America."

1758. *Didelphis dorsigera* LINNÆUS, 'Syst. Nat.,' 10th Ed., p. 55. Type description. Based upon Seba's 'Thesaurus,' I, Pl. XXXI, figs. 5, 4, and II, Pl. LXXXIV, fig. 4.

1846. *Didelphys dorsigera* and *murina* WATERHOUSE, 'Nat. Hist. Mamm.,' I, pp. 507–511.

1888*a*. *Didelphys* (*Micoureus*) *murinus* THOMAS, 'Cat. Marsup. Monotr. Brit. Mus.,' pp. 343–347. Includes whole of *murina* group.

1892. *Marmosa murina* THOMAS, Proc. Zool. Soc. London, pp. 309–318. On the probable identity of the animals of the Lidth de Jeude collection with Seba's figures in the 'Thesaurus.'

1895. *Marmosa murina* THOMAS, Ann. Mag. Nat. Hist., (6) XV, p. 190. Gloger's names, *Asagis seu Notagogus–Marmosa* (Thomas's first use of this name).

1905. *Marmosa murina* TROUESSART, 'Cat. Mamm. viv. foss.,' Suppl., p. 855. Listed.

1911. *Marmosa murina* THOMAS, Proc. Zool. Soc. London, p. 144. Mammals of 10th Ed. of Linnæus. Suggests Surinam type locality.

1911*a*. *Marmosa parata* THOMAS, Ann. Mag. Nat. Hist., (8) VII, p. 517. Type description.

1916. *Marmosa murina* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 270. Listed.

1916. *Marmosa parata* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 270. Listed.

1919. *Marmosa murina* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 35. Listed.

1919. *Marmosa parata* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 35. Listed.

1920. *Marmosa parata* THOMAS, Ann. Mag. Nat. Hist., (9) VI, p. 283. Recorded Pará and Villa Braga material.

1927. *Marmosa murina parata* POHLE, Abh. Senckenber. Naturforsch. Gesellsch., XL, p. 239. Material from Pernambuco.

TYPE LOCALITY.—Unknown. (According to Linnæus "Asia, America.") Fixed by Thomas (1911) as Surinam.

TYPE SPECIMEN.—None designated by original describer. Any one of the animals of the Lidth de Jeude collection MAY have been the type, but no proof to this effect can be obtained. Thomas's designation of B.M. 67.4.12:541–2 as co-types was not justified.

MATERIAL EXAMINED (38 specimens)

LOCALITY UNKNOWN.—[B.M. 67.4.12.541 (Lidth de Jeude), o.ad.male; U.S.N.M. 194227 (Lidth de Jeude), ad.male; B.M. 67.4.12.542–546 (Lidth de Jeude), females].

BRAZIL.—Igarapé Assu, Pará (B.M. 4.7.4.100, type of *parata*, ad.female); "Pará" (B.M. 14.2.21.3, 20.7.14.42, o.ad.females; B.M. 7.1.1.187, 11.4.28.36, juv. males); Caldeirão, Marajó (B.M. 24.2.4.31–33, 26.1.2.15–16, ad.males; B.M. 25.2.4.35–38, ad.females; B.M. 24.2.4.34, 26.1.2.17, y.ad.females; Hamburg 40768, ad.female; Hamburg 40766 (2), juveniles); Marajó (B.M. 12.5.11.14, ad.female); Parahyba, Maranhão (F.M.N.H. 26445, y.ad.male); Cocos, Coda (F.M.N.H. 23945,

y.ad.male); Tury-Assu (B.M. 25.5.12.14, ad.female); Penha, Parahyba, Pernambuco (Berlin 36205–06, y.ad.males; Berlin 36204, juvenile); Dois Irmãos, Recife (Berlin 36177, juv.male; Berlin 36201, ad.female).

BRITISH GUIANA.—Hoolie Island, Rio Essequibo (Berlin 33644, ad.male); origin unknown (Hamburg, ex Rödings Mus., ad.female).

SURINAM.—"Surinam" [Amsterdam (Dec. 22, 1906), ad.male].

Pelage rather short, generally 6 to 7 mm., shorter than in *muscula* of Guiana, but may attain 8 or 9 mm. in length. Fur not very soft. Color above warmer than hair brown (R.); in some Marajó specimens it is true hair brown (R.). (This brown color shows various degrees of fading toward the brown of *klagesi* in old material, and in alcoholics may become more or less cinnamon.) In material from the Province of Pernambuco the color is a more reddish brown. Underparts, which are as a rule little or not at all narrowed by gray-based hairs, near some shade of creamy white or creamy buff. In Marajó specimens cartridge buff (R.). Compared with *muscula*, this dorsal coloration, even in the darkest specimens, is decidedly paler, and contrasted with red forms like *madeirensis* or *klagesi*, it is darker and much more mixed with fuscous, which results in a gray-brown color. The red wash of Pernambuco material overlies a rather deep fuscous-brown shade (not the basal slate color of the hairs), but young animals of the Pernambuco series are considerably grayer than adults.

Eye-ring moderately broad, except its posterior lower part. Ear moderately large; larger in Caldeirão specimens than in Pernambuco animals. Feet, compared with those of *muscula*, large and strong; in big males the hind foot attains a length of 24 to 25 mm.; brownish white. Tail of moderate length, gray-brown, lightened somewhat beneath; in Pernambuco specimens may be lighter at the tip.

Females generally much smaller. Inguinal color, when developed, purplish brown, near Kaiser brown (R.) in Marajó specimens; or it may contain areas of clear white hairs (Marajó). Length of hind foot in females 20 to 22 mm.

SKULL.—Large and strongly constructed. Zygomata well expanded. Nasals well broadened at maxillo-frontal suture. Supraorbital processes large and pointed, slightly undulating, but without grooves on dorsal surface. Temporal ridges moderately approximated in males, far apart in females and young males. Palate moderately broad; tooth rows convergent; teeth rather small, compared with *m. duidæ* and *m. maranii*. Bullæ moderate, well rounded.

DISTRIBUTION.—*Murina*, as here restricted, ranges from at least as far south as Pernambuco northwest to Brazilian Guiana, and probably

along the narrow coastal strip between the sea and the heavy rain forest as far as British Guiana. In the rain forest it is replaced by the smaller darker *muscula*.

REMARKS.—The material secured by the British Museum from the Lidth de Jeude collection comprises now one male and five young females in alcohol and also the "type" of *dorsigera* (B.M. 67.4.12.546) which has been skinned from alcohol and mounted with seven young on its back. A second male, marked "Lidth de Jeude" is in the United States National Museum.

Thomas's fixation of the type locality to Surinam seems entirely logical. If the original description be studied it becomes clear that Seba's animals were a large form of *murina* (as understood in this paper) and had a strong reddish tone in the pelage—definitely ruling out the smaller, darker *murina muscula*. Structurally the small number of mammæ ("7 or 9") points to *murina* rather than to any member of either the *mitis* or *mexicana* sections, which have 7–1–7 to 9–1–9, thus restricting the possible locality to the Orinoco-Amazonian region. Seba's series then is practically limited to the reddish subspecies *murina*, *klagesi*, or *madeirensis*, or an assortment of these. In view of the suspicion that the Lidth de Jeude animals may represent the actual co-types from which he made his descriptions and drawings, it is desirable that the form inhabiting the fixed type locality agree closely with these animals. And this in fact is the case. The form of the coastal portion of the Guianas (not the interior) is neither to be separated from the Lidth de Jeude series nor, in my opinion, from the *murina* of Marajó and Pará, with the result that *parata* becomes a synonym of *murina murina*.

Since there is no way of deciding which of these is identical with it, and since it is needful to record the extensive literature written upon *dorsigera*, the species is treated for that purpose as synonymous with *murina murina*.

A description of the Lidth de Jeude animal, B.M. 67.4.12.541, which after all may be a co-type of *Marmosa murina*, is added here.

A large reddish male in alcohol, whose skull has been extracted and cleaned. Fur rather long. Color rufescent-brown above. Black ocular marks extending from base of vibrissæ to 3 mm. behind posterior canthus. Whole ventral surface maize yellow (R.) to Naples yellow (R.), self-colored, except in narrow gray-based fringing margins along the sides. Ventral color brighter on chest and neck. Vibrissæ long, black. Ears dark brown, appearing moderately pigmented. Feet buffy white. Tail dark gray-brown, slightly bicolor; scale spirals 20 per cm.; hairs between scales very minute and scarcely visible without a lens.

Skull densely ossified. Muzzle broad, blunt. Zygomata heavy, and widely expanded. Nasals abruptly broadened at maxillo-frontal suture. A well-marked frontal depression. Supraorbital processes broadly expanded, rather triangular, the outer tips roughened. No supraorbital grooves. Postorbital constriction moderate in extent. Temporal ridges somewhat approximated on parietals. Palate without accessory fenestræ. Teeth small, the rows convergent. Bridge moderately broad. Bullæ small, smoothly rounded, without processes. Coronoid moderately erect; its anterior edge not greatly thickened, straight to slightly curved, the tip scarcely falcate.

Marmosa murina muscula[1] (Cabanis)

Plate III, Figures 25, 26; Plate XVI, Figures 147, 148

1848. *Didelphis muscula* CABANIS, in Schomburgk: 'Reisen in British Guiana,' III, p. 778. Type description.

1855. *Didelphys musculus* WAGNER, Schreber 'Säugeth. Suppl.,' V, p. 245. "In the Karaiben—Niederlassung Arrai on the upper Pomeroon." (Translation.)

1888*a*. *Didelphys* (*Micoureus*) *murina* THOMAS (part), 'Cat. Marsup. Monotr. Brit. Mus.,' pp. 343–347.

1898. *Marmosa muscula* TROUESSART, 'Cat. Mamm. viv. foss.,' II, p. 1239. Listed as syn. of *murina*.

1901. *Marmosa klagesi* THOMAS, Ann. Mag. Nat. Hist., (7) VIII, p. 154. Specimen from Kanuku Mts.

1907. *Marmosa chloe* THOMAS, Ann. Mag. Nat. Hist., (7) XX, p. 167. Type description.

1910. *Marmosa chloe* THOMAS, Ann. Mag. Nat. Hist., (8) VI, p. 189. Record from Rio Supinam.

1916. *Marmosops chloe* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 271. Listed.

1919. *Marmosa chloe* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 36. Listed.

1921. *Marmosa chloe* ANTHONY, Zoologica, III, p. 265. Recorded specimens from Kartabo.

TYPE LOCALITY.—"Karaiben-Niederlassung Arrai," Pomeroon, British Guiana.

TYPE SPECIMEN.—Berlin 2331, juv. male, coll. Schomburgk. Type in Berlin Museum.

MATERIAL EXAMINED (43 specimens)

BRITISH GUIANA.—"Karaiben-Niederlassung Arrai" (Berlin 2331, type, juv. male); Hyamu Creek, Demarara R. (U.S.N.M. 172953, ad.female); Hyde Park, Demarara R. (B.M. 7.6.20.16, type of *chloe*, y.ad.male; B.M. 7.6.20.15, 7.6.20.17, y.ad.males; F.M.N.H. 18545, juv.female); Clarkesdale, Demarara R. (B.M. 7.6.20.18, ad.female); Comaccka, 80 mi. up Demarara R. (B.M. 5.11.1.28, juv.male); Dunoon [M.C.Z. 46424 (?)]; Kartabo, R. Essequibo [A.M.N.H. 42907, 64157, y.ad.males;

[1] *D. guianensis* KERR, 'Animal Kingdom,' 1742, p. 194, probably equals *muscula*, but is insufficiently described for identification.

A.M.N.H. 41909, y.ad.male; A.M.N.H. 48136, 41906, juv. males; A.M.N.H. 42908, ad.female; A.M.N.H. 42909, 48135, y.ad.females; A.M.N.H. 69151 (Alc.) juvenile]; Bonasica, R. Essequibo (B.M. 12.6.5.32, 13.5.23.18, ad.males; B.M. 12.6.5.33, 13.5.23.10, (?); A.M.N.H. 93147, o.ad.male); Bartica Grove, R. Essequibo (B.M. 10.11.10.19, juv.male; B.M. 10.11.10.18, ad.female); Pen Hope, 120 miles east of Georgetown (B.M. 87.1.28.9, ad.female); R. Supinaam, tributary of lower R. Essequibo (B.M. 10.5.4.53–54, juv.males; B.M. 10.5.4.55, ad.female); Moon Mountains (B.M. 11.6.7.55, ad.male); North Kanuku Mountains (B.M. 1.6.4.135, male).

SURINAM.—"Surinam" [Stuttgart 1293 (two specimens), ad.male, y.ad.female; Stuttgart 1390½ (three specimens), juv. male, juv. female, ad.female; U.S.N.M. 238113 (Alc.), y.ad.male; U.S.N.M. 13247 (Alc.), y.ad.female]; Maroni (Berlin 3355, y.ad.male; Berlin 36197, y.ad.female); Bergendal (Berlin 4494, o.ad.male).

FRENCH GUIANA.—Cayenne (F.M.N.H. 22205, juv.male; B.M. 5.1.8.12, ad. female).

Generally smaller than the closely allied *m. murina.*

Pelage usually rather long, but in animals from nearer the coast may be shorter. Color dorsally sepia (R.) to natal brown (R.); ventrally, white or creamy white, often, though not always, much narrowed by encroachment of gray-based hairs. Ears well pigmented, small. Feet grayish white. Tail brown, scarcely any lighter beneath.

Compared with *m. murina* from Marajó, *muscula* is smaller, darker, and in males its hind feet do not exceed 23 mm. As in *murina,* the color of *muscula* in very old museum specimens that have been mounted and exposed to light fades to a nondescript brown.

SKULL.—Skull very like that of *m. murina,* but smaller and rather less strongly built. Supraorbital ridges without dorsal grooves. Canines of females in general shorter and straighter than those of males.

The type of *muscula,* Berlin 2331, is a juvenile specimen of indeterminate sex. Ears missing. Vibrissæ proportionately rather short. Fur of moderate length. Color fuscous brown; ventrally, appearing self-colored on throat, chest, and mid-ventral line. Condition of skin very poor. Skull in every way agreeing with those of numerous other juveniles from British Guiana rain forests, which have previously been referred to *chloe.*

DISTRIBUTION.—Typically, rain forest region of British, Dutch, and French Guiana.

REMARKS.—*Muscula* appears to grade imperceptibly into *klagesi* at the north of the Guianas. Specimens, especially those taken by Beebe at Kartabo, exhibit very similar underparts, but are darker dorsally.

One individual lacking a skull, A.M.N.H. 64157, is unusually gray ventrally. This may be due to the buffy tips having worn away, but the specimen does not appear greatly worn.

Marmosa murina roraimæ Tate

Plate III, Figure 27; Plate XVI, Figure 149

1931. *Marmosa murina roraimæ* TATE, Amer. Mus. Novitates, No. 493, p. 4. Type description.

TYPE SPECIMEN.—A.M.N.H. 75703, ad.male, Coll. Tate and Carter, No. 4695, December 25, 1927. Type in A.M.N.H.

TYPE LOCALITY.—Arabupu, Rio Arabupu, Mt. Roraima, Venezuela, 4000 ft.

MATERIAL EXAMINED (14 specimens)

VENEZUELA.—Paulo, Rio Cuquenam, Mt. Roraima (A.M.N.H. 75548, y.ad. male); Arabupu, Rio Arabupu (A.M.N.H. 75703, type, ad.male; A.M.N.H. 75704, 75707, ad.males; A.M.N.H. 75699, y.ad.male; A.M.N.H. 75705, ad.female; A.M.N.H. 75696–98, 75700, 75702, 75706, 75708, y.ad.females; A.M.N.H. 75701, o.ad.male).

Dorsal color nearest to bister (R.); underparts not varying from cream color (R.), little or not at all narrowed by gray-based hairs. Pelage of soft long, smooth-lying fur. Ears moderate. Feet gray-white.

Separable from its nearest ally, *muscula* by the dorsal pelage, which quite lacks the natal-brown (R.) color of the lowland animal, by the uniformly colored underparts, which in *muscula* vary from cream color (R.) to a dull gray-white, and generally by the length and softness of the fur.

SKULL.—The skull is not distinguishable from that of true *muscula*, having well-developed supraorbital prominences, broad palate, strongly convergent teeth, and the bullæ well-rounded and of moderate size.

Although only definitely recorded from the foot of Mt. Roraima, this species will probably be found in appropriate situations (4000-foot forest and gallery woods) throughout the upland sandstone formation, eastward to the upper part of the Mazaruni escarpment, and southward on to the Pacaraima Mountains.

Marmosa murina klagesi Allen

Plate IV, Figure 28; Plate XVII, Figure 150

1900*a*. *Marmosa klagesi* ALLEN, Bull. Amer. Mus. Nat. Hist., XIII, p. 198. Type description.

1905. *Marmosa klagesi* TROUESSART, 'Cat. Mamm. viv. foss.,' Suppl., p. 855. Listed.

1916. *Marmosops klagesi* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 270. Listed.

1919. *Marmosa klagesi* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 37. Listed.

TYPE LOCALITY.—Ciudad Bolivar, Venezuela.

TYPE SPECIMEN.—A.M.N.H. 16121, adult male, coll. S. M. Klages, October 26, 1899. Type in A.M.N.H.

MATERIAL EXAMINED (10 specimens)

VENEZUELA.—Rio Munduapo, near San Fernando de Atabapo (B.M. 99.9.11.51, female); Ciudad Bolivar (A.M.N.H. 16121, type, male; A.M.N.H. 16132, 16123, males; A.M.N.H. 16122, juv.male); Suapure, Caura Valley (A.M.N.H. 16952, female); La Union, Rio Caura (A.M.N.H. 21312, female; A.M.N.H. 21313, juv. male; A.M.N.H. 21314, juv.female); "Venezuela" (Paris 1885/25, y.ad. ?).

Color dorsally uniform brown, between Verona brown (R.) and mikado brown (R.); ventrally a dull straw yellow, near massicot yellow (R.). No trace of narrowing of the ventral area by gray-based hairs. Line of demarcation between dorsal and ventral color rather marked and straight. Ears small, rather strongly pigmented, fuscous. Eye-ring moderately broad.

Feet rather paler than the dorsal color, face with usual paler color. Tail dark brown, rather longer proportionately than in *m. muscula*, slightly lightened beneath.

Pelage rather firm and velvety in typical material, not very short; but in specimens from up-river, the fur is practically identical in texture with that in *m. muscula*.

Like *murina murina* of the Pará region, these animals are large and strongly built, usually exceeding *m. muscula* in size. The hind foot reaches 23 mm. in males.

SKULL.—Skull as with the remainder of the species very strong; without distinguishing characters. The supraorbitals apparently always without grooves.

TEETH.—Large and strong; canines long and curved.

DISTRIBUTION.—Lower Rio Orinoco; merging with the darker forms *murina* and *muscula* to the east; west and south in the neighborhood of Rio Suapure and the mouth of the Rio Meta, meeting the northern outposts of the large-eared, large-toothed *duidæ*. Probably considerable extension northward through the gallery woods of the Orinoco llanos, but no evidence available.

Marmosa murina duidæ Tate

Plate IV, Figure 29; Plate XVII, Figure 151

1931. *Marmosa murina duidæ* TATE, Amer. Mus. Novitates, No. 493, p. 5. Type description.

TYPE LOCALITY.—Middle Camp, foot of Mt. Duida, eight miles north of Esmeralda, upper Rio Orinoco, southern Venezuela. 350 feet.

TYPE SPECIMEN.—A.M.N.H. 76984. Old adult male. Coll. Olalla y hermano, No. 300, February 3, 1929. Type in A.M.N.H.

MATERIAL EXAMINED (5 specimens)

VENEZUELA.—Foot of Mt. Duida, Upper Orinoco (A.M.N.H. 76984, type, o.ad.male); Rio Ocamo, Upper Orinoco (A.M.N.H. 78103, o.ad.male; A.M.N.H. 78105, y.ad.female); La Laja, Esmeralda, Upper Orinoco (A.M.N.H. 76986, juv. female); Esmeralda, Upper Orinoco (A.M.N.H. 76971, juv.male).

A *murina*-like form distinguished in the adults by its markedly long, narrow palate.

Color above natal brown (R.), paler in the face, juvenile specimen slightly grayer; underparts dirty buff, self-colored from chin to behind the fore limbs, the hairs farther posteriorly gray-based. Ears dark fuscous, large. Eye-ring well developed, slightly reduced beneath the eye. Vibrissæ blackish. Feet heavy and broad, light gray-brown. Tail long, unicolor, dark fuscous-brown, with few whitish spots.

SKULL.—Heavy, elongate, narrow-muzzled, with zygomata well-expanded, a very long palate, and the tooth rows rather more parallel than in most members of the *murina* section. Supraorbital processes pointed, well developed. Bullæ rather large in size, rounded.

TEETH.—Canines very thick, long, oval in cross section. Anterior edge of coronoid perfectly straight.

Compared with *klagesi*, *roraimæ*, and *muscula*, larger and heavier, with more parallel tooth rows, larger bullæ, larger teeth, much stouter canines, and much larger ears in the males. Pelage in some specimens more cinnamon, and others matching that of *klagesi* very closely.

DISTRIBUTION.—Known only from the Duida region.

HABITAT.—The type taken in dense forest under a rotting log.

Marmosa murina madeirensis Cabrera

Plate IV, Figure 30; Plate XVII, Figure 152

1842. *Didelphis macrotarsus* WAGNER, Archiv für Naturgeschichte, VIII, p. 359. Type description. No locality given.

1850. *Didelphis macrotarsus* WAGNER, Abh. Math. Phys. Akad. Wiss., München, V, p. 145. Brief description and set of measurements of two males. Locality Rio Madeira.

1854. *Marmosa murina* BURMEISTER, 'Thiere Brasil,' p. 138. Compared with *murina*.

1855. *Didelphis macrotarsus* WAGNER, Schreber, 'Säugeth. Suppl.,' V, p. 242. "Natterer found this form . . . up the Madeira." (Translation.)

1899. *Marmosa macrotarsus* TROUESSART, 'Cat. Mamm. viv. foss.,' II, p. 1239. Listed as synonym of *murina*.

1913. *Marmosa madeirensis* CABRERA, Trab. Mus. Nac. de Cien. Nat., Madrid, Zool. Ser., No. 9, p. 12. New name for preoccupied *macrotarsus*.

1916. *Marmosa madeirensis* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 270. Listed.

1919. *Marmosa madeirensis* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 37. Listed.

TYPE LOCALITY.—Rio Madeira, Brazil.

TYPE SPECIMENS.—None designated in original description. Vienna 195, adult male, collected by Natterer, is no doubt a co-type and may be one of the two males mentioned by Wagner in 1847. The specimen, formerly mounted with the skull inside the skin, has been remade and the skull cleaned. In Vienna Museum.

MATERIAL EXAMINED (14 specimens)

BRAZIL, AMAZONAS.—Rio Madiera (Vienna 195, co-type, ad.male); Rosarinho, Lago Miguel, Rio Madeira (A.M.N.H. 92202, juv.female); Rio Yavari (Leyden, ad. ?); Manacaparu, near mouth Rio Negro (Berlin 36198–99, y.ad.males; Berlin 36200, y.ad.female); Santarem, Rio Tapajoz (A.M.N.H. 2015/16214, y.ad.female); Villa Braga, Rio Tapajoz (B.M. 20.7.14.43, y.ad.male); Villa Bella Imperatrix, Rio Andira (A.M.N.H. 92870–71, 92873, ad. males; A.M.N.H. 92872, 92876–77, ad. females).

The original *macrotarsus* has the dorsal color dull cinnamon-brown and the ventral color dull straw-buff. The under surface is preponderantly self-colored, only a narrow fringe of gray-based hairs being visible on each margin. Ears rather small, moderately pigmented, fuscous. Feet light brown. Tail dark brown, lighter beneath. Skull essentially similar to that of *murina*, but with slight grooves on the dorsal surface of the supraorbitals. Teeth stout, but without marked characters. A.M.N.H. 92202, from near the mouth of the Rio Madeira seems in every way similar to Natterer's animal. It is probably nearly topotypical.

Three young animals from Manacaparu, Rio Solimões, a little above the mouth of the Rio Negro, are referred to *madeirensis*. Their color is somewhat darker than the present faded color of the type, and their underparts are buffy white along the rather narrow median line, with rather broad marginal gray-based bands.

In the Rio Tapajoz specimens the dorsal color is brighter cinnamon and the ventral area rather more narrowed than in the type of *madeirensis*, but the six specimens recently collected at Villa Bella Imperatrix suggest that the older animals may be faded. They appear identical with the fresh specimen from the Rio Madeira. The supraorbitals have no trace of grooves. Teeth somewhat small, especially the canines ($M^{1-3} = 5.4$).

Madeirensis is probably in reality a gray-brown forest form, the type of which has reached its present light brown hue through fading.

REMARKS.—The subspecies most nearly allied to *madeirensis* and one with which it probably intergrades is *muscula* of the Guianas.

DISTRIBUTION.—Amazonia: neighborhood of the Madeira and Tapajoz rivers and the south bank of the Amazon.

Marmosa murina maranii Thomas

Plate IV, Figure 31; Plate XVII, Figure 153

1924*a*. *Marmosa maranii* THOMAS, Ann. Mag. Nat. Hist., (9) XIII, p. 537. Type description.

1927. *Marmosa maranii* THOMAS, Ann. Mag. Nat. Hist., (9) XIX, p. 374. Considers *maranii* identical with *waterhousei*.

TYPE LOCALITY.—San Lorenzo, Rio Marañón, north shore, just above junction with Rio Huallaga, Peruvian Amazons. 500 feet.

TYPE SPECIMEN.—B.M. 24.2.22.65. Young adult male. Coll. Latham Rutter. Type in B.M. (The "co-type" named by Thomas appears from the characters of the skin to be a dark *noctivaga*. It has no skull.)

MATERIAL EXAMINED (8 specimens)

PERU.—San Lorenzo, Rio Marañón (B.M. 24.2.22.65, type, y.ad.male); Orosa, opposite mouth of Rio Napo, Rio Amazonas (A.M.N.H. 73856, o.ad.female; A.M.N.H. 73855, ad.female); Pebas, Loreto [B.M. unregistered, (in alc.), young].

ECUADOR.—Rio Curaray (mouth), (A.M.N.H. 71959, ad.male; A.M.N.H. 68127, juv.male; A.M.N.H. 46675, ad.female; A.M.N.H. 71963, juv.female).

Color of type above between fuscous and natal brown (R.); underparts cream-buff. Self-colored throat, neck, chest, a fascia 5 mm. in width, and posterior part of abdomen. Ocular marks very strongly developed in front of eye. Ear moderately large, fuscous. Tail coarsely scaled (15 to 16 per cm.). The seeming shortness of the haired portion of the tail in the type is deceptive, the adjoining parts being telescoped or crushed together. The collector's measurement was 172; but now the tail measures only 167.

SKULL.—Skull of type with zygomata narrower than in *m. waterhousei*,—so much so that the palatal length is in excess of the width of the zygomata, a character which is quite unusual in the *murina* group and does not hold for other specimens.

The two females from Orosa, referred to *maranii*, have somewhat smaller teeth and smaller supraorbital ridges.

DISTRIBUTION.—Probably limited to the lower Marañón and Napo region.

REMARKS.—In 1927, Thomas decided that his *maranii* and the skull of *waterhousei* were synonymous. He considered *maranii* "sufficiently like" Tomes' description of *waterhousei*, quoted under *m. waterhousei*, in spite of the difference in zygomatic-palatal ratio shown in the skulls. *Maranii* is primarily fuscous brown; *waterhousei* principally rufous. While undoubtedly closely related, the two forms are treated here as subspecifically distinct.

Marmosa murina waterhousei (Tomes)

Plate IV, Figures 32, 33; Plate XVII, Figures 154, 155

1860. *Didelphys waterhousei* TOMES, Proc. Zool. Soc. London, XXVIII, p. 58. Type description.

1860*a*. *Didelphys waterhousei* TOMES, Proc. Zool. Soc. London, XXVIII, p. 217. Description of a second specimen.

1860*b*. *Didelphys waterhousei* TOMES, Proc. Zool. Soc. London, XXVIII, p. 303. Possible identity with *scapulatus*.

1898. *Marmosa waterhousei* TROUESSART, 'Cat. Mamm. viv. foss.,' II, p. 1238 (Syn. *cinerea*).

1916. *Caluromys waterhousei* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 269. Listed.

1919. *Marmosa* (*Marmosa*) *waterhousei* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 39. Listed.

1921. *Didelphys waterhousei* THOMAS, Ann. Mag. Nat. Hist., (9) VII, p. 522. Confusion of *waterhousei* with *cinerea*.

1922. *Marmosa bombascaræ* ANTHONY, Amer. Mus. Novitates, No. 32, p. 5. Type description.

TYPE LOCALITY.—Gualaquiza, near Rio Zamora, Oriente, Ecuador, 3000 feet.

TYPE SPECIMEN.—B.M. 7.1.1.215. A skull without skin, labeled female. Poorly cleaned from alcohol, but in good condition. Type in B.M.

MATERIAL EXAMINED (15 specimens)

ECUADOR.—Gualaquiza, Rio Zamora (B.M. 7.1.1.215, type, o.ad.female; B.M. 14.4.25.85, ad.female); Zamora, near Gualaquiza (A.M.N.H. 47186, type of *bombascaræ*, ad.female); Rio Curaray (mouth), Rio Napo (A.M.N.H. 71959, ad.male); Mirador, Oriente (A.M.N.H. 46675, ad.female); mouth of Rio Curaray, Oriente (A.M.N.H. 68127, juv.male; A.M.N.H. 71963, juv.female). No locality (B.M. 59.11.28.4, ad.?).

COLOMBIA.—Paime, Rio Meta (A.M.N.H. 69181, 70564, o.ad.females; B.M. 23.11.13.15, juv.?); "Bogotá" (7, y.ad.?); Fusagasuga (B.M. 28.11.8.3, female); "Bogotá" (8, ad.male).

VENEZUELA.—La Azulita, south of Lake Maracaibo, Zulia (F.M.N.H. 22176, y.ad.female).

Murina-like forms with rather dense gray-brown or cinnamon fur, and underparts dull buffy white. Throat pattern and median fascia of varying width (usually present) self-colored. Ears moderate to small, deep fuscous. Tail rather long, and coarsely scaled, smooth and rather shiny. Feet large and heavy in old specimens, dirty brown-gray in color; claws large and stout. The color and pattern in *waterhousei* are often nondescript, the former often dim and dull, the latter highly variable.

Skull characterized by flaring zygomata; a rather pointed muzzle; well-expanded basal portions of the nasals; strongly marked supraorbital ridges, which, however, are frequently but little pointed; com-

paratively little "waist" or postorbital constriction; small teeth; moderately large bullæ with sometimes a spine which does not join the basal part of the alisphenoid.

Due to the fact that the skin of the type is lost, part of Tomes' description is quoted: "general color dark brownish-gray, tipped with rufous on the sides; underparts brownish buff, with a stripe of yellowish white along the centre of the throat and breast . . . length of hind foot 0″ 10½‴″ (=about 23 mm.). This description appears to have been drawn up from a spirit specimen. *Bombascaræ* and the other available material agree very closely with the above description. The former is perhaps a trifle clearer in ventral color than the Colombian animals, but they are obviously members of a single subspecies.

Colombian animals are brownish fuscous above, ventrally a dirty buff-brown. Self-colored hairs may extend posteriorly only to the chest, or continue as a narrow stripe down chest and belly. This is often occluded. Eye-ring strongly developed anterior to the eye. Feet very broad and heavy in old specimens. Ears small, fuscous. Tail practically unicolorous, rather long. Belly hair long. The specimen from Venezuela is slenderer, and rather brighter cinnamon than southern animals.

Skull.—Skull of the type short, broad, rather massive, with broadly expanded zygomata, well-developed supraorbital processes, a rather narrow palate, and small teeth. Bullæ small and rounded; a minute process. *Bombascaræ* is a younger animal of slightly smaller dimensions, but the small spine of the bulla is present. The Colombian specimens conform in general characters to the Ecuadorian material, but the spine may be absent.

Distribution.—Eastern slopes of the Andes from the Rio Meta in Colombia to southern Ecuador; also from Paime, east side of Magdalena, probably throughout the intervening slopes to Zulia, Venezuela.

May be distinguished from *maranii* by the usually greater supraorbital development, and the reddish body color, and from *rubra* by its smaller size and narrower postorbital region.

Remarks.—Although this name has been applied for many years to *germana* and *rutteri*, the members of the *cinerea* group found in the Oriente of Ecuador, examination of the material shows that *waterhousei* is unquestionably a member of the *murina* group. Ever since Tomes declared *waterhousei* to be a form whose female has a pouch, confusion has existed. His figure of the skull (1860*b*, p. 303) appears to be drawn from what is now considered the type. Certainly it is not a picture of the skull of a member of the *cinerea* group, but his colored picture of

"*waterhousei*" appears to be a "*cinerea*" (Pl. LXXVI). The skin of *maranii*, far from resembling a *cinerea*, is superficially much more like *noctivaga lugenda*, so much so that Thomas designated a skin without skull which appears to be *noctivaga*, as a co-type of his *maranii*.

Marmosa rubra Tate

Plate IV, Figure 34; Plate XVII, Figure 156

1931. *Marmosa rubra* TATE, Amer. Mus. Novitates, No. 493, p. 6. Type description.

TYPE LOCALITY.—Mouth of Rio Curaray, Prov. del Oriente, Ecuador.

TYPE SPECIMEN.—A.M.N.H. 71973. Old adult female. Coll. Olalla y hermano, December 7, 1925. Type in A.M.N.H.

MATERIAL EXAMINED (12 specimens)

ECUADOR.—Mouth of the Rio Curaray, Oriente (A.M.N.H. 71973, type, o.ad.female; A.M.N.H. 71950, 71952, 71974, 71976, ad.males; A.M.N.H. 71953, 71972, ad.females; A.M.N.H. 71963, juv.female); San José (abajo), Mt. Sumaco, Oriente (A.M.N.H. 68127, juv.male; A.M.N.H. 68137–39, ad.females).

Rather large; warm red-brown with cinnamon underparts; small ears; large feet; bicolor fuscous tail.

Color above bright, between chestnut (R.) and burnt sienna (R.); beneath near ochraceous-buff (R.). Self-colored hairs from throat to chest in an irregular stripe about 1 cm. in width. A much narrower line of irregularly placed areas of abruptly paler (creamy) hairs accompanies the stripe. In other specimens than the type, these latter may either be wanting or may be expanded to include a width of some 8 mm. of the median part of the throat. Face somewhat paler than dorsum, with a very narrow, fairly well-defined median reddish-fuscous line from rhinarium to brow, rather similar to that in *Philander*. Eye-ring much reduced behind and below eye, narrowing anteriorly and terminating among the vibrissæ. Ears small, fuscous. Feet large, dull gray in color on the dorsal surface; claws long and stout. Tail bicolor, dark fuscous above, lighter beneath.

SKULL.—Skull of type short, with widely expanded zygomata; postorbital region very broad; supraorbital processes not pointed, reduced to fine raised beading; nasals not greatly expanded at base; tooth rows rather strongly convergent, and canines quite short.

DISTRIBUTION.—Probably the Rio Napo basin.

Marmosa tyleriana Tate

Plate IV, Figure 35; Plate XVII, Figure 157

1931. *Marmosa tyleriana* TATE, Amer. Mus. Novitates, No. 493, p. 6. Type description.

TYPE LOCALITY.—"Central Camp," Mt. Duida Plateau, Upper Rio Orinoco, Venezuela, 4800 feet.

TYPE SPECIMEN.—A.M.N.H. 76983, y.ad.female, coll. Olalla y hermano, No. 272 February 6, 1929. Type in A.M.N.H.

MATERIAL EXAMINED (2 specimens)

SOUTHERN VENEZUELA.—Mt. Duida Plateau, 4500 ft. (A.M.N.H. 76983, type, y.ad.female; 6900 ft., A.M.N.H. 77085, juv.male).

A general likeness to a very large *dryas* on account of vinaceous underparts and long, lax fur, but actually quite different. Color dark brown, ears large, very dark. Distal half of tail creamy.

Color above near russet (R.) with something of the mottled appearance of *marica*. Hair long and lax above and below; face scarcely any lighter. Underparts near fawn color (R.); hairs everywhere gray-based, except inguinal area which is rusty-vinaceous. Ears large and deeply pigmented, eye-rings and vibrissæ moderate. Throat gland absent. Fore feet gray-brown; light gray hind feet. Tail of moderate length, particolor, its basal half fuscous brown, slightly bicolor.

SKULL.—Elongate, narrow; muzzle relatively broad, zygomatic arches relatively narrow. Supraorbital ridges barely noticeable, a distinct postorbital constriction. Palate long, narrow. Bullæ rather large, smoothly rounded, without processes.

DISTRIBUTION.—Known only from the plateau of Mt. Duida, southern Venezuela.

REMARKS.—A peculiar species, which although allied to *murina* through its broad brain case and small teeth, parallels the *mitis* section in its exceptionally enlarged bullæ and the *noctivaga* group in its long narrowed skull and palate.

In the *murina* and *noctivaga* groups the particolored tail generally indicates species inhabiting dry regions or areas having marked dry seasons; but *tyleriana* is indigenous to one of the wettest places in South America, the drier period coming only for a very few weeks of the year, during January and February.

The type was caught by hand during the daytime. Its label is marked "4 mammæ, 3 large and 1 small."

This form, together with numerous other animals and plants, is probably strictly endemic on the high, quartzite plateaus of the Duida region.

Marmosa quichua Thomas

Plate IV, Figure 36; Plate V, Figures 37, 38; Plate XVII, Figure 158; Plate XVIII, Figures 159, 160

1899. *Marmosa quichua* THOMAS, Ann. Mag. Nat. Hist., (7) III, p. 43. Type description.

1905. *Marmosa quichua* TROUESSART, 'Cat. Mamm. viv. foss.,' Suppl., p. 856. Listed.

1913*a*. *Marmosa musicola* OSGOOD, Field Museum Nat. Hist., X, p. 95. Type description.

1916. *Caluromys musicola* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde Berlin, p. 269. Listed.

1916. *Marmosa quichua* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 270. Listed.

1919. *Marmosa musicola* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 38. Listed.

1919. *Marmosa quichua* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 39. Listed.

1920. *Marmosa quichua* THOMAS, Proc. U. S. N. M., LVIII, p. 248. Mentions the type.

1927. *Marmosa musicola* THOMAS, Ann. Mag. Nat. Hist., (9) XIX, p. 374. Brief remarks.

1927*b*. *Marmosa musicola* THOMAS, Ann. Mag. Nat. Hist., (9) XX, p. 608. Records material from Chinchavita, Peru.

1928. *Marmosa quichua* THOMAS, Ann. Mag. Nat. Hist., (10) II, p. 265. Records specimens from the Ucayali.

TYPE LOCALITY.—Ocabamba, near Cuzco, Peru. Probably about 9,000 feet.[1]

TYPE SPECIMEN.—B.M. 98.11.6.18. Young adult female. Coll. Otto Garlepp October 2, 1897. Type in B.M.

MATERIAL EXAMINED (48 specimens)

PERU.—Moyabamba, Huallaga drainage (F.M.N.H. 19354, type of *musicola*, o.ad.female; F.M.N.H. 19352, ad.female; F.M.N.H. 19355, 19357, y.ad.females; F.M.N.H. 19353, juv. male); Yurac Yacu, near Moyabamba, Huallaga drainage (B.M. 27.1.1.179-180, 27.1.1.182-183, males; B.M. 27.1.1.184-186, females); Contamana, Rio Ucayali (B.M. 28.5.2.246–247, males); Cerro Azul, near Contamana, Rio Ucayali (B.M. 28.5.2.244–245, females); Tingo Maria, Upper Rio Huallaga (B.M. 27.11.1.261, ad.male; B.M. 27.11.1.263–264, y.ad.males; B.M. 27.11.1.262, juv.male; B.M. 27.11.1.265–267, females; B.M. 27.11.1.183, o.ad.female; B.M. 27.11.1.292–293, females; F.M.N.H. 24754, o.ad.female); Rio Chinchao, Upper Rio Huallaga (F.M.N.H. 24752, y.ad.female); Pozuzo, Upper Rio Pachitea drainage (F.M.N.H. 24743, juv.male; F.M.N.H. 24742, 24744–45, juv.females; F.M.N.H. 24755, o.ad.female); Chicosa, Ucayali drainage (B.M. 28.5.2.242, o.ad.male; B.M. 28.5.2.243, y.ad.female); Ocabamba, north of Cuzco, type of *quichua* (B.M. 98.11.6.18, y.ad.female); San Ramon, near Chanchamayo, Perené drainage (F.M.N.H. 20779–81, juv.males); Chanchamayo, Perené drainage (B.M. 7.6.15.10, y.ad.male; Berlin 36216, ad.male; U.S.N.M. 172954, juv.male; F.M.N.H. 18886, juv.male; B.M. 11.10.16.6, ad.female; B.M. 9.7.5.6, y.ad.female); Marcapata, Inambari drainage (Berlin 36217, y.ad.?; B.M. 4.12.4.19, juv.?; Berlin 36218, juv.?).

A dull cinnamon-gray member of the *murina* group of relatively small size occurring in eastern Peru.

Color somewhat variable, but usually near Verona brown (R.) dorsally, becoming warmer on the sides. The color is dim, with a gray-

[1]The type locality of Dr. Osgood's *musicola* is Moyabamba, at the northern and opposite end of the known range of *quichua*.

ish cast, and quite lacks the vividness of such forms as *mexicana.* Animals from the Ucayali are darker, matching the more fuscous hues of *ucayaliensis* of the *noctivaga* group.

Ventrally from cartridge buff (R.) to cream-buff (R.), the throat and chest being broadly self-colored, but the unicolorous area posterior to the chest narrowed by gray-based hairs to form a stripe rarely more than 10 mm. in width, and usually only about 5 mm. The tips of the gray-based hairs washed with pale cinnamon. In the type of *quichua* the fascia is 10 mm. wide; in that of *musicola* it is narrowed to 2 or 3 mm.

Kalinowski's animals from the south of Peru are very slightly grayer and less brownish than the northern form. A juvenile from Moyabamba in the north possesses the brown color of the adults; but those collected by Heller at Pozuzo near the head of the Rio Pachitea are very gray in appearance and have dull cartridge buff (R.) ventral coloring. On the other hand, Schenke's young animals that come from Chanchamayo, still farther south, are again rather more cinnamon.

Eye-rings moderately developed; often rather narrowed. Ears moderate; in one specimen from Chanchamayo appearing rather large. Feet small, buffy brown; claws often long and sharp. Tail remarkably long compared with head and body, its surface smooth and glossy and with the covering of fine hairs much reduced. Its scales from 16 to 20 per cm.

Inguinal color in females near auburn (R.).

SKULL.—Skull proportionately short and broad. Muzzle short, pointed; the line from zygomatic arch to muzzle concave. Nasals rather abruptly expanded at base, and slightly separated by entering points of the frontals. Supraorbital ridges sharp, produced in adulthood into small but definitely pointed processes which occur rather far back; prolonged posteriorly on the parietals as faintly marked, never converging temporal ridges. Lambdoidal crest only slightly developed. Palate broad; tooth rows strongly convergent. Anterior palatal foramina very short antero-posteriorly; no accessory openings behind the posterior palatal vacuities. Lateral posterior palatal foramina small. Bridge rather short and broad. Bullæ well separated, rounded and inflated, occasionally with minute incipient spine.

TEETH.—Rather small; canines short. Mandible rather short, the ascending ramus with its anterior edge strongly flanged and slightly bent.

Most nearly allied to *murina,* but distinguished by the following features: the proportionately longer tail, (the average ratio of the length

of the tail to that of head and body being as 3 to 2); the smooth, shining surface of tail; the rather long basal part of tail bearing body fur; relatively great breadth of skull; small, pointed supraorbital processes placed rather far back on the supraorbital ridges; complete lack of any postorbital narrowing; and small teeth.

The lowland form of *quichua* is easily confused with *caucæ ucayaliensis* from which it is almost indistinguishable in many instances by the color and pattern of the skin alone; but the small claws, short, finely

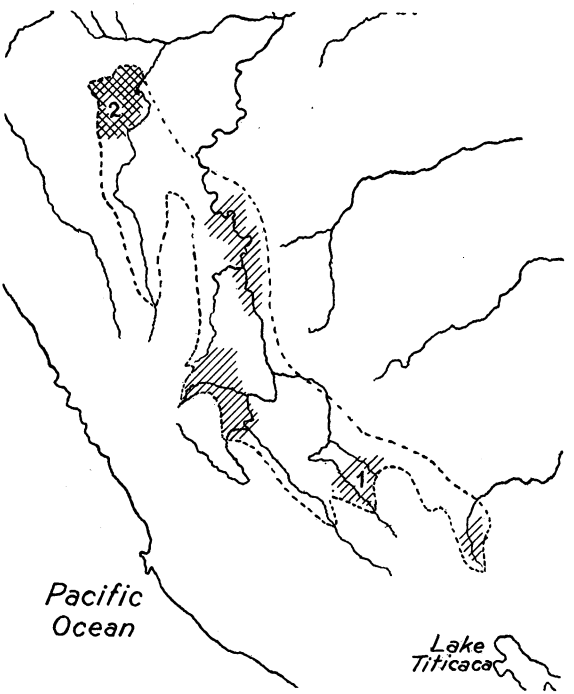


Fig. 13. Distribution of *M. quichua*.
1, *M. quichua*; 2, (*M. musicola*).

setose tail of *ucayaliensis* coupled with the cranial characters of the *noctivaga* group to which *ucayaliensis* belongs,—i.e., processes on the bullæ, narrowed skull and palate, etc.,—and the larger teeth of *ucayaliensis* are indicators of the superficiality of the resemblance.

Distribution.—Andean foothills of eastern Peru, probably not above 4000 feet (upper drainages of Huallaga, Ucayali, and Inambari rivers); extending down to 500 feet on the Ucayali. Not known north of the Marañón. (Map, Fig. 13.)

REMARKS.—Insufficient adult material is available for study, especially from southern Peru. Nevertheless, careful comparison of animals from north and south, both adult and immature, serves chiefly to stress their extremely close relationship. The distinctions marked by Thomas and Osgood relative to size and to the presence or absence of supraorbital processes seems not to hold, the type of *quichua* being a young adult female and that of *musicola* an old adult female, and there is little doubt also that the partial whitening of the tail in *quichua* is either a local or an adventitious feature, similar to that occurring in *canescens* and other species. Possibly this particolor-tailed variety may prove to hail from the drier valleys of the eastern slope. In any case it is an offshoot from the widely distributed, brown-tailed *musicola*-like form.

Five phases of *quichua* may be seen, the differences between which are faint and probably not constant, for which reason, although they are indicated below, no names are applied to them:

1.—Foothills of northern and central Peru (eastern slope), with M^{1-3} from 5.5 to 5.7; the color in both adults and juveniles dull brownish. Ears medium in size. This is true *musicola* Osgood.

2.—From Pozuzo, also in the foothills. Adults similar to *musicola*, but the juveniles have the pelage dusty gray-brown, the brown but little perceptible.

3.—From Ocabamba (altitude greater), true *quichua*, colored essentially as *musicola*, but the tail with terminal portion white.

4.—Large gray animals with M^{1-3} reaching 5.8 in female, taken by Kalinowski at Marcapata, the southern known extent of the range of *quichua*.

5.—Ucayali animals pale fuscous-brown, with M^{1-3} in males reaching 6.0. These are the animals which present such close superficial likeness to *caucæ ucayaliensis*.

If *musicola* be allowed to stand as a subspecies, then names should be proposed for the remaining races of *quichua*.

Mitis Section

This section contains the largest members of the *murina* group. Its range extends through the northern part of South America and the southern part of Central America. Three of the four species comprising it are red, the fourth, *simonsi*, in response apparently to the pronounced xerophytic and even desert conditions in which it lives, being gray.

Distinctive characters are the large, scarcely pigmented ears (smaller in *ruatanica*) thick, often short, rather densely pilose tail; proportionately short, broad hind foot; orange-brown color (when developed) of the inguinal area in females (also found in *mexicana* and *canescens* sections), as contrasted with the purple-brown of the *murina* section.

In the skull the principal features are: grooved supraorbital ridges; pronounced constriction in the postorbital region; great breadth of the palate; and enlarged alisphenoid bullæ (rather smaller in *ruatanica*).

The distribution is from northwestern Peru and southern Ecuador (*simonsi*) northward to Honduras—broken distribution (*ruatanica*); from the northern part of Colombia eastward to the Paria Peninsula

Fig. 14. Distribution of *M. mitis* section.
1, *M. mitis;* 2, *M. chapmani;* 3, *M. simonsi;* 4, *M. ruatanica.*

and the Island of Margarita (*mitis*); and finally the islands of Trinidad, Grenada and Tobago (*chapmani*). (Map, Fig. 14.)

It seems probable that the number of mammæ which may become functional is very high in this section. In *mitis mitis*, A.M.N.H. 15362 from Mamatoco, the functional number is 7–1–6; in "*grenadæ*" (*chapmani*) Thomas says 7–1–7; and A.M.N.H. 69940, *robinsoni*, had 19 young attached to the teats. Of *chapmani*, Allen (1897) says, "a female . . . has six mammæ developed; to each was attached a young one

almost 30 mm. long. A second female . . . has eleven functional mammæ, to each of which, when captured, a young one was attached. . . . " The mammæ are entirely confined to the inguinal region.

Possibly the great abundance of the several species where they occur may be connected with the production of so many young. Allen states of *chapmani* (1893) that it was "so abundant as to prove a positive source of annoyance." *Mitis* is apparently very plentiful at Santa Marta, Mérida region, at San Estaban and E. Trompillo in Carabobo; *isthmica* is plentiful at Gatun, Panama, and at Tacarcuna, in the Darien; and *simonsi* can be collected by scores on the island of Puna, Ecuador, and along the brackish estuaries near Guayaquil.

KEY TO *mitis* SECTION

1.—Size very large to moderate; ears very large; bullæ large, rounded; palate commonly with accessory posterior openings . . . . . 2.
Size very large; ears moderate; bullæ moderate; palate without accessory posterior openings . . . . . *ruatanica.*
2.—Size very large to moderate, hind foot in old adults sometimes reaching 26 mm.; insular; Trinidad, Grenada, Tobago . . . . . *chapmani.*
Size moderate; hind foot rarely exceeding 24 mm. (in *mitis casta* a specimen has the hind foot 27 and a second 25 mm.); mainland, and near-by islands . . . 3.
3. Color some shade of cinnamon . . . . . *mitis.*
Color gray . . . . . *simonsi.*

Marmosa mitis Bangs

(Synonymy under subspecies)

Pelage usually long and rather close. This is most pronounced in mountain forms, but in specimens from the lowlands the pelage is seldom more than 2 mm. shorter. Mountain pelage 9–11 mm. on the back; lowland pelage 7–9 mm.

The color reaches its richest in the highland animals of Santa Marta and of Mérida, and its palest in specimens of *robinsoni* from the arid Margarita Island. Ventrally usually near cartridge buff (R.), deepening slightly in some specimens. The ventral pattern, except in *mitis casta,* shows all degrees of narrowing of the median band of unicolorous hairs from 15 to 20 mm. in width, down to almost complete union of the gray-based hairs of each side of the belly.

Face markedly paler than dorsal body color. Vibrissæ rather short in males, and frequently as short as 23–25 mm. in females. Ears proportionately large, being both long and broad; their color, apparently on account of lack of pigment, usually very much paler than in members of the *murina* group. Proportionately rather larger than the ears of the two

allied species, *ruatanica* and *chapmani*, and about the same size as in *simonsi*. Tail short, rather thick and quite densely clothed with small fine hairs which give it a whitish appearance like the ears. Tail of *mitis* proportionately the shortest and most densely haired of the four species in the section. Its scales vary from 17 to 22 per cm. Stretching may cause them to total only 16 or less, but the usual count is about 19. The scales are often counted with difficulty on account of the covering hairs.

Foot generally short and broad, its length of some value subspecifically; in true *mitis*, small; in *casta* and *fulviventer*, of medium size; and in *robinsoni*, rather large. Females have much smaller feet than males. Claws stout.

SKULL.—Skull like those of *chapmani* and *ruatanica*, but smaller; however, it is larger than in *simonsi*, blunt and broad in outline and

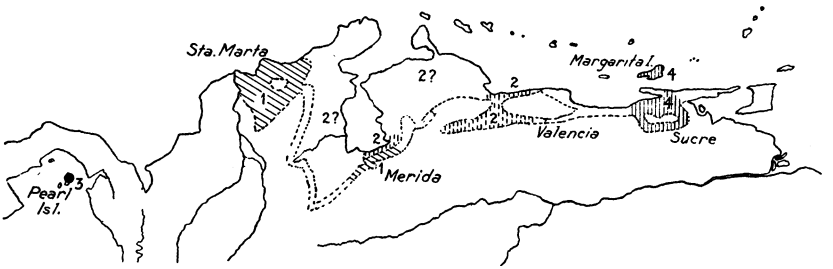


Fig. 15. Distribution of *M. mitis*.
1, *M. mitis mitis;* 2, *M. mitis casta;* 3, *M. mitis fulviventer;* 4, *M. mitis robinsoni.*

heavily ossified. Nasals broadened at the base in a smooth sweeping curve, and rather rounded behind. Supraorbital ridges well developed, moderately pointed, with pronounced dorsal grooves; the ridges carried backward over the parietals as heavy temporal ridges which in males may approach to within 4 mm. of each other, but in females remain more widely separated. A pronounced constriction of the skull behind the supraorbital processes which is characteristic of the entire section. Palate very broad, both anteriorly and posteriorly; a second pair of posterior vacuities circular in form behind the normal slitlike ones (characteristic of *chapmani;* less well developed in *simonsi;* absent in *ruatanica*). Bullæ large, smooth, rounded; proportionately the largest of the *murina* group.

TEETH.—Teeth without distinctive characters, varying in size with the subspecies; when compared with the *murina* forms, much heavier and stronger. Canines heavy and thick antero-posteriorly, but often

short; mandible deep, the ascending ramus with its anterior edge rather strongly curved.

Apart from the limits of individual variation, the remarkable uniformity of the species *mitis* and the fact that individuals conforming to the definitions of these forms crop up irregularly throughout the animal's range—from the Paria Peninsula in the Province Sucre, Venezuela to Santa Marta, Colombia, and the islands of Saboga and San Miguel, off Panama (Pacific side of the Isthmus)—make retention of the several named forms of very doubtful value. (Map, Fig 15, p. 113.)

The named and not certainly separable forms are as follows:

1.—On Margarita Island, a form with underparts rather broadly buff (15 mm. self-colored at narrowest part), and the brown of the dorsal color decidedly light and sandy..... *mitis robinsoni.*

2.—A mainland form darker than the above, with the ventral fascia more restricted and the gray bases of the lateral ventral hairs showing through more noticeably; found in the provinces of Sucre and Anzoategui. Provisionally referred to..... *mitis robinsoni.*

3.—A form with very pale, whitish-buff underparts, practically unnarrowed by gray-based hairs. Found along the rather arid coast and dry interior of Venezuela in the provinces of Lara, Carabobo, Falcon (probably), and parts of Zulia (Osgood's *pallidiventris*)..... *mitis casta.*

4.—A form ranging from Mérida to Santa Marta, in regions of high rainfall, and generally at considerable altitude, which has the ventral area markedly narrowed and the gray bases of the lateral hairs often strikingly prominent, is characteristic, but the typical facies shows chiefly in specimens taken at greater altitude. Specimens from lower elevations (Bonda, Santa Marta, Honda, Rio Magdalena) show some tendency to become *casta*-like. Although the type specimen is from a high altitude locality (8000 feet), all these are included by Bangs in his *mitis*. At this altitude certain individuals, both in the Santa Marta Range and in the Mérida region, have the ventral stripe narrowed to as little as 5 mm..... *mitis mitis.*

5.—No representatives of *mitis* exist in collections from the region intervening between the Rio Magdalena and the Islands of San Miguel and Saboga. But on these islands Bangs' *fulviventer*, with hair slightly shorter and with the self-colored ventral area again very narrow (although overmarked with buff yellowish), is found..... *mitis fulviventer.*

These four forms, *robinsoni*, *casta*, *mitis*, and *fulviventer*, are practically indistinguishable cranially.

The wide distribution of *mitis* through the extreme north of South America and the fact that it is impossible to define its forms suggest that it is a very plastic species. Under these conditions there is no necessity to postulate an environmental connection for *mitis casta* between the dry coastal fringe and the Valencia basin. *Casta* of the coast and *casta* of Valencia are better considered parallel pale-bellied varieties which have

reacted nearly equally to subequal climatic conditions. They may have evolved from a *mitis mitis*-like ancestry which should yet exist in the humid strip along the upper part of the coastal range.

It is further suggested that this parent type may continue in appropriate situations on the Silla de Caracas, and (probably intermittently) eastward into Anzoategui and Sucre where it becomes *mitis robinsoni*.

Marmosa mitis mitis Bangs

Plate V, Figure 39; Plate XVIII, Figure 161

1896. *Marmosa murina* THOMAS, Ann. Mag. Nat. Hist., (6) XVIII, p. 314. Remarks under *m. fuscata*.

1898*a*. *Marmosa mitis* BANGS, Proc. Biol. Soc. Washington, XII, p. 162. Type description.

1905. *Marmosa mitis* TROUESSART, 'Cat. Mamm. viv. foss.,' Suppl., p. 856. Listed.

1904*b*. *Marmosa mitis* ALLEN, Bull. Amer. Mus. Nat. Hist., XX, p. 417. Numerous records with brief description.

1916. *Marmosa mitis* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 270. Listed.

1919. *Marmosa mitis* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 38. Listed.

TYPE LOCALITY.—Pueblo Viejo, Sta. Marta region, Colombia, 8000 feet.

TYPE SPECIMEN.—M.C.Z., 8123. Old adult male. Coll. W. W. Brown, Jr., March 25, 1898. Type in M.C.Z.

MATERIAL EXAMINED (97 specimens)

COLOMBIA.—Pueblo Viejo, Sta. Marta, 10° 58′ S., 73° 36′ W., 8000 feet (M.C.Z. 8123, type, o.ad.male; M.C.Z. 8117–21, 8126, 8132, 8143, U.S.N.M. 85531, F.M.N.H. 18508, B.M. 9.4.15.18, ad.males; M.C.Z. 8122, 8125, 8127, 8129–31, 8133, 8135, 8137, 8139–40, 8142, U.S.N.M. 85532, F.M.N.H. 18508, B.M. 9.4.15.18–19, ad. females); Palomina, Sta. Marta, 5000 feet (M.C.Z. 8280, U.S.N.M. 85533, B.M. 9.4.15.20, ad.males; M.C.Z. 8285, juv.male; M.C.Z. 8270–75, 8277–78, 8281–82, 8284, 8403, 8405, ad.females); La Concepcion, Sta. Marta, 3000 feet (M.C.Z. 8409–10, ad.males; F.M.N.H. 18507, y.ad.male; M.C.Z. 8411–12, 8407, ad.females); San Miguel, Sta. Marta, 7500 ft., 11° 2′ S., 73° 41′ W. (M.C.Z. 8266, F.M.N.H. 18506, ad.males; M.C.Z. 8267, 8269, ad.females); "Santa Marta" City (Pittsburgh 1000, ad.male); Bonda, (7 miles east of Sta. Marta), 11° 17′ S., 72° 2′ W., 150–250 feet (Pittsburgh 1017, juv.; A.M.N.H. 23273, v.y.male; A.M.N.H. 15358–59, 23280, juv.males; A.M.N.H. 15357, ad.male; Pittsburgh 1008, ad.female; A.M.N.H. 14610, 23275–76, 23292, ad.females; Pittsburgh 1014, 1016, juv.females; A.M.N.H. 15360–61, 23274, 23281, juv.females); Rio Don Diego, 45 miles east of Sta. Marta, (lowlands) Pittsburgh 3100, 3107, 3140-41, ad.males; Pittsburgh 3101, y.ad.male; Cincinnati, San Lorenzo Mts., Sta. Marta, 4500 ft., Pittsburgh (2630, juv.male); Taganga, 2 miles northeast of Sta. Marta (A.M.N.H. 15363, ad.female); Minca, Rio Guaiga, 12 mi. southeast of Sta. Marta, 11° 12′ S., 74° 2′ W., 2000 ft., (A.M.N.H. 23293, ad.male); Honda, Rio Magdalena, Sta. Marta, 5° 15′ S., 74° 50′ W., 600 ft. (A.M.N.H. 34602, ad.male); Mamatoco, Rio Manzanares, (2 miles below Bonda), 11° 15′ S., 74° 17′ W., 62 ft. (A.M.N.H. 15362, ad.female).

VENEZUELA.—Cafetal de Milla, Mérida (U.S.N.M. 149005, ad.male; B.M. 98.7.1.21, ad.female); Montes de Chama, Mérida, (Berlin 24810, ad.male); Montes de Pedregozo, Mérida (B.M. 98.7.1.19, ad. male); Cafetal de Chama, Mérida (B.M. 5.1.1.6, ad.female); Vegas del R. Chama, Mérida (B.M. 98.7.1.20, ad.female); "Mérida" [M.C.Z. 17866, ad.male; B.M. 2.3.4.8, ad.female; A.M.N.H. 24320, 24323–24, 33166, juveniles; B.M. 14.9.1.86, male; B.M. 14.9.1.91, (?)].

Characteristic specimens are from high altitudes of Santa Marta. Dorsum near cinnamon-brown (R.), and unicolorous hairs of the ventral area cartridge buff. Rather frequently the body area of the belly strongly narrowed by gray-based hairs which in turn have a light over-wash of the dorsal color. Pattern of the self-colored area highly variable, most often approaching the following: chin area slightly narrowed by cinnamon hairs, expanding on throat to 20 mm. or more. This width maintained until just beyond the fore limbs, and then narrowed abruptly to about 10 mm., or even 5 in cases. It broadens again at the lower belly and extends on to the inner side of each hind leg. The cinnamon tips of the gray-based hairs may be almost absent; the ventral constriction may be as little as 15 mm.

Eye-ring often rather narrow and reduced—not extending more than 2 mm. behind the eye. Feet rather small; tail rather short as compared with other members of the species.

DISTRIBUTION.—Apparently throughout the Santa Marta region, lower Rio Magdalena, northern slopes of the Venezuelan Andes near Mérida. There is no record as yet of *m. mitis* from the Caracas region farther east.

Juveniles from the Mérida region are often confused with *marica*. They are easily distinguished through the very much smaller teeth of the latter.

Marmosa mitis casta Thomas

Plate V, Figures 40, 41; Plate XVIII, Figures 162, 163

1911*a*. *Marmosa mitis casta* THOMAS, Ann. Mag. Nat. Hist., (8) VII, p. 516. Type description.

1911. *Marmosa mitis casta* ALLEN, Bull. Amer. Mus. Nat. Hist., XXX, p. 246. Records from San Esteban.

1912. *Marmosa mitis pallidiventris* OSGOOD, Field Mus. Nat. Hist., X, p. 39. Type description.

1916. *Marmosa casta* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 270. Listed.

1919. *Marmosa mitis casta* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 38. Listed.

TYPE LOCALITY.—San Esteban, near Puerto Cabello, Prov. of Carabobo, Venezuela, 250 feet.

TYPE SPECIMEN.—B.M. 11.5.25.184. Adult male. Coll. S. M. Klages, No. 207. February 6, 1911, Type in B.M.

MATERIAL EXAMINED (28 specimens)

VENEZUELA.—El Trompillo, Carabobo (B.M. 14.9.1.86–93, ad.males; B.M. 14.9.1.94–97, ad.females); Puerto Cabello, Carabobo (Berlin 9184, ad.male); San Esteban, Carabobo (B.M. 11.5.25.184, type, ad.male; B.M. 11.5.25.179–185, males; B.M. 11.5.25.186–187, females; A.M.N.H. 31532, M.C.Z. 17867, males); Anzoategui, Lara, 4705 feet (A.M.N.H. 32141, juv.male); Valera, 10 mi. N. of Cucuta, Zulia (F.M.N.H. 22175, male; F.M.N.H. 18692, type of *pallidiventris*, y.ad.female).

A pale, rather dull-colored form of *mitis* with pale underparts, inhabiting the coastal region of the provinces of Carabobo, Falcon (probably), and Zulia, the interior about Lake Valencia and the province of Lara.

Color of back rather duller than cinnamon-brown (R.), lacking the vividness of the same region in true *mitis*. Underparts a shade deeper than cartridge buff (R.), and practically without restricting gray-based hairs. Size as in *mitis*, somewhat smaller than *robinsoni*. Tail proportionately as *mitis*. Mammæ in B.M. 14.9.1.97 at least 7.1.7.

DISTRIBUTION.—*Casta* appears to be the representative of *mitis* in the arid coastal strip between La Guaira and the Gulf of Maracaibo, and again in the Valencia basin. Excepting the specimen from Lara, it has not been recorded at a greater altitude than 1500 feet in the hills near San Estaban.

The material taken at El Trompillo, just south of Lake Valencia seems to indicate discontinuous distribution. Klages (Allen, 1911) describes the general aridity of the country and the narrow humid belt on the northern slope at the upper part of the San Esteban Valley. He states that the pass through the coastal range has an altitude of 4443 feet.

Although the drainage at Valencia is interior, there appears to be practically no hill barrier to the southwest between it and the Rio Pao, a tributary of the Orinoco. Probably the range of *casta* reaches as far south as the extent of the foothills south of Valencia,—i.e., to the beginning of the llanos.

The type of Osgood's *pallidiventris*, a young female, agrees very well with *casta*, but it has gray-based hairs bordering the ventral region, which seems to place it in an intermediate position between *casta* and *mitis*. His second specimen, however, F.M.N.H. 22175, from Valera, which he refers to *pallidiventris*, appears identical with *casta*.

Marmosa mitis fulviventer Bangs

Plate V, Figure 42; Plate XVIII, Figure 164

1901. *Marmosa fulviventer* BANGS, American Naturalist, XXXV, p. 632. Type description.

1905. *Marmosa fulviventer* TROUESSART, 'Cat. Mamm. viv. foss.,' Suppl., p. 855. Listed.

1904. *Marmosa fulviventer* ELLIOT, Field Columbian Mus. Publ. 95, Zoöl. Ser., IV, part 1, p. 8. Brief description.

1905. *Marmosa fulviventer* ELLIOT, Field Columbian Mus. Publ. 105, Zoöl. Ser., VI, p. 4.

1916. *Marmosa fulviventer* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 270. Listed.

1919. *Marmosa fulviventer* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 36. Listed.

TYPE LOCALITY.—San Miguel Island, Panama (Pacific side).

TYPE SPECIMEN.—M.C.Z. 8435. Old adult male. Coll. April 28, 1900. Type in M.C.Z.

MATERIAL EXAMINED (5 specimens)

PANAMA.—San Miguel Island (M.C.Z. 8435, type, o.ad.male; M.C.Z. 8438, ad.male; M.C.Z. 8436–37, ad.females); Saboga Island (M.C.Z. 10809, ad.male).

An insular variety of *mitis*, but larger and with larger feet.

Color near cinnamon-brown, almost as in *casta*, duller than in *mitis*.

In the five specimens examined, the ventral self-colored hairs which are almost pinched out behind the fore limbs, are dull cream-buff (R.) on chest and throat. Pelage shorter, feet larger and stouter, but otherwise the animals resemble *mitis*.

DISTRIBUTION.—Only recorded from the islands of Saboga and San Miguel, Panama (Pacific coast).

Marmosa mitis robinsoni Bangs

Plate V, Figure 43; Plate XVIII, Figure 165

1898. *Marmosa robinsoni* BANGS, Proc. Biol. Soc. Washington, XII, p. 95. Type description.

1905. *Marmosa robinsoni* TROUESSART, 'Cat. Mamm. viv. foss.,' Suppl., p. 856. Listed.

1916. *Marmosa robinsoni* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 270. Listed.

1919. *Marmosa robinsoni* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 39. Listed.

TYPE LOCALITY.—Margarita Island, north of Cumana, Prov. of Sucre, Venezuela.

TYPE SPECIMEN.—M.C.Z. 7749. Old adult male. Coll. Lt. Wirt Robinson, July, 1895. Type in M.C.Z.

MATERIAL EXAMINED (9 specimens)

VENEZUELA.—Margarita Island, Sucre (M.C.Z. 7749, type, o.ad.male; U.S.N.M. 63209, ad.male; U.S.N.M. 63212, juv.male; U.S.N.M. 63210, y.ad.female); Cuchivano, near Cumanacoa, Sucre (A.M.N.H. 69938, ad.male); San Antonio de Maturin, Sucre (A.M.N.H. 69939, y.ad.male; A.M.N.H. 69940, ad.female); Ypure, Sucre (B.M. 0.5.1.59, o.ad.male); Campo Alegre, Sucre (B.M. 0.5.1.58, ad.male).

The extreme eastern representative of *mitis*. Dorsally near sayal brown (R.) or tawny (R.), with ventral color cartridge buff (R.). Main-

land specimens slightly darker—near snuff brown (R.), and have the lateral gray-based belly hairs more developed. One island specimen, U.S.N.M. 63209, marked by the collector "pale var." Its present color is not so vivid as cinnamon (R.), probably on account of the admixture of gray in the hairs. The ocular marks extend a little farther backward than in *m. mitis*.

In general the animals appear rather larger than *m. mitis*, with larger hind feet and longer tails.

DISTRIBUTION.—Although originally described from Margarita Island, the mainland opossums appear to be essentially the same, except for the slightly darker color tone already mentioned. Known distribution then is: Margarita, the Paria Peninsula, the Province of Sucre both north and south of the Turumiquire Range.

A female, A.M.N.H. 69940, taken at San Antonio de Maturin in April had nineteen young attached to the teats. Robinson's female, taken in July, was in breeding condition. Juvenile specimens, half grown, were obtained in July on Margarita.

Marmosa chapmani Allen

Plate V, Figures 45, 46; Plate VI, Figure 46; Plate XVIII, Figure 166, 167; Plate XIX, Figure 168

1893. *Didelphis* (*Micoureus*) *murina* ALLEN AND CHAPMAN, Bull. Amer. Mus. Nat. Hist., V, p. 230. Records and remarks on Trinidad animals.

1897. *Marmosa murina* ALLEN AND CHAPMAN, Bull. Amer. Mus. Nat. Hist., IX, p. 27. Additional remarks.

1900*a*. *Marmosa chapmani* ALLEN, Bull. Amer. Mus. Nat. Hist., XIII, p. 197. Type description.

1905. *Marmosa chapmani* TROUESSART, 'Cat. Mamm. viv. foss.,' Suppl. p. 855. Listed.

1911*a*. *Marmosa grenadæ* THOMAS, Ann. Mag. Nat. Hist., (8) VII, p. 514. Type description.

1911*a*. *Marmosa tobagi* THOMAS, Ann. Mag. Nat. Hist., (8) VII, p. 515. Type description.

1911*a*. *Marmosa nesaea* THOMAS, Ann. Mag. Nat. Hist., (8) VII, p. 516. Type description.

1911. *Marmosa chapmani* G. M. ALLEN, Bull. Mus. Comp. Zoöl., LIV, p. 194.

1914. *Marmosa tobagi* CLARK, Ann. Mag. Nat. Hist., (8) XIII, p. 69.

1916. *Marmosa chapmani* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 270. Listed.

1916. *Marmosa grenadae* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 270. Listed.

1919. *Marmosa chapmani* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 36. Listed.

1919. *Marmosa tobagi* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 39. Listed.

TYPE LOCALITY.—Caura, Head of Caura Valley, northern range, Trinidad, 500 feet.

TYPE SPECIMEN.—A.M.N.H. 7666/6052. Adult male. Coll. F.M. Chapman. Type in A.M.N.H.

MATERIAL EXAMINED (62 specimens)

TRINIDAD.—Caura (A.M.N.H. 7666/6052, type, ad.male; A.M.N.H. 7667–6053 to 7670/6056, 7665/6051, 7672/6058, 7675/6061, ad.males; A.M.N.H. 7664/6050, juv. male; A.M.N.H. 7674/6060, ad.female; A.M.N.H. 7676/6062, y.ad.female; M.C.Z. 7783, U.S.N.M. 85556, ad.males; F.M.N.H. 5459, ad.female); Caparo (A.M.N.H. 7660/6046 to 7663/6049, ad.males); Princestown [A.M.N.H. 6045/4767 to 6050/4770, 6052/4772, 6053/4773, 6055/4775, 6056/4776, 6058/4778, ad.males; A.M.N.H. 6051/4771, y.ad.female; F.M.N.H. 5497–98, ad.males; A.M.N.H. 6123 (Alc.), y.ad.female; A.M.N.H. 6121 (Alc.), ad.female]; Heights of Ourepouche (A.M.N.H. 31229, 31231, juv.males; A.M.N.H. 31230, juv.female); Savana Grande (B.M. 97.6.7,24, type of *nesaea*, ad.male; B.M. 97.6.7.25, ad.male; B.M. 97.6.7,26, o.ad. female); "Trinidad" [B.M. 91.7.2.6 (spirit), 95.3.9.6, o.ad.males; B.M. 97.6.7, ad.male; Not Reg. B.M. (spirit), ad.male; B.M. 95.3.9.7, ad.female; M.C.Z. 13635–38, adults; A.M.N.H. 7420 (Alc.), ad.female; A.M.N.H. 7430 (Alc.), ad.male; A.M.N.H. 7426 (Alc.), ad.female].

GRENADA.—Grand Etang (M.C.Z. 8113, ad.male); Annandale (B.M. 87.6.30.4, type of *grenadae*, ad.male; B.M. 87.6.30.5, ad.male; B.M. 87.6.30.6, ad.female); St. George (M.C.Z. 6121, ad.male).

TOBAGO.—Waterloo (B.M. 97.6.7.53, type of *tobagi*, y.ad.male); Richmond (B.M, 97.6.7.52, ad.male); "Tobago" [U.S.N.M. 197042, (?); B.M. 12.1.22.1 (spirit), ad.female; B.M. 11.11.8.1 (spirit), female].

A large, insular species belonging to the *mitis* section.

Color above darker than *mitis robinsoni* of the island of Margarita and the adjoining mainland,—near russet (R.). Ventral coloring broadly cream buff, often darkening on throat to chamois (R.). Some gray-based hairs present on each side of the belly region, but since the gray does not appear on the surface it has little effect upon the general pattern. No sharp line of demarcation between dorsal and ventral colors.

Ears not quite so large proportionately as in *mitis*. Eye-ring well developed posteriorly in most specimens, but much reduced beneath the eye. Tail proportionately as in *mitis*.—i.e., rather short. Feet large and heavy; claws stout.

SKULL.—Large and strong; broad and short as in *mitis;* with well-developed postorbital constriction and pronounced grooves on the dorsal surface of the pointed supraorbital ridges. Also as in *mitis*, the basal parts of the nasals, although broadened, have not the rather square outline of *murina* and its allies. Palate, which is wide, with tooth rows convergent, besides having the usual slitlike posterior fenestræ, contains in each palatal bone a nearly circular vacuity from 2 to 3 mm. from the posterior margin. This is present in the subspecies of *mitis*, but absent

in the case of *ruatanica* and its subspecies. Bullæ, although not quite so large as in *mitis*, much larger than in *ruatanica*.

DISTRIBUTION.—*Chapmani* is apparently common on Trinidad; and the animals from Grenada and Tobago which, although appearing very slightly smaller than the Trinidad animals, are essentially the same, are referred to this species. *Chapmani* appears to be most nearly similar to *mitis robinsoni*. Tobago specimens in the British Museum are self-colored on chin, neck and breast, and have a median fascia 8 mm. in width; those from Grenada have practically all the ventral area unicolorous maize yellow (R.).

Marmosa simonsi Thomas

Plate VI, Figures 47, 48; Plate XIX, Figures 169, 170

1882. *Didelphis murina* THOMAS, Proc. Zool. Soc. London, p. 111. Records from Tambillo and Tumbez, Peru.

1899*b*. *Marmosa simonsi* THOMAS, Ann. Mag. Nat. Hist., (7) IV, p. 287. Type description.

1905. *Marmosa simonsi* TROUESSART, 'Cat. Mamm. viv. foss.,' Suppl., p. 856. Listed.

1916. *Marmosa* (*Caluromys*) *simonsi* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 269. Listed.

1919. *Marmosa simonsi* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 39. Listed.

TYPE LOCALITY.—Puna Island, Ecuador.

TYPE SPECIMEN.—B.M. 99.8.1.20. Young adult male. Coll. P. O. Simons, No. 9, 1898. Type in B.M.

MATERIAL EXAMINED (86 specimens)

ECUADOR.—Puna, Guayas (B.M. 99.8.1.20, type, y.ad.male; B.M. 99.8.1.21–22, males; B.M. 99.8.1.23–25, females); Hda. San Ramon, Puna (A.M.N.H. 66870–75, 66881–82, 66851–54, 66885, ad.males; A.M.N.H. 66855, 66883, y.ad.males; A.M.N.H. 66856–64, 66884, y.ad.females; A.M.N.H. 66865–69, 66876–80, ad.females); Guayaquil (U.S.N.M. 121156, 121158, ad.males; U.S.N.M. 121155, ad.female; B.M. 99.8.1.50–54, ad.males; B.M. 99.9.9.140, o.ad.male; B.M. 99.8.1.55–57, ad.males); Chongoncito, near Guayaquil (A.M.N.H. 63401–02, 63404, 63406, 63410–11, ad.males; A.M.N.H. 63413, y.ad.male; A.M.N.H. 63405, 63407, 63412, ad.females; A.M.N.H. 63403, 63408–09, 63414, y.ad.females); Cerro Bajo Verde, near Guayaquil (A.M.N.H. 63416, ad.male); Vinces, Los Rios (A.M.N.H. 63350, ad.male; A.M.N.H. 63346, y.ad.male; A.M.N.H. 63343–45, y.ad.females); Rio Briceño, Bahia de Caraquez (A.M.N.H. 64525–26, 64530, ad.males; A.M.N.H. 64531–33, 64536, ad.females); Los Pozos, near Arenillas (A.M.N.H. 67282, y.ad.male; A.M.N.H. 67293, y.ad. female); Valley of Casanga (A.M.N.H. 47181, ad.male).

NORTHERN PERU.—Near Tumbez (B.M. 81.9.7.3, ad.female); Tambillo [B.M. 81.9.7.28, juv. (?)]; "Peru" [Berlin 9183, female (?)].

A very distant gray species of the *mitis* section inhabiting the xerophytic regions of Ecuador and extreme northern Peru.

Dorsal color near hair brown (R.); underparts straw yellow (R.). Self-colored hairs occur only at chin and throat. The gray bases of the hairs show through, causing the ventral pelage in some specimens to take on a slightly greenish-sulphur tint.

Eye-rings well developed. Ears large. Feet small and rather slender. Tail of moderate length, the terminal half or third being white.

SKULL.—Skull not so blunt and short as in *mitis;* nasals more squarely widened proximally; strongly pointed supraorbital ridges with rather shallow grooves; temporal ridges moderately, but not greatly approximated. Palate rather broad, with a second pair of posterior vacuities rather smaller than those present in *mitis* and *chapmani.* Bullæ large and well rounded. Tooth rows straight, well convergent; canines moderate.

DISTRIBUTION.—Through the coastal region of Ecuador, wherever there is a pronounced dry season: Puna, Guayaquil, Vinces, Chongoncito, Bahia de Caraquez, and to northern Peru. It does not extend into the rain forests, at the foot of the Andes. The specimen from Tambillo, 5700 feet, on the Marañón drainage, collected by Stolzmann, shows that *simonsi,* like many other animals, has at some period crossed the Andes. Tambillo is arid.

Marmosa ruatanica

(Synonymy under subspecies)

This species and *chapmani* are the largest members of the *murina* group.

The pelage is usually thick and luxuriant, with a surface dorsal coloring near cinnamon-brown (R.). In forested regions this color takes a much warmer tone, and a correspondingly duller hue when the animals live in drier regions (Bahia de Caraquez, Ecuador). The ventral coloration varies from cream-buff (R.) to warm buff (R.), but may occasionally assume a darker tone (see subspecies). The paling of the face is apparent, although perhaps sometimes less pronounced than in *mitis.* Ears large, but proportionately smaller than any of the other three species of the section. Eye-rings only moderately broad in northern animals, but sometimes very strongly developed in *ruatanica mimetra* of Ecuador.

Tail proportionately somewhat longer than in *mitis* and *chapmani,* and certain individuals from Barro Colorado have it markedly longer. In none of the animals of the *mitis* section can it be called bicolor, being about the same color beneath as above. Scales 15 to 18 spirals for each centimeter. Feet large and stout as in *chapmani.*

SKULL.—Strong and heavily ossified, rather less blunt in outline than *mitis*. Base of the nasals a trifle more abruptly expanded than in *mitis*, squared or rounded behind, slightly separated by entering points of the frontals. Supraorbital processes strongly developed, somewhat backward pointing, with minute denticulate processes in old specimens. Constriction of the skull pronounced. Groove on the dorsal surface of supraorbital process usually pronounced, but only slight in the type of

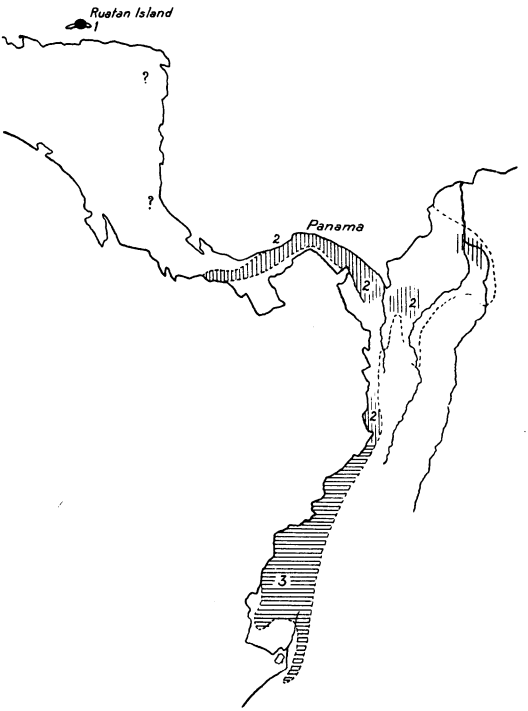


Fig. 16. Distribution of *M. ruatanica.*
1, *M. ruatanica ruatanica;* 2, *M. ruatanica isthmica;* 3, *M. ruatanica mimetra.*

ruatanica ruatanica. Usually a strong convergence of the temporal ridges toward the midline of the cranium (to within 2 mm. of each other); but no case is known of a crest being developed in the *murina* group.

Palate broad, perhaps not quite so broad proportionately as in *mitis*. Additional posterior palatal vacuities referred to in *mitis* and *chapmani* almost always absent, or, if present, extremely minute. Bullæ proportionately smaller than in *mitis* and *chapmani*. Teeth large and strong, as in *chapmani*.

DISTRIBUTION.—According to present evidence, the distribution of *ruatanica* is interrupted between Ruatan Island to the north of Honduras and the Panama Canal Zone. Even though absent from this area (and further collecting will probably reveal it), there can be little doubt that it did exist a short time ago. Between the Canal Zone and Santa Rosa, Ecuador, its recorded southern limit, its range appears to be unbroken., and in the latter country it is known to ascend the forested Andean slopes to 5000 feet above sea level. On the Manavi coast of that country it penetrates for a short way into the arid strip which marks the northern extension of the Peruvian desert. (Map, Fig. 16, p. 123.)

Eventually it may be advisable either to ignore the extremely small and decidedly unstable subspecific distinctions between the three forms now admitted in *ruatanica*, or else to erect a fourth subspecies to accommodate the coarse-haired animals of the dry strip at Bahia de Caraquez. In any case, it is desirable to point out the closeness of the relationship of these forms.

Marmosa ruatanica ruatanica Goldman

Plate VI, Figure 49; Plate XIX, Figure 171

1911. *Marmosa ruatanica* GOLDMAN, Proc. Biol. Soc. Washington, XXIV, p. 237. Type description.

1916. *Marmosa ruatanica* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 270. Listed.

1919. *Marmosa ruatanica* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 39. Listed.

TYPE LOCALITY.—Ruatan Island, off north coast (Caribbean) of Honduras.

TYPE SPECIMEN.—U.S.N.M. 7785/37700. Adult male. Coll. J. Ackhurst. Type in U.S.N.M.

MATERIAL EXAMINED

The type only.

Although very closely allied to *isthmica* and *mimetra*, *ruatanica* is treated as subspecifically distinct—at least until more material becomes available.

Dorsal color superficially near Mars brown (R.), but examination shows that the pelage has been partly stripped (probably by ants while the animal lay dead in the trap), and most of the tips of the hairs cut off. Here and there patches of undamaged hair show that the tips of the dorsal fur were colored russet (R.).

The underside exhibits a peculiar greenish cast overlying the yellow buff in the throat and neck region nearest to pale chalcedony yellow (R.), and becomes cream-buff (R.) posteriorly. The face is also tinged

with this greenish hue. The color is so unusual that the skin appears to have been exposed to some chemical. The pattern of the area of self-colored hairs, although not clearly determinable, owing to the condition of the skin, appears essentially like that of *isthmica* and exhibits only a moderate degree of narrowing at the pectoral region (15 mm.).

Ears, tail, and feet not different from those of *isthmica*.

Known only from Ruatan Island.

Marmosa ruatanica isthmica Goldman

Plate VI, Figure 50; Plate XIX, Figure 172

1912. *Marmosa isthmica* Goldman, Smithsonian Misc. Coll., LVI, p. 1. Type description.

1916. *Marmosa isthmica* Anthony, Bull. Amer. Mus. Nat. Hist., XXXV, p. 363. Brief account.

1916. *Marmosa isthmica* Matschie, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 270. Listed.

1917. *Marmosa mexicana isthmica* Goldman, Proc. Biol. Soc. Washington, XXX, p. 109. Footnote.

1919. *Marmosa mexicana isthmica* Cabrera, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 37. Listed.

1930*a*. *Marmosa mexicana isthmica* Enders, Journ. Mammalogy, XI, p. 282. Remarks on behavior of living specimens.

Type Locality.—Rio Indio, near Gatun, Canal Zone, Panama.

Type Specimen.—U.S.B.S. 170969. Adult male. Coll. E. A. Goldman, February, 16, 1911. Type in U.S.B.S.

Material Examined (80 specimens)

Panama.—Boquete, Chiriqui Region, 4000 feet, Upper Rio Caldera, on R.R. from David (M.C.Z. 10154, ad.male); Gatun, Canal Zone Region, Rio Indio (U.S.B.S. 170969, type, ad.male; A.M.N.H. 36728, 36735, ad.males; A.M.N.H. 36730, 36727, y.ad.males; A.M.N.H. 36725, ad.male; A.M.N.H. 36726, 36729, 36724, y.ad.females); Barro Colorado Island, Gatun Lake (U.M. 59964, o.ad.male; U.M. 59961, 59963, ad.males; U.M. 59962, juv.male; U.M. 59960, y.ad.female; Dickey 16688, ad.male); El Real de Sta. Maria, Rio Tuyra, Darien Region (A.M.N.H. 37577, y.ad.male; A.M.N.H. 37576, 37578–79, y.ad.females); Maxon Ranch, Rio Trinidad, Darien Region (A.M.N.H. 36731, ad.male; A.M.N.H. 36732, y.ad.female); Tapaliza, near Mt. Tacarcuna, Darien Region (A.M.N.H. 37890, ad.male; A.M.N.H. 37889, ad.female); Mt. Tacarcuna, Darien Region (A.M.N.H. 37859–60, 37862–65, 37867–68, 37870–71, 37873, 37878, 37880, 37884–88, 37892, ad.males; A.M.N.H. 37876, 37881–82, 36779, y.ad.females; A.M.N.H. 36869, 36875, 36877, 37877, ad.females; A.M.N.H. 37861, 37883, 37891, 37893, y.ad.females; A.M.N.H. 37866, ad.female; M.C.Z. 17097, ad.male; M.C.Z. 17098, ad.female; A.M.N.H. 37869, 37875, ad. females); Sta. Cruz de Cana, U.S.B.S. 178702–07, 178712, 178769, ad.males; U.S.B.S. 178710, y.ad.male; U.S.B.S. 178711, 178971, y.ad.females).

Colombia.—Tusma, Rio Magdalena (B.M. 95.8.1.34, ad. ?); Condoto, Choco, 300 feet (B.M. 13.8.10.15–16, 14.5.28.29, males); Medellin (B.M. 78.8.31.8, female); Las Lomitas, Cauca, 5000 feet (A.M.N.H. 32177, ad.male); San José, Coast Belt,

western Colombia, 200 feet (A.M.N.H. 31682-83, y.ad.males; A.M.N.H. 31694, juv.female).

Doubtfully distinct from *r. ruatanica* and separable from the Ecuadorian *r. mimetra* only in certain cases by the stronger cinnamon color of the ventral pelage and the smoother, more shiny tail scales of the latter.

Color of dorsal fur between sayal brown (R.) and cinnamon-brown (R.); in Darien material, slightly brighter, especially on the flanks. Underparts cream-buff (R.) to warm buff (R.); in U.M. 59964, recently collected by R. K. Enders, much deeper—near ochraceous-buff (R.).

Face markedly paler, as in all *mitis* section. Ears moderate; decidedly less in proportion than *mitis*. Tail moderate to rather long. Feet large and stout.

The representative of this species in western Panama approaches *zeledoni* in coloration, but the ears are larger, the width of the pale facial area between the black eye-rings is greater (a *mitis*-section character), and the caudal pubescence is denser and longer. In its skull, however, there are features partly bridging over the above differences: the teeth are as large and stout as in true *isthmica;* the supraoccipital and short palatal openings are as in *zeledoni;* the temporal ridges are widely separated; and the posterior foramina of the palate are unusually short, extending backward only very slightly behind the protocone of M^3. This animal, M.C.Z. 10154, is an adult male. It is referred here to *isthmica* in spite of the breadth of the postorbital region and across the temporal ridges. The color of the pelage is brighter than in most *isthmica.*

DISTRIBUTION.—From western Panama through the Canal Zone eastward into Colombia. Specimens from southwestern Colombia are probably transitional between *isthmica* and *mimetra.*

Fragments of jaws referable to this species and others, apparently of *Philander*, have been discovered in the casts of the owl *Pulsatrix* on Barro Colorado Island in Gatun Lake, Canal Zone (Dr. G. M. Allen).

On the same island, Dr. F. M. Chapman has seen a *Marmosa* (probably of this species) in silhouette against the evening sky, run out along the branches of balsa trees to drink from the great chalice-like flowers. At the present time Mr. R. Enders is working on the biology of this form.

Marmosa ruatanica mimetra Thomas

Plate VI, Figure 51; Plate XIX, Figure 173

1880. *Didelphys murina* THOMAS, Proc. Zool. Soc. London, p. 403. Record from Balzar.

1921. *Marmosa mimetra* THOMAS, Ann. Mag. Nat. Hist., (9) VII, p. 521. Type description.

TYPE LOCALITY.—Santo Domingo de los Colorados, west Ecuador, 1600 feet.
TYPE SPECIMEN.—B.M. 15.1.1.54. Adult male. Type in B.M.

MATERIAL EXAMINED (37 specimens)

ECUADOR.—Santo Domingo de los Colorados (B.M. 15.1.1.54, type, 15.1.1.53, 15.1.1.55, 15.1.1.59–60, ad.males; B.M. 15.1.1.61, y.ad.females; B.M. 15.1.1.57, juv.female); Baeza, East of Andes (Stockholm 23, o.ad.female).

NORTHERN ECUADOR.—Nanegal (B.M. 98.5.1.20, juv.male); Mindo (B.M. 13.10.24.67, juv.male; B.M. 13.10.24.68, ad.female; B.M. 13.10.24.69, juv.female); Gualea (A.M.N.H. 46682, y.ad.male; Stockholm 45, o.ad.female; Stockholm 13, juv.male); Balzar Mts. (B.M. 80.5.6.89, juv.?); Paramba (B.M. 1.6.5.19, ad.male; B.M. 99.12.5.11, juv.female); Carondelet (B.M. 1.6.5.20, ad.female); San Javier (U.S.N.M. 113319, ad.male; B.M. 1.3.19.48, y.ad.male; B.M. 1.3.19.49, ad.female); Chota (B.M. 99.2.18.43, ad.male); "North Ecuador" (B.M. 99.12.5.12, juv.female); "Ecuador" (B.M. 59.11.28.4, ad.male).

CENTRAL ECUADOR.—El Destino, Rio Cuaque (A.M.N.H. 64534–35, y.ad.males); Rio Briceño, Bahia de Caraquez (A.M.N.H. 64528–29, ad.males; A.M.N.H. 64527, y.ad.male); Vinces (A.M.N.H. 63348, y.ad.male; A.M.N.H. 63347, 63349, ad. females); Cerro Manglar Alto (A.M.N.H. 64524, v.y.ad.male); Puente de Chimbo (A.M.N.H. 62124, y.ad.male; A.M.N.H. 62125, v.y.ad.male).

SOUTHERN ECUADOR.—Santa Rosa (A.M.N.H. 61392, ad.male).

Color dorsally auburn (R.) to bay (R.); underparts buff-yellow to pinkish buff (R.). Self-colored throat, chest, ventral fascia (12 mm.), insides of limbs and abdomen. Color of throat and hinder inguinal region deepening to cinnamon-buff (R.). Individual animals of the north of Ecuador have the self-colored hairs nearly white. Pelage commonly long, thick, and soft, but animals taken in the dry coastal sections at Bahia de Caraquez have thin, short, rather coarse hair. Eye-rings in most instances decidedly more pronounced than in *isthmica*. Ears, feet, and tail as in other subspecies.

DISTRIBUTION.—The coastal region of Ecuador, at least as far south as Santa Rosa (but probably absent from the near-desert of Santa Elena), ascending the Andean slopes (at least in the north) as high as Gualea (5000 feet), and ranging northward into Colombia, where it merges with *isthmica*.

A single individual at Stockholm, secured through Söderström of Quito, who employed Indian collectors, is labeled "below Baeza." Baeza is on the eastern side of the Andes at 5000 feet. Since a height of land at last 10,000 feet in altitude intervenes between the known range of the species and Baeza, in all probability this specimen is mislabeled.

Mexicana Section

Small to medium sized, cinnamon-colored animals with yellow-buff to cream-buff underparts, variously accentuated ocular marks, medium to rather small-sized ears, and tails of medium length. Scales

of the tails from coarse to rather fine; a short, fine pubescence, formed of minute hairs growing between the scales, neither so smooth as in the *murina* section nor so densely felted as in the *mitis* section. Females with inguinal region, when developed, orange-brown, not purple-brown, and mammæ 7–1–7.

Skulls less shortened than in *mitis* section, with supraorbital processes rarely much developed. Temporal ridges widely separated. No postorbital constriction. Teeth small. Bullæ usually quite small; often rather conical; proportionately large in young animals.

The section contains one full species formed of three subspecies.

Marmosa mexicana Merriam

(Synonymy under subspecies)

A small to moderate sized reddish-brown species ranging from Mexico to western Panama, and varying from bright to dull coloration, according to whether it lives in a habitat of humid tropical forest or rather drier country. Underparts yellowish in the vividly colored phases, more buffy in the duller-hued forms, sometimes with a median white pectoral area (*savannarum*).

Eye-rings intensely black and of variable extent—in specimens from Jalapa usually large (also the case with those from the Corn Islands). Ears rather small. Tail of moderate length, finely haired throughout its length, thus somewhat intermediate in character between the *mitis* and *murina* sections; slightly bicolor. Feet moderate in size.

Skull.—Small to medium, not nearly so blunt and massive as in members of the *mitis* section, and without the postorbital constriction. Supraorbital ridges only slightly projecting, with slight grooves dorsally, never strongly projecting as in *murina* section. Temporal ridges rarely even slightly approximated. Bullæ small and moderately rounded to very slightly ovoid.

Distribution.—A wide-ranging and very adaptable species. (Most of the cinnamon-colored animals reaching the United States in fruit ships appear to be *mexicana*.) While as yet collecting of this species is insufficient to establish the fact with certainty, *mexicana* appears to range along both sides of Central America—on the Caribbean side from Vera Cruz and on the Pacific side from Oaxaca to Chiriqui. Low country affording a ready passage from one side to the other occurs only at the Isthmus of Tehuantepec, the Lake Nicaragua region, and in western Panama. Nevertheless it is possible that there is a communication at an altitude of about 4000 feet in Honduras. *Mexicana* is apparently

equally at home in humid forest and in the much drier climates of Yucatan and the Corn Islands, and its vertical range reaches at least 4000 feet above sea level. Its extreme northern limit is probably to be found in the heavy tropical forest on the outer fringing bar of the Laguna de Tamiahua, just south of Tampico. (Map, Fig. 17.)

Consideration of the rather scanty adult material (most material in museums is young) which represents the members of the *mexicana* section, *zeledoni*, *mexicana*, and *mayensis* shows that few hard and fast lines can be drawn distinguishing them. Practically every statement concerning differences of structure or color must be qualified. The entire series from western Panama to Mexico, of which few are fully-grown animals, is regarded as comprising a single species, which, although quite variable,

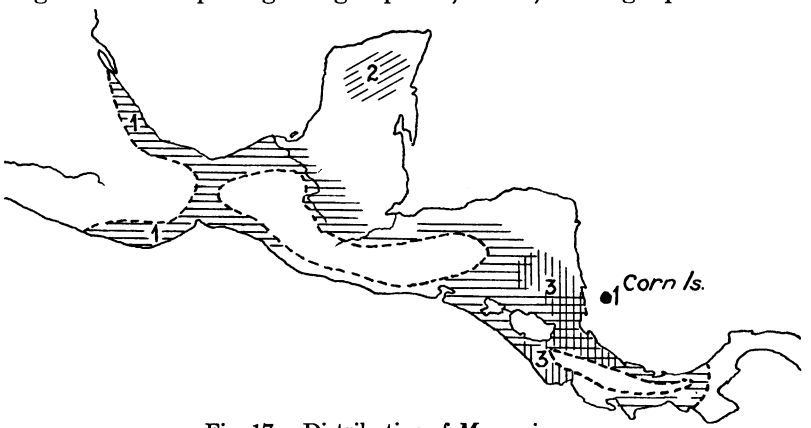


Fig. 17. Distribution of *M. mexicana*.
1, *M. mexicana mexicana;* 2, *M. mexicana mayensis;* 3, *M. mexicana zeledoni.*

produces regionally certain fairly definite phases. These regional forms, however, seem not to be mutually exclusive. Age and size play a large part in the appearance of the animals, with the result that differences due rather to growth than to mutation and environment are apt to be accounted distinctive. But allowing for these growth characters several regional forms can be recognized. These are often to be found in close proximity to one another and appear to have a distribution which, although seemingly irregular, may prove to be of interdigitating character. They are discussed below.

A medium-sized, reddish form whose young are also red, having straw-yellow underparts without any very sharp line of demarcation. Dorsal color seldom overspreading the sides of the ventral surface. Ears rather small. Skull moderately broad, with small, slightly pointed supraorbital processes which are often lightly grooved on top.

Temporal ridges but slightly approximated. Palate very thin and delicate, almost invariably with irregular accessory fenestræ on the posterior portions of the palatal bones. Teeth rather small, the canines being slender and not very long. Young animals colored much as adults, with the postorbital region broad, temporal ridges almost undeveloped and very widely separated, the palate extremely short in proportion to its greatest width. Dorsal fur varies in lowland animals from 8–10 mm. and from 10–12 mm. in length in those from 3000 to 4000 feet above sea level. May be considered typical *mexicana*.

The range is from Vera Cruz, Mexico, through the Isthmus of Tehuantepec to the states of Oaxaca and Chiapas on the Pacific side. Specimens from slightly drier parts of the region are less vividly colored.

Animals referable to the above description occur at Chilasco, Guatemala, and at Chinandega (Chinandega animals are somewhat dull colored and have the zygomata extremely broad), Matagalpa, and Ocotal, in northeastern Nicaragua.

An offshoot of the above, *m. mayensis*, found in Yucatan, has the dorsal color a less vivid cinnamon and the underparts cream color (R.) instead of the decided yellow of *m. mexicana*. A young animal with milk teeth in place has the color of the underparts light pinkish cinnamon (R.), contrasting markedly with most juvenile individuals of *mexicana*. One specimen of the latter from Jalapa, however, shows a distinct trend in this direction.

No fully adult specimen of the Yucatan animal is known, since the type itself is only just past the juvenile stage and its permanent premolars are only partly through.

In the mountains of Alta Vera Paz, Guatemala, a large reddish form occurs with rather large supraorbital ridges, but with the zygomatic breadth less than the palatal length and the temporal ridges rather closely approximated. The functional mammæ in females of this form are 6–1–6 and 7–1–7.

The neighborhood of Navarro, Costa Rica, produces a form *m. zeledoni*, slightly larger than *mexicana*, with warm cinnamon coloration above and cream-buff (R.) below. The outstanding feature of *zeledoni* is the sharp line of transition from cinnamon to buff. Due to the "make" of the skin in the type the ventral stripe appears unusually narrow; the specimen A.M.N.H. 29542, shows more nearly the proper width.

The skull, contrasted with that of *m. mexicana*, is larger in adulthood, with the nasals usually, but not always, somewhat separated at

the base by the frontals. The palate, which nearly always lacks the accessory openings in the palatal bones, is more strongly ossified than in *m. mexicana.* The anterior flange of the ascending ramus of the dentary is usually thin and sharp-edged on the outer side instead of smooth and rounded, but this character is not invariable. No specimen examined shows the slightest tendency for the temporal ridges to approach each other; they remain at least 4 mm. apart on the parietal bones. When age characters are discounted, the supraorbital ridges are found to afford no distinguishing features of subspecific value. Half-grown specimens may be as red as the adults and have the adult ventral pelage, or they may be very much darker—near Mars brown (R.). The red juvenile forms appear to come chiefly from the Caribbean coast of Nicaragua. This large form probably extends into western Panama.

From the Chiriqui region of western Panama comes the specimen described as *m. savannarum.* It has most of the characters of *m. mexicana,* i.e., small size, fenestrated palate, and lack of the very sharply defined contact line of dorsal and ventral coloring. Its principal distinctive feature is the patch of white on the chest, some 40 mm. in length by nearly 10 mm. in width.

The skull, though small and that of a young animal (evidence, the closeness of M_4 to the ascending ramus), seems to agree very closely with *m. mexicana.* Its palate is highly fenestrated. The other four specimens of *savannarum* mentioned by the author lack the clearly defined white patch.

A number of the animals in the British Museum, all of them subadult, seem referable rather to true *mexicana* than to the variety under consideration.

In a *mexicana*-like series (most of them rather young animals) from the Corn Islands, off the Caribbean coast of Nicaragua, the sharply drawn transition line is lacking and small accessory palatal openings are present. The ventral color is less yellowish, being nearest to cartridge buff (R.). Dorsally the color is a shade darker than in *m. mexicana.*

Here then is the series of six more or less distinguishable, more or less intergrading varieties of *mexicana.* It seems probable that but two principal forms are concerned—the small, very widely ranging *mexicana* and the large *zeledoni* of much more restricted habitat. Cajabon animals are not nearly so large as fully adult *zeledoni,* and are treated as *mexicana.* In this paper *zeledoni* is held to be a subspecies distinct from *mexicana,* with which *savannarum* is considered synonymous. Although Chinandega and Matagalpa animals can usually be recognized, and those

from the Corn Islands, perhaps on account of their uniformity of age and "make" seem distinct, it has not been deemed advisable to separate them from the parent species. Before 1900, Oldfield Thomas considered separating the Chinandega animals (the name *chinandegæ* written in pencil on a specimen in the British Museum) but evidently decided against it, and until old adult animals are secured from the Corn Islands, it seems better that they remain *mexicana mexicana*. In the same way the continued separation of *savannarum* on the basis of a near-juvenile specimen with a white patch on the breast seems inadvisable—especially since further collecting in the neighborhood reveals only *zeledoni* with its color contrasts and normally buff-colored *mexicana*.

Probably study of a large series of adults collected from many localities in each of the Central American states will reveal a number of geographical races of the present *mexicana* which may then profitably receive names. At present the available material is inadequate for such an analysis.

KEY TO *Mexicana* SECTION

1.—Size relatively large; with pronounced line of demarcation between dorsal and ventral colors in adults (and usually in young); without accessory post-palatal vacuities; palate well ossified.....*mexicana zeledoni*.
Size smaller; without pronounced line of dorso-ventral color demarcation; with accessory post-palatal vacuities; palate delicate and only slightly ossified.....2.
2.—Ventral color yellow-buff or buff in both adults and young..*mexicana mexicana*.
Ventral color cream color (R.) in subadult; light pinkish buff (R.) in juveniles. *mexicana mayensis*.

Marmosa mexicana mexicana Merriam

Plate VI, Figures 52, 53, 54; Plate XIX, Figures 174, 175, 176

1846. *Didelphys murina* WATERHOUSE, 'Nat. Hist. Mamm.,' I, p. 511, line 11. Reference.

1880. *Didelphys murina* ALSTON, 'Biol. Centr. Amer. Mamm.,' p. 200. Brief description.

1885. *Didelphys murinus* TRUE, Proc. U.S.N.M., VII (1884), p. 587. Listed.

1888*a*. *Didelphys murina* THOMAS, 'Cat. Marsup. Monotr. Brit. Mus.,' p. 343–347 (in part).

1891*a*. *Didelphys* (*Micoureus*) *murina* ALLEN, Bull. Amer. Mus. Nat. Hist., III, p. 218. Record from La Carpintera, Costa Rica.

1893*a*. *Didelphis* (*Micoureus*) *murina* ALLEN, Bull. Amer. Mus. Nat. Hist., V, p. 240. Record from Jimenez, Costa Rica.

1895*a*. *Marmosa murina* THOMAS, Ann. Mag. Nat. Hist., (6) XVI, p. 58. Record from Managua.

1897. *Marmosa murina mexicana* MERRIAM, Proc. Biol. Soc. Washington, XI, p. 44. Type description.

1897. *Marmosa murina mexicana* ALLEN, Bull. Amer. Mus. Nat. Hist., IX, p. 208. Record from Jalapa, with remarks.

1897. *Marmosa murina mexicana* ALLEN, Bull. Amer. Mus. Nat. Hist., IX, p. 44. Record from Costa Rica.

1902. *Marmosa mexicana* BANGS, Bull. Mus. Comp. Zoöl., XXXIX, p. 19. Remarks.

1904. *Marmosa murina mexicana* ELLIOT, Field Columbian Mus. Publ. 95, Zoöl. Ser. IV, part 1, p. 6. Brief description.

1905. *Marmosa murina mexicana* ELLIOT, 'Checklist Mamm. N. Amer.,' Field Columbian Mus. Publ. 105, Zoöl. Ser., VI, p. 2.

1905. *Marmosa murina mexicana* TROUESSART, 'Cat. Mamm. viv. foss.,' Suppl., p. 855. Listed.

1908. *Marmosa murina mexicana* ALLEN, 'Mammals from Nicaragua.' Bull. Amer. Mus. Nat. Hist., XXIV, p. 648. Record from Chinandega.

1910. *Marmosa murina mexicana* ALLEN, Bull. Amer. Mus. Nat. Hist., XXVIII, p. 92. Records.

1916. *Marmosa mexicana* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 270. Listed.

1917. *Marmosa murina savannarum* GOLDMAN, Proc. Biol. Soc. Washington, XXX, p. 108. Type description.

1919. *Marmosa mexicana mexicana* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 37. Listed.

1926. *Marmosa murina mexicana* NELSON AND GOLDMAN, 'Naturalist's Guide to the Americas,' p. 579. Listed.

1929. *Marmosa mexicana zeledoni* G. M. ALLEN, Bull. Mus. Comp. Zoöl., LXIX, pp. 129–130. The *Marmosa* from the Corn Islands.

TYPE LOCALITY.—Juquila, Oaxaca, Mexico. 1500 meters.

TYPE SPECIMENS.—U.S.B.S. 71526. Young adult male. Coll. Nelson and Goldman, February 28, 1895. Type in U.S.B.S.

MATERIAL EXAMINED (69 specimens)

EASTERN MEXICO.—Jalapa, Vera Cruz, 4400 feet (B.M. 97.9.9.82, y.ad.male; B.M. 97.9.9.83, female; A.M.N.H. 12454/10763, male; A.M.N.H. 12453/10762, 12456/10765, v.y.females; A.M.N.H. 12455/10764, female); Vera Cruz (B.M. 88.8.8.30,?); Pasa Neuva, Vera Cruz (A.M.N.H. 17135, y.male; A.M.N.H. 17136, y.female); Texolo, Vera Cruz (M.C.Z. 9910, y.male); Achotal, Station on F. C. de Vera Cruz (F.M.N.H. 13805–06, y.ad.males); San André, Tuxtla, Vera Cruz (B.M. 7.1.1.186, male).

MEXICO.—"Mexico" (Berlin, 4228, juv.); Truxpan (probably Jalisco) [U.S.N.M. 10719, (Alc.) (10 young), o.ad.female]; Mirador [U.S.N.M. 62217, (Alc.), juv.female].

WESTERN MEXICO.—Chicharras, Chiapas (U.S.B.S. 77680, male); Huehuetan, Chiapas (U.S.B.S. 77681, male; U.S.B.S. 77682, female); Oaxaca, Juquila, 1500 m., (U.S.B.S. 71526, type, male).

GUATEMALA.—San Cristobal, Vera Paz (Berlin 36223–24, ?); San Jeronimo, 2950 ft., a few miles east of Salamá, Baja Vera Paz. (B.M. 65.5.18.67, ?); Cajabon, Alta Vera Paz (Stuttgart 1740, y.ad.male; B.M. 80.11.22.7, o.ad.male; B.M. 80.11.22.8, y.ad.female); Chilasco, 5000 feet, on tributary of Rio Palochic (A.M.N.H. 14377, male); "Guatemala" (A.M.N.H. 14248, male); Coban, Alta Vera Paz (B.M. 75.2.27.15, female; B.M. 75.2.26.14, y.ad.female).

HONDURAS.—Rio Umulla (Berlin 2576, y.ad. ?).

NICARAGUA.—Ocotal, 4500 feet, near Honduras Border (A.M.N.H. 28506, male); Matagalpa, 3000 feet (A.M.N.H. 29269, male); Chinandega, 700 feet (B.M. 94.11.1.7, male; B.M. 94.11.1.8, female; A.M.N.H. 28314, juv.female); San Emilio, Lake Nicaragua (B.M. 97.4.7.12, female); Managua (B.M. 95.4.27.6, y. female); Rio Coco (A.M.N.H. 29271, y. female; A.M.N.H. 29270, juv. female); Vijagua (A.M.N.H. 29541, male); San R. del Norte, 5000 feet, near Honduras Border (A.M. N.H. 28285, male).

CORN ISLANDS.—(M.C.Z. 23891, 23893–94, 23897–900, y.males; M.C.Z. 23887, 23895–96, females; M.C.Z. 23888–90, ?; M.C.Z. 23892, ad.male).

WESTERN PANAMA.—Boqueron, Chiriqui (A.M.N.H. 18915, type of *savannarum*, v.y.male; A.M.N.H. 18914, v.y.female); Bogava, Chiriqui (U.S.B.S. 284344, juv. male; M.C.Z. 10155, juv.male; M.C.Z. 10156–57, juv. females; B.M. 0.7.11.87–89, 0.7.11.91–92, 3.3.3.107, juv.males); Veragua, (Province) west of Colon and Cocle (B.M., not reg., y.male).

The dominant, widely ranging red *Marmosa* of Central America.

This variable form need only be compared with *mexicana mayensis* and *zeledoni*. In most instances its dorsal color is a richer cinnamon than in *mayensis* which is near cinnamon-brown (R.). Ventrally it is often near Naples yellow (R.) (Sta. Cruz) or buff, whereas the older of the two known specimens of *mayensis* is creamy.

Contrasted with *zeledoni* the transition from dorsal to ventral color is gradual, or at most only somewhat abrupt; moreover, between the northern *m. mexicana* and *zeledoni* there is some difference in size (also the case with Panamanian *mexicana*), but the big specimens from the mountains are practically equal to it. The palatal distinction previously mentioned is not certainly constant.

On account of the rather slight evidence available (most of the existing material comprises very young or juvenile specimens) all but *m. zeledoni* and *mexicana mayensis* from the xerophytic region of Yucatan are here treated as one subspecises—*mexicana mexicana*. *Mayensis*, after adult animals have been secured, may eventually require merging with the Vera Cruz phase of *mexicana*.

Although not definitely ascertained as true, specimens from the northern part of the range of *mexicana mexicana* appear generally to be smaller than those from the south. Animals taken among the mountains of Nicaragua are usually large, and these large examples extend northward as far as the Vera Paz region of Guatemala. But Vera Paz animals are generally warm cinnamon while Nicaraguan specimens have a distinct admixture of fuscous. Again, the Nicaraguan animals are chiefly young adults, and very nearly of the dimensions of *zeledoni*, from which they differ only by their darker color and lack of a very sharp line of

demarcation between upper and lower colors. In them this line is more pronounced than in Mexican specimens.

No geographical boundaries can be assigned for these variants, and provisionally they are retained as a single subspecies.

DISTRIBUTION.—*Mexicana mexicana* appears to extend from Vera Cruz and Oaxaca southward to Chiriqui, Panama, excepting the arid parts of Yucatan and the higher parts of the mountains in Guatemala, Honduras, Nicaragua, and Costa Rica. It has not yet been shown to be excluded from the range of *zeledoni* in Nicaragua and Costa Rica, although this may be so.

Marmosa mexicana mayensis Osgood

Plate VII, Figure 55; Plate XX, Figure 177

1913. *Marmosa mayensis* OSGOOD, Proc. Biol. Soc. Washington, XXVI, p. 176. Type description.

1916. *Marmosa mayensis* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 270. Listed.

1917. *Marmosa gaumeri* GAUMER, 'Monographia Mamíferos de Yucatan,' pp. 3–8.

1919. *Marmosa mexicana mayensis* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 37. Listed.

TYPE LOCALITY.—Izamal, east of Mérida, Yucatan, Mexico.

TYPE SPECIMEN.—F.M.N.H. 19994. Young adult. Sex unknown, but probably male. Permanent P^3 just erupting. Coll. G. F. Gaumer. Type in F.M.N.H.

MATERIAL EXAMINED (2 specimens)

MEXICO.—Izamal, Yucatan (F.M.N.H. 19994, type, v.y.ad.?); Chichen-Itza, southeast of Izamal (A.M.N.H. 91192, juv.female).

This form is really only very slightly different in color from *mexicana* and shows no structural distinctions whatever.

The subadult is rather less vivid in color than *mexicana*, and its underparts are creamy instead of the yellow buff of *mexicana*. The juvenile female from Chichen-Itza displays a ventral coloring which is pinkish buff (R.) instead of the yellow-buff of young *mexicana*.

Mayensis probably results wherever *mexicana* lives in country like the Mérida section of Yucatan with a pronounced dry season and scrub vegetation.

Marmosa mexicana zeledoni Goldman

Plate VII, Figure 56; Plate XX, Figure 178

1904. *Marmosa murina* ELLIOT, Field Columbian Mus. Publ. 95, Zoöl. Ser., IV, part 1, p. 5. Brief account.

1911. *Marmosa zeledoni* GOLDMAN, Proc. Biol. Soc. Washington, XXIV, p. 238. Type description.

1916. *Marmosa zeledoni* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde Berlin, p. 270. Listed.

1919. *Marmosa mexicana zeledoni* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 37. Listed.

TYPE LOCALITY.—Navarro, near Crosi, Caribbean slope, between 2500 and 3000 feet. Drainage into Rio Reventazon.

TYPE SPECIMEN.—U.S.N.M. 12885–37133. Young adult male. Coll. Juan Cooper for José C. Zeledon, March 1, 1878. Type in U.S.N.M.

MATERIAL EXAMINED (11 specimens)

COSTA RICA.—Navarro (U.S.N.M. 12885/37133, type, ad.male; U.S.N.M. 12884/37717, male); Boruco, 1700 feet, Pacific side (A.M.N.H. 11794/10063, juv. female); Jimenez, 700 feet, Rio Jimenez (A.M.N.H. 9593/7930, juv.male); Rio Pacuaré, 25 feet (Dickey 14246–48, ad.males).

NICARAGUA.—Bluefields (U.S.B.S. 36348/48713, y.male); Escondido R. (U.S. B.S. 50882, y.male; U.S.B.S. 36349, juv.female); Rio Tuma, east of Matagalpa, below 1000 feet (A.M.N.H. 29542, ad.male).

Adults generally larger than *mexicana*. (Even the type specimen, which is a rather young adult, is larger.) Equal in size to small specimens of *isthmica*, but distinguishable from it by the deeper cinnamon color, the strongly marked line of demarcation between the back and belly colors, the widely separated temporal ridges of the skull, and the lack of any pronounced postorbital constriction.

Color perhaps nearest to pecan brown (R.) but richer and more vivid; ventrally cream color (R.). Junction of the two colors very sharply defined. Ventral, self-colored area usually about 20 mm. wide on chin and neck, broadening at the arms, then narrowing again to 15 mm. or less until the hind legs, on to which the cream color extends, are reached. Face paler than the body but not markedly so. Eye-rings not very extensive, proportionately less defined than in *mexicana*. Ears moderate; proportionately less than in *isthmica*, which *zeledoni* somewhat resembles, and by actual measurement larger than those of *mexicana*. Tail only moderately long, with a type of pubescence similar to that in *mexicana* (in worn specimens the tail is almost as bare-appearing as in the *murina* section).

SKULL.—Skull based on the rather young and very much smaller type, differs from *isthmica* in actual size, in the shorter slitlike posterior palatal openings, narrow zygomatic width, longer and narrower supraoccipital, size of the teeth—especially the canines and premolars—and the fact that the temporal ridges do not become approximated.

From *mexicana* it is distinguished by its larger size, the nasals slightly divergent proximally (usually), and the absence of accessory palatal openings.

Zeledoni appears to be a local variety of *mexicana*. Its type is from nearly 3,000 feet above sea level, yet the specimen from Bluefields agrees

with it very closely. In spite of its much greater size, the teeth of the type are identical in form and size with those of the type of *savannarum* which is a quite young animal. It should be remembered that the chief distinctions between *mexicana* and *zeledoni* are the line of contrast where dorsal color meets ventral, and the somewhat larger size and larger hind foot of the latter. The specimens in the Dickey collection have the lines of demarcation somewhat less sharply defined than have typical animals.

Canescens Section

Animals of the *murina* group which show affinities with the *mitis* section (?) in the pronounced cranial ridges, short, rather pilose tail, and short foot.

All known forms are grayish or brownish gray. The median area of glandular skin on the lower part of the neck is apparently absent, the hairs appearing uniform over the whole neck. The ears are large.

The skull, which is often pear-shaped in outline through the widest part of the zygomatic arch being near the squamosal, shows the following distinctive characters: strongly produced, winglike supraorbital processes, which in fully grown animals are extended backward as strikingly raised, backward-coverging temporal ridges; unusual dorso-ventral depth of the zygomatic arch; and an accessory opening in each side of the palate (chiefly formed in the palatal shelf of the maxilla) which lies between the slitlike posterior palatal vacuity and M^2. In subadult animals the elevated crests formed by the temporal muscles on the parietals are yet undeveloped, but the characters of the palate, and the flat, wide-spreading supraorbital processes are present.

Nasals usually somewhat broadened at base; palate broad and tooth rows well convergent (except *c. insularis*). Bullæ usually well inflated, rounded, sometimes with a small eminence anteriorly—in the position of the spurlike process in other groups of *Marmosa*.

The reflexed part of mandible strongly bent; and its tip may even curve upward. Also, in old specimens the inferior border of the dentary strongly bent at a point beneath M_4.

Key to *canescens* Section

1. Upper molar tooth row with M^{1-3} greater than 5.5 ..... 2.
   Upper molar tooth row with M^{1-3} less than 5.5 ..... 3.
2.—Pattern of dorsal pelage very strongly marked; highlands near Oaxaca. *canescens oaxacæ.*
   Pattern of dorsal pelage very obscure; species of lowlands or of moderate altitudes ..... *canescens canescens.*

3.—Palate relatively broad; skin without pronounced cinnamon wash dorsally; mainland form.....*canescens sinaloæ.*
Palate relatively narrow; skin with distinct cinnamon wash dorsally; Tres Marias Islands.....*canescens insularis.*

Marmosa canescens Allen

(Synonymy under subspecies)

Includes all the known grayish-colored *Marmosa* of Mexico.

Dorsally gray, rarely with a faint cinnamon over-shade; a more or less obscured dorsal pattern. Ventral color yellowish-buff, buff, or cream-buff; generally broadly self-colored, but in individuals sometimes rather narrowed by gray-based hairs.

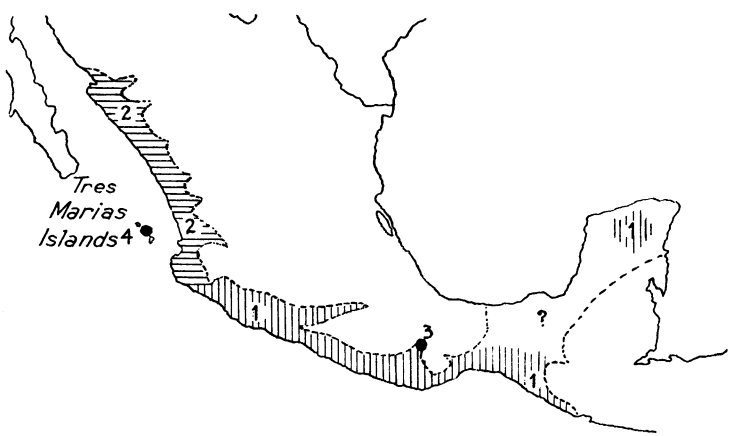


Fig. 18. Distribution of *M. canescens.*
1, *M. canescens canescens;* 2, *M. canescens sinaloæ;* 3, *M. canescens oaxacæ;* 4, *M. canescens insularis.*

The pattern consists of contrasts of relatively light yellowish-gray and darker gray areas. In most individuals, the outline of the *canescens* pattern is barely suggested, or even quite obscured; the present description is drawn up from the most strongly marked member of the section, *canescens oaxacæ.* The light color occurs on the frons between the eye-rings; on the cheeks, continuing to the region just anterior to the ears; beneath the ears, down the sides of the neck, and up on to the shoulders where it narrows the darker dorsal color to about 12 mm. Behind the fore limb the color (less intense) becomes pale again, and continues thus along the flanks to the hind limb. The dark color originates at the two eye-rings, unites on top of the forehead, and, first narrowed slightly by the twin patches of paler color in front of the ears and again more strongly by the scapular patches, continues to the tail.

Fur very short and crisp to quite long, (*c. insularis*). Eye-rings moderately developed, not extending very far forward among the roots of the vibrissæ. Vibrissæ moderate to rather short.

Ears large proportionately. Tail appears haired much as in the *mexicana* section, and in one individual of *canescens canescens* the distal third is white. Tail slightly bicolor.

SKULL.—See *canescens* section.

DISTRIBUTION.—Western Mexico from Sinaloa to Oaxaca; probably extending through the Tehuantepec lowlands to the eastern side; and represented in the dry parts of Yucatan by *gaumeri*, which appears inseparable from *canescens*. (Map, Fig. 18, p. 138.)

REMARKS.—In this species differences of age and seasonal variations may be confused with specific distinctions. Only the character of the shorter molar tooth row in *sinaloæ* can be held as generally distinctive from *c. canescens*, and transitional forms are not lacking. In a general way the place of contact between the small and large-toothed forms occurs somewhere near the provinces of Colima and Jalisco. Animals of Tepic, Sinaloa, and the Tres Marias Islands appear to be uniformly small-toothed.

Sinaloæ and *insularis* are rather easily separable. Material representing the former has been collected only in January, February, May, and July; the specimens of *insularis* from Tres Marias were secured in May. Of the former only two or three can be considered fully adult animals with the elevated temporal ridges characteristic of the section; the remainder are young adults of the year which have only recently changed their third premolars. Tres Marias animals are all subadult. They appear to differ from the mainland form by the longer, narrower palate, longer and more cinnamon-washed dorsal fur, and yellower ventral fur (young specimens of the mainland form have yellow underparts; old ones duller and more buffy. But this may be a seasonal rather than an age character, since while all the old specimens are dated July the young ones were caught earlier in the year).

Among the southern forms three have received names: *canescens* in Oaxaca; *oaxacæ* based upon a very dark-colored example and a nursing juvenile from the upland country at Oaxaca; and *gaumeri* (now synonymized with *canescens*) from the arid parts of Yucatan—also originally founded on a single individual.

Much as in the case of *sinaloæ*, long-haired specimens of *canescens* (the type is one of them) taken in April and May at the type locality, Sto. Domingo de Guzman, present a decidedly different appearance from

short, crisp-haired animals from Tapanatepec collected in September—although the localities are both in the Province of Oaxaca. This difference is treated as a seasonal condition.

Distinctness is preserved for four of the five forms in the section, pending the finding of more material which, besides either substantiating or obliterating the identity of *oaxacæ*, will fill in the distributional gaps in the ranges of *canescens* and *sinaloæ*.

The gray color leads one to conclude that *canescens* was already living in and adapted to arid country before it became differentiated into its present subspecies, and today these various subforms still occur predominantly in xerophytic country. The dark, strongly marked *c. oaxacæ* may represent a return to more humid climatic conditions. But since the *canescens*, *mexicana*, and *mitis* sections must be supposed to have had a common ancestor, which was in all probability a cinnamon-colored form, *insularis* may have become separated before the gray coloration of the other subspecies became established. This is substantiated by the fact that *insularis* is structurally further removed from other subspecies than they are from each other.

Marmosa canescens canescens Allen

Plate VII, Figures 57, 58; Plate XX, Figures 179, 180

1891. *Didelphys* (*Micoureus*) *murina* Allen, Bull. Amer. Mus. Nat. Hist., III, (1890), p. 190. Records from Sto. Domingo.

1893. *Didelphis* (*Micoureus*) *canescens* Allen, Bull. Amer. Mus. Nat. Hist., V, p. 235. Type description.

1897. *Marmosa canescens* Allen, Proc. Biol. Soc. Washington, XI, p. 43. See remarks under *Marmosa oaxacæ*.

1905. *Marmosa canescens* Trouessart, 'Cat. Mamm. viv. foss.,' Suppl., p. 856. Listed.

1904. *Marmosa canescens* Elliot, Field Columbian Mus. Publ. 95, Zoöl. Ser., IV, part 1, p. 6. Brief description.

1905. *Marmosa canescens* Elliot, 'Checklist N. Amer. Mammals,' Field Columbian Mus. Publ. 105, Zoöl. Ser., VI, p. 2.

1913. *Marmosa gaumeri* Osgood, Proc. Biol. Soc. Washington, XXVI, p. 175. Type description.

1916. *Caluromys gaumeri* Matschie, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 269. Listed.

1916. *Caluromys canescens* Matschie, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 269. Listed.

1917. *Marmosa gaumeri* Gaumer, 'Monographia de Mamíferos de Yucatan,' p. 6.

1919. *Marmosa canescens* Cabrera, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 36. Listed.

1919. *Marmosa gaumeri* Cabrera, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 37. Listed.

TYPE LOCALITY.—Santo Domingo de Guzman, Isthmus of Tehuantepec, Oaxaca, Mexico.

TYPE SPECIMEN.—"A.M.N.H. 3111–2433. Adult male. April 30, 1890. Coll. Dr. A. C. Buller." Type in A.M.N.H.

MATERIAL EXAMINED (34 specimens)

MEXICO.—Sto. Domingo de Guzman, Tehuantepec, Oaxaca (A.M.N.H. 3111/2433, type, ad.male; A.M.N.H. 3112/2434, o.ad.male; A.M.N.H. 3114/2437, 3115/2436, U.S.N.M. 73319, ad.males; A.M.N.H. 3110/3422, 3113/2435, U.S.N.M. 73320, ad.females); Tehuantepec, Oaxaca [U.S.N.M. 9514 (Alc.), o.ad.male; U.S.N.M. 60387, (Alc.) y.ad.male; M.C.Z. 23677, ad.male; M.C.Z. 23681, y.ad.male; M.C.Z. 23679–80, ad.females; M.C.Z. 23678, y.ad.female]; Tlapacingo, Oaxaca (U.S.B.S. 70242, juv.female); Pto. Angel, coast, Oaxaca (U.S.B.S. 71527, y.ad.male); Oaxaca (U.S.B.S. 68241, juv.male); Tlapa, Rio Xochihuehuellen, near Oaxaca boundary, Guerrero (U.S.B.S. 70239–40, juv.females); Acapulco, Guerrero (U.S.B.S. 70767, y.ad.male); Sochi, Guerrero (U.S.B.S. 70238, y.ad.male); Amolac, Puebla, near Rio Avatlan (U.S.B.S. 70237, y.ad.male); Los Reyes, Michoacan (U.S.B.S. 125659, 125925, ad.males); Hda. Magdalena, Colima (U.S.B.S. 33283, y.ad.male); Tepic, 3000 ft. (U.S.B.S. 88045, ad.male); Yaxcaba, southwest of Chichen-Itza, Yucatan (F.M.N.H. 19995, type of *gaumeri*, y.ad.?); "Yucatan" [U.S.N.M. 219927 (Alc.), ad.male, U.S.N.M. 219923 (Alc.), y.ad.female; U.S.N.M. 219925 (Alc.), juv. female; U.S.N.M. 219924, 219926 (Alcs.), juvs.]; "Mexico" (Paris 296A/1510, y.ad.male).

The type is in rather long pelage. Dorsally between mouse gray (R.) and deep mouse gray (R.); ventrally a dull shade of cartridge buff (R.), the self-colored area restricted in the mid-ventral part of the body to 15 mm. Relieving shade forming the dorsal pattern is an obscure shade of buffy gray, and the pattern itself in this form barely distinguishable. Eye-ring not strongly developed; vibrissæ moderate; ears moderately pigmented. Feet short and small, buff colored. The skull shows all the characters of the species perfectly; its M^{1-3} measure 5.9.

Specimens taken by W. W. Brown in September, also in Oaxaca, have the pelage short and crisp, and the ventral area apparently not narrowed.

DISTRIBUTION.—Yucatan, the provinces of Oaxaca (and probably parts of Chiapas), Guerrero, parts of Puebla, Michoacan. A specimen from Colima and another from Tepic appear intermediate between *c. canescens* and *c. sinaloæ;* the Tepic animal, U.S.B.S. 88045, has a decidedly warm color, intermediate between *canescens* and *insularis.*

REMARKS.—Two females in nursing condition which are quite young adults, M.C.Z. 23679 and 23680, indicate that these animals may reach sexual maturity long before they are fully grown. Functional mammæ apparently 4–1–4 (October).

The type locality of *gaumeri* Osgood, now synonymized with *c. canescens*, is "Yaxcaba, southwest of Chichen-Itza, Yucatan, Mexico";

the type specimen, F.M.N.H. 19995, quite a young adult with M_4 still close to the ascending ramus of the dentary. Sex unknown.

Dissection of the old adult male spirit specimen, U.S.N.M. 219927 from Yucatan, reveals the prominent supraorbital and parietal ridges of true *canescens*. Since the nasals, although but little widened at the base, are slightly expanded and a number of true *canescens* from Tehuantepec have only slightly broadened nasals, the distinction between *canescens* and *gaumeri* is held to be inconstant. Details of size, color, etc., are similar.

Marmosa canescens sinaloæ Allen

Plate VII, Figure 59; Plate XX, Figure 181

1882*a*. *Didelphys murina* Thomas, Proc. Zool. Soc. London, p. 372. Record. Apparently referable to *sinaloæ*.

1898. *Marmosa sinaloæ* Allen, Bull. Amer. Mus. Nat. Hist., X, p. 143. Type description.

1905. *Marmosa sinaloæ* Trouessart, 'Cat. Mamm. viv. foss.,' Suppl., p. 856. Listed.

1904. *Marmosa sinaloæ* Elliot, Field Columbian Mus. Publ. 95, Zoöl. Ser., IV, part 1, p. 6. Brief description.

1905. *Marmosa sinaloæ* Elliot, 'Checklist N. Amer. Mamm.,' Field Columbian Mus. Publ. 105, Zoöl. Ser., VI, p. 3.

1906. *Marmosa sinaloæ* Allen, Bull. Amer. Mus. Nat. Hist., XXII, p. 194. Records from Escuinapa, Sinaloa.

1916. *Caluromys sinaloæ* Matschie, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 269. Listed.

1919. *Marmosa sinaloæ* Cabrera, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 39. Listed.

Type Locality.—Tatameles, Sinaloa, Mexico.

Type Specimen.—B.M. 98.3.2.161. Young adult male. Coll. P. O. Simons, 1897. Type in B.M.

Material Examined (16 specimens)

Mexico.—Tatameles, Sinaloa (B.M. 98.3.2.161, type, y.ad.male; A.M.N.H. 13763, y.ad.female); Mazatlan, Sinaloa (B.M. 98.3.2.162, y.ad.male); Escuinapa, Sinaloa (A.M.N.H. 24894, o.ad.male; A.M.N.H. 24892–93, ad.males; A.M.N.H. 24895–96, ad.females; A.M.N.H. 24137, 24513, y.ad.males; A.M.N.H. 24136, 24512, y.ad.females); Rancho Palo Amarillo, Amatlan, Sinaloa (A.M.N.H. 25287, y.ad.male); near Mazatlan, 300 ft., Sinaloa (U.S.N.M. 96753, y.ad.male); Culiacan, Sinaloa (U.S.N.M. 96754, y.ad.male); Rosario, Sinaloa (A.M.N.H. 13764, y.ad.male).

Color of the type dorsally near hair brown (R.); ventrally buff-yellow (R.) to warm buff (R.). The self-colored hairs of the underparts narrowed at the stomach region to 10 mm.

Adult animals have the underparts less yellow, the ventral color in A.M.N.H. 28494, being near cartridge buff (R.), deepening on the throat

to cream-buff (R.). The dorsal color too in the majority of specimens is near wood brown (R.), with much gray of the under fur showing through.

SKULL.—Skull with characteristic shape (in old specimens) and accentuated ridges of *canescens*, but the teeth measure much less. Owing to youth of the type the long elevated parietal ridges have not formed. Other features as in *canescens*.

DISTRIBUTION.—Provinces of Sinaloa, Durango, and Tepic. The record from Ventanas, Durango is the most northerly for the entire genus (excepting, of course, animals found in shipments of fruit to the United States).

REMARKS.—The one female, A.M.N.H. 24896, with developed inguinal region is fully grown, and was taken on July 17. Mammæ apparently 4–1–4.

Marmosa canescens oaxacæ Merriam

Plate VII, Figure 60; Plate XX, Figure 182

1897. *Marmosa oaxacæ* MERRIAM, Proc. Biol. Soc. Washington, XI, p. 43. Type description.

1905. *Marmosa oaxacæ* TROUESSART, 'Cat. Mamm. viv. foss.,' Suppl., p. 856. Listed.

1904. *Marmosa oaxacæ* ELLIOT, Field Columbian Mus. Publ. 95, Zoöl. Ser., IV, part 1, p. 8. Brief description.

1905. *Marmosa oaxacæ* ELLIOT, 'Checklist N. Amer. Mamm.,' Field Columbian Mus. Publ. 105, Zoöl. Ser., VI, p. 3.

1916. *Caluromys oaxacæ* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 269. Listed.

1919. *Marmosa oaxacæ* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 38. Listed.

TYPE LOCALITY.—"City of Oaxaca, State of Oaxaca, Mexico." 4600 feet.

TYPE SPECIMEN.—U.S.B.S. 68240, No. 6571. Adult female. Coll. Nelson and Goldman, August 14, 1894. Type in U.S.B.S.

MATERIAL EXAMINED (2 specimens)

MEXICO.—Oaxaca, Oaxaca (U.S.B.S. 68240, type, ad.female; U.S.B.S. 68241, juv.male).

According to Dr. Allen, the highland or "Sonoran" representative of *c. canescens*.

Color of the darker part of the dorsal pattern a brownish cast of deep mouse gray (R.), of the lighter part a dull, scarcely describable color, but thought of as a yellowish shade of gray. The pattern outlines have already been described under the full species. *Oaxacæ* has also some asymmetrical fuscous dorsal marks which may well be adventitious. Ventral color near cream-buff (R.); some narrowing at the posterior thoracic region. Ears rather deeply pigmented; vibrissæ short; feet small.

SKULL.—Skull with zygomatic arch slightly wider anteriorly than in other subspecies and normally broad palate. Bases of nasals widened as in *canescens*.

DISTRIBUTION.—Known only from Oaxaca City, Mexico.

REMARKS.—The juvenile male is too small to be other than nursing. It was taken on September 8, so is not the young of the female, caught August 14.

Mr. Goldman states that the Oaxaca highlands are not, strictly speaking, part of the Sonoran zone. He says that *oaxacæ* was trapped very near the crest of the continental divide, and that the region is comparatively dry. Whether this locality is connected by a dry belt with the arid coastal area is uncertain, but in some cases such interior arid parts are undoubtedly quite isolated.

Marmosa canescens insularis Merriam

Plate VII, Figure 61; Plate XX, Figure 183

1882. *Didelphys murina* THOMAS, in Alston's 'Biologia Cent. Amer.,' Suppl., p. 212. Collections by Forrer.

1898. *Marmosa insularis* MERRIAM, Proc. Biol. Soc. Washington, XII, p. 14. Type description.

1899. *Marmosa insularis* NELSON, North Amer. Fauna, No. 14, p. 15. Listed.

1905. *Marmosa insularis* TROUESSART, 'Cat. Mamm. viv. foss.,' Suppl., p. 856. Listed.

1904. *Marmosa insularis* ELLIOT, Field Columbian Mus. Publ. 95, Zoöl. Ser., IV, part 1, p. 7. Brief description.

1905. *Marmosa insularis* ELLIOT, 'Checklist N. Amer. Mamm.,' Field Columbian Mus. Publ. 105, Zoöl. Ser., VI, p. 3.

1916. *Caluromys insularis* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 269. Listed.

1919. *Marmosa insularis* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 37. Listed.

TYPE LOCALITY.—"Maria Madre Island," Tres Marias Islands, off coast of Jalisco, Mexico.

TYPE SPECIMEN.—U.S.B.S. 89215. Young adult male. Coll. Nelson and Goldman, No. 11028, May 16, 1897. Type in U.S.B.S.

MATERIAL EXAMINED (5 specimens)[1]

MEXICO.—Maria Madre Island, Tres Marias Is., off Jalisco (U.S.B.S. 89215, type, y.ad.male; U.S.B.S. 89217–18, 95976, y.ad.males; U.S.B.S. 89216, y.ad.female.

Apart from individuals of *c. sinaloæ*, *insularis* is the only member of the gray species *canescens* with a decided tendency toward cinnamon coloration. Color above between wood brown (R.) and avellaneous (R.); the face and lighter portions (conforming to the *canescens* pattern)

[1]Forrer's specimens (Thomas, 1882) appear to have been lost from the British Museum collections.

near cinnamon-buff (R.). Underparts cream-buff (R.) paling to cartridge buff (R.) at the posterior part of the body. Hair long.

Ears long, but not very markedly larger than *canescens* and *sinaloæ;* only slightly pigmented. Eye-rings very little developed beneath the orbit. Feet small, buffy brown. Tail brown.

SKULL.—The form of the supraorbital ridges and the lateral palatal openings described for the section indicate that *insularis* is allied to *canescens*. It is separable from its nearest ally, *sinaloæ*, on the mainland by the longer and narrower palate, the lesser zygomatic extent, and the approximation of the alisphenoid bullæ. In three out of the four specimens the palatal length exceeds the zygomatic width.

DISTRIBUTION.—Actually known only from Maria Madre Island. Not taken on the other islands of the group.

REMARKS.—"Common in the forest on the top of the ridge which extends along the middle of Maria Madre Island." The more fulvous color would lead one to expect it to be a forest form. The lack of the deep cinnamon hue of *mexicana*, etc., suggests that the forest is perhaps of a rather dry, or semixerophytic type.

No fully grown specimen is yet known in collections.

NOCTIVAGA GROUP

Size varying from small to moderate (length of head and body from 111 mm. in *invicta* to 160 mm. in *polita*); tail rather short to moderate in length (*invicta*, 137 mm.; *noctivaga*, 207 mm.).

Dorsal color usually some shade of dark brown, but may be reddish, or gray-brown. Warm cinnamon-reds (usual in *murina* group) are exceptional. Ventrally both color and pattern are variable (see under species).

Pelage from very lax and long (*incana*) to quite short and rather crisp (*purui*). Stiffening of the gular hairs of males appears sporadically in the group (*noctivaga, collega, sobrina, incana, purui*) and reaches extreme development in *scapulata*. The hairless, glandular area on the under surface of the neck only slightly less highly developed in females than in males. Length of fur decidedly variable, and does not necessarily correspond with change of altitude. Probably it is determined more by season and moulting. Its texture, however, seems to vary rather consistently, the deep-colored *lugenda* of the rain and cloud forests possessing laxer, finer hairs than have lowland animals. Ocular patch typically well marked, the greater part of the black being in front of the eye and extending among the bases of the vibrissæ. In *leucastra* it is reduced

almost to nothing. Ears generally small or moderate, but proportionately large in *leucastra, ocellata, incana incana, incana bahiensis,* and *scapulata.* Vibrissæ not exceeding 36 mm. in length in adults. Feet throughout the group proportionately small. Hind foot in no case exceeding 23 mm. (*incana* and the larger subspecies of *noctivaga*); excepting *carri,* seldom exceeding 20 mm. in length in the *fuscata* section. Base of tail clothed with body hair for only a short distance (not exceeding 20 mm.). Scales small, 20 or more spirals per cm. of tail length. Each scale characteristically overlaid by three broad, flat, appressed bristles, usually black, whose length exceeds the length of the scale (this arrangement modified in *fuscata* section). In *ocellata* the hairs are longer, narrower, and white in color. They are sometimes few or nearly absent in the large fuscous brown and red forms, making the tail appear naked, shining, and dark brown; but in gray forms, the tails of which are whitened distally (*leucastra, ocellata, yungasensis*), the hairs become long enough almost to conceal the scales. This latter type of tail (*ocellata*) is usually short, while the smooth sort (*noctivaga*) is proportionately longer.

Skull elongate, narrow. With skull in norma verticalis, the nasals exceed the premaxilla to a noticeable extent. Their basal parts at the maxillo-frontal suture may be moderately (in *noctivaga* and *fuscata* sections) to little or not at all expanded (*incana* section and in *carri*). In no case are they greatly broadened. Supraorbital ridges in the larger species form a very definite "beading" at the junction of the orbital and frontal portions of the frontal bones. In the smaller forms (*fuscata* section) and in *incana* and *carri* the beading is practically absent, and the supraorbital region tends to be smoothly rounded and without pronounced angles. The beaded supraorbital ridges of the *noctivaga* group are never produced into pointed prominences as in the *cinerea* and *murina* groups. The temporal ridges, backward continuations from the supraorbitals, do not appreciably converge posteriorly, and in the small species are widely separated on the rounded brain case and scarcely visible. Lambdoidal crest little or not at all developed.

Palate long and narrow (excepting *invicta*). The tooth rows in this group are the least convergent of the whole genus *Marmosa,* and, especially in *incana* section, the premolar rows tend to be subparallel. Ratio of greatest breadth across bullæ to length from bulla to petrosal is low. Alisphenoid bullæ compressed, subtriangular, pyramid-shaped and furnished with a well-developed process from the inner anterior face which ankyloses with the basal portion of the alisphenoid in line with the

pterygoid (Fig. 5, p. 39). In mountain forms of *caucæ*, the bulla may be rather inflated, but it always has a stout process.

DISTRIBUTION.—The group occurs northward as far as the Isthmus of Panama (Darien) and southward to latitude S.25° in Brazil. Its headquarters are in the Andes, where certain members are found as high as 9000 feet, and among the adjoining foothills. The Cochabamba region

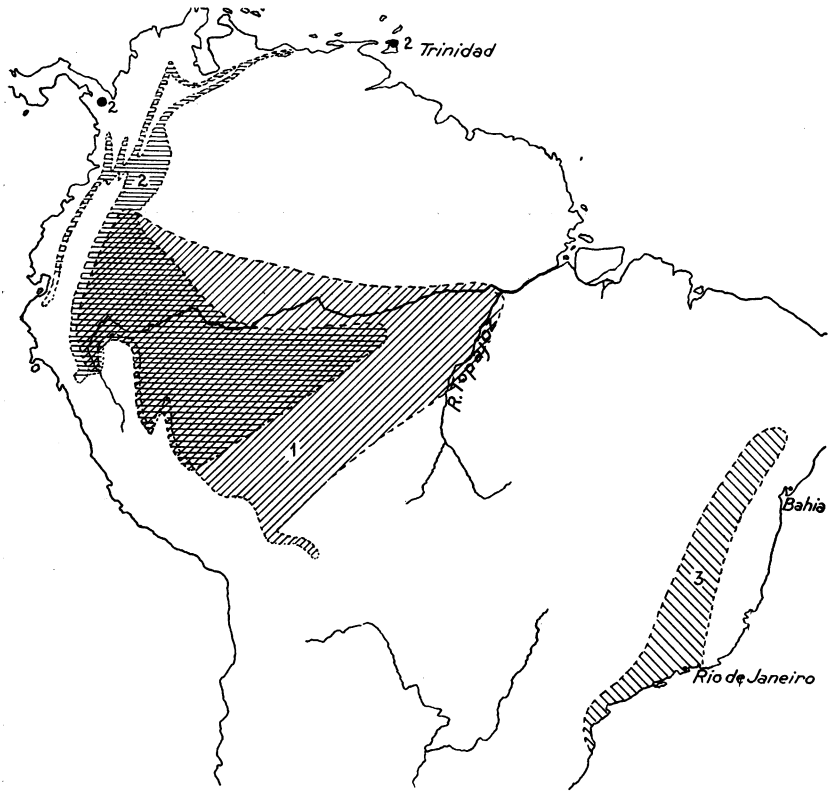


Fig. 19. Distribution of *M. noctivaga* group.
1, *M. noctivaga* section; 2, *M. fuscata* section; 3, *M. incana* section.

of Bolivia marks its most southerly range along the Andean chain (but see footnote under *keaysi*). The *incana* section, whose distribution is probably discontinuous with that of the Andean sections, represents it in eastern Brazil. Only one insular form is known,—*carri* from Trinidad. (Map, Fig. 19.)

The group falls into three fairly well-defined sections, shown in the following key. It must be borne in mind, though, that although distinc-

tions are necessarily emphasized in a work of this nature, the members of these sections are all very closely allied.

Key to Sections of *noctivaga* Group

1.—Size generally small; total length not in excess of 210 mm., and generally from 180 to 190 (excepting *carri* which attains 315), ventral pelage gray-based, tipped with silver-gray; or, if median fascia of self-colored white or buff hairs is present, then the maxillary series M^{1-3} not exceeding 6.1 mm. *fuscata.*

Size moderate to large, sometimes reaching a total length of 365 mm.; ventral pelage never entirely gray as above; teeth larger.....2.

2.—Color of underparts clear creamy white, without narrowing by lateral, colored hairs, or if buff instead of white, with area of strongly modified hairs on throat and scapular region (*scapulata*); skull with supraorbital region smooth, or nearly so.....*incana.*

Color of underparts not as in *incana* section, or, if broadly self-colored white or buff, then with pronounced, sharp-edged and generally beaded supraorbital ridges.....*noctivaga.*

Noctivaga Section

The principal and most diversified section of the *noctivaga* group, comprising moderate to large, narrow-skulled forms of *Marmosa* with fuscous, reddish-fuscous, or brownish-gray upperparts, and either buffy, dull or glossy white underparts which may be markedly or not at all narrowed by gray-based hairs. The skulls have the interorbital region generally rather broad, and the supraorbital ridges invariably sharp-edged and generally strongly beaded.

Although adaptive radiation, from the point of view of structure, is as yet only incipient, a number of forms whose exact relationship can not easily be resolved, are known. The several quite large, fuscous-brown forms from eastern Ecuador and eastern Peru, *polita*, *collega*, *lugenda*, *keaysi*, and *noctivaga* proper, are now treated as subspecies of *noctivaga.* Two gray species, *leucastra* and *ocellata*, although externally very similar to each other differ cranially in the breadth of the orbital region, the degree of development of supraorbital beading, size of the teeth, and finer structure of the tail. The latter, with its somewhat reduced supraorbital ridges, appears to approach the *incana* section. *Yungasensis*, a species from the Unduavi Valley, Bolivia, is characterized by very soft, straight, glossy pelage, silky white ventral fur, and rather small teeth, and is treated as specifically distinct from *noctivaga.* It may be significant that the reddish forms *neglecta* and *dorothea*, represented in collections by four and two specimens, respectively, are all females. The

suggestion is here made that they represent erythrochroic phases of the subspecies in their vicinity,—of *noctivaga* in the case of *neglecta*, and of *keaysi* for *dorothea*. A color correlation may be noted in these cases; with the appearance of the red dorsal tone, a corresponding deepening of the ventral aspect from whitish to buff or yellowish takes place.

DISTRIBUTION.—The *noctivaga* section reaches from the eastern Andean slope eastward as far as Villa Braga, Rio Tapajoz, Brazil, where *n. collega* was taken. From north to south it extends from the Napo drainage in Ecuador to the Yungas of Bolivia. (Map, Fig. 20.)

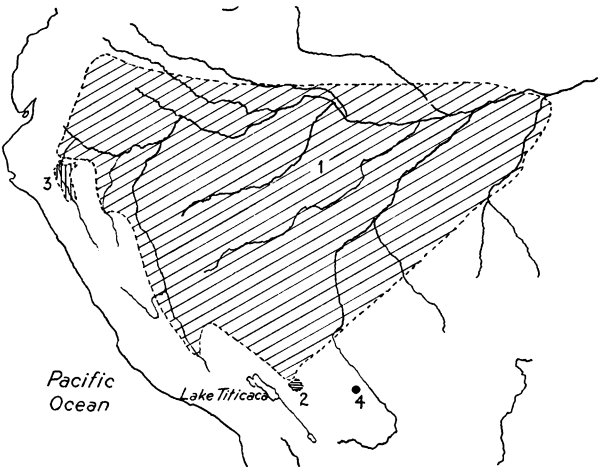


Fig. 20. Distribution of *M. noctivaga* section.
1, *M. noctivaga;* 2, *M. yungasensis;* 3, *M. leucastra;* 4, *M. ocellata.*

Four full species, the determination of which is shown in the key following, are recognized.

KEY TO SPECIES OF *noctivaga* SECTION

1.—Size large; fuscous, red-fuscous, red-brown, never grayish; tail long, brownish, appearing very naked; ventral self-colored area generally decidedly narrowed by gray-based hairs, never broadly self-colored and unnarrowed, ears small to medium in size. Skull with pronounced supraorbital beading. *noctivaga.*

Size moderate; dark brownish-gray, with long, satiny pelage. Underparts glossy white, only moderately narrowed by lateral pelage (width of white about 20 mm.). Tail well clothed with whitish down; ears small. *yungasensis.*

Size moderate; brownish gray; the hairs, although long, rather coarse and lusterless. Underparts not at all narrowed by lateral, or gray-based hairs (width of white area in adults about 30 mm.). Ears rather large to large. . 2

2.—Black ocular area generally greatly reduced or absent; ears rather large; skull similar to that of *noctivaga*, with well-marked supraorbital beading; maxillary M^{1-3}, 6.3–6.7 in males. From Marañón Valley, Peru..... *leucastra.*

Black ocular area apparently always well-developed; ears very large; skull with interorbital region narrowed, and supraorbital beading reduced, although the frontal bone has a sharp angle at the orbit. Maxillary M^{1-3} in males, 5.5–6.0. From Santa Cruz region, Bolivia..... *ocellata.*

Marmosa noctivaga (Tschudi)

(Synonymy under subspecies)

Noctivaga includes the subspecies *noctivaga*, *keaysi*, *lugenda*, *polita*, *collega*, and the reddish forms, known only from females, *dorothea* and *neglecta.*

Color dorsally from dark fuscous-brown to russet brown (R.) or cinnamon-rufous (R.), but more generally dark, with only slight admixture of red. Ventrally, from buffy to white, the unicolorous area often constricted to from 10 to 17 mm. by gray-based hairs. In red forms, underparts buff.

Pelage rather harsh and crisp; softer in *lugenda.* Face rather paler than body. Size of ears moderate to small, usually rather deeply pigmented—near bone brown (R.). Tail long for the group, dark brown, rather shiny in appearance; the scale spirals in adults from 20 to 26 per cm.

Skull.—Large to medium, strongly constricted; with supraorbital ridges and beading well marked, and interorbital region broad. Ridges of temporal muscles usually rather prominent, parallel. Lambdoidal crest small. Nasals distinctly broadened behind, in contrast to the almost uniformly narrow nasals of *carri* (a member of the *fuscata* section without orbital ridges), but never to the extent found in the *murina*, *cinerea*, and *microtarsus* groups.

Teeth.—Largest and strongest in the northern part of the range of the species, becoming progressively smaller towards the south. Canines long, in females somewhat compressed. Maxillary molar row M^{1-3} varying from 6.0–6.9 in males, and from 5.8 to 6.5 in females.

Distribution.—Nearly the whole of the area assigned to the *noctivaga* section is occupied by one or another of the subspecies of *noctivaga;* from the Andean slopes eastward to the Rio Tapajoz, and from Ecuador southward to northern Bolivia (Yungas). (Map, Fig. 21, p. 151.)

Remarks.—Darkening of the dorsal color generally coincides with whitening of the underparts. On the contrary, red forms like *n. dorothea* are usually strongly yellowish beneath. The exceptionally dark phases

referable to *n. lugenda* have the gray-based hairs encroaching to an unusual extent upon the white median area, so that out of a total width of 25 mm. of white hairs, some 6 mm. on each side may have the bases gray.

Reddish varieties and the somewhat red *n. polita* have the under surface rather broadly self-colored. *M. n. noctivaga* itself occupies an intermediate position with respect to pattern and coloration.

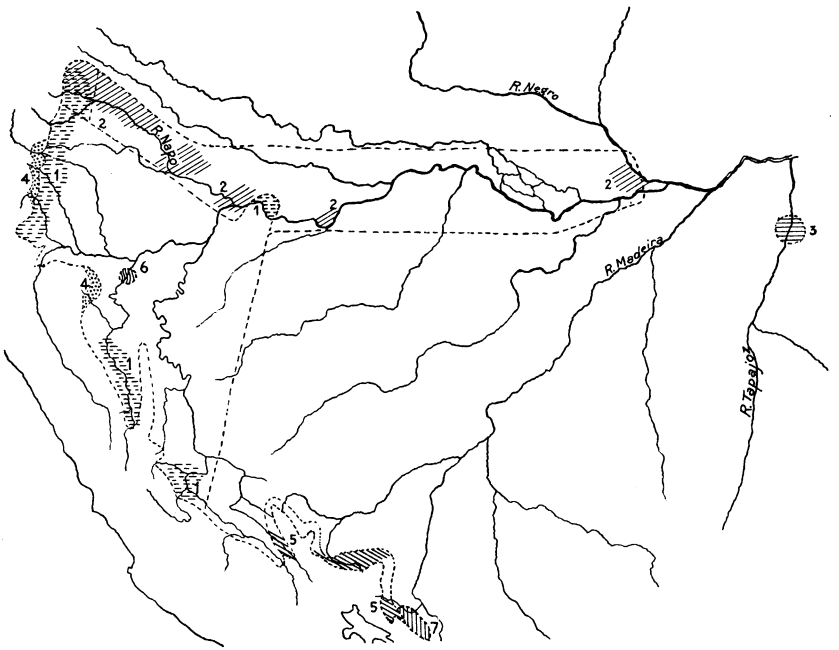


Fig. 21. Distribution of *M. noctivaga*.

1. *M. noctivaga noctivaga*
2. *M. noctivaga polita*
3. *M. noctivaga collega*
4. *M. noctivaga lugenda*
5. *M. noctivaga keaysi*
6. *M. noctivaga neglecta*
7. *M. noctivaga dorothea*

The three most widely distributed forms are *n. noctivaga, n. collega,* and *n. polita;* and from the first of these both red and very dark varieties apparently originate. Probably these dark and red forms arise from *noctivaga* independently in different parts of its range when subjected to requisite conditions of heat, light, and humidity.

Red phases have been found in three rather widely separated localities: *n. dorothea*, from Bolivia (Rio Solocame, 7000 feet, and Mapiri, 2000 feet); Osgood's *neglecta* (three females) from Rio Yurimaguas,

Ucayali, 600 feet; and one specimen from Tingo Maria, upper Rio Huallaga, 2000 feet, also referable to *neglecta*.

Unusually dark specimens referable to *lugenda* Thomas from Yurac Yacu, 2500 feet. near Moyobamba, are: from Guayaba, Rio Zamora, Ecuador, 4500 feet, one; from Gualaquiza, Ecuador, 3000 feet, one; and from Mera, Rio Pastaza, Ecuador, 3000 feet, three.

In comparing and evaluating the subspecies, allowance must be made for differences due to sex and age of the types. In these respects the condition of the types of the seven species which are now included in *noctivaga* is shown in the following list: *n. polita*, y.ad.male; *n. collega*, o.ad.male; *n. noctivaga*, y.ad.female; *n. keaysi*, o.ad.male; *n. lugenda*, y.ad.male; *n. neglecta*, y.ad.female; *n. dorothea*, ad.female.

KEY TO SUBSPECIES OF *noctivaga*

1.—Pelage of the back some shade of fuscous brown, not rufous; underparts not broadly deep yellow-buff.....2.
Pelage of the back near russet brown, cinnamon-rufous or pecan-brown; underparts cream-buff to cartridge-buff.....5.
2.—Ventral fascia of self-colored hairs not less than 20 mm. in width; teeth large, maxillary, M^{1-3} not less than 6.3 mm.....3.
Ventral fascia of self-colored hairs less than 20 mm. in width, usually only 10 mm.....4.
3.—Ventral fascia buff-colored. From the Rio Tapajoz of Brazil.....*n. collega.*
Ventral fascia white. From Rio Napo basin, Ecuador.....*n. polita.*
4.—Maxillary M^{1-3} in males not exceeding 6.4; tail brown above, very pale beneath. *n. keaysi.*
Maxillary M^{1-3} in males 6.6–6.7; tail only slightly paler beneath than above; dorsal pelage very dark, near mummy-brown; underparts white..*n. lugenda.*
Maxillary M^{1-3} 6.5–7.7 in males; tail only very slightly paler beneath than above; dorsal color from natal-brown to Mars brown; underparts buff..*n. noctivaga.*
5.—Known only from female specimens. Maxillary M^{1-3} not less than 6.4–from north Peru.....*n. neglecta.*
Maxillary M^{1-3} not greater than 5.9—from Bolivia.....*n. dorothea.*

Marmosa noctivaga noctivaga (Tschudi)

Plate VII, Figures 62, 63; Plate XX, Figures 184, 185

1846. *Didelphis noctivaga* TSCHUDI,[1] 'Fauna Peruana,' p. 148. Type description.
1846. *Didelphys noctivaga* WATERHOUSE, 'Nat. Hist. Mamm.,' I, p. 526. Based upon Tschudi.
1855. *Didelphys noctivaga* WAGNER, Schreber: 'Säugeth., Suppl.,' V, p. 240. Compares *impavida* and *noctivaga*.
1905. *Marmosa noctivaga* TROUESSART, 'Cat. Mamm. viv. foss.,' Suppl., p. 857. Listed.

[1]For Tschudi's itinerary see: P. Godet. 1900–1901. "J.-J. de Tschudi," Bull. Soc. Neuchateloise Sci. Nat., XXIX, pp. 36–56.

1916. *Marmosops noctivaga* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin. p. 271. Listed.

1919. *Marmosa noctivaga* CABRERA, 'Gen. Mam.,' Mus. Nac. Cien. Nat., Madrid, p. 38. Listed.

1927*b*. *Marmosa noctivaga* THOMAS, Ann. Mag. Nat. Hist., (9) XX, p. 606. Chinchavita record; also remarks on Tschudi's type and discussion of *impavida*.

1928*a*. *Marmosa noctivaga* THOMAS, Ann. Mag. Nat. Hist., (10) II, p. 294. Record from Pebas.

TYPE LOCALITY.—"Montaña de Vitoc," near Chanchamayo, Rio Perené drainage, Peru.

TYPE SPECIMEN.—None designated. Berlin 3375, a rather young female (?) with small teeth, marked as collected by Tschudi, is to be considered a co-type. None are now to be found at Neuchâtel. No others elsewhere.

MATERIAL EXAMINED (34 specimens)

PERU.—Pozuzo, Pachitea drainage (F.M.N.H. 24755, juv.male); "Vitoc," near Chanchamayo, Perené drainage [Berlin 3375, co-type, (?) female]; Chanchamayo, Perené drainage (B.M. 5.11.2.26, juv.male; B.M. 5.11.2.24–25, males); San Ramon, near Chanchamayo, Perené drainage (F.M.N.H. 20782, y.ad.male); Rio Chinchao, Huallaga drainage (F.M.N.H. 24740, ad.male; F.M.N.H. 24751, y.ad.female); Rio Cayumba, Huallaga drainage (F.M.N.H. 24736, 24738–39, ad.males; F.M.N.H. 24737, ad.female); Tingo Maria, Huallaga drainage (B.M. 27.11.1.250–255, ad.males; B.M. 27.11.1.249, 27.11.1.256–260, females); Chinchavita, Huallaga drainage (B.M. 27.11.1.248, male); Pebas, Loreto, Rio Amazonas, B.M. 28.7.21.111–112, males); Unreg. B.M. female.

ECUADOR.—Gualaquiza, Santiago drainage [B.M. 14.4.25.84, (?); B.M. 24.2.22.-66, female]; Canelos, Rio Bobonaza, Pastaza drainage (A.M.N.H. 67290, o.ad.male; Rio Copataza, Pastaza drainage (A.M.N.H. 67287, o.ad.male; A.M.N.H. 67280, juv. male); Mirador, Rio Napo, Napo drainage (A.M.N.H. 46676, male).

Dorsal color near bay, but varying from natal brown (R.) to Mars brown (R.), paling slightly on the sides. The underparts are buff-yellow (R.), to maize yellow (R.), the anterior half of body, throat and chest unrestricted in adults, but from the chest backward narrowed to a mean width of about 15 mm. by gray-based hairs. In A.M.N.H. 46676 (no skull) from Mirador, Rio Napo at the extreme northern limit of the range of *n. noctivaga* the fascia is only 11 mm. in width.

TEETH.—Large and strong, canines practically uncompressed. Upper molar tooth row M^{1-3} in males 6.3 to 7.7, in females up to 7.1.

DISTRIBUTION.—From Ecuador, south of the Rio Napo, along the foot of the Andes to central Peru. Generally below 3000 feet. At higher altitudes it seems to be represented by *keaysi*, *lugenda*, and the pale form from Ambo mentioned below. The range eastward is unknown, but appears to be at least as far as Pebas, upper Rio Amazonas.

A phase of *noctivaga*, collected by Heller at Ambo near the headwaters of the Rio Huallaga, 6700 feet (5 juveniles), which is decidedly

paler and dustier in coloration, with underparts a dull shade of cream color (R.) instead of the buffy white of nearby *noctivaga*, may eventually prove distinct. The five specimens are remarkable for having the greater part of the tail white with only the basal third and a few distal blotches fuscous. Patches in the center of the back in some individuals seem to be acquiring the darker adult pelage, and possibly the white of the tails may be lost with adulthood.

The size of the teeth in the young skulls prove them to belong to *noctivaga* rather than to *caucæ*, but they are too young for much reliance to be placed upon other characters.

F.M.N.H. 24751 from R. Chinchao, some 30 miles northeast of Ambo, has also part of the tail (one-third) white; its body color more nearly approaches that of adult *n. noctivaga*. Ambo lies in the center of a large isolated dry area.

REMARKS.—Dr. Otto Fuhrmann has with great kindness loaned from the University at Neuchâtel what purports to be the type of *noctivaga*. This animal is a mounted skin (male) with skull inside, and is accompanied by an unattached label stating that it was collected by Tschudi and is type of *noctivaga*. That the animal is a member of the *cinerea* group is easily shown by the length of its hind foot (27 mm.) and the large teeth, as well as the usual woolly pelage of that group.

Regarding the identity of this historical species, for some time thought by Thomas to be a member of the *cinerea* group, there can now be little doubt. The figure in 'Fauna Peruana' is extremely unlike *cinerea;* the distance "des Kopfes bis zum Ohr, 1″ 3‴" is far too small for a *cinerea* measurement, and much of Tschudi's description fits the present *noctivaga*. Emerging from the nonessentials are the correct size of the animal, its gray-brown dorsal color, and its whitish ventral hue, with the hairs of the sides gray-based. Only the "sehr weich, dicht und lang" fur is somewhat discordant with the rather crisp, sleek pelage of *noctivaga*. These points, coupled with the fact of an actual Tschudi animal still in existence (Berlin 3375), and the presence of juvenile specimens collected by Schunke at Chanchamayo (B.M. 5.11.2.24/26) that are practically topotypical, leave no doubt as to what *noctivaga* is like.

Tschudi's own allusions to the species help to settle the locality from which the *noctivaga* was brought—"In hollow tree-stumps or beneath arched roots we met the light-shunning opossums. They stayed quietly in their dark holes until the sun set, then slipped out and sought insects and fruit. They came stealthily into the poorly made huts, searching

through every corner, worrying the sleeping inmates, running over face and body (*Didelphis impavida* and *noctivaga* Tschudi) and were caught unfailingly when a bit of banana or pineapple was placed as bait."—Tschudi, 1846. 'Reiseskizzen,' II, pp. 248–249. This description is included in his account of the Valley and Montaña of Vitoc, near Chanchamayo.

Marmosa noctivaga polita Cabrera

Plate VIII, Figure 64; Plate XXI, Figure 186

1913. *Marmosa polita* CABRERA, Trab. Mus. Nac. de Cien. Nat., Madrid, Zool. Ser., No. 9, p. 10. April 30, 1913. Type description.

1916. *Marmosa polita* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 270. Listed.

1919. *Marmosa (Marmosa) polita* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 38. Listed.

1920. *Marmosa polita* THOMAS, Ann. Mag. Nat. Hist., (9) VI, p. 281. Footnote on age of type, under *collega*.

TYPE LOCALITY.—Confluence of rivers Coca and Napo, Oriente, Ecuador.

TYPE SPECIMEN.—Mus. Cien. Nac. Madrid, 797. Young adult male. Coll. D. Marcos J. de la Espada, No. 146. Type in Madrid Museum (?).

MATERIAL EXAMINED (18 specimens)

ECUADOR.—San José de Sumaco (A.M.N.H. 68134, o.ad.male; A.M.N.H. 68135, ad.male; A.M.N.H. 68131, juv.male; A.M.N.H. 68133, ad.female; A.M.N.H. 68130, juv.female); mouth Rio Curaray (A.M.N.H. 71949, 71955, ad.males; A.M.N.H. 71961, 71969, y.ad.males; A.M.N.H. 71948, o.ad.female; A.M.N.H. 71967, juv.male; A.M.N.H. 71962, juv.female).

PERU.—Orosa, Rio Amazonas, Mouth of Rio Napo (A.M.N.H. 73853, o.ad. male; A.M.N.H. 73854, y.ad.male).

BRAZIL.—Santa Rita, Tabatinga (Berlin 35832, juv.male); Igarapé Cacao Pereira, Rio Negro (A.M.N.H. 91352, y.ad.male; A.M.N.H. 91351, y.ad.female).

Seemingly the northeastern representative of *noctivaga* within the range of that species.

Color above varying from natal brown (R.) to warm sepia (R.) with the underparts dull white. Underparts of *polita* practically without any encroachment by gray-based hairs. This feature is generally sufficient to distinguish it from *noctivaga* of Peru. But *noctivaga* from Ecuador (A.M.N.H. 67287) may have the greater part of the underside decidedly buff-colored, and areas within the buff as clear and white as in *polita*. The juvenile specimen (Berlin 35832) from Sta. Rita, Tabatinga, and two from the south bank of the Rio Negro nearly opposite Manaos, are referred to this species. These are perhaps very slightly smaller than *polita* and their tails are paler beneath.

SKULL.—Strongly built, with well-developed supraorbital ridges. Both the *polita* skulls and that of *collega* give an impression of more massive construction than in *n. noctivaga,* but definite structural distinctions are scarcely to be found.

TEETH.—Among the larger of the subspecies of *noctivaga,* length of maxillary M^{1-3} in males 6.9–7.1, in females 6.7–6.8.

DISTRIBUTION.—The type came from the Rio Coca, tributary of the Napo. The American Museum possesses a number of examples from the mouth of the Rio Curaray, another tributary, and from San José de Sumaco, about 3500 feet, much nearer the source of the Napo. The two specimens in the American Museum from Orosa, mouth of Rio Napo, appear typically *polita,* as also the animals spoken of above from Tabatinga and the Rio Negro.

REMARKS.—There is little doubt that *polita* merges with *noctivaga* to the south, while in the Andes at the western part of its range, it assumes the deepened color of *lugenda.* Specimens from San José de Sumaco, Ecuador, however, have the unicolored hairs of the belly scarcely narrowed at all by gray-based hairs, whereas the animals from Mera in the Pastaza Valley, referred to *lugenda,* have the fascia narrowed to about 15 mm. Animals referable to true *polita* apparently do not occur much to the south of the Rio Napo. Juvenile specimens, both from San José de Sumaco and from the mouth of the Pastaza, have the white belly-hairs decidedly restricted by gray-based hairs along the sides. They bear a strong likeness to the representative of *caucæ* at the Curaray, but are readily separable by their much larger ears and teeth.

The eastern extent of *polita* is very imperfectly known. In all probability it extends throughout the river-fringe (igapo) forest of the upper Amazonian region. But as shown in the list of material, it has been taken only in a few widely separated localities, apart from the rather large series from the type region: Orosa, mouth of Rio Napo, Tabatinga, lower Rio Negro.

The type of *polita* has not been examined; but Thomas's conclusion (from Cabrera's figure) that P^3 is a milk tooth seems scarcely well founded. Specimens with the milk teeth still in place as well as adults have been examined at the American Museum, and the figure, perhaps due to faulty drawing, agrees with neither very well. On the other hand, the closeness of M_4 to the ascending ramus of the mandible implies that the specimen is young. On the whole, from the illustration and from his measurements, Cabrera's type appears to be a young adult with permanent dentition.

Marmosa noctivaga collega Thomas

1920. *Marmosa collega* THOMAS, Ann. Mag. Nat. Hist., (9) VI, p. 281. Type description.

TYPE LOCALITY.—Villa Braga, Rio Tapajoz, Brazil.

TYPE SPECIMEN.—B.M. 20.7.14.40. Old adult male. Coll. Miss E. Snethlage, June 7, 1917. Type in British Museum.

MATERIAL EXAMINED

The type only.

One of the large subspecies of *noctivaga*.

Color on the back near natal brown (R.), with a small, adventitious white spot. Underparts maize yellow, (R.), paling at throat and stomach to cream color (R.), unicolorous except for a slight narrowing at the costal region to 20 mm. Fur seems somewhat thinner and laxer than in *polita*. Ventral fur short (6 mm.).

SKULL.—Strongly built, as in *polita* and *noctivaga*, showing almost no distinctive features. Perhaps the most outstanding difference is the smallness of the bullæ and their relatively short distance apart. It is doubtful, though, whether this is to be counted upon as of systematic value.

TEETH.—While little value is to be placed upon characters drawn from a single specimen (male), the tooth row M^{1-3} is shorter than in the series of males of *polita*.

DISTRIBUTION.—Villa Braga, Rio Tapajoz, Brazil. Nothing is known of the range of this form. Collecting will probably prove it to be of wide distribution, and the eastern representative of *noctivaga* and *polita*.

REMARKS.—This animal is retained as a subspecies only with considerable doubt. It is very closely allied to *noctivaga* and *polita*, and the appearance of more specimens may require that it be merged with one of them.

Marmosa noctivaga lugenda Thomas

Plate VIII, Figure 66; Plate XXI, Figure 188

1927. *Marmosa noctivaga lugenda* THOMAS, Ann. Mag. Nat. Hist., (9) XIX, p. 373. Type description.

TYPE LOCALITY.—Yurac Yacu, 20 miles west of Moyobamba (Huallaga drainage), Peru.

TYPE SPECIMEN.—B.M. 27.1.1.178. Young adult male. Coll. R. W. Hendee, July 2, 1926. Type in B.M.

MATERIAL EXAMINED (5 specimens)

PERU.—Yurac Yacu, Huallaga drainage (B.M. 27.1.1.178, type, y.ad.male).

ECUADOR.—Guayaba, near Gualaquiza (A.M.N.H. 47183, y.ad.female); Mera, Rio Pastaza (A.M.N.H. 67291, ad.male; A.M.N.H. 67278, juv.male; A.M.N.H. 67285, v.y.ad.female).

Dorsal color very dark, nearest to mummy brown (R.); ventral color white, restricted to a width of about 10 mm. by broad bands of gray-based white-tipped hairs.

SKULL.—Skull appearing as in normal *noctivaga*. Teeth not reduced in size.

DISTRIBUTION.—From the type locality northward along the Andes, at least as far as the Rio Pastaza (Mera and Palmera) at about 3000 feet.

REMARKS.—Apparently the representative of *noctivaga* in the rain forests on the eastern Andean slopes in northern Peru and southern and central Ecuador. Its strongly narrowed, clear white median ventral stripe and soft dorsal fur are the best distinguishing characters. B.M. 14.4.25.84, collected by Hammond at Gualaquiza, and listed in this paper under *noctivaga noctivaga* is somewhat reddish, but from its narrowed, white ventral stripe suggests a transition form in the direction of *lugenda*.

Marmosa noctivaga keaysi[1] (Allen)

Plate VIII, Figure 67; Plate XXI, Figure 189

1900*a*. *Thylamys keaysi* J. A. ALLEN, Bull. Amer. Mus. Nat. Hist., XIII, Art. 16, p. 198. Type description.

1900*b*. *Thylamys keaysi* J. A. ALLEN, Bull. Amer. Mus. Nat. Hist., XIII, Art. 18, p. 219. Allusion to above.

1901. *Thylamys keaysi* J. A. ALLEN, Bull. Amer. Mus. Nat. Hist., XIV, Art. 3, p. 42. Allusion to type description with correction of type locality.

1905. *Marmosa keaysi* TROUESSART, 'Cat. Mamm. viv. foss.,' Suppl., p. 856. Listed.

1916. *Thylamys keaysi* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 271. Listed.

1919. *Marmosa* (*Thylamys*) *keaysi* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 40. Listed.

TYPE LOCALITY.—First described (1900, p. 198) as "Juliaca"; corrected (1901, p. 42) to "Inca Mines . . . about 200 miles northeast of Juliaca . . . on the Inambari River," Peru, about 6000 feet.

TYPE SPECIMEN.—A.M.N.H. 16068. Old adult male. Coll. H. H. Keays, December 23, 1899. Type in A.M.N.H.

MATERIAL EXAMINED (8 specimens)

PERU.—Inca Mines, Rio Inambari (A.M.N.H. 16068, type, o.ad.male; A.M.N.H. 16070, 16473, ad.males; A.M.N.H. 16472, y.ad.female; A.M.N.H. 16069, ad.female); Marcapata, Rio Inambari (B.M. 4.12.4.20, juv. ?); Machu Picchu, Rio Inambari (A.M.N.H. 91529, ad.male).

BOLIVIA.—Ticunhuaya, Rio Tipuani, 4800 ft. (A.M.N.H. 72567, y.ad.female).

Dorsal color near bone brown (R.) or warm sepia (R.); beneath paler than light buff (R.). General appearance very like that of a small

[1]The animal referred by Matschie to *noctivaga* (Coll. Neumann) may have been *keaysi*. It was from Tamailla, "west of Tucuman near the watershed between Argentina and Chile in the Aconquija Range." (Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, 1894, p. 64).

n. noctivaga, the ears similarly of moderate to small size. Tail, however, while brown above, is usually markedly light, almost whitish, beneath. Inguinal area in A.M.N.H. 16069 close to clay color (R.).

SKULL.—A small copy of *noctivaga*, with usual broadened interorbital region; orbital ridges well developed in age; but molar tooth row decidedly small. Canines in males long and sharp, in females short and compressed.

DISTRIBUTION.—So far as known, the eastern slopes of the Andes in south Peru and north Bolivia, between altitudes of 4800 and 6000 feet; but if the red females, at present named *dorothea*, truly represent a color phase of *noctivaga keaysi*, the range is extended southward to the Yungas and the vertical distribution increased to between 2000 and nearly 7000 feet.

REMARKS.—Visible mammæ in A.M.N.H. 16069 are 3–1–?

A female specimen from Incachaca, Cochabamba, Bolivia, 7700 feet, may be referable to *keaysi*. It has no skull. This would still farther extend the range.

Marmosa noctivaga neglecta Osgood

Plate VIII, Figure 68; Plate XXI, Figure 190

1915. *Marmosa impavida neglecta* OSGOOD, Field Mus. Nat. Hist., X, p. 187. Type description.

1916. *Marmosa neglecta* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 270. Listed.

1919. *Marmosa* (*Marmosa*) *neglecta* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 37. Listed.

TYPE LOCALITY.—Yurimaguas, Rio Huallaga, Peru. 600 feet.

TYPE SPECIMEN.—F.M.N.H. 19636. Young adult female. Coll. M. P. Anderson, September 28, 1912. Type in F.M.N.H.

MATERIAL EXAMINED (4 specimens)

PERU.—Yurimaguas, Huallaga drainage (F.M.N.H. 19636, type, ad.female; F.M.N.H. 19637–38, ad.females); Tingo Maria, Huallaga drainage (F.M.N.H. 24750, ad.female).

Dorsal color "russet brown to cinnamon rufous"; underparts buff, much deeper than the underparts of normal buffy-white *noctivaga*, and contracted by gray-based hairs only to 12, 14, and 23 mm., respectively, in the three Yurimaguas specimens. The Tingo Maria animal has its underparts broadly buff. Inguinal color near ochraceous tawny (R.), but lighter.

SKULL AND TEETH.—Indistinguishable from those of females of true *noctivaga*.

DISTRIBUTION.—From Yurimaguas and Tingo Maria only. The latter has an altitude about 1500 feet higher than the former, but both are on the Rio Huallaga.

REMARKS.—As intimated elsewhere, *neglecta* is regarded as a red phase of the female sex of *noctivaga*.

Marmosa noctivaga dorothea Thomas

Plate VIII, Figure 69; Plate XXI, Figure 191

1911*a*. *Marmosa dorothea* THOMAS, Ann. Mag. Nat. Hist., (8) VII, p. 516. May, 1911. Type description.

1916. *Marmosops dorothea* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 271. Listed.

1919. *Marmosa* (*Marmosa*) *dorothea* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 36. Listed.

TYPE LOCALITY.—"Rio Solocame and Mapiri, Bolivia. Alt. 2300 metres." The type specimen is from the Solocame; a second example from Mapiri, 2000 feet. This shows a difference of nearly 5000 feet between localities.

TYPE SPECIMEN.—B.M. 1.6.7.79. Adult female. Coll. P. O. Simons, June 26, 1901. The Mapiri specimen was also secured by Simons. Type in B.M.

MATERIAL EXAMINED (2 specimens)

BOLIVIA.—Rio Solocame, Rio Bopi, Yungas (B.M. 1.6.7.79, type, ad.female); Mapiri, near Rio Beni (B.M. 1.2.1.36, female).

Upper surface near pecan brown (R.). Ventral surface cream-buff (R.), not narrowed appreciably by gray-based hairs.

SKULL.—Rather small, but *noctivaga*-like in form, with broadened supraorbital region and well-defined supraorbital ridge.

TEETH.—Small. Canines rather short, but uncompressed.

DISTRIBUTION.—The Yungas of Bolivia.

REMARKS.—Based upon two female specimens, *dorothea* may be considered a red phase of *noctivaga keaysi*, whose range extends from Inca Mines, Rio Inambari, southern Peru to the Tipuani Valley, Bolivia.

Marmosa yungasensis Tate

Plate VIII, Figure 70; Plate XXI, Figure 192

1931. *Marmosa yungasensis* TATE, Amer. Mus. Novitates, No. 493, p. 7, Type description.

TYPE LOCALITY.—Pitiguaya, Rio Unduavi, Yungas, Prov. de la Paz, Bolivia. 5600 feet.

TYPE SPECIMEN.—A.M.N.H. 72558. Old adult female. Coll. G. H. H. Tate. No. 4037. May 10, 1926. Type in A.M.N.H.

MATERIAL EXAMINED (8 specimens)

BOLIVIA.—Pitiguaya, Yungas (A.M.N.H. 72566, 72561, y.ad.males; A.M.N.H. 72564, juv.male; A.M.N.H. 72558, type, o.ad.female; A.M.N.H. 72559–60, y.ad. females; A.M.N.H. 72562, v.y.ad.female· A.M.N.H. 72550, juv.female).

A subtropical form with long, fine pelage, rather small ears, and underparts clear white, the hairs self-colored. Skull with unusually short canines for the group.

Median region of the back darkest, near natal brown (R.), paling gradually to russet (R.) on the sides. Face rather lighter than back. Ocular mark well developed, not narrowed beneath eye. Underparts pale creamy white, hairs without gray bases, even at sides, the white area narrowed slightly in the costal region and at the neck. Feet unusually small, slender, grayish white. Tail faintly bicolor, quite densely fine-haired throughout. Ears rather small, semitranslucent, fuscous brown. Throat gland moderately developed (female). Dorsal pelage length 9 to 10 mm.

SKULL.—Skull rather lightly ossified. Molars rather smaller than in *noctivaga* and *dorothea*, but larger than in *ocellata*. A sharp supraorbital ridging, without definite beading, although there is an indication in the young males that beading will form with age. Temporal ridges not approximated.

DISTRIBUTION.—The deep valleys of the Yungas region of Bolivia at about 5000 feet.

Marmosa leucastra Thomas

Plate VIII, Figure 71; Plate XXI, Figure 193

1926*b*. *Marmosa noctivaga* (?) THOMAS, Ann. Mag. Nat. Hist., (9) XVII, p. 616. Record from Tambo Carrizal.

1927*b*. *Marmosa leucastra* THOMAS, Ann. Mag. Nat. Hist., (9) XX, p. 607. Type description.

TYPE LOCALITY.—Tambo Carrizal, 40 miles south of Chachapoyas, northern Peru, and almost due east of Balsas. "9000 feet."[1]

TYPE SPECIMEN.—B.M. 26.4.1.102. Young adult male. Coll. R. W. Hendee, September, 1925. Type in B.M.

MATERIAL EXAMINED (6 specimens)

PERU.—Tambo Carrizal (B.M. 26.4.1.102, type, y.ad.male); Chachapoyas (B.M. 24.12.12.65–66, males; B.M. 24.12.12.67–68, females); Near Perico, Marañón Valley (M.C.Z. 17056, y.ad.male).

Sharply different from the other *noctivaga*-like forms on account of the light, gray-brown dorsal color and clear, unnarrowed white underparts, together with the almost total suppression of eye-rings.

Fur rather long, fine. Ears longer than those of *n. noctivaga*. Tail with distal part whitish.

SKULL.—Indistinguishable from *noctivaga* skull. Teeth large.

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[1]The altitude of Tambo Carrizal is given by Osgood as 5000 feet.

DISTRIBUTION.—Taken at Chachapoyas and Tambo Carrizal. Probably distributed along the valley of the Marañón in rain-shadow areas.

REMARKS.—A young specimen taken by Dr. G. K. Noble near Perico, in the Marañón Valley, about 1000 feet, is referred with some doubt to *leucastra*. Its pelage is rather softer, and the eye-rings are rather less reduced.

Marmosa ocellata Tate

Plate VIII, Figure 72; Plate IX, Figure 73; Plate XXI, Figure 194; Plate XXII, Figure 195

1931. *Marmosa ocellata*, TATE, Amer. Mus. Novitates, No. 493, p. 7. Type description.

TYPE LOCALITY.—Buenavista, Dept. of Santa Cruz, Bolivia, 500 meters.

TYPE SPECIMEN.—B.M. 26.1.5.25. Old adult male. Coll. José Steinbach, No. 1479, August 6, 1924. Type in British Museum.

MATERIAL EXAMINED (5 specimens)

BOLIVIA.—Buenavista, Santa Cruz (B.M. 26.1.5.25, type, o.ad.male; B.M. 28.2.9.87, o.ad.male; Pittsburgh 4958, o.ad.male; Pittsburgh 4979, juv.male; B.M. 28.2.9.90, y.ad.male).

Rather larger than *leucastra* but having a similar light gray-brown dorsal, and broadly cream-white, self-colored ventral aspect. Differs from *leucastra* in having strongly developed eye-rings, narrowed interorbital region, and much smaller molar teeth.

Color above between light drab (R.) and hair brown (R.), becoming slightly cinnamon on sides, with the face lighter. Eye surrounded with black, which extends forward to the black vibrissæ, and backward almost to the base of the ear. Eye-ring narrowed below the posterior half of the eye. Ventral pelage dull white, a few gray-based hairs at junction with dorsal color. Feet buff-white. Tail slightly bicolor, and decidedly particolor, the distal one-third to one-fifth whitish. The whole tail clothed with fine white hairs. Ears large, light fuscous, semitranslucent, profusely haired terminally, but with few hairs at the thicker part. Throat gland well developed. Length of dorsal pelage 9–10 mm.

SKULL.—Heavily built; but scarcely of characteristic *noctivaga* appearance on account of the supraorbital region which is narrowed and lacks prominences or beading, being merely angled. Temporal ridges not approximated. Molars very small. Palate relatively narrow, highly fenestrated.

DISTRIBUTION.—Known only from Buenavista, Bolivia.

Incana Section

The animals belonging to this division of *noctivaga* have broadly self-colored white or buff-white underparts, grayish (brownish in *scapulata*) dorsal hairs, and ears moderate in size to very large. The skull attains extreme narrowness and, except in *scapulata*, lacks supraorbital ridges. The section is also marked off geographically from the remainder of the *noctivaga* group, being only known from eastern and southeastern Brazil. (Map, Fig. 22.)

Two species, one of which comprises three subspecies, can be distinguished in the following key:

1.—Color brown, with white underparts; throat and scapular region clothed with erect, modified hairs . *scapulata.*
Color gray to brownish gray, with white underparts; hairs of scapular area unmodified,—those of throat sometimes slightly stiffened (*incana*) . . 2.

2.—Relatively large; ears very large; hairs of throat in adult males somewhat modified; molar tooth rows short (M^{1-3} 6.0.–6.1) . . . . . *incana incana.*
Relatively large; ears very large; hairs of throat appear to be quite unmodified; molar tooth rows larger (M^{1-3} 6.3–6.5) . . . . . *incana bahiensis.*
Smaller; ears moderate; hairs of throat unmodified or rarely slightly modified; molar tooth rows large, (M^{1-3} 6.2–6.5) . . . . . *incana paulensis.*

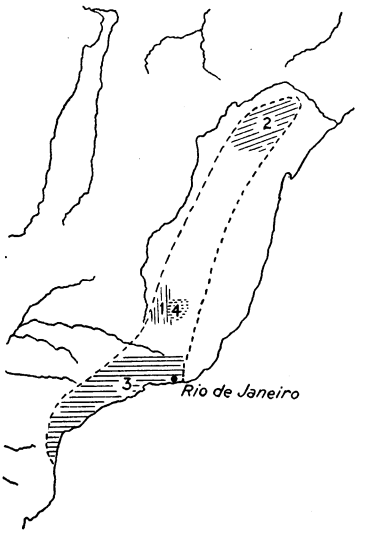

Fig. 22. Distribution of *M. incana* section.

1, *M. incana incana;* 2, *M. incana bahiensis;* 3, *M. incana paulensis;* 4, *M. scapulata.*

REMARKS.—Due to dearth of material and collecting localities, some misgiving is felt in separating the three subspecies of *incana*. However, since specimens are rather easily recognized, and their places of origin, broadly speaking, can be determined from their appearance, it seems admissible to distinguish them by names.

The section, as a whole, seems nearest to those Bolivian members of the *noctivaga* section with white underparts. *Ocellata* of Santa Cruz has grayish pelage, rather large ears, and a tendency for the interorbital region to be narrowed; yet it is quite distinct from the section under consideration, having coarser pelage and the ratio of zygomatic breadth to greatest length of skull much higher.

Marmosa incana (Lund)

(Synonymy under subspecies)

Color dorsally gray, slightly brownish-tinged; underparts broadly self-colored white, quite unnarrowed by encroachment of lateral hairs. Line of transition sharp. Pelage long and very soft, except the throat area of males of *i. incana* and *i. bahiensis*. Extent of body hair on tail rather short.

SKULL.—Markedly long and narrow, compared with *noctivaga* and *fuscata* sections. Bullæ moderately rounded. Tooth rows only slightly convergent, the premolar portions of the row being nearly parallel. Interorbital region narrow.

DISTRIBUTION.—Over more than 1000 miles of country in eastern Brazil. The three forms described represent the north, center, and southeast, between the provinces of Bahia and São Paulo. Its range westward is quite unknown.

REMARKS.—While anatomically distinguishable, all three are very closely allied, *i. incana* and *i. bahiensis* in particular; and further collecting may reveal considerable intergradation between them.

Marmosa incana incana (Lund)

Plate IX, Figure 74

1841. *Didelphis incana* LUND, Det. K. Danske Vidensk. Selskabs. Afh., VIII, p. 237. Type description.

1846. *Didelphis incana* WATERHOUSE, 'Nat. Hist. Mamm.,' I, p. 503. Based upon Lund. Suspects closely allied to "micouré à queue longue" Azara.

1854. *Didelphis incana* BURMEISTER, 'Thiere Brasil,' I, p. 137. Based upon Lund.

1887. *Didelphis grisea* LYDEKKER, 'Cat. Mamm. B.M.' V, p. 281. Based upon Lund.

1888*a*. *Didelphis grisea* THOMAS, 'Cat. Marsup. Monotr. Brit. Mus.,' p. 349. (In part.) First two references to Azara's *marmota*, but description drawn up from a specimen of *incana*.

1893. *Grymæomys griseus* WINGE, E. Mus. Lundii, II, pp. 6, 12.

1894. *Marmosa incana* THOMAS, Ann. Mag. Nat. Hist., (6) XIV, p. 184.

1894. *Didelphys griseus* GOELDI, Proc. Zool. Soc., p. 461.

1905. *Marmosa incana* TROUESSART, 'Cat. Mamm. viv. foss.,' Suppl., p. 856. Listed.

1916. *Didelphis* (*Marmosops*) *incana* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, pp. 261, 271. Listed.

1919. *Marmosa* (*Marmosa*) *incana* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 37. Listed.

TYPE LOCALITY.—Lagoa Santa, Minas Geraes, Brazil.[1]

TYPE SPECIMEN.—None designated. Of the Copenhagen material listed below, Copenhagen 223 and 224 were collected by Lund, the others by Reinhardt. These

[1]For description of Lagoa Santa see Warming, 1892.

two animals then may be considered co-types and the others as topotypes. Copenhagen 224, an old male with the skull in the skin, is in poor condition, unstuffed, and distorted. The tail is missing. Coll. P. W. Lund.

MATERIAL EXAMINED (10 specimens)

BRAZIL.—Lagoa Santa, Minas Geraes (Copenhagen 224, 132, o.ad.males; Copenhagen 126,127, ad.males; Copenhagen 133, ad.female; Copenhagen 223, y.ad.female; Copenhagen 128,131, females; Berlin 2519, ad.?); Mandi, Lagoa Santa, Minas Geraes (Copenhagen 138, juv.?).

The color of the male of *incana* taken by Lund at Lagoa Santa is gray, with a suggestion of brownish wash above; beneath it is clear white, the hairs all unicolorous, and the white area, as in other subspecies, quite unrestricted by lateral color invasion.

Pelage in the males very long and fine (10 to 13 mm.); in females which can be definitely distinguished as such (by the development of the mammary area; not simply by the absence of the scrotum, often removed by collectors from males) the fur is markedly shorter (5 to 8 mm.). Gular hairs well stiffened in males. Tail light fuscous; whitish toward the tip.

A decided difference in size is to be seen between males and females.

TEETH.—Molar tooth rows remarkably short. Max. M^{1-3} 6.0 to 6.1; mandibular M_{1-4} 7.8 to 7.9.

DISTRIBUTION.—Only recorded from Lagoa Santa.

REMARKS.—Growth seems to continue long after sexual maturity has apparently been attained and tooth wear is noticeable. *I. incana* appears to carry this to an extreme, resulting in the very large specimens, such as Copenhagen 132, which are occasionally captured.

Marmosa incana bahiensis Tate

1931. *Marmosa incana bahiensis* TATE, Amer. Mus. Novitates, No. 493, p. 8. Type description.

TYPE LOCALITY.—Lamarão, Bahia, Brazil.

TYPE SPECIMEN.—B.M. 3.9.5.137. Adult male. Coll. A. Robert, 1903. Type in B.M.

MATERIAL EXAMINED (10 specimens)

BRAZIL.—Lamarão, Bahia (B.M. 3.9.5.137, type, ad.male; B.M. 3.9.5.138–141; 3.9.5.143–144, ad.males; B.M. 3.9.5.142, juv. male; B.M. 3.9.5.145–146, ad.females).

Very near *i. incana*, with similar coloration and similar differences in length of pelage in the sexes. Ears also very large. Females much smaller than males. Distinguished by its proportionately longer molar tooth rows and the absence of any trace of modification of the gular hairs in males.

Color of hairs of back mouse gray (R.) [old specimens fade to hair brown (R.) or benzo brown (R.)]. Ventrally clear creamy white. Fur very soft and lax.

Tail proportionately short (150–170 mm.).

SKULL.—Smaller than in *i. incana*, but essentially similar.

TEETH.—Tooth row proportionately longer (max. M^{1-3}, 6.3 to 6.5; mand. M_{1-4}, 8.1 to 8.3). Coronoid process depressed, not strongly inclined to dentary.

DISTRIBUTION.—Known only from the series collected in 1903 by Alphonse Robert from Lamarão for the British Museum, representing the extreme northern range of *incana*, as so far determined.

B.M. 3.9.5.145 has apparently 3–1–3 functional mammæ.

Marmosa incana paulensis Tate

Plate IX, Figure 75; Plate XXII, Figure 196

1894. *Micoureus griseus* GOELDI, Proc. Zool. Soc. London, p. 461. Description of specimen from Serra dos Orgãos.

1931. *Marmosa incana paulensis* TATE, Amer. Mus. Novitates, No. 493, p. 8. Type description.

TYPE LOCALITY.—Therezopolis,[1] Rio de Janeiro, Brazil.

TYPE SPECIMEN.—F.M.N.H. 26576. Young adult male. Coll. C. C. Sanborn. Type in F.M.N.H.

MATERIAL EXAMINED (11 specimens)

BRAZIL.—Therezopolis, Rio de Janeiro (F.M.N.H. 26576, type, y.ad.male; F.M.N.H. 26577, y.ad.female); Rio de Janeiro (B.M. 76.12.8.5–6, ?); Sumidouro, near Rio de Janeiro, São Paulo (Copenhagen 136, o.ad.male; Copenhagen 129, 137, B.M. 93.4.16.3 , ad.males); Roça Nova, Paraná (B.M. 3.7.1.111, ad.male; M.C.Z. 24802, ad.female); "Brazil" (Berlin 3708, female?).

Somewhat smaller than the other two subspecies.

Dorsal color gray, with slight brownish wash, considerably darker than the more northern forms; ventrally ivory white (R.).

No distinction in length of pelage between the sexes. Teeth larger than in *i. incana* and about equal in size to those of *i. bahiensis* (max. M^{1-3}, 6.2 to 6.5; mand. M_{1-4}, 7.9 to 8.4). Canines short. Bullæ rather well inflated.

DISTRIBUTION.—If one may generalize from the localities in which this form has been found, it is the coastal representative of *incana* between the neighborhood of Rio and the Province of Paraná, but enters the interior at the southern part of its range.

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[1]Mr. Sanborn has called my attention to the fact that Therezopolis, the type locality of *M. i. paulensis*, is in the State of Rio de Janeiro and not in the State of São Paulo, as published in Amer. Mus. Novitates, No. 493.

Marmosa scapulata (Burmeister)

Plate IX, Figure 76; Plate XXII, Figure 197

1856. *Grymaeomys scapulatus* BURMEISTER, 'Fauna Brasiliens,' p. 79. Type description.

1888*a*. *Didelphys cinerea* THOMAS, 'Cat. Marsup. Monotr. Brit. Mus.,' p. 342. Shown as synonym.

1916. *Grymaeomys* (*Marmosops*) *scapulatus* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, pp. 263, 271. Listed.

1919. *Marmosa* (*Marmosa*) *cinerea cinerea* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 36. Listed.

TYPE LOCALITY.—Minas Geraes, Brazil.[1]

TYPE AND ONLY SPECIMEN.—Berlin 2330. Old adult male. Coll. von Olfers, No. 207. Type in Berlin Museum.

MATERIAL EXAMINED

The type only.

A large member of the *incana* section distinguished by the pronouncedly erect stiff hairs of the neck and scapular regions (whence probably the name).

Present color of the skin faded to light brownish. When Burmeister described it, each hair was "at base slate gray, then pale yellow-red, and last cinnamon"; so, apparently the original exterior color was near cinnamon.

Ventrally it is self-colored dull white, somewhat yellower on the neck. No constriction of the broadly white ventral area by gray from the sides. Eye-ring moderate; slightly developed toward bases of vibrissæ. From what remains of the ears they appear to have been about as large as those of *incana incana*.

The tract of erect hairs originates at the throat, passes upward on each side in front of the arms to cover approximately each of the scapulæ. On the dorsum a narrow area of soft, unmodified hairs 8 mm. in width separates the two scapular patches.

Pelage elsewhere long, and a little coarse. Feet small, as in *incana*. Tail rather long, its color now indeterminable, but, according to Burmeister, "flesh-brown, and beneath whitish."

SKULL.—Skull with characteristically narrow form and narrow palate of the *incana* section. Nasals narrow and pointed behind; supraorbital region smooth to very slightly ridged; bullæ small, compressed, rather conic, with well-developed processes.

TEETH.—Teeth generally larger than in *incana*. Canines rather long.

DISTRIBUTION.—"Minas Geraes."

[1]Matschie gives Porto Alegre (p. 271) without stating his authority, but no record of such a place in Minas Geraes has been found.

Fuscata Section

Includes the smaller members of the *noctivaga* group. Dorsal color fuscous to bone brown (R.) (slightly redder in some individuals from Contamana, Rio Ucayali, Peru, and in *caucæ purui* from Rio Purus). Supraorbital region smoothly rounded and without, or almost without (specimens from Cajamarca, Peru), traces of supraorbital ridges.

Two main trends of development are apparent in the section: Northern forms (Colombia, Venezuela, eastern Panama, Trinidad) with underparts uniformly silvery gray, unrelieved by any median patches or fasciæ of white or buffy self-colored hairs. Southern forms (Colombia, Ecuador, Peru, Brazil) distinguished by an irregular, longitudinal, ventral fascia of self-colored, creamy or white hairs,—the fascia reaching from chin to belly, being relatively narrow in the animal of the northwestern part of the range (*c. caucæ*).

Although color usually distinguishes these two divisions, what may be considered annectant forms exist in Colombia: The type of *perfusca* and A.M.N.H. 34641 from El Roble have each a white spot on the throat. Two specimens of *c. caucæ*, one from Ricaurte, A.M.N.H. 34202, and the other from San Antonio, Cauca, A.M.N.H. 32178, have the median band absent from the throat region and reduced on the chest to a small patch 5 mm. across, which is continued posteriorly as an irregular line only 2 or 3 mm. in width. This irregularity and reduction applies also to three specimens referable to *c. caucæ* from the valley of the Rio Pastaza, Ecuador, between 3000 and 7600 feet. In more southern forms, the fascia is broader, but varies greatly in pattern and shade. It is usually asymmetrical, and its color ranges from white to creamy-buff. This variability seems inherent throughout the group, and specimens, some with white underparts, others with cream, appear irregularly between Colombia and Peru. However, restricted areas apparently favor the development of a preponderance of a certain shade. Even in *fuscata*-like forms the extreme tips of the belly hairs may be buffy instead of silvery (*carri*).

Skull.—Skull generally small (total length 32–34 mm.) and not heavily ossified. (That of *carri* is unusually large and strongly constructed.) Characteristically narrow in proportion to the width across the zygomata; muzzle generally rather narrow (in the type of *oroensis* especially so), but in *invicta* rather short and broad. Nasals scarcely at all expanded at the base in *fuscata* and its allies; in *caucæ* a moderate expansion is noted, but not so great as in the *noctivaga* section. Supraorbital ridges characteristically absent or nearly so, and the region

smoothly rounded. Brain case large, and well rounded. Palate narrow, with small fenestræ of irregular form behind the posterior palatal opening, sometimes roofed over; of little systematic significance except possibly in *carri*. Zygomata and bridge without special features. Bullæ rather variable within the section, but conforming to the *noctivaga* form, with strong process. In *carri*, *fuscata*, and *invicta* they are only mod-

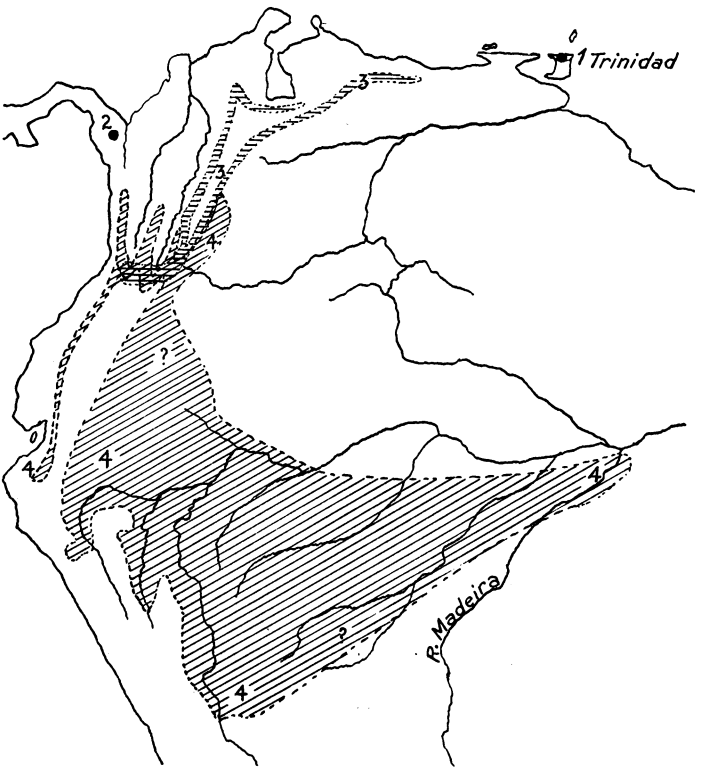

Fig. 23. Distribution of *M. fuscata* section.
1, *M. carri*; 2, *M. invicta*; 3, *M. fuscata*; 4, *M. caucæ*.

erately compressed, as is generally the case in *caucæ*, but individuals are seen in *caucæ sobrina* and *caucæ oroensis* in which they are quite small and pointed. As a whole, the section has the bullæ more inflated than have *noctivaga* and *incana* sections. Mandible and coronoid process offer no unusual features. *Carri* apparently has the anterior flange of the coronoid very straight; in *fuscata* it is variable; in *invicta* and most of the subspecies of *caucæ* it is decidedly curved.

TEETH.—Teeth in all forms but *carri* characteristically small; smallest in *invicta*, variable in *fuscata*, and generally somewhat larger in *caucæ*. Canines of males long and curved in *carri;* either long and curved or shorter and compressed in *fuscata;* in *invicta* very short and strongly compressed; and in *caucæ* variable, but generally moderately long, curved and not much compressed. In females the canine is quite often short, compressed, and furnished with an incipient cingulum, although there is a marked variation in the extent of this modification. In *carri* the molars (particularly the protoconids of the lower teeth) and premolars are larger than those of other species.

DISTRIBUTION.—Inhabiting the Andean system and adjoining territory north of Bolivia: Trinidad, eastern Panama, Venezuelan Andes, Colombian Andes, Andes of Ecuador and Peru, the western Amazonian drainage, the Rio Curaray, Ecuador, the Rio Ucayali, Peru, and the Madeira and Purus in Brazil. No record of any capture above 9000 feet. (Map, Fig. 23, p. 169.)

Characteristically subtropical, rain-forest frequenting animals, rarely extending their range into country with subxerophytic vegetation (*caucæ oroensis*). Rather more terrestrial than most divisions of *Marmosa*.

KEY TO SPECIES OF *fuscata* SECTION

1.—Underparts silvery gray, with at most a white spot on throat.....2.
Underparts with median area buffy to creamy white.....*caucæ*.
2.—Ratio of palatal length to zygomatic breadth less than 1; size very small. *invicta*.
Ratio of palatal length to zygomatic breadth greater than 1; size larger.....3.
3.—Size proportionately large; color relatively light brown; ears large; nasals unbroadened proximally.....*carri*.
Size medium; color fuscous brown; ears medium in size; nasals distinctly broadened proximally.....*fuscata*.

Marmosa carri (Allen and Chapman)

Plate IX, Figure 77; Plate XXII, Figure 198

1897. *Thylamys carri* ALLEN AND CHAPMAN, Bull. Amer. Mus. Nat. Hist., IX, Art. 2, p. 27. Type description.
1905. *Marmosa carri* TROUESSART, 'Cat. Mamm. viv. foss.,' Suppl., p. 856. Listed.
1916. *Thylamys carri* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 271. Listed.
1919. *Marmosa (Thylamys) carri* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 40. Listed.

TYPE LOCALITY.—Caparo (Cacao plantation), north central lowlands of Trinidad.

TYPE SPECIMEN.—A.M.N.H. 5922/7314. Adult male. Coll. F. M. Chapman. Named after A. B. Carr, Trinidad. Type in A.M.N.H.

MATERIAL EXAMINED (7 specimens)

TRINIDAD.—Caparo (A.M.N.H. 5922/7314, type, ad.male; A.M.N.H. 5923/7315, ad.male; A.M.N.H. 5921/7313, y.ad.female); "Trinidad" [B.M. (spirit) y.ad.female; Basle 3319 (spirit) o.ad.female; Basle 3320, 3321 (spirit) y.ad.females].

Size, from available evidence, markedly greater than *fuscata* or *invicta*. About equal to small, or female *noctivaga* and *incana*. The males of this species are decidedly larger than the females.

Color dorsally near Verona brown (R.), but probably darker in newly captured specimens. Beneath, silvery gray [storm gray (R.) to hathi gray (R.)], the tips of the hairs inclined to buffy, instead of the white of the mainland forms. A young female has inguinal parts near cinnamon-buff (R.). An adult female at Basle has the abdomen darker. Transition from dorsal color to ventral moderately sharp.

Fur rather short and crisp. Dorsal length from 5 to 7 mm. Ventrally, in males, about 6 mm. Vibrissæ in males, maximum 33.

Ears warm sepia (R.) to fuscous (R.); dimensions in male 22×17.[1]

SKULL.—Large and heavily ossified, compared with the remaining members of the *fuscata* section; narrow and elongate, with supraorbital region smoothly rounded, narrow (broader in female); and temporal ridges barely developed, not approximated. Nasals unexpanded at maxillo-frontal suture. Palate with two pairs of small fenestræ (absent in female) behind the posterior palatal vacuities and close to the posterior margin, much closer to the median line of the palate than are the corresponding fenestræ (when present) of allied forms. Alisphenoid bullæ not extremely conical, but conforming to the characteristic shape exhibited throughout the *noctivaga* group. Process well developed.

TEETH.—Canines large, curved, and uncompressed in males; in females rather short, straight, compressed laterally, somewhat premolariform, having a cingulum. Length of maxillary M^{1-3} 6.0 to 6.3 (*fuscata*, 5.4 to 6.1). Length of mandibular M_{1-4} 7.8 to 8.1 (*fuscata*, 7.3 to 8.0). There is a noticeable difference in the length of the molar tooth row in the sexes.

DISTRIBUTION.—Known only from the island of Trinidad.

Marmosa invicta Goldman

Plate IX, Figure 78; Plate XXII, Figure 199

1912. *Marmosa invicta* GOLDMAN, Smithsonian Misc. Coll., LVI, No. 36, p. 1. Feb. 19, 1912. Type description.

1916. *Marmosops invicta* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 270. Listed.

[1]Dr. Allen's published measurements in type description were taken from specimens whose ears had been greatly drawn out, giving an appearance of unusual size.

1916. *Marmosa invicta* ALLEN, Bull. Amer. Mus. Nat. Hist., XXXV, p. 201. Note under *caucæ*.

1919. *Marmosa* (*Marmosa*) *invicta* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 37. Listed.

TYPE LOCALITY.—Cana, mountains of eastern Panama. Alt. 2000 feet.

TYPE SPECIMEN.—U.S.B.S. 178708. Ad.male. Coll. E. A. Goldman, March 14, 1912. Type in U.S.B.S.

MATERIAL EXAMINED (2 specimens)

EASTERN PANAMA.—Cana, Darien (U.S.B.S. 178708, type, ad.male; U.S.B.S. 178709, ad.female).

Decidedly the smallest member, not only for the *fuscata-madescens* section, but of the entire *noctivaga* group.

Dorsally near bone brown (R.).[1] Ventrally silver-gray, formed by fuscous-based hairs tipped with silver-gray. The underparts of *invicta* appear darker than in *fuscata* and *carri*. Fur quite short, rather firm. Transition from dorsal to ventral coloration is moderately abrupt. The slightly developed inguinal area of the female is near army brown (R.).

SKULL.—Skull of the narrowed *noctivaga* type, with which it agrees in particulars of the elongate, narrow nasals, compressed, triangular bullæ with decided process. It falls into the *fuscata* section by reason of its small size and smooth supraorbital region, but differs sharply and exceptionally in having the ratio of palatal length to zygomatic breadth less than 1. This appears due rather to the shortness of the muzzle (short palate and nasals), than to breadth of the zygomata in relation to the skull taken as a whole. Median frontal depression pronounced. Palate with posterior palatal vacuities small, and with very small fenestræ behind them (either patent, or covered with translucent bony material) widely separated.

TEETH.—Canines with cingula both in male and female, short, straight, laterally compressed. Maxillary M^{1-3} 5.3 to 5.5; mandibular M_{1-4} 6.7 to 7.1.

DISTRIBUTION.—Known only from the type locality.

Marmosa fuscata Thomas

Plate IX, Figures 78, 80; Plate XXII, Figures 200, 201

1896. *Marmosa fuscata* THOMAS, Ann. Mag. Nat. Hist., (6) XVIII, p. 313. Type description.

1905. *Marmosa fuscata* TROUESSART, 'Cat. Mamm. viv. foss.,' Suppl., p. 856. Listed.

1911. *Marmosa fuscata* ALLEN, Bull. Amer. Mus. Nat. Hist., XXX, Art. 10, p. 246. Record from Cumbre de Valencia.

[1]The blackish area on the flanks and rump seen only in the male, which Goldman connects with moulting, suggests strongly that the hairs have had the brown tips clipped off by ants, leaving only the darker basal portions. Such clipping may often be observed in specimens of *simonsi* from Puna Island, Ecuador. Moulting in *Marmosa* has not been studied.

1916. *Marmosops fuscata* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 270. Listed.

1919. *Marmosa (Marmosa) fuscata* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 36. Listed.

1924. *Marmosa perfusca* THOMAS, Ann. Mag. Nat. Hist., (9) XIII, p. 236. Type description.

TYPE LOCALITY.—Rio Albarregas (not Abbarregas), Mérida, Venezuela.

TYPE SPECIMEN.—B.M. 96.11.1.6. Young adult female. Coll. Briceño Gabaldon. Type in B.M.[1]

MATERIAL EXAMINED (9 specimens)

VENEZUELA.—Rio Albarregas, Mérida (B.M. 96.11.1.6, type, y.ad.female; B.M. 5.7.5.23, male); "Mérida" (B.M. 3.1.5.2, male; B.M. 3.1.5.3, female); Cumbre de Valencia (A.M.N.H. 31531, ad.female); La Azulita, northwest of Mérida (F.M.N.H. 22174, ad.male); "Cafetos" de Mérida (Berlin 24802, marked female, y.ad.male).

COLOMBIA.—Fusagasuga, near Bogotá (B.M. 23.11.13.18, o.ad.female); El Roble, Cauca (A.M.N.H. 34641, y.ad.female).

Size medium, between *carri* and *invicta*.

Color of type brownish fuscous, near bone brown (R.) dorsally. Other Mérida specimens are nearly the same; the animal from Cumbre de Valencia is between bone brown (R.) and mummy brown (R.); the specimen from La Azulita, foothills south of Lake Maracaibo, 3500 feet, in the rain belt, is darker, approaching fuscous; the type of *perfusca* was described as "dark bistre," but it is not so dark as the Azulita specimen; a specimen from El Roble, Colombia, is again lighter. Ventrally, the animals are all remarkably uniform—lead-gray, with silvery white tips to the hairs. *Perfusca* type has a small white spot on the throat. Line of demarcation between dorsal and ventral color moderately sharp. Length of fur on back varies from 6 to 10 mm. For normally rather soft and lax.

SKULL.—Skull normally narrow and moderate in size (between *carri* and *invicta*). Nasals only very slightly expanded at the proximal end. Supraorbital region smooth and unridged. Temporal ridges only very slightly prominent, remaining widely separated in the parietal region. Posterior palatal fenestræ referred to under *carri* and *invicta* may be present or absent, but are always widely separated when present. Palate long, narrow. Bullæ small, triangular, compressed, with well-marked process.

TEETH.—Apart from sex, the canines show great variability. They may be long and not greatly curved (F.M.N.H. 22174), although never so large as in *carri*, or short, straight, compressed, and furnished with a

[1]Type Locality of *perfusca*, Fusagasugá, near Bogotá, Colombia, 6000 feet; and type specimen, B.M.23.11.13.18. Old adult female—not male, as stated by Thomas. Coll. Nicéforo Maria, September, 1923.

small cingulum (A.M.N.H. 31531). Maxillary M^{1-3} varies in length from 5.4 to 6.1, irrespective of sex; 6.1, however, is unusually long. In the same way the mandibular row M_{1-4} varies from 7.3 to 8.0.

DISTRIBUTION.—From the scanty records of specimens, appears broken. It will probably be shown to extend from at least as far eastward along the Venezuelan coastal ranges as the Silla de Caracas. At present it is known from the Mérida Andes and from the region about Bogotá, and probably occurs in suitable localities between these regions. No trace of it was discovered by the American Museum Expedition to Mt. Turumiquire early in 1926.

REMARKS.—*Perfusca* is not left as a subspecies distinct from *fuscata*, in spite of want of material to link them together. Both are silver-gray-bellied, and have the characteristic smooth supraorbital region of the skulls of the *fuscata* section. From the limited number of specimens, *fuscata* is seen to be a decidedly variable form as regards size, color, length of molar tooth rows, and form of the canine. *Perfusca* was distinguished by its describer mainly by slightly greater size; but actually its molar tooth rows are shorter than in the female A.M.N.H. 31531 from Cumbre de Valencia, Venezuela. Thomas described the type as "aged male"; it is a female. No other specimen was known from Colombia until recently; but in going over the American Museum collection, a second specimen from El Roble, Cauca Valley, apparently referable to *perfusca*, has been found. Although a young adult female it conforms fairly closely to the measurements of the type, but its color is lighter. This specimen tends to bridge the scarcely more than distributional gap between *fuscata* and *perfusca*. Finally, it can be seen from the list of material that no very old specimens of *fuscata* exist in collections for comparison. The type of *perfusca* is a very old specimen, which fact will probably account for its unusual size.

Marmosa caucæ Thomas

(Synonymy under subspecies)

In spite of their considerable variability in color, pattern, length of pelage, and extensive range, the animals now treated appear to belong to a single species with general uniformity of cranial characters and continuous distribution. Pale ventral fascia always present, narrower in northern forms, and broader in southern. Dorsal color varying with the subspecies from the bone brown (R.) of *sobrina* to rather light wood brown (R.) or Prout's brown (R.) of *oroensis* and *madescens*. Animals from the drier part of the range have their color contrast more marked.

Pelage generally lax, but varying in length with altitude and moult. Gular hairs stiffened in old specimens from Medina and Mambita in Colombia and from Portovelo, Lunamá and Pallatanga, Ecuador.

Ear rather constantly small, reaching its greatest size in *sobrina* 20.5×16; about 15×12 to 18×14 in *madescens*. Tail throughout the species darker above and lighter beneath.

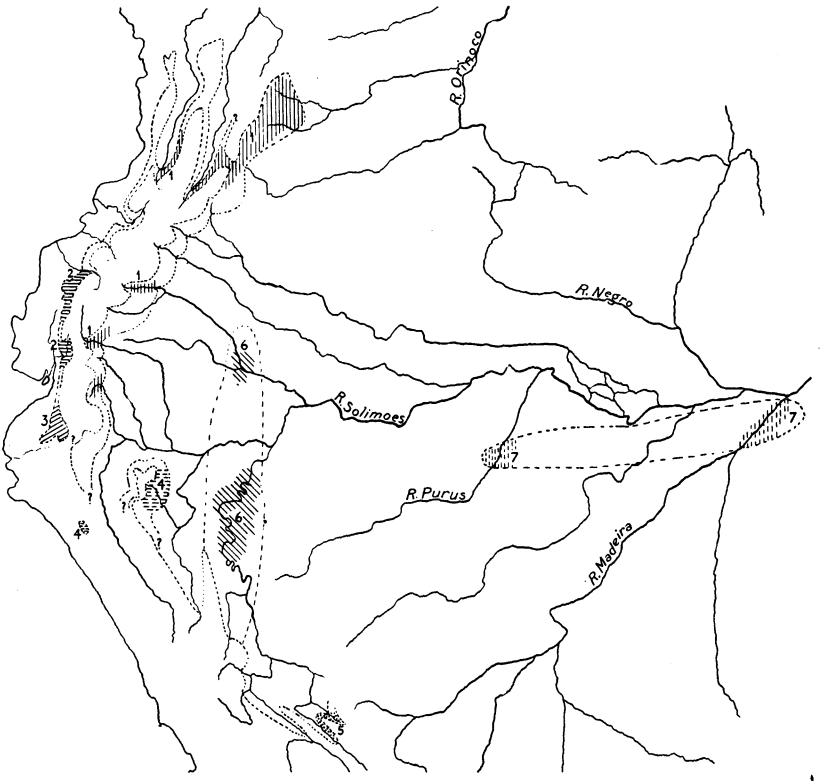

Fig. 24. Distribution of *M. caucæ*.

1. *M. caucæ caucæ*
2. *M. caucæ sobrina*
3. *M. caucæ oroensis*
4. *M. caucæ madescens*
5. *M. caucæ albiventris*
6. *M. caucæ ucayaliensis*
7. *M. caucæ purui*

SKULL.—Very similar to the skull of *fuscata*, its nearest ally; of moderately small size (basal length, 28–30; zygomatic breadth, 16–17); the zygomatic arches evenly rounded; muzzle moderately pointed; upper surface of skull in general smoothly rounded, or at most with only faint suggestions of supraorbital ridges; temporal ridges generally just

discernible, but always widely separated; nasals moderately expanded at the maxillo-frontal suture; palate rather narrow, usually fenestrated behind the posterior palatal openings. Bullæ only moderately compressed, but in *purui*, the lowland representative of the Solimões region, small and pointed. Mandible without special characters; the coronoid process usually rather strongly arched.

TEETH.—Small. Canines moderate to short, varying from curved teeth, oval in section, to short straight compressed teeth. Premolars and molars normal.

DISTRIBUTION of *caucæ* is from the Rio Meta, Bogotá, and upper Cauca region of Colombia, southward along both sides of the Andes. The southern limit on the Pacific side is reached in the Province of El Oro, Ecuador, and possibly the extreme northern edge of Peru. On the Atlantic slope the form *c. caucæ* reaches southward into Ecuador, at least to the valley of the Rio Pastaza. The ranges of *caucæ sobrina* and *caucæ caucæ* appear to overlap, but it may be found that these two forms frequent slightly different habitats and so do not actually associate. *Caucæ madescens* occurs in Peru, apparently with a vertical range between 2500 feet at Yurac Yacu and nearby places, where a large series was secured by Hendee, up to 8000 or 9000 feet. It is found west of Cajamarca at Taulis, about 9000 feet, apparently on Pacific drainage, and in the Cajamarca basin. This possibly indicates broken distribution, but there may be some connection around the southern end of the Marañón Valley at appropriate elevations. A single specimen, U.S.N.M. 194378, from Torontoy, formerly referred to *c. madescens*, is renamed *c. albiventris*. Notwithstanding the complexity of the Peruvian eastern watershed, the distribution of *caucæ* may well be continuous. Animals inhabiting the seasonally dry parts of southwestern Ecuador may be derived from the Peruvian form by way of the relatively low passes near Huancabamba, or vice versa. (Map, Fig. 24, p. 175.)

The two subspecies, *ucayaliensis* and *purui*, are, respectively, the representatives of *caucæ* in the nearer and more distant lowlands east of the Andes; the former distributed through the Ucayali, Napo, and (?) Upper Solimões, the latter known from the Purus and Madeira rivers.

REMARKS.—The nearest allies of *caucæ* are *fuscata, invicta,* and *carri*, from which the most obvious distinction lies in the ventral pattern and coloration. Local races, which appear to intergrade and whose ranges are not clearly defined, are considered here as subspecies and, while varying somewhat in color, pattern, length of pelage, and minor cranial characters, are generally distinguishable. In order to facilitate com-

parison of the several subspecies, a list showing sex and age of the types of *caucæ* follows: *c. madescens*, juv.male (milk premolar in lower jaw); *c. oroensis*, y.ad.male; *c. celicæ*, y.ad.male (treated as synonym of *oroensis*); *c. sobrina*, o.ad.male; *c. caucæ*, ad.male; *c. purui*, ad.male.

Although retained for the present as full subspecies, *caucæ* and *sobrina* are probably only local color phases of the one form. *Sobrina*, the darker, occurs primarily along the western slopes of the Andes of Ecuador; *caucæ* is from the Cauquita, tributary of the Rio Cauca in Colombia, and reaches eastward to Bogotá and down to the plains of the Rio Meta. It extends in a slightly modified state (the ventral surface being washed with light cinnamon) from Bogotá southward along the eastern Andean slope, at least as far as the Rio Pastaza in Ecuador. Western specimens of the species appear very slightly larger than those from east of the Andes, but on this point it is still unsafe to generalize.

The erection of the new subspecies, *albiventris* and *ucayaliensis*, may be questioned, especially since one is based upon a single specimen. Yet these forms are really easily distinguishable from their nearest allies, *madescens* and *purui*, neither of which seems to occur, respectively, so far south or west.

Key to the Subspecies of *caucæ*

1.—Bullæ , although provided with a process, moderately inflated and rarely much compressed; pelage long to moderately long. Mountain forms.....2.
Bullæ generally greatly compressed and pointed beneath; pelage generally short to moderately long. Lowland (eastern) forms.....6.

2.—Underparts clear, self-colored white, almost unnarrowed by gray-based hairs. *c. albiventris.*
Underparts with self-colored area more or less confined laterally by gray-based hairs.....3.

3.—Tail rather strongly bicolor (lighter beneath).....4.
Tail scarcely at all bicolor.....5.

4.—Pelage proportionately long and dark colored.....*c. madescens.*
Pelage proportionately short and light colored.....*c. oroensis.*

5.—Color dorsally light fuscous; under surface with tips of gray-based hairs usually more or less washed with cinnamon. Colombia and eastern Andes of Ecuador.....*c. caucæ.*
Color dorsally dark fuscous-brown; under surface with tips of gray-based hairs white or creamy like those of the self-colored hairs. Western Andes of northern Ecuador.....*c. sobrina.*

6.—Self-colored ventral area but little narrowed; palate in male long and narrow. *c. purui.*
Self-colored ventral area moderately to much narrowed; palate of normal dimensions.....*c. ucayaliensis.*

Marmosa caucæ caucæ Thomas

Plate X, Figure 81; Plate XXII, Figure 202

1900. *Marmosa caucæ* THOMAS, Ann. Mag. Nat. Hist., (7) V, p. 221. Type description.

1905. *Marmosa caucæ* TROUESSART, 'Cat. Mamm. viv. foss.,' Suppl., p. 856. Listed.

1912. *Thylamys caucæ* ALLEN, Bull. Amer. Mus. Nat. Hist., XXXI, p. 73. Record from San Antonio, Cauca.

1916. *Thylamys caucæ* ALLEN, Bull. Amer. Mus. Nat. Hist., XXXV, p. 201. Records from southwestern Colombia.

1916. *Marmosops caucæ* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 270. Listed.

1919. *Marmosa* (*Marmosa*) *caucæ* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 36. Listed.

TYPE LOCALITY.—Rio Cauquita, near Cali, 1000 m. In "R. Caquetá, a tributary of the Cauca, near Cali," Colombia, Mr. Thomas has correctly quoted the label on the type specimen. This label, however, is not the original label of Batty Parrish and Company. The American Geographical Society finds no tributary of the Rio Cauca named Caquetá, and Dr. F. M. Chapman declares that Batty never visited the Caquetá of eastern Colombia. However, numerous birds collected by the latter are labeled "Rio Cauquita, 1000 metres, near Cali," which stream is apparently the true name of the type locality of *caucæ*. Judging by the kinds of birds secured there, the place marks the junction of semiarid brush country with humid subtropics.

TYPE SPECIMEN.—B.M. 99.9.6.51. Adult male. Coll. J. H. Batty, No. 470, August, 1897.

MATERIAL EXAMINED (13 specimens)

COLOMBIA.—Ricaurte, 5000 feet (A.M.N.H. 34202, o.ad.male); western Quindio, Central Andes, 9000 feet (A.M.N.H. 32978, y.ad.male); San Antonio, Rio Cauca, Rio Cali, 7000 feet (A.M.N.H. 32178, o.ad.male); Rio Cauquita, Rio Cauca (B.M. 99.9.-6.51, type, ad.male); Mambita, Rio Meta (A.M.N.H. 62242, ad.female); Medina, Rio Meta (A.M.N.H. 70563, ad.male); Guaicaramo, Rio Meta [B.M. 26.12.11.2, ad.female; Bogotá 2, (?)]; Fusagasuga, near Bogotá, 6000 feet (Bogotá 4, ad.male).

ECUADOR.—Baeza (Stockholm 18, juv.); Palmera, Rio Pastaza, 4000 feet (A. M.N.H. 67284, ad.male; A.M.N.H. 67289, ad.female); San Antonio, Rio Ulva, 7600 feet (A.M.N.H. 67286, ad.female).

Size large, apparently one of the largest of the several subspecies.

Dorsal color in A.M.N.H. 32178 natal brown (R.) [the type is near Hay's brown (R.)], and in the Rio Pastaza animals darker, near light seal brown (R.). Beneath, with the median stripe greatly narrowed and often broken (Rio Pastaza, Ecuador). Color of fascia, creamy white. Those portions of the under surface which in other subspecies have the hair tips colored like the self-colored fascia and their bases gray, in *caucæ* may have the tips of the hair light brown—army brown (R.) to fawn color (R.), which gives an appearance of a light-brown wash over most of the under surface of the body.

SKULL.—The skulls of *caucæ* and *sobrina* are the largest and most strongly built of any of the subspecies.

DISTRIBUTION.—Eastern slopes of the Andes of Colombia and Ecuador, central and western Andes of Colombia. Probably interdigitating with *sobrina* of the western side. Two very young specimens (March), one from Baeza, Ecuador, the other from San José de Sumaco, Ecuador, have been examined. In these the self-colored ventral area is narrowed, but no trace can be seen of any brown over-color.

Marmosa caucæ sobrina Thomas

Plate X, Figure 82; Plate XXII, Figure 203

1913*a*. *Marmosa sobrina* THOMAS, Ann. Mag. Nat. Hist., (8) XII, p. 573. Type description.

1916. *Marmosops sobrina* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 270. Listed.

1919. *Marmosa* (*Marmosa*) *sobrina* CABRERA, 'Gen. Mamm.,' Mus Nac. Cien. Nat., Madrid, p. 39. Listed.

TYPE LOCALITY.—Mindo northwestern Ecuador, 4200 feet.

TYPE SPECIMEN.—B.M. 13.10.24.70. Old adult male. Coll. Gilbert Hammond, No. 163, July 3, 1913. Type in B.M.

MATERIAL EXAMINED (9 specimens)

ECUADOR: SUBTROPICS TO TROPICS.—Mindo, northwestern Ecuador (B.M. 13.10.24. 70, type, o.ad.male); Santo Domingo de los Colorados (B.M. 15.1.1.58, o.ad.male); Puente de Chimbo (A.M.N.H. 63415, juv.female); Pallatanga (A.M.N.H. 61610–11, o.ad.males; A.M.N.H. 61613–14, juv.males; A.M.N.H. 61612, juv.female); Ventura, Rio Chanchan (A.M.N.H. 61863, y.ad.female).

A large form with extremely dark pelage.

Dorsally, the color is near seal brown (R.) [in type description mummy brown (R.)], in the two animals from the type locality and Santo Domingo de los Colorados; specimens from Pallatanga to the south are near Hay's brown (R.). The unicolorous, median ventral area is characteristically rather broad (10 to 15 mm.); about 10 mm. in Pallatanga specimens, but variable; 8 mm. at Ventura, south of Pallatanga. The line of demarcation between dorsal and ventral color, while rather abrupt; is wavy and irregular.

DISTRIBUTION.—From the latitude of Guayaquil, the normal southern limit to which the warm ocean current, "el nino," reaches, northward along the western Andean slope. The range of the subspecies appears to interdigitate with that of *c. caucæ* on Colombia and with *c. oroensis* in southern Ecuador.

Sobrina and *caucæ* are only doubtfully distinguishable in subadults. The chief differences between old animals is to be found in the greater

size of *sobrina* and the frequent occurrence of a ventral cinnamon overwash in *caucæ*. On the average, skulls in *sobrina* slightly exceed those of *caucæ* in total length, zygomatic breadth, palatal length, breadth across M^3, length of nasals, breadth of brain case, distance from underside of condyle to tip of coronoid, length of M_{1-4} in mandible.

Marmosa caucæ oroensis Anthony

Plate X, Figures 83, 84; Plate XXIII, Figures 204, 205

1922. *Marmosa oroensis* Anthony, Amer. Mus. Novitates, No. 32, p. 3. March, 1922. Type description.

1922. *Marmosa celicæ* Anthony, Amer. Mus. Novitates, No. 32, p. 4. March, 1922. Type description.

Type Locality.—Portovelo, Prov. del Oro, Ecuador, 2000 feet (of *celicæ*, Celica, Prov. de Loja, Ecuador, 6900 feet).

Type Specimen.—A.M.N.H. 47180. Young adult male. Coll. H. E. Anthony, No. 1983. September 2, 1920. Type in A.M.N.H.

Material Examined (12 specimens)

Southwestern Ecuador.—Portovelo, El Oro (A.M.N.H. 47180, type, y.ad. male; A.M.N.H. 61381, ad.female); Alamor, El Oro (A.M.N.H. 61385–86, y.ad. males; A.M.N.H. 61387, juv.male; A.M.N.H. 47184, ad.female); Guainche, Alamor (A.M.N.H. 61388, juv. male; A.M.N.H. 61389, o.ad.female); Lunamá, near Alamor (A.M.N.H. 61383, o.ad.male; A.M.N.H. 61384, y.ad.male); Celica, Loja, 6900 feet (A.M.N.H. 47182, type of *celicæ*, y.ad.male); Salvias, El Oro (A.M.N.H. 47179, *celicæ*, y.ad.female).

"Between drab brown and wood brown" is the actual color of the tips of the dorsal hairs; the general effect of the dorsal surface, however, is near natal brown (R.). Comparison with *madescens* and *celicæ* reveals practically no difference in the latter, and in the former makes *madescens* out to be rather warmer in tone. The varyingly narrowed ventral stripe is between yellowish creamy and white. Transition from dorsal color to gray-based ventral hairs abrupt, but the line wavy and irregular.

Skull.—The skull shows little distinction from those of *madescens* and *sobrina*. See under remarks.

Distribution.—Probably throughout the western foothills in southern Ecuador below 7000 feet. Taken chiefly in the Province of El Oro, between 2000 and 7000 feet.

Remarks.—The specimens from Portovelo, 2000 feet, on the border of the xerophytic belt of deciduous forest that divides the cloud forest from the desert of Tumbez were described under the name *oroensis*. The principal difference between *celicæ*, here reduced to a synonym, and *oroensis*, is based upon slight swellings of those parts of the frontals in

the orbits which cover the olfactory lobes. The author of *oroensis* finds the swellings less developed in two females. Since this feature appears throughout the species to a varying extent, it seems to furnish scarcely sufficient grounds for separating the Portovelo specimens from other material from southern Ecuador.

Marmosa caucæ madescens Osgood

Plate X, Figure 85; Plate XXIII, Figure 206

1913*a*. *Marmosa madescens* Osgood, Field Museum of Natural History, X, p. 94. Type description.

1916. *Marmosops madescens* Matschie, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 271. Listed.

1919. *Marmosa* (*Marmosa*) *madescens* Cabrera, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 37. Listed.

1927. *Marmosa madescens* Thomas, Ann. Mag. Nat. Hist., (9) XIX, p. 375. Record from San Nicolas, 4500 feet, 20 miles east of Chachapoyas.

Type Locality.—Tambo Ventija, 10 miles east of Molinopampa, north Peru, about 9000 feet.

Type Specimen.—F.M.N.H. 19689. Juvenile male (milk premolars in mandibles). Coll. Osgood and Anderson, No. 4822, June, 1912. Type in F.M.N.H.

Material Examined (23 specimens)

Peru.—Taulis, west of Cajamarca, 9000 feet (A.M.N.H. 73161, o.ad.female; A.M.N.H. 73162–63, juv.males); Tambo Ventija, near Molinopampa (F.M.N.H. 19689, type, juv.male); Yurac Yacu, 2500 feet [B.M. 27.1.1.187–198, males; B.M. 27.1.1.200 (spirit) male; B.M. 27.1.1.199, female; B.M. 27.1.1.201–202 (spirit) females]; Uchco, 5000 feet (F.M.N.H. 19687, juv.male); Moyobamba, 2800 feet (F.M.N.H. 19356, v.juv.females); Poco Tambo (F.M.N.H. 19688, v.juv.female).

Moderately dark dorsally in the type and in other animals from nearby places.

Color (in type description) "Prout's brown," but the type now appears nearer Hay's brown, (R.) intermediate between *oroensis* and *sobrina*. Beneath creamy or yellowish creamy, the pattern decidedly variable.

Pelage long and soft, in the high mountain forms reaching a dorsal length of 12 mm. (type specimen), while that of the animals taken at Yurac Yacu averages 8 mm. Length of pelage is variable partly on account of the vertical range, but also probably on account of the moult, for the length of the fur is not necessarily proportioned to the altitude at which the animal is taken. The following dorsal pelage lengths of a series of specimens are shown in ascending order of altitude:

2500 feet	Yurac Yacu	7, 7, 8, 8, 9, 9 mm.
2800	Moyobamba	8, 9 mm.
3000	Leguia	5, 6 mm.
4000/5100	Poco Tambo	7, 8 mm.
5000	Uchco	10, 11 mm.
9000	Tambo Ventija	10, 11 mm.
9000	Taulis	10 mm.

SKULL.—The skull shows some tendency in old specimens, especially at high altitudes, to develop slight supraorbital ridges. This causes no confusion with members of the *noctivaga* section because in *caucæ madescens* the teeth are always much smaller than those in *noctivaga* and the brain case is proportionately rounder and broader.

MAMMARY FORMULÆ.—Yurac Yacu. B.M. 27.1.1.201 3–1–3?; B.M. 27.1.1. 202 4–1–4.

DISTRIBUTION.—Northeastern Peru, on the Huallaga and Marañón drainages between 9000 and 2500 feet. The animals from Taulis, which appears to be on the Pacific slope, are referred to *madescens*.

REMARKS.—As stated under "History and Nomenclature," the identity of *impavida* Tschudi cannot now be determined. Yet, as shown in the quotation from his "Reiseskizzen" under *n. noctivaga*, that form and *impavida* occurred together in the humid subtropics of the Chanchamayo Valley. In my opinion *impavida* was probably allied to *madescens*. Hendee and Rutter both found *noctivaga* and *madescens* in similar localities, while in the Pastaza Valley, eastern Ecuador, a like association is found in the case of their northern representatives, *lugenda* and *caucæ*. Whether *caucæ madescens* or *caucæ albiventris* or yet a third subspecies is the form of *caucæ* occurring in the Chanchamayo is unknown; but the less likely of these two is *albiventris*, whose white underparts suggest a rather dry habitat.

An alternative suggestion is that *impavida* may have been a form of *quichua*. This again is unlikely, since *quichua* fits Tschudi's description very poorly and (apparently) avoids regions of very high rainfall.

Marmosa caucæ albiventris Tate

Plate X, Figure 86; Plate XXIII, Figure 207

1920*b*. *Marmosa impavida* THOMAS, Proc. U. S. Nat. Mus., LVIII, p. 248. Discusses the under-mentioned specimen.

1931. *Marmosa caucæ albiventris* TATE, Amer. Mus. Novitates, No. 493, p. 9. Type description.

TYPE LOCALITY.—Torontoy, near Cuzco, Peru, alt. 8000 feet.

TYPE SPECIMEN.—U.S.N.M. 194378. Adult male. Coll. E. Heller, No. 129. April 30, 1915. Type in U.S.N.M.

MATERIAL EXAMINED

The type only.

The dorsal color of this animal is identical with type *c. madescens;* but ventrally it is clear white to the bases of the hairs from chin to vent, with the exception of an asymmetrical spot of gray-based hairs, 10 mm. in width, just behind the left arm and a slight reduction of the average width from 22 mm. to 16 mm. in the mid-ventral region. Tail rather strongly bicolor as in *madescens.*

SKULL.—The skull, which shows characters of full adulthood besides much wear of the teeth, is essentially like that of *madescens.* Minute beading has developed, the expansion of the nasals is slightly more abrupt, and the bullæ seem very slightly smaller.

DISTRIBUTION.—Known only from Torontoy.

Marmosa caucæ ucayaliensis Tate

Plate X, Figure 87; Plate XXIII, Figure 208

1928. *Marmosa madescens* THOMAS, Ann. Mag. Nat. Hist., (10) II, p. 265. Records from Contamana. Resemblance to *quichua.*

1931. *Marmosa caucæ ucayaliensis* TATE, Amer. Mus. Novitates, No. 493, p. 9. Type description.

TYPE LOCALITY.—Lagarto, Rio Ucayali, Peru.

TYPE SPECIMEN.—A.M.N.H. 78952. Young adult male. Coll. Olalla y Hijos. March 20, 1928. Type in A.M.N.H.

MATERIAL EXAMINED (25 specimens)

PERU.—Lagarto, Ucayali drainage, 25 miles below mouth of Rio Tambo (A.M.N.H. 78952, type, y.ad.male; A.M.N.H. 76532, male; A.M.N.H. 76533, y.ad.female; A.M.N.H. 76531, juv.female; A.M.N.H. 78953, y.ad.female); San Jeronimo, Ucayali drainage [B.M. 28.5.2.248–250, males; B.M. 28.5.2.251–254, 28.5.2.257, 28.5.2.259–263 (spirit), females; B.M. 28.5.2.255, juv.female]; Contamana, Ucayali drainage (B.M. 28.5.2.256, female); Leguia, Pachitea drainage, long. W. 75°, lat. S. 9° 20′ (B.M. 23.10.16.45, male; B.M. 23.10.16.46, female).

ECUADOR.—Mouth of Rio Curaray, Napo drainage (A.M.N.H. 71954, 71970, ad.males; A.M.N.H. 71965, ad.female).

A lowland representative of *caucæ* closest to *purui* characterized by unusually short fur (especially ventrally) and by exceptionally small, compressed bullæ.

Color of the type fuscous (R.) dorsally. This color is found in the majority of the specimens seen; but A.M.N.H. 78953 and B.M. 28.5.2. 253, 254, and 256 are much more reddish [near natal brown (R.) or Hay's brown (R.)], being apparently analogous to the red *neglecta* and *dorothea* in *noctivaga.* Underparts with the self-colored area generally moderately broad, narrowed to 10 mm. in the type; 15 mm. in A.M.N.H. 78953. Creamy white in most specimens, but in red examples cream color (R.).

Feet light buffy. Ears fuscous. Tail fuscous, lighter beneath.

SKULL.—Closely similar to *caucæ madescens*, except in the bullæ which are much more compressed, and to *c. purui*, except for the shorter distance from palate to bulla.

TEETH.—Canines moderately long in male (in males from Curaray rather compressed), shorter and compressed in females.

Five females from the Rio Ucayali have functional mammæ as follows: B.M. 28.5.2.259, 3–1–3; B.M. 28.5.2.260, 3–1–3; B.M. 28.5.2.261, 4–1–4; B.M. 28.5.2.262, 4–1–4; B.M. 28.5.2.263, 4–1–4.

DISTRIBUTION.—The lowlands of the Rio Ucayali and adjoining country, and also at the mouth of the Rio Curaray, lower Rio Napo, Ecuador.

REMARKS.—The best series of this subspecies collected by Hendee is in the British Museum. The Curaray specimens seem to bear somewhat the same relationship to those of the Ucayali that *n. polita* does to *n. noctivaga*, but in a different way. They are slightly larger (in body measurements rather than cranially), and the ventral self-colored area, instead of being wider than in the southern form, is often narrower. These differences scarcely form sufficient reason for separating the Curaray form. The skulls have the same width of arches and narrowed muzzles, and the tooth rows and bullæ are of the same size. The fur is similarly short and crisp, and the ears equal in size.

Ucayaliensis from Curaray can be distinguished easily from young specimens of *polita*, which are of the same size and color, by the smaller teeth, smaller ears, and narrow ventral fascia.

Marmosa caucæ purui Miller

Plate X, Figure 88; Plate XXIII, Figure 209

1913. *Marmosa purui* MILLER, Proc. Biol. Soc. Washington, XXVI, p. 31. Type description.

1916. *Thylamys purui* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 271. Listed.

1919. *Marmosa (Marmosa) purui* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 38. Listed.

TYPE LOCALITY.—Hyutanaham, Upper Rio Purus, Brazil.

TYPE SPECIMEN.—U.S.N.M. 105543. Adult male. Coll. Steere. March, 1901. Specimen in alcohol. The skull cleaned. Type in U.S.N.M.

MATERIAL EXAMINED (3 specimens)

BRAZIL.—Hyutanaham, Upper Rio Purus [U.S.N.M. 105543, type (Alc.), ad.male; U.S.N.M. 105544 (Alc.), y.ad.female]; Rosarinho, L. Miguel, Rio Madeira (A.M.N.H. 92201, ad.female).

Color dorsally, probably due in part to fading by alcohol, slightly darker than russet (R.), ventrally near cream color (R.), practically not narrowed by gray-based hairs. Line of demarcation straight and rather pronounced. Size of ears, compared with the series of *ucayaliensis*, larger or equal (19.0×15 in the male, but only 15.5×12 in the female).

The small, conic bullæ and strongly developed process of the bulla, as well as the narrow palate and proportionately narrow zygomatic arches, show the subspecies to be a member of the *noctivaga* group. From the small size of the teeth and lack of pronounced supraorbital ridges it must be included in the *fuscata* section. (It was compared by its author with *M. n. keaysi.*) From other subspecies of *caucæ*, the type is found to differ markedly in the long distance of the bulla from the palate and from the posterior molar, and in the fact that the posterior ends of the frontals and the anterior end of the supraoccipital project backward and forward, respectively, thus making the median suture between the left and right parietals unusually short (4.4 mm.). In the female, on the contrary, the above characters are far less apparent, and the skull is very nearly identical with that of *caucæ ucayaliensis*. In all, the female appears annectant between the male type and *ucayaliensis*, having the color and pattern of *purui* and the skull structure and small ears of *ucayaliensis*. It is evident that much more collecting is required before a decision can be reached regarding the merging of these two forms.

MAMMÆ.—Only 2–1–2 functional, but the animal is a young adult with short canines. Probably it has the characteristic number for *caucæ*. A single nursing young one was taken with the female. Evidently others were lost.

DISTRIBUTION.—Known only from the upper Rio Purus.

REMARKS.—Certain specimens of *ucayaliensis* from the Ucayali have the ventral area with the self-colored hair of the fascia but little narrowed, and in this feature appear to approach *purui*. This is exceptional, and none of the animals from the Rio Curaray in Ecuador show such broadening.

MICROTARSUS GROUP

Size small to very small—only one form (*lepida grandis*) approaching the size of a small member of the *murina* group; length of head and body 75 mm. in *emiliæ*, 100 in *marica*, 110 in *buenavistæ*, and 120 in *lepida grandis*.

Pelage of various qualities and textures,—even slightly waved (*marica*), but never woolly. Long guard hairs present in some species (*microtarsus, dryas, aceramarcæ*).

Dorsal color from cinnamon to cinnamon-gray or gray; never deep fuscous. Ventral color white, buff, yellow, or cinnamon-buff; gray-based ventral hairs present in varying degree, or absent. Vibrissæ normally long in rufous forms, short in grayish forms. Ear moderately large to small. Feet and claws small. Tail somewhat bicolor, moderately long to very long (*emiliæ*); never incrassated; very finely scaled and provided with long, minute hairs between scales (reduced in A.M.N.H. 67279 referred to *lepida*). Body hair on tail of slight extent.

Mammary arrangement in *lepida* section of the *murina* type,—i.e., entirely abdominal, accompanied by profound modification of the color and texture of the surrounding hair; in *microtarsus* section the mammæ arranged as in *elegans* group,—i.e., both pectoral and abdominal, the formula 7–1–7, and the surrounding hairs little or not at all modified.

Skull.—Small to very small; zygomata narrowly to broadly expanded. Relative brain capacity great or moderate as the form is small or larger. Nasals usually moderately well expanded at the maxillo-frontal suture. With skull in norma verticalis the nasals in the *microtarsus* section never exceeding the premaxillæ, but premaxillæ in *lepida* section usually strongly produced anteriorly. Interorbital region moderately broad; supraorbital ridges usually developed, but may be absent, in which case the frontals are smoothly rounded. On the other hand, they may be strongly developed into triangular processes. No marked post-orbital constriction. Temporal ridges well separated. Palate broad to narrow, very highly fenestrated (*microtarsus* section) or lacking accessory fenestræ (*lepida* section). Bridge broad. Bullæ moderately large, usually well rounded to slightly conic-pointed, with or without process.

Teeth.—Teeth proportionately small to moderate in size. Canines long, short, or very short, and provided with minute cusps at cingulum (*parvidens*).

Although treated as single group, it should be noted that apart from small size and brown or cinnamon coloration, the *microtarsus* and *lepida* sections have little in common. On the contrary they present marked and perhaps fundamental differences in the arrangement of the mammary system and in the palate. The first (*microtarsus*) conforms to the mammary arrangement seen in the *elegans* group (although other factors, such as the auditory bulla, teeth, swelling of the tail, are not in agreement); the second (*lepida* section) is similiar to the *murina* group in the arrangement of mammæ, palate, bullæ, etc. Considerable doubt must remain as to whether the present *microtarsus* group is monophyletic in the sense that the other four groups of *Marmosa* are until much more

material, both dried specimens and alcoholics for making accurate counts of the mammæ, can be accumulated from over the whole range of the group.

For distribution of *microtarsus* group see figure 25.

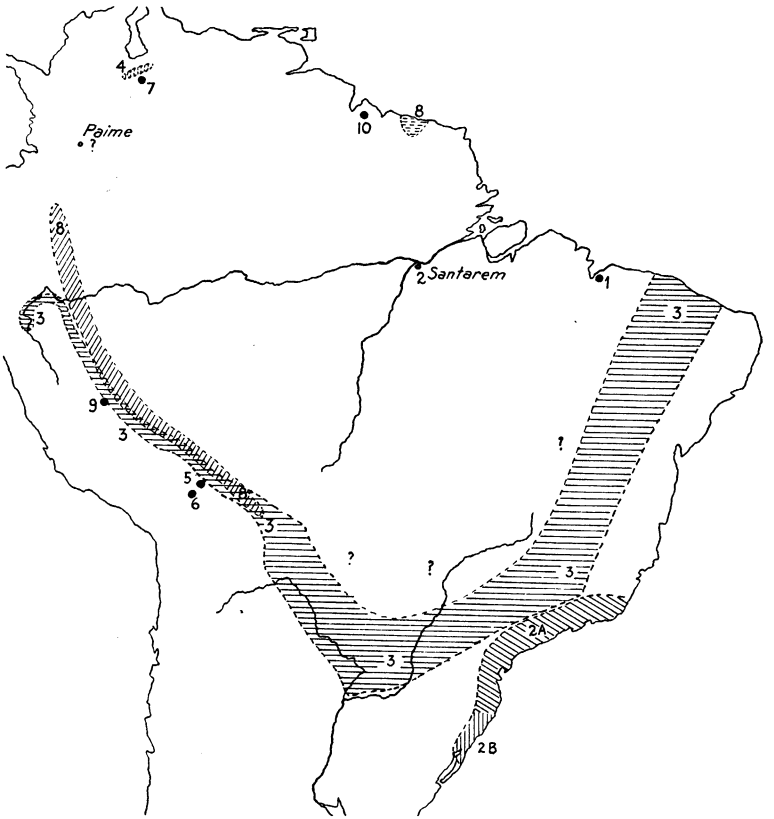

Fig. 25. Distribution of species and subspecies of *microtarsus* group.

1. *M. emiliæ*
2A. *M. microtarsus microtarsus*
2B. *M. microtarsus guahybæ*
3. *M. agilis*
4. *M. marica*
5. *M. unduaviensis*
6. *M. aceramarcæ*
7. *M. dryas*
8. *M. lepida*
9. *M. juninensis*
10. *M. parvidens*

Microtarsus Section

One of the two main divisions of the *microtarsus* group and distinguished by extreme fenestration of the palate and the presence of both pectoral and abdominal mammæ, this section, which extends vertically from sea level to 11,000 feet, contains the majority of the animals belonging in the group.

Several trends of development may be remarked in the section: the very small, long-tailed *emiliæ* of Ceará; the rough-haired *microtarsus* of southeastern Brazil (and Santarem); the smoother coated gray or brown *agilis*-like forms from farther north and west, including their longer haired relative *marica* of the Venezuelan Andes (subtropics); and finally, the two small, reddish forms, *aceramarcæ* and *dryas*, from widely separated lower temperate regions in Bolivia and Venezuela.

Such is the general structural uniformity of these small forms of *Marmosa* that distinguishing characters are found only with much difficulty. And these are apparently of rather fluctuating and unstable value, offering little basis in many cases for distinctions of higher than subspecific rank. Lack of material also prevents anything more than a very imperfect comprehension of the distribution and intergradation of the forms comprising this group.

KEY TO *microtarsus* SECTION

1.—Ratio of tail length to body length almost as 2 to 1; species very small.. *emiliæ*.
Ratio of tail length to body length at most as 3 to 2; size larger.....2.
2.—Pelage bright cinnamon, long, fine, rough-appearing, and with numerous over-hairs; from southeastern Brazil.....(*microtarsus*) 3.
Pelage more even, shorter, flat-lying, duller in color; or, if reddish and provided with long guard hairs, then from high Andes of Bolivia and Venezuela...4.
3.—Relatively large; maxillary M^{1-3} from 4.8 to 5.3....*microtarsus microtarsus*.
Relatively small; maxillary M^{1-3} from 4.4 to 4.6.....*microtarsus guahybæ*.
4.—Pelage strongly waved or mottled in appearance; from subtropics of Venezuelan Andes.....*marica*.
Pelage very little or not at all waved.....5.
5.—Throat gland undeveloped; guard hairs numerous.....6.
Throat gland developed; guard hairs few.....(*agilis*) 8.
6.—Color brownish gray above, buffy white beneath; dorsal surface of shank same color as foot.....*unduaviensis*.
Color deep cinnamon above, beneath cinnamon washed; dorsal surface of shank of hind leg deep fuscous; guard hairs very numerous.....7.
7.—Color dorsally between auburn and bay; from mountains of Mérida region. *dryas*.
Color dorsally between Mars brown and russet; from Cordillera Real, Bolivia. *aceramarcæ*.
8.—Dorsal color brown, mainly cinnamon.....9.
Dorsal color gray or brownish gray.....10.
9.—Ventral surface, or at least the median line, white.....*agilis chacoensis*.
Ventral surface buff.....*agilis agilis*.
10.—Pelage long and lax, very slightly waved.....*agilis peruana*.
Pelage short and straight, not waved.....11.
11.—Size relatively small (northeastern Brazil).....*agilis beatrix*.
Size relatively large (Sta. Cruz, Bolivia).....*agilis buenavistæ*.

NOTE.—Three specimens in M.C.Z., referred to under *a. peruana*, which have no skulls, are not accounted for in this key, since it cannot be determined whether they belong in the *lepida* section or in the present one.

Marmosa emiliæ Thomas

Plate X, Figure 89; Plate XXIII, Figure 210

1909. *Marmosa emiliæ* THOMAS, Ann. Mag. Nat. Hist., (8) III, p. 379. Type description.

1916. *Grymæomys emiliæ* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 270. Listed.

1919. *Marmosa emiliæ* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 36. Listed.

TYPE LOCALITY.—Pará, Brazil.

TYPE SPECIMEN.—B.M. 9.3.9.10. Young adult male, M^4 not fully through. Coll. Miss E. Snethlage, No. 30, February 13, 1909. Type in B.M.

MATERIAL EXAMINED

The type only.

Color dorsally between chestnut-brown (R.) and carob brown (R.); ventrally creamy, the hairs self-colored to the roots. Eye-rings well marked. Ears proportionately rather large. Feet whitish. Tail excessively long, nearly twice length of head and body. Fur soft, rather short.

SKULL short and broad, essentially as in *agilis*, but smaller. Muzzle short and very narrow. Palate with normal fenestration of the group; bullæ large and provided with a small process. Teeth very small.

DISTRIBUTION.—Pará, and extent unknown.

REMARKS.—The unusual feature in *emiliæ* is the very long tail. Its small size is less notable, because, after all, it is a young animal.

Marmosa microtarsus (Wagner)

(Synonymy under subspecies)

Vividly colored, between tawny (R.) and russet (R.), with long pelage which is usually rough or shaggy-looking on account of the numerous over-hairs. Face distinctly paler than body color. Underparts, posterior to the throat, with the hairs entirely gray-based. Vibrissæ usually well-developed and rather long. Ocular mark in *m. microtarsus* large and very black, though in *m. guahybæ* small.

SKULL.—Skull so remarkably like that of *agilis* that it is doubtful whether the slight cranial differences between the two species are constant. For description see under subspecies.

DISTRIBUTION.—Records indicate it more or less confined in southeastern Brazil to the coastal strip of the provinces of São Paulo, Paraná,

Santa Catharina, and Rio Grande do Sul. At Palmeira, Paraná, it reaches an altitude of 3000 feet. However, a *microtarsus* is known from Santarem (B.M).

From the known distribution it appears to frequent regions of moderate to comparatively high rainfall in contrast to at least some forms of *agilis*, of the Chaco country, Lagoa Santa, and the dry northeastern portion of Brazil.

Marmosa microtarsus microtarsus (Wagner)

Plate XI, Figures 90, 91; Plate XXIII, Figures 211, 212

1842. *Didelphis microtarsus* WAGNER, Archiv für Naturgeschichte, VIII, (1), p. 359. Type description.

1850. *Didelphis microtarsus* WAGNER, Abh. Math. Phys. Akad. Wiss., München, V, p. 147. Fuller description and set of measurements. Loc. Ypanema.

1855. *Didelphys microtarsus* WAGNER, Schreber 'Säugeth, Suppl.,' V, p. 243. Full description and measurements.

1883. *Didelphis microtarsus* PELZELN, 'Bras. Säugeth.,' Verhandl. Kaiserl. Königl. Zool. Bot. Gesell., Wien, Suppl., XXXIII, p. 114. Brief description and mention of living specimens.

1888*a*. *Didelphis pusilla* THOMAS, 'Cat. Marsup. Monotr.,' Brit. Mus., p. 348. Includes synonymy of *agilis;* but most of material listed is *m. microtarsus* and none is truly *agilis*.

1893. *Grymæomys microtarsus* WINGE, 'Jordf. Nulevende Marsup. Lagoa Santa,' E. Mus. Lundii, II, p. 24. Probably based upon the Copenhagen specimen, No. 225, which, although collected by Lund, is not certainly known to be from Lagoa Santa.

1894. *Micoureus pusillus* GOELDI, Proc. Zool. Soc. London, p. 462. Description based upon living specimens with habit notes.

1898. *Marmosa microtarsus* TROUESSART, 'Cat. Mamm. viv. foss.,' II, p. 1239. (Syn. *murina murina*.)

1900*a*. *Marmosa microtarsus* THOMAS, Ann. Mus. Civico, Genova, (2) XX, p. 546. Mammals from Paraná. Thomas thinks *microtarsus* distinct from "*pusilla*."

1916. *Marmosa microtarsus* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 270. Listed.

1919. *Marmosa microtarsus* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 37. Listed.

TYPE LOCALITY.—Ypanema, São Paulo, Brazil.

TYPE SPECIMEN.—None designated. Apparently based upon at least three specimens collected by Natterer at Ypanema which are to be regarded as co-types. These are Vienna 48, 48A, and 48B. 48A bears a label marked as follows[1]:

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[1]The back of the label gives the date when it was made over into a study skin (January, 1927). Vienna 48B is younger, with rather narrower skull and has the supraorbital ridges less sharpened. The scrotum, though small, is visible. Its label bears on the face:

Didelphis murina, m. et. f. L.
48B. Natterer Brasilien.

and on the back:

Didelphis murina, m. et. f.
Nat. Nr. 48 Ypanema, 4. Jun. 819.
Brasilien—

It is better preserved than 48A, with slightly pale face, rough cinnamon brown hair, underparts cinnamon buff, gray-based, except chin.

N. 48 Bras.
Didelphis microtarsus m. Natt.
Joh. Natterer, Ypanema
2. Oktob. 821.

MATERIAL EXAMINED (25 specimens)

BRAZIL.—Ypanema, between São Paulo and Sorocaba, São Paulo [Vienna 48A, ad.male, 48B, y.ad.male, 48, juv.male (all co-types)]; Rio de Janeiro, São Paulo (B.M. 52.8.27.18,?); Theresopolis, Rio de Janeiro, São Paulo (F.M.N.H. 26575, ad. male); Porto Real, Rio de Janeiro, São Paulo [B.M. 91.6.16.7–8, (Alcs.), ad.males; Berlin 12265, ?]; Palmeira, Paraná [B.M. 0.6.29.18–19, (Alcs.), y.ad.males]; Joinville, Sta. Catharina [B.M. 13.7.8.14–18 (Alcs.), juveniles; Berlin 36560, (skull only), ?; Hamburg 39831 (spirit), juv.male]; Near Rio Itapocu, Sta. Catharina [Hamburg 39155 (Alc.), juv.female]; Blumenau, Sta. Catharina [Berlin 7262, (skull only) ?]; Ararangua, Sta. Catharina (Vienna ?, o.ad.male); "Sta. Catharina" (F.M.N.H. 22438, y.ad.?; B.M. 50.7.8.40, ad.male); No Locality [Berlin 3709, ad.male; Copenhagen 225 (Lund Coll.)?; Copenhagen L 24, ad.male].

Description of the co-type, Vienna 48A: Dorsal color rather bright cinnamon-red, with the face paler. Hair long and rough. Underparts cinnamon-buff, the hairs gray-based, and only those of the chin self-colored. Ears large and broad, not much pigmented (or perhaps faded); tail finely haired, but worn in places, and the scales countable. Feet rather small and slender. Scrotum large.

SKULL.—With broadly expanded zygomata, and rather narrow muzzle. Nasals rather long-pointed behind, with moderate expansion at the base. Supraorbital ridges finely beaded, with incipient processes; temporal ridges widely separated. Palate highly fenestrated as usual in the group, rather broad behind; tooth rows moderately convergent. Bullæ moderately large and rounded, with small processes.

Compared with *agilis*, *microtarsus* is remarkable for the rough appearance of its pelage. This seems due to the more numerous over-hairs in *microtarsus* and the tendency in *agilis* for the hair to lie more appressed. *Microtarsus* is much more vividly colored than *agilis*, and the spreading of the gray-based hairs completely across the ventral area, except for the chin, affords another probably constant difference. In general, too, the inside of the ear-conch of *microtarsus* seems rather deeply fuscous pigmented terminally, and yellowish basally; compared to the duller and more nearly uniformly colored ears of *agilis*. The vibrissæ of *microtarsus* are proportionately longer, the hind foot, as a rule, slightly longer, and the ear smaller than in *agilis*. The scales of the tail of *microtarsus* are less fine than those of *agilis*.

The skulls are extremely alike, differing solely in finer detail; in the usually slightly longer tooth rows of *microtarsus;* in its somewhat broad-

er and shorter bridge and proportionately greater width across the petrosals.

The specimen from Santarem is unquestionably *microtarsus;* but only a fragment represents the skin, so that no subspecific distinction can be asserted. Its color seems darker, with a stronger admixture of fuscous than in typical specimens.

Members of this species have not infrequently been identified as *pusilla* Desmarest. In each case the specimens were actually the cinnamon-colored *microtarsus* and came from southeastern Brazil. True *pusilla* forms part of the *elegans* group, whose only known representative in Brazil is *velutina.*

Marmosa microtarsus guahybæ Tate

Plate XI, Figures 92, 93; Plate XXIV, Figures 213, 214

1872. *Grymæomys agilis* HENSEL, Abh. König. Akad. Wiss., Berlin, p. 124. Record from Guahyba and brief description.

1888*a*. *Didelphis pusilla* THOMAS, 'Cat. Monotr. Marsup. Brit. Mus.,' p. 348. See material listed.

1931. *Marmosa microtarsus guahybæ* TATE, Amer. Mus. Novitates, No. 493, p. 10. Type description.

TYPE LOCALITY.—Island of Guahyba, near Porto Alegre, Rio Grande do Sul, Brazil.

TYPE SPECIMEN.—Berlin 4306. Young adult male. Coll. Hensel. Type in Berlin Museum.

MATERIAL EXAMINED (9 specimens)

BRAZIL.—Rio Grande do Sul: Guahyba Island, near Porto Alegre (Berlin 4306, type, y.ad.male); Taquará [B.M. 82.9.30.42 (Alc.), ad.female]; São Lourenço [Berlin 11127, y.ad.male; B.M. 85.6.26.25 (Alc.), 88.11.30.15 (Alc.), ad.males; B.M. 99.8.12.2 (Alc.), y.ad.male; B.M. 87.5.17.5 (Alc.) juv.female; U.S.N.M. 236677, ad. ?]; "Rio Grande do Sul" [B.M. 91.3.20.13 (Alc.), ad.male].

A small form of *microtarsus* with short tooth rows, occupying the southern part of the range of *microtarsus* in the Province of Rio Grande do Sul, Brazil.

Size much less than that of *m. microtarsus.*

Color above light, rather warm cinnamon, the face considerably paler. Hairs of underparts gray-based from the chest posteriorly; those of chest and anterior to chest self-colored. Color a rather deep buff, with chin whitish. Eye-ring only moderately developed, extending 2 to 3 mm. toward the ear and forward among the roots of the vibrissæ; narrowed or absent beneath eye. Ears small. Vibrissæ rather short. Feet very small, light brown-buff; toes small. Tail slightly bicolor.

SKULL.—Skull rather narrower than in *m. microtarsus*, but this may be an age character; supraorbital parts smoothly rounded in type. Bullæ with only a suggestion of an anterior process. Teeth very small.

DISTRIBUTION.—Probably confined to the coastal parts of Rio Grande do Sul, perhaps extending for a short distance into Sta. Catharina, where it must meet the larger *m. microtarsus*.

REMARKS.—Several specimens of this animal were collected by von Ihering, and possibly the animal observed by Dr. G. M. Allen in the museum at São Paulo labeled in pencil *thomasi* may be this animal. No description was ever published, however.

The female, B.M. 82.9.30.42, exhibits remarkable mammary development. The number of functional teats is 7–1–7, and they extend from belly to breast (Fig. 3, p. 35).

Hensel, who refers his specimen to *agilis*, says "found under a root of a tree . . . only captured with difficulty on account of its quickness."

Marmosa agilis (Burmeister)

(Synonymy under subspecies)

Although of extremely wide range, records seem to show that this species, except possibly in extreme northeastern Brazil, does not reach the Atlantic coast.

Color varies from the dull, dusty brown of *a. agilis* and *a. chacoensis*, to the grayish brown of *a. beatrix* and *a. buenavistæ*. In each case, however, the fur lies smooth and close, and is very uniform in length, while the ears vary from moderate to large. In every case, too, there is an area of self-colored hairs passing down the middle of the ventral surface of the body. Vibrissæ short. Tail proportionately a little shorter than in *microtarsus*.

SKULL.—The skull, although embodying the group characters, offers scarcely any characters of specific value. The teeth are almost always rather smaller than in *m. microtarsus*, but larger than in *m. guahybæ*. The palate, general proportions of the skull, etc., vary with the subspecies under consideration, and parallel *microtarsus* and other species of the group very closely. The bullæ may have processes or be without them, according to subspecies.

DISTRIBUTION.—From Ceará, in northeastern Brazil southwest to Lagoa Santa; then continuing southwest, but interior to the coastal sections of São Paulo, Paraná, Santa Catharina, and Rio Grande do Sul (which is the range of *microtarsus*), to the Chaco of Paraguay and Argentine. Thence it ranges westward into the Santa Cruz region of Bolivia,

and reaches northward into the Peruvian Andean foothills. (Map, Fig. 26.)

Marmosa agilis agilis (Burmeister)

Plate XI, Figure 94; Plate XXIV, Figures 215, 216

1854. *Grymæomys agilis* BURMEISTER, 'Thiere Brasil,' I, p. 139. Type description. "A quite young individual."

1856. *Grymæomys agilis* BURMEISTER, Erläut. zur Fauna Brasiliens, Berlin, p. 82. Fuller description. Skull, Pl. XI, f. 6. Locality, Lagoa Santa.

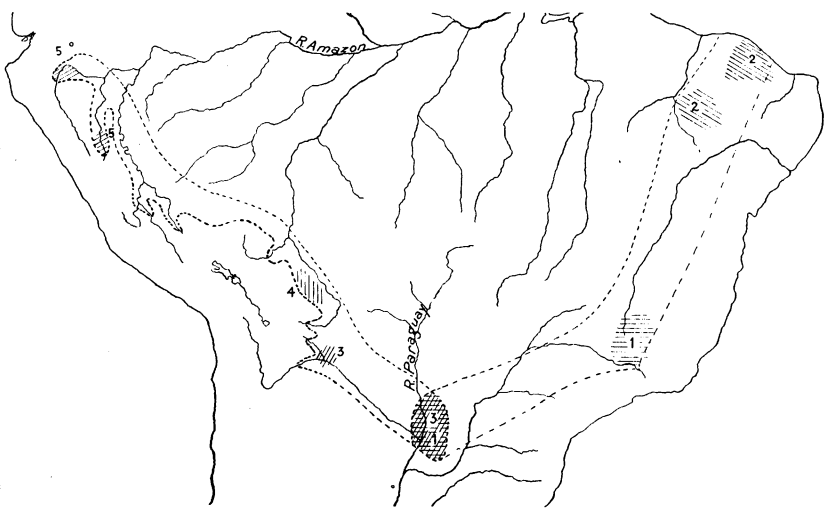

Fig. 26. Distribution of *M. agilis*.

1, *M. agilis agilis;* 2, *M. agilis beatrix;* 3, *M. agilis chacoensis;* 4, *M. agilis buenavistæ;* 5, *M. agilis peruana.*

1893. *Grymæomys pusillus* WINGE, 'Jordf. Nulevende Pungdyr Lagoa Santa,' E. Mus. Lundii, II, p. 27. Structure of Lagoa Santa animals.

1916. *Grymæomys agilis* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 270. Listed.

1919. *Marmosa agilis* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 38. Listed as synonym of *microtarsus*.

TYPE LOCALITY.—Lagoa Santa,[1] Brazil.

[1] "Lagoa Santa is a small village of the Brazilian province of Minas Geraes. It is situated at S. lat. 19° 40′, to the N.N.W. of Rio de Janeiro. . . . There lived . . . Lund from 1835 to 1880 . . . was visited three times by Reinhardt." See Warming, 1892.

TYPE SPECIMEN.—Described from a single individual, but not designated by number—apparently the young adult now at Halle, sex indeterminable. The skin, which is mounted, carries the following label[1]:

Didelphis agilis
Burmeister, Säugeth. Bg.
D. murina el. elegans Lund.
nr. 147 Gr.
Lagoa Santa Burm.

MATERIAL EXAMINED (22 specimens)

BRAZIL.—Lagoa Santa, Minas Geraes [Halle 357 (262), type, y.ad.?; B.M. 93.4.16.4, female; Copenhagen 145–147, 149–152, 154, 155, 157,?]; Brumado, Minas Geraes (Copenhagen 148, ?).

PARAGUAY.—"V. Clarrica" (probably Villa Rica) (Hamburg 42356, ad.female); Sapucay (B.M. 3.2.3.39, y.ad.male; B.M. 3.4.7.22, ad.male; B.M. 4.1.5.46–47, y.ad.males; B.M. 3.4.7.23, female); Concepcion [B.M. 11.11.9.22, (Alc.), ad.male; B.M. 11.11.9.23, ad.female]; Itapé Camp, Chaco, near Sapucay (Berlin 40135, ad.male).

Skin of type very faded brown. The hair rather close and even in length. Chest and posterior parts gray-based; throat and neck with self-colored hairs, buff-white. Vibrissæ short; eye-rings elongate before and behind, narrowed above and below. Feet small. Tail thickly covered with fine hair.

SKULL.—Skull apparently rather short and broad. Muzzle pointed. Bullæ rather large, rounded, with process.

TEETH.—Canines short, close together; tooth rows well convergent.

The following is a more complete description prepared from a fully adult male, B.M. 3.4.7.22, from Sapucay, Paraguay.

Dorsal color a dull, almost dusty shade, nearest to russet (R.) or Brussels brown (R.). Color ventrally between warm buff (R.) and cinnamon-buff (R.). Gray-based hairs throughout, except from upper chest to chin and around the scrotal region. Face not markedly paler than dorsum; ears large, light gray-brown; vibrissæ short; feet rather pale; tail very slightly bicolor, brown.

Skull with well-expanded zygomata; nasals moderately expanded at base; supraorbital ridges sharp-edged and with incipient processes;

---

[1]The skull is in a small round box labeled:

262
Didelphis
agilis
Cranium

This box is contained in a second box which also bears a label:

Didelphis
agilis Burm.
No. 357, Lagoa Santa
(Burm.)

The skull is in fragments, only the palato-nasal part being intact; but this allows measurements of the teeth. Also the bullæ are together and measurable. No other specimen of *agilis* exists in Halle Museum.

temporal ridges widely separated. Palate strongly fenestrated, rather long; tooth rows moderately convergent; canines very short; bridge moderate in breadth. Bullæ rather large, well rounded, with small, but quite distinct processes.

The specimen, B.M. 11.11.9.23, has a total of 13 functional mammæ (6–1–6); the most anterior pair reaching the thoracic region, but not so far forward as the arms, as seen in *microtarsus guahybæ*.

Marmosa agilis beatrix Thomas

Plate XI, Figure 95, Plate XXIV, Figure 217

1910*a*. *Marmosa beatrix* THOMAS, Ann. Mag. Nat. Hist., (8) VI, p. 502. Type description.

1916. *Grymæomys beatrix* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 270. Listed.

1919. *Marmosa beatrix* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 36. Listed.

TYPE LOCALITY.—Ipu, Ceará, Brazil.

TYPE SPECIMEN.—B.M. 11.4.23.24. Old adult female. Coll. Miss E. Snethlage. Type in B.M.

MATERIAL EXAMINED (4 specimens)

BRAZIL.—Ipu, Ceará (B.M. 11.4.23.24, type, o.ad.female); Jua, near Iguatú, Ceará (F.M.N.H. 20230–31, ad.males); Serra Ibiapaba, Piauhy, lat. S. 3°-5°, long. W. 39° 40′–41° (F.M.N.H. 25248, o.ad.male).

Color of dorsal region with the distinct grayish cast often seen in animals from rather dry regions—from benzo brown (R.) on the middle back lightening to cinnamon-drab (R.) on the sides. Ventrally a whitish shade of cream-buff (R.). Face rather pale; ears rather large, light fuscous-brown. Eye-rings narrowed. Feet small, light gray-brown. Tail rather short, gray-brown, bicolor. Glandular area of throat highly developed. Hairs around it discolored.

SKULL.—Broad and short, palate short, teeth small; but essentially like *a. agilis*.

DISTRIBUTION.—The drier parts of northeastern Brazil south of the Amazon. Probably throughout the Provinces of Ceará, Piauhy, and the arid part of northeastern Brazil.

REMARKS.—The old male from Piauhy is dorsally rather browner than the type.

Marmosa agilis chacoensis Tate

Plate XI, Figure 96; Plate XXIV, Figure 218

1931. *Marmosa agilis chacoensis* TATE, Amer. Mus. Novitates, No. 493, p. 10. Type description.

TYPE LOCALITY.—Sapucay, Paraguay.

TYPE SPECIMEN.—B.M. 4.1.5.48. Young adult male. Coll. W. Foster, No. 1123, September 11, 1903. Type in B.M.

MATERIAL EXAMINED (6 specimens)

PARAGUAY.—Sapucay (B.M. 4.1.5.48, type, male; B.M. 5.8.1.8, male); "Paraguay" (B.M. 98.5.14.6, female); Itapé Camp, Chaco, near Sapucay (Berlin 40134, y.ad.male).

ARGENTINA.—Las Palmas, Chaco (U.S.B.S. 236329, y.ad.male); Villa Montes, Upper Pilcomayo R., long. W. 63° 30′, Chaco (München 1926/641, y.ad.male).

Type similar to *a. agilis*, but generally smaller and with ventral area self-colored, buffy-white and its centermost portion clear white. Dorsal color essentially the same dusty brown as in *a. agilis*, near walnut brown (R.); face scarcely paler than dorsum. In the type the face has a faint suggestion of a median line, but this feature is not constant. Eyering more reduced than in *a. agilis* or in *a. buenavistæ*. Ear moderate, light fuscous-brown. Tail slightly bicolor, light gray-brown.

SKULL.—Skull with zygomatic expansion rather slight (possibly an age character); nasals rather irregular and moderately broadened at base; no trace of supraorbital ridges, and the postorbital constriction rather pronounced, though less so in other specimens. Molar tooth rows shorter than in *a. agilis*.

The above description of the type, however, is too restrictive, and other animals which are provisionally referred to *chacoensis* are: U.S.B.S. 236329, from the Argentine Chaco, in which the hairs of the underparts are unicolorous and white throughout, the lateral color blending gradually into the white; and München 1926/641 from Villa Montes, Paraguayan Chaco, with the underparts dull cinnamon-buff, from chin to chest self-colored and posteriorly gray-based, the gray bases, however, short. The latter animal should perhaps be distinguished subspecifically, but until more material is collected it is best to leave it in *chacoensis*.

DISTRIBUTION not ascertained, but probably throughout Paraguay, and westward into northern Argentine.

Marmosa agilis buenavistæ Tate

Plate XI, Figure 97; Plate XXIV, Figure 219

1931. *Marmosa agilis buenavistæ* TATE, Amer. Mus. Novitates, No. 493, p. 10. Type description.

TYPE LOCALITY.—Buenavista, Dept. of Sta. Cruz, Bolivia.

TYPE SPECIMEN.—B.M. 26.12.4.91. Adult nursing female. Coll. J. Steinbach, No. 1618, March 7, 1916. Type in B.M.

MATERIAL EXAMINED (10 specimens)

EASTERN BOLIVIA.—Buenavista (B.M. 26.12.4.91, type, ad.female; B.M. 28.2.9.93, ad.female; B.M. 26.12.4.92–93, juveniles; B.M. 28.2.9.92, 26.12.4.90.

males); Rio Palomotitlas, tributary of Rio Piray, Buenavista (B.M. 28.2.9.89, ad.male); Lake Balzon (B.M. not registered, male); Puerto Suarez, on Laguna Caçeres, tributary of Rio Paraguay (Pittsburgh 1854, juv.male); Province of Sara (Pittsburgh 2168, juv.male).

Larger than the white-bellied *chacoensis* of Paraguay, with larger ears. Color above near Verona brown (R.) with the face paler. Underparts yellow buff, self-colored except for the gray-based hairs which narrow the stomach area to a strip of self-colored hairs only 10 mm. in width. Eye-rings well marked, narrowed beneath posterior corner of eye. Vibrissæ black, long. Ear rather large, light fuscous. Feet buffy. Tail slightly bicolor, light fuscous-brown.

SKULL.—Skull with rather broad zygomata, snout pointed, but rapidly broadening. Supraorbital ridges sharp, the processes only moderately developed. Palate as in *a. agilis*. Bullæ well developed, rounded, with process as in *agilis*.

DISTRIBUTION.—Known only from Santa Cruz region, Bolivia.

REMARKS.—This form is distinguished from *agilis* by its coarser pelage and long vibrissæ, and from *chacoensis* by its buff ventral color and large ears.

An apparently distinct form of *agilis*-like *Marmosa* also from Buenavista and collected by Steinbach may be mentioned here. It is B.M. 28.2.9.92, an adult male, collected on March 6, 1925. No skull can be found. Its pelage is remarkably harsh, and the region of throat and neck is covered with erect stiff hairs. Color above between russet (R.) and cinnamon-brown (R.) beneath near tawny-olive (R.). Ears small, fuscous brown. Eye-rings somewhat narrow. Feet a little darker than the ventral color. Tail gray-brown, slightly bicolor. Measurements of skin (dry); head and body, 93; tail, 120; hind foot, 18 (collector states 15); length of ear, 16.

Marmosa agilis peruana Tate

Plate XI, Figure 98; Plate XXIV, Figure 220

1927*b*. *Marmosa marica* THOMAS, Ann. Mag. Nat. Hist., (9) XX, p. 608. States that these are indistinguishable from *marica*.

1931. *Marmosa agilis peruana* TATE, Amer. Mus. Novitates, No. 493, p. 11. Type description.

TYPE LOCALITY.—Tingo Maria, Upper Rio Huallaga, Huánuco, Peru, 2000 feet.

TYPE SPECIMEN.—B.M. 27.11.1.268. Young adult male. Coll. R. W. Hendee, No. 1063, January 20, 1927. Type in B.M.

MATERIAL EXAMINED (2 specimens)

PERU.—Tingo Maria, Rio Huallaga (B.M. 27.11.1.268, type, y.ad.male; B.M. 27.11.1.269, v.y.ad.female).

Above near Prout's brown (R.), with face paler. Underparts buffy, self-colored as far back as chest. Pelage very slightly "waved" as in *marica*. Vibrissæ very short. Ears very small. Glandular area on throat well developed. Feet buffy white. Tail light fuscous-brown, slighty bicolor.

SKULL.—Very near the *marica-agilis* type. Zygomata broadly spreading. Nasals narrow, with but broadened basal parts. Muzzle narrow. Supraorbital processes practically undeveloped. Palate with moderately convergent tooth rows and with usual accessory openings found in the section. Very small teeth. Bullæ small, rather compressed, with well-developed processes.

DISTRIBUTION.—Known only from Tingo Maria, Peru.

REMARKS.—This is the third of three superficially convergent species in northeastern Peru—the other two being the grayer forms of *quichua* and the Ucayali representative of *caucæ*. From the former, *peruana* is distinguished by its much smaller teeth, possession of accessory posterior palatal openings, lack of supraorbital ridges, possession of a process on the bulla, and relatively short, pilose tail. Its smaller size, short, broad palate, and other characters of the *microtarsus* group separate it from *ucayaliensis*.

It is separable from *marica* by its gray-brown and less "waved" pelage, less yellow throat, less gray posterior underparts, smaller ears, shorter vibrissæ, smaller teeth and bullæ.

The following animals are probably, but not certainly, distinct from the above (since *peruana* is based upon quite young specimens): Three specimens whose skulls are unfortunately lost, M.C.Z. 17057 to 17059, one male and two females, collected by the Harvard Peruvian Expedition of 1916. They belong, apparently, in the *microtarsus* group, and appear more nearly allied to *agilis*, *buenavistæ*, or even *marica* than to *lepida*. Dorsal color between tawny (R.) and russet (R.), with scarcely any of the normal mottling of *marica;* face distinctly paler; ventral color a strong yellow, near apricot yellow (R.) or buff-yellow (R.), the anterior parts of the body as usual more deeply colored than the posterior. Gray-based hairs commence behind the arms posteriorly, leaving, however, a median self-colored stripe about 6 mm. in width. Dorsal pelage 8 mm. Throat gland well developed. Eye-rings only moderately developed. Ears small, light brown. Vibrissæ short. Feet small, brownish buff. Tail moderately long, strongly bicolor, fuscous brown dorsally and ventrally buffy brown. They are from Bellavista, in the dry Marañón Valley, about S. lat. 5° 30′; altitude about 1000 feet. Collected at the end of September by natives.

Marmosa marica[1] Thomas

Plate XI, Figure 99; Plate XXIV, Figure 221

1896. *Marmosa pusilla* THOMAS, Ann. Mag. Nat. Hist., (6) XVIII, p. 314. Remark under *m. fuscata.*

1898. *Marmosa marica* THOMAS, Ann. Mag. Nat. Hist., (7) I, p. 455. Type description.

1905. *Marmosa marica* TROUESSART, 'Cat. Mamm. viv. foss.,' Suppl., p. 856. Listed.

1916. *Grymæomys marica* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 270. Listed.

1919. *Marmosa marica* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 37. Listed.

TYPE LOCALITY.—R. Albarregas, (not Abbaregas) Mérida, Venezuela. Altitude 1630 meters.

TYPE SPECIMEN.—B.M. 98.5.15.1. Coll. S. Briceño Gabaldon, January 24, 1897. Type in B.M.

MATERIAL EXAMINED (26 specimens)

VENEZUELA.—Mérida Region: Rio Albarregas (B.M. 98.5.15.1, type, y.ad.male; B.M. 98.7.1.24, male; B.M. 98.7.1.23, female); Cafetal de Milla (A.M.N.H. 21324, male; U.S.B.S. 168227, male; B.M. 98.7.1.24, o.ad.male; A.M.N.H. 21332, ad. female; A.M.N.H. 24325–26, males; A.M.N.H. 21319, female; Llano de Mérida (B.M. 98.7.1.22, male); Cafetal de Mérida (A.M.N.H. 24321, female; A.M N.H. 24322, juv.male; A.M.N.H. 21331, male; A.M.N.H. 21329, female; M.C.Z. 18720, male; U.S.N.M. 123320, ad.female); Pedregosa (A.M.N.H. 30533, male); "Mérida Region" (Berlin 33450, ad.male; Berlin 24798–99, ad.females; Berlin 10975, juv. female; Bern 923A; F.M.N.H. 1050–51, ?; F.M.N.H. 18885, male).

Color of the back as a whole between sorghum brown (R.) and snuff brown (R.), but not uniform as in *microtarsus* and *lepida.* Instead it appears mottled or marbled with lighter and darker browns. This mottled appearance may be lost at moult for a time, and specimens occur (A.M.N.H. 24321) in which only the middle third of the body has the normal appearance, the coloration of the anterior and posterior thirds being fairly smooth. Ventrally from cream to yellow-buff, the throat and sides of neck cream-buff (R.), from chest backward usually dull gray-white. Gray-based hairs present except on chin, throat, neck, and a large pectoral patch sometimes 10 mm. in width, but often narrower. Eye-rings not greatly developed, scarcely produced behind eye. Ears rather large, light fuscous-brown. Feet brownish buff, rather small. Tail light cinnamon in color, moderately long, not appearing bicolor.

SKULL.—Short and broad; expansion of nasals at base rounded. Supraorbital ridges scarcely sharp, processes only incipient. Brain case

[1] Since the completion of this paper, Mr. E. R. Blake of the Mandel Orinoco Expedition has secured a male (F.M.N.H.38056) of this species from Mt. Turumiquire, Province of Sucre, Venezuela, at an altitude of 8500 feet. Beyond a very slight enlargement of the dark area around the eyes, I am unable to note any character differing from typical *marica* of the Mérida region. Mr. Blake's capture marks a noteworthy extension of the range of this subtropical species. A female was captured also but the skin was lost.

broad. Palate highly fenestrated, broad; tooth rows well convergent. Bullæ large; with well-developed processes. Teeth small; canines short. Anterior border of ascending ramus nearly straight.

DISTRIBUTION.—Probably throughout the Mérida Andes between 4000 and 6000 feet.

REMARKS.—The young of *Marmosa mitis* have occasionally been confused with adult *marica*, but are easily distinguished when the teeth are compared.

Almost all the known material comes from the Venezuelan collector, Salomon Briceño Gabaldon, whose characteristic paper labels are found on specimens in all museums. He states that it does much harm in the coffee plantations, that it nests in trees, produces six young (probably more than six are produced, though), and may become very tame.

Marmosa unduaviensis Tate

Plate XI, Figure 100; Plate XXIV, Figure 220

1931. *Marmosa unduaviensis* TATE, Amer. Mus. Novitates, No. 493, p. 11. Type description.

TYPE LOCALITY.—Pitiguaya, Rio Unduavi, Yungas, Bolivia, 5800 feet.

TYPE SPECIMEN.—A.M.N.H. 72563. Adult male. Coll. G. H. H. Tate, No. 4059, May 12, 1926. Type in A.M.N.H.

MATERIAL EXAMINED (2 specimens)

BOLIVIA.—Pitiguaya, Rio Unduavi, 5800 feet (A.M.N.H. 72563, type, ad.male; A.M.N.H. 72565, y.ad.female).

Dorsal color nearest to mummy brown (R.), darkest along the mid-dorsal line, paler on the sides; face scarcely paler. Eye-rings not very well developed. Ventrally between cartridge buff (R.) and cream-buff (R.); the chin deep cream-buff (R.), almost chamois (R.); a narrow intermittent median white line, distinct in the type only on the lower chest.

Pelage very long and rather lax, but showing specialization in the throat region somewhat analagous to that of *incana*. At the mid-line of the neck two series of short stiff hairs, one on either side, lie with their tips pointing inward and touching at the median line. This median area is only 5 mm. in width. On either side, commencing beneath the ears and extending backward to the fore limb, are areas of long, erect, but unstiffened hairs whose tips are tinged with brown dorsal coloring. Gray-based hairs are present in the last-described parts of the neck, and, excepting at the white central line, although the bases are exceedingly short, they occur from the chest posteriorly. Ears small, fuscous brown. Vibrissæ very short, black. Feet very small, buffy brown. Tail rather short, fuscous brown.

SKULL.—Skull with the characteristic form of *agilis;* zygomata moderately broadened; brain case moderate; supraorbital region broken; palate rather broad; bullæ rather large, well rounded, with a minute or incipient process.

DISTRIBUTION.—Known only from Pitiguaya, Bolivia.

Marmosa aceramarcæ Tate

Plate XI, Figure 101; Plate XXIV, Figure 223

1931. *Marmosa aceramarcæ* TATE, Amer. Mus. Novitates, No. 493, p. 12. Type description.

TYPE LOCALITY.—Rio Aceramarca, tributary of Rio Unduavi, Yungas, Bolivia. 10,800 feet.

TYPE SPECIMEN.—A.M.N.H. 72568. Young adult female. Coll. G. H. H. Tate, No. 4189, May 25, 1926. Type in A.M.N.H.

MATERIAL EXAMINED

The type only.

May be distinguished from *unduaviensis* by its quite different color, lack of an incipient mid-dorsal stripe, presence of numerous long over-hairs in the coat, much smaller teeth, and the extreme slenderness of the upper part of the ascending ramus of the mandible.

Color dorsally near Mars brown (R.) or russet (R.), but containing fuscous shades that in certain lights make it look darker. Face not a paler shade of body color; but lower part of face touched with gray. No suggestion of a dorsal stripe; Eye-rings moderate. Hairs of underparts, except chin, which is buffy brown, with a light tawny (R.) over-wash, beneath which are gray bases. Gray-based hairs throughout except a barely visible median series of hairs on throat which are self-colored. Pelage very long and lax, and filled with numerous over-hairs, whose translucent tips give them a whitish appearance. The modified throat hairs seen in *unduaviensis* practically undifferentiated. Ears fuscous, rather deeply pigmented, small. Vibrissæ short. Feet very small, whitish buff, the exterior part of the shank fuscous. Fore limb, with the forearm dorsally fuscous. Tail moderate in length, rather deep fuscous.

SKULL.—Skull with zygomata but little expanded, muzzle very narrow and canines close together. Palate rather long and narrow; bullæ large, rather close together, with well-developed processes.

TEETH.—Very small. Dentary with both the ascending ramus and the long processus angularis extremely slender.

DISTRIBUTION.—Known only from the upper part of the Valley of Aceramarca, opposite Ichuloma, on the LaPaz-Yungas Railroad.

Marmosa dryas Thomas

Plate XI, Figure 102; Plate XXIV, Figure 224

1898. *Marmosa dryas* THOMAS, Ann. Mag. Nat. Hist., (7) I, p. 456. Type description.
1905. *Marmosa dryas* TROUESSART, 'Cat. Mamm. viv. foss.,' Suppl., p. 856. Listed.
1916. *Grymæomys dryas* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 270. Listed.
1919. *Marmosa dryas* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 36. Listed.

TYPE LOCALITY.—Culata, Mérida, Venezuela, 4000 meters.

TYPE SPECIMEN.—B.M. 98.5.15.2, old adult male. Coll. S. Briceño Gabaldon. Type in B.M.

MATERIAL EXAMINED (6 specimens)

VENEZUELA.—Mérida Region: Selva Culata, 4000 m. (B.M. 98.5.15.2, type, o.ad.male); Montañas Uchisera, 3000 m. (B.M. 98.7.1.27, ad.female); Uchisera, 3000 m. (B.M. 98.7.1.26, y.ad.female); Montes de la Serra, 3000 m. (B.M. 13.2.3.15, juv.female); Cafetales de Mérida? (Berlin 24804, ad.female ?); "Mérida" 2500 m. (Paris 1900/567, ad.female).

A small richly colored species, probably from the extremely high forest, which is sharply distinct from its neighbor, *marica*, found in the coffee region of the Mérida Andes.

Dorsal coloration between auburn (R.) and bay (R.), with much less of the "waved" or mottled appearance of *marica;* the color, too, deeper and richer. Face very little lighter than body. The entire surface overspread ventrally, with a wash near mikado brown (R.), and hairs gray-based throughout. No trace, beyond a small mark on chest, of the buffy or creamy color found in *marica*. Hands and feet whitish brown. Tail slightly bicolor, brown. Pelage long, soft and lax, with numerous overhairs as in *aceramarcæ*.

SKULL.—Skull with only moderately expanded zygomata; muzzle narrow and pointed. Interorbital region smooth. Palate rather narrow; teeth, especially the premolars, only moderately convergent. Bullæ of medium size, well rounded, without processes.

DISTRIBUTION.—Mérida Andes between 2500 and 4000 meters.

REMARKS.—This is still a very rare animal in collections, and, as with *marica*, most of the specimens listed were captured by Briceño Gabaldon. Probably it can be found in cloud forest at high altitudes on suitable mountain slopes near Mérida.

Lepida Section

This division, whose inclusion with *microtarsus* may prove to be artificial rather than natural, is distinguished by the unfenestrated condition of the palate coupled with the arrangement of the mammæ.

While in the *microtarsus* section the palate is highly fenestrated and the mammæ are both abdominal and pectoral, the reverse is found in the *lepida* section, the palate, excepting its usual foramina, being unusually entire (at most, minutely fenestrated), and the mammæ confined to the abdomen.

Within the above restrictions, considerable variation occurs which parallels the conditions seen in the *microtarsus* section quite closely. Great variability in the size of the ear, body color, length of pelage, in the nasals, supraorbital processes, teeth, and bullæ are apparent. Four forms are recognized in the key which follows, and were enough material at hand, probably others might be distinguished. Notable among these are the white-bellied A.M.N.H. 67243 from the Rio Pachitea, Peru, and A.M.N.H. 67279 from Canelos, Ecuador, which has small round bullæ with distinct processes. Another specimen, Bogotá 6, which is a rather young female from Paime, Colombia, has small ears, abdominal mammæ, small supraorbital processes, and round bullæ without processes as in *lepida*. It cannot be associated with *marica* because of the purely incipient fenestration of the palate, lack of processes on the bullæ, and the quality of the pelage which, besides having the throat white instead of buff, is very short and close. This specimen, which is mounted (skull cleaned, however), is mentioned here without assigning any specific determination to it.

For distribution of the *Lepida* section, see Fig. 25, p. 187.

KEY TO *lepida* SECTION

1.—Size proportionately large (largest form in the section), head and body 120, tail 145 mm.; color bright cinnamon above, pale cinnamon below. *lepida grandis.*

Size smaller (head and body not exceeding 110, tail 133 mm.); color above bright cinnamon or dull fuscous-cinnamon.....2.

2.—Ears small (15×11).....*lepida lepida.*

Ears large (18×14).....3.

3.—Ventral color almost entirely grayish white, the hairs with gray bases. *juninensis.*

Ventral color chiefly self-colored cream-buff.....*parvidens.*

Marmosa lepida (Thomas)

(Synonymy under subspecies)

Rich red-brown members of the *microtarsus* group. Pelage moderate to long, smooth and generally unmottled. Ears very small; eye-ring not extending for more than 2 mm. behind eye, but reaching forward among roots of vibrissæ. Feet very small; shanks long and slender. Tail long.

SKULL.—Skulls with supraorbital processes, scarcely fenestrated palates, and the premaxillæ prolonged in front of the incisors to such an extent that the difference between the basal and total lengths of the skulls is about 4 mm. instead of the usual 2 to 3 mm. of *microtarsus* and *agilis*. Palate very little produced backwardly posterior to the last molar. Distance across M^3 teeth, due to narrowing of palate, compared with width of zygomatic arch, is unusually small, as is also the breadth across the petrosals compared with the width across bullæ.

Marmosa lepida lepida (Thomas)

Plate XI, Figure 103; Plate XXIV, Figure 225

1858. *Didelphys pusilla* TOMES, Proc. Zool. Soc. London, p. 548. Four specimens reported from Gualaquiza. These probably equal A.M.N.H. 67279. They are no longer to be found in the British Museum.

1888. *Didelphys* (*Micoureus*) *lepida* THOMAS, Ann. Mag. Nat. Hist., (6) I, p. 158. Type description.

1888*a*. *Didelphys lepida* THOMAS, 'Cat. Monotr. Marsup.,' p. 347. Reference here to the Surinam specimen in the Stuttgart Museum. Also much fuller description.

1905. *Marmosa lepida* TROUESSART, 'Cat. Mamm. viv. foss.,' Suppl., p. 856. Listed.

1916. *Marmosa lepida* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 270. Listed.

1919. *Marmosa lepida* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 37. Listed.

1927*b*. *Marmosa lepida* THOMAS, Ann. Mag. Nat. Hist., (9) XX, p. 608. Remark under *musicola*.

TYPE LOCALITY.—Sta. Cruz, near Yurimaguas, Rio Huallaga, Peru. About 600 feet.

TYPE SPECIMEN.—B.M. 69.3.31.4. Adult female. Coll. E. Bartlett. Type in B.M.

MATERIAL EXAMINED (12 specimens)

PERU.—Sta. Cruz, Rio Huallaga (B.M. 69.3.31.4, type, ad.female); Lagarto, Upper Rio Ucayali (A.M.N.H. 78001, y.ad.female); Puerto Marquez (Rio Pachitea, A.M.N.H. 67243, ad.male).

BOLIVIA.—Buenavista, Sta. Cruz, 500 m. (B.M. 26.12.4.95, y.ad.female); no locality [B.M. 67.4.12.54–55, (Alcs.), juveniles; B.M. 26.12.4.96, juv. ?]; "Bolivia" (B.M. 69.4.22.1, ?).

ECUADOR.—Sarayacu, Rio Bobonaza (A.M.N.H. 67279, ad.female).

SURINAM.—San Alouatta [Stuttgart 337, (Alc. and juveniles), ad. female]; Paramaribo [M.C.Z. 17199 (Alc.), ad.male)].

Dorsal color near Sanford's brown (R.); one of the most vividly colored members of the genus. Color paling a little on sides. Face paler. Ventrally a dirty gray-buff (apparently partly caused by dust and grime; the color of a fresh specimen, A.M.N.H. 78001, is near ivory

yellow (R.). Ventral hairs self-colored, except the customary narrowing by gray-based hairs from the thorax posteriorly to a fascia about 10 mm. in width. Eye-ring strongly marked, black, running forward among vibrissæ, but scarcely at all backward. Ear very small. Vibrissæ moderate. Feet grayish-buff. Tail long, rather dark fuscous, scarcely lighter beneath.

SKULL.—Skull with broadly expanded zygomata; and with distinct, semiabrupt nasal expansion, somewhat separated by frontals posteriorly. Strongly marked supraorbital ridges and processes; the temporal ridges divergent on skull. No postorbital constriction. Palate rather long and narrow, the highly fenestrated condition in *microtarsus*, *agilis*, *marica*, etc., not apparent. Openings in palate, other than the anterior and posterior palatal vacuities, either very small or absent. Tips of premaxillæ immediately in front of incisors prolonged and pointed. Bridge narrow. Bullæ moderate to rather small; without process.

TEETH.—Very small; canines short.

The specimen A.M.N.H. 67279, from Sarayacu, Rio Bobonaza, Ecuador, has the mammary area developed. It is restricted to the belly, and its color is a purplish-brown. This specimen is not quite so vividly colored as in Peruvian and Bolivian animals.

DISTRIBUTION.—Known from the lowlands adjoining the eastern foothills of the Andes in Ecuador, Peru, Bolivia, Dutch Guiana. The seemingly broken distribution suggests that *lepida* has a very wide range. Its rarity in collections may be due to peculiar habits requiring special methods of trapping.

REMARKS.—There seems no question but that the two animals from Dutch Guiana belong in *lepida*. The bright coloring, restriction of the eye-ring behind the eye, supraorbital processes, unfenestrated, narrow palate, and forwardly prolonged premaxillæ are all present in *lepida*. They may be distinct subspecifically, but since they are spirit specimens more material is required in order to make sure. At present no distinction can be noted between material from Peru and specimens from Dutch Guiana.

The Guiana female has the functional mammæ 3–1–3 = 7. The mammary region is strictly confined to the belly, a character which distinguishes *lepida* from *microtarsus* and *agilis*.

The specimen from the Rio Pachitea, a region of tropical forest, is rather darker than typical *lepida* and the underparts are self-colored white, narrowed considerably, however, by lateral gray-based bands of gray-white.

Marmosa lepida grandis Tate

Plate XI, Figure 104; Plate XXIV, Figure 226

1931. *Marmosa lepida grandis* TATE, Amer. Mus. Novitates, No. 493, p. 12. Type description.

TYPE LOCALITY.—Buenavista, Sta. Cruz, Bolivia.

TYPE SPECIMEN.—B.M. 26.12.4.94. Adult female. Coll. J. Steinbach, No. 1609. January 25, 1926. Type in B.M.

MATERIAL EXAMINED (2 specimens)

BOLIVIA.—Buenavista, Sta. Cruz (B.M. 26.12.4.94, type, ad.female; B.M. 26.12.4.96, juv.male).

Color as in true *lepida* a reddish-cinnamon; but size very much larger, with larger skull and teeth.

Dorsal color near Sanford's brown, ventrally washed with pale cinnamon (in *l. lepida* the ventral color is buffy-white). Throat and chin alone have self-colored hairs. Pelage thin and soft, very long. Eye-rings reduced beneath. Ears very small, semitranslucent, light fuscous. Feet very small; claws very small. Tail unicolorous, rather densely pilose, light fuscous. Belly rusty vinaceous. Functional mammæ apparently 3–1–3 = 7.

SKULL.—Skull a large copy of *l. lepida*, with similarly prolonged premaxillæ. Fine, pointed supraorbital processes. Bullæ rounded, without processes.

TEETH.—Larger than in *l. lepida* (the mandibular M_{1-4} 6.6 instead of 6.3).

DISTRIBUTION.—Only known from Buenavista.

REMARKS.—Steinbach reports on the label "with 5 young animals on the tail." The juvenile listed is one of the young.

It is interesting to note that both subspecies of *lepida* exist in the same region (Sta. Cruz). Possibly they will be united after more specimens are collected. At present, however, they seem very distinct.

Marmosa juninensis Tate

Plate XI, Figure 105; Plate XXIV, Figure 227

1931. *Marmosa juninensis* TATE, Amer. Mus. Novitates, No. 493, p. 13. Type description.

TYPE LOCALITY.—Utcuyacu, between Tarma and Chanchamayo, Perené drainage, Province of Junin, Peru, 4800 feet.

TYPE SPECIMEN.—A.M.N.H. 63864. Rather young adult nursing female. Coll. H. Watkins, No. 15, November 25, 1919. Type in A.M.N.H.

MATERIAL EXAMINED

The type only.

Dorsal color rather warm brown, near argus brown (R.). Ventrally remarkable for the self-colored fascia posterior to the throat being nearly completely obscured by gray-based hairs. The gray basal portions of these hairs approach very nearly to the tip, thus giving the underparts a decidedly grayish appearance somewhat suggestive of the silvery gray of *fuscata*. Inguinal hairs tawny (R.).

SKULL.—Very small. Zygomata not wide-spreading; muzzle narrow. Bullæ moderate, the anterior process well-developed but short.

TEETH.—Very small; canines extremely short, compressed.

DISTRIBUTION.—Known only by the type from Utcuyacu.

Marmosa parvidens Tate

Plate XII, Figure 106; Plate XXIV, Figure 228

1931. *Marmosa parvidens* TATE, Amer. Mus. Novitates, No. 493, p. 13. Type description.

TYPE LOCALITY.—Hyde Park, 30 miles up Demarara River, British Guiana. Alt. 20 feet.

TYPE SPECIMEN.—F.M.N.H. 18545, young adult female. Coll. S. B. Warren, No. 8. September 8, 1906. Type in F.M.N.H.

MATERIAL EXAMINED

The type only.

Distinguishable from the form of *lepida* occurring in Dutch Guiana by its more obscure pelage, large ears, narrow zygomatic expanse, molariform canines, and proportionately very large upper and lower first premolars.

Dorsal color a fuscous shade of reddish, near Hay's brown (R.) or natal brown (R.), becoming slightly paler on sides. Face markedly paler, near sayal brown (R.) or tawny-olive (R.). Eye-rings quite narrow all the way around. Ventral color nearest to cream-buff (R.), generally self-colored, except in belly region where narrowed by gray-based hairs to 12 mm. Ears large, fuscous. Feet very small, grayish white. Tail brown, paler beneath.

SKULL.—Skull with zygomata rather narrow, and the arches very low at the position of the postorbital process when seen from the sides. Nasals only slightly expanded at the maxillo-frontal suture. Supraorbital ridges unbeaded; represented by a slight angle only. No postorbital constriction. Palate rather narrow, without accessory fenestræ. Bridge narrow. Bullæ moderately inflated, with strong process.

TEETH.—Very small, showing unusual modification of the first premolars and canines. The former unusually large, with antero-posterior length of P^1 1.2 mm. (of P^2 1.5 mm.). The upper canine is short,

strongly compressed, and provided with anterior and posterior cingular cusps (similar to those sometimes developed in *fuscata*). In the mandible P_1 is also enlarged and the canine is low and premolariform, so that the row of teeth, C, P_1, P_2, P_3, form a series very uniform in appearance.

DISTRIBUTION.—Known only from type locality.

This animal is shown to belong to the *microtarsus* group by its very small feet and claws, short vibrissæ, and minute teeth. It has been confused with *murina muscula*, for the present specimen was identified as *muscula* by O. Thomas.

ELEGANS GROUP

Size moderate to very small. Includes the smallest known species of *Marmosa*, the recently described *M. formosa*.

It is characteristic of the entire group that there is a development of a tricolor type of pattern, which, however, may be rather obscured in long-haired forms. Instead of the usual bicolor system composed of a dorsal color, paling a little on the sides, which is replaced at a generally well-marked transition line by a distinct ventral color, the *elegans* group displays three distinct shades, separated from each other along each side by two lines of transition. The additional lines are subdorsal, running from a point at the center of the frons past the inner edge of each ear (not including it), and straight backward through scapulæ and hips, where they again approach the median line of the body and merge with the tail. This pair of lines encloses the major part of the dorsal area of head and body, the color of the area being very dark brownish-gray or grayish fuscous. The fuscous area is pointed at front, projecting forward between the ears, and narrows again to a point as it merges with the dark color of the upper surface of the tail. The second area, light gray in color, frequently tinged with buffy or yellowish, extends between the dark dorsal region and the edge of the belly color at the normal transition line. Ventral color either buffy, grayish, or snowy white. Gray-based hairs are variable in development—either lacking or almost covering the under surface of the body. Pelage extremely variable in length and texture. Rarely the point of the dorsal pattern is carried down the muzzle as a faint median stripe (*venusta sponsoria*).[1] Ears in most forms large; smaller in *velutina* and others. Vibrissæ generally short, but of moderate length in *elegans* proper. A characteristic of the group is the very small size of the feet and claws in proportion to that of the body.

[1]A nasal stripe is also found in specimens of *rubra* of the *murina* group, and a tricolor plan may be seen in the *canescens* section.

The toes, too, may be extremely short (*velutina*). The bicolored tail is proportionately short throughout the group (very short in *velutina*). Its base is provided with very little body fur. It is believed to be subject to marked incrassation in every species. This thickening of the tail takes place during the southern winter, the entire organ serving as a reservoir for the storage of fat. Near its base the tail may acquire a diameter of 1 cm., although just at the junction with the body there is always a slight constriction. Its surface is very finely scaled, and always provided with such copious fine hairs between the scales that the latter can be counted only with considerable difficulty. Mammæ, apparently in all members of this group, numerous, being both pectoral and abdominal, and arranged in two ranks extending from just within and posterior to the axillary region of the fore limb to the posterior part of the abdomen. As in all *Marmosa*, an unpaired mamma occurs at the middle of the abdomen. Mammary formula 7–1–7. No profound modification of pelage of the mammary area, such as is seen in *murina*, *noctivaga*, and *cinerea* groups can be noted. The hairs are at most only slightly shorter than those of males and occasionally (*marmota*) acquire a faint salmon tinge.

Skull.—Sometimes rather strongly ossified (*marmota*), but more usually the bones are light and thin. Zygomata slightly to moderately broadened. With skull in norma verticalis nasals never exceeding premaxillæ anteriorly. Nasals so nearly uniform in width that the usual expansion at the suture between frontal and maxilla is sometimes scarcely discernible. Interorbital region characteristically much narrowed. Supraorbital ridges usually absent, the frontal bones at that place being as a rule smoothly rounded; but in some forms a definite angle or even incipient beading may be formed. A marked postorbital constriction is developed in the *elegans* section which is absent in the large-brained species such as *pallidior*. Temporal ridges in most forms widely separated and scarcely visible, but in *elegans* and *marmota* rather close together. Palate moderately broad to narrow; with lateral posterior foramina oval, and very large. Bridge characteristically narrow. Auditory bullæ very large,—much larger in proportion than in any other group of *Marmosa*; a process usually developed.

Teeth.—Small; canines short; P^2 and P^3 subequal; a tendency for molars to be compressed antero-posteriorly.

Seasonal swelling of the tissues of the tail as a result of fat storage probably takes place in every member of the *elegans* group, but due to the comparative rarity of a number of the species and their having been

trapped during the Argentine summer, it cannot be positively stated that incrassation always occurs. Species and subspecies in which the tail is known to become swollen are *elegans, venusta, cinderella, sponsoria,*

Fig. 27. Distribution of *M. elegans* group.

1A. *M. elegans elegans*
1B. *M. elegans coquimbensis*
1C. *M. elegans soricina*
2A. *M. marmota marmota*
2B. *M. marmota verax*
3. *M. janetta*
4. *M. pusilla* (=*citella*)
5. *M. venusta*
6. *M. pallidior*
7. *M. bruchi*
8. *M. formosa*
9. *M. velutina*

pallidior, bruchi, and *velutina.* Only in two species, *elegans* and *pallidior,* have enough specimens with swollen tails been observed for a table showing the months of maximum enlargement to be constructed.

DEGREE OF INCRASSATION OF TAIL IN *elegans* GROUP

	elegans	*pallidior*
January	not swollen	?
February	not swollen	greatly swollen
March	?	greatly swollen
April	moderately swollen	greatly swollen
May	moderately swollen	moderately swollen
June	?	greatly swollen
July	?	moderately swollen
August	much swollen	?
September	little swollen	?
October	little swollen	very little swollen
November	little swollen	?
December	not swollen	?

The table for *elegans* is based upon material, all of which came from fairly near Valparaiso, but in the case of *pallidior* the specimens providing the data were from widely separated localities from Bolivia to Nequen. Swelling apparently reaches its peak during August for *elegans*, while in the case of *pallidior* the tails are swollen apparently from February until June. That of *cinderella* seems to reach its maximum size between July and October.

For distribution of the *elegans* group see Fig. 27, p. 211.

KEY TO SECTIONS OF *elegans* GROUP

Two sections of the group can be distinguished. In the first I have placed true *elegans* and, in spite of the geographical isolation, *janetta* of southeastern Bolivia, and *marmota* with its allies. The second contains the rest of the group.

Size large to rather small; brain case rather small and narrow; interorbital region narrow, especially behind.....*elegans* section.
Size medium to very small; brain case generally large, unnarrowed; interorbital region not greatly narrowed.....*venusta* section.

Elegans Section

Moderate to large-sized animals with white or creamy-buff bellies, scarcely any gray-based ventral pelage, large skulls with relatively small brain cases and greatly narrowed interorbital regions (in age). Four species are included.

While conforming to the above general characters, *elegans* and *marmota* are found to differ from one another in a number of points: the very much denser, finer, and longer pelage of *elegans* often obscures the dorsal pattern which in *marmota* is so distinct; *elegans* has normally much longer vibrissæ; its bulla in relation to the size of the skull is

normally smaller; its palate on the average narrower; molar tooth rows definitely shorter in proportion to the basal length; and nasals often rather longer than those of *marmota*.

Janetta, the third species of the section, is marked off from the two above by its browner, *venusta*-like dorsal coloration. The color of the underparts is a dull, lusterless buffy-white, and the ventral hair, while not short, is so thin that the color of the skin shows through it. The skull has distinct supraborbital edges (contrasting with *elegans*) and lacks, at least in part, the abrupt broadening of the anterior part of the interorbital region of *marmota*. As Thomas has remarked, it is closest to *verax*. Possibly it should be called *marmota janetta*.

The fourth is the smaller, white-bellied *pusilla*.

KEY TO *elegans* SECTION

1.—Pelage relatively long, somewhat obscuring the tricolor pattern. From west of the Andes (*elegans*) ..... 2.
Pelage relatively short. Tricolor pattern distinct. From east of the Andes ..... 3.
2.—Color very pale; gray-based ventral pelage only slightly developed. From Coquimbo region ..... *elegans coquimbensis*.
Color moderately dark; a median self-colored ventral band about 15 mm. in width. From Valparaiso region ..... *elegans elegans*.
Color very dark; self-colored hair on throat only. From Valdivia region. *elegans soricina*.
3.—Color brownish, with little admixture of gray. Southeastern Bolivia ..... *janetta*.
Color gray, with little brown. Chaco and Paraguay. (*marmota*) ..... 4.
4.—Very large. Skull with M^{1-3} 5.6 or more ..... *marmota marmota*.
Smaller. Skull with M^{1-3} 5.3 or less ..... 5.
5.—Bulla 2.7 to 2.9 in width ..... *marmota verax*.
Bulla 3.0 to 3.4 in width ..... *pusilla*.

Marmosa elegans (Waterhouse)

(Synonymy under subspecies)

One of the larger members of the group; confined to the western side of the Andes in Chile.

Pelage typically, very long and fine, the dorsal "pattern" often somewhat indistinct, and the colors of sides and upperparts varying with the subspecies. Ventral color white; self-colored hair occupying most of the underparts in the northern form and almost completely replaced by gray-based hair in the extreme south, with an intermediate condition in typical *elegans*. Eye-rings more or less reduced. Vibrissæ quite short. Ears very large and broad. Feet small and white-haired. Tail rather short, subject to seasonal incrassation. Mammæ 7–1–7, abdominal and pectoral, as customary in the group.

DISTRIBUTION.—Waterhouse quotes Bridges as saying that he has found *elegans* as far north as Cobija in Antofogasta, and as far south as Curico, Colchagua. The former is at about S. lat. 23° and the latter S. lat. 34°, which gives *elegans* a total north and south extension of about 700 miles. *Soricina* R. A. Philippi from Valdivia extends this for another 300 miles, more or less southward. Thus the species has a north and south range of about 1,000 miles, while its east and west extension is nowhere greater than 200 miles.

Marmosa elegans elegans (Waterhouse)

Plate XII, Figures 107, 108; Plate XXV, Figures 229, 230

1839. *Didelphis elegans* WATERHOUSE, 'Zool. Voy. Beagle,' p. 95. Type description.
1841. *Didelphys elegans* WATERHOUSE, 'Jardine Nat. Library,' XI, p. 106. Description and remarks.
1843. *Thylamys elegans* GRAY, 'List. Mamm., Brit. Mus.,' p. 101. Listed.
1844. *Didelphys elegans* BRIDGES, Proc. Zool. Soc. London, p. 154. Brief note from letter.
1846. *Didelphis elegans* WATERHOUSE, 'Nat. Hist. Mammalia,' I, p. 515. Added description and measurements.
1847. *Didelphys elegans* GAY, 'Hist. Chile, Zool.,' I, p. 84. Diagnosis of genus and species.
1888*a*. *Didelphys elegans* THOMAS, 'Cat. Marsupials,' p. 352. Description.
1894. *Marmosa elegans* THOMAS, Ann. Mag. Nat. Hist., (6) XIV, p. 188. Mention.
1902*a*. *Marmosa elegans* THOMAS, Ann. Mag. Nat. Hist., (7) IX, p. 158. Partial revision of *elegans* group. Separation of *venusta*, etc.
1905. *Marmosa elegans* TROUESSART, 'Cat. Mamm. viv. foss.,' Suppl., p. 856. Listed.
1916. *Thylamys elegans* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 271. Listed.
1919. *Marmosa* (*Thylamys*) *elegans elegans* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 40. Listed.

TYPE LOCALITY.—Valparaiso, Chile.

TYPE SPECIMEN.—B.M. 53.8.29.18. Young adult male. Collected in October (Waterhouse). Type in B.M.

MATERIAL EXAMINED (81 specimens)

CHILE.—"Aconcagua" [B.M. 44.10.14.6 (Alc.), male]; Limache, Aconcagua (F.M.N.H. 23859, ad.female; F.M.N.H. 24064, juv.female; F.M.N.H. 22338, ad.male; F.M.N.H. 22336, juv. ?; F.M.N.H. 23858, ad.male); Papudo, Aconcagua (F.M.N.H. 23855, 23857, ad.males; F.M.N.H. 22668, female; F.M.N.H. 23856, ad.male; F.M.N.H. 22669, juv.female; F.M.N.H. 22666, ad. ?); Longatoma, Aconcagua [F.M.N.H. 22670 (Alc.), ad.female]; Valparaiso (B.M. 53.8.29.18, type, y.ad. male; B.M. 39.6.10.1, 55.12.24.73, y.ad.males; La Cruz), Valparaiso (F.M.N.H. 23872, ad.female; F.M.N.H. 23874, ad.male; F.M.N.H. 23873, ad.female; F.M.N.H. 24395, 23871, ad.males); Coast Hills, Valparaiso (B.M. 0.9.1.6, 98.11.2.14, y.ad. males; B.M. 98.11.2.11–15, ?; B.M. 97.5.1.13, juv.male; B.M. 0.9.1.7, 0.10.2.6–7,

ad.males; B.M. 97.5.1.12, y.ad.female; B.M. 98.8.2.12–14, ad.females); Quilpue, Valparaiso (B.M. 8.4.7.31–34, y.ad.males; B.M. 8.4.7.35–36, ad.females; Bern 1226, male; Bern 1227–29, females; M.C.Z. 7508, y.ad.male); Olmue, Valparaiso (F.M.N.H. 22334, ?; F.M.N.H. 22331, 22335, ad.females; F.M.N.H. 22333, ad.male; F.M.N.H. 22337, juv. ?; F.M.N.H. 22332, ad.female; F.M.N.H. 22330, ad.male); Calera, Valparaiso (F.M.N.H. 23860, 23865–66, ad.males; F.M.N.H. 23864, ad. female; M.C.Z. 20830, y.ad.female); Palos Quemados, Valparaiso (F.M.N.H. 23868–69, ad.males; F.M.N.H. 23867, 23870, ad.females); Laguna, Valparaiso (B.M. 98.12.2.5, 99.8.5.6, ad.males; B.M. 99.8.5.7–8, ad.female); "Valparaiso" (Berlin 2332, female); Puente Alto, Rio Maipo, Santiago (B.M. 3.12.2.9–11, 4.1.7.22, ad.males; B.M. 4.1.7.23–24, ad.females); "Chile" [Hamburg 40345, juv.female; Berlin 3881 (Coll. Philippi), y.ad.?; Berlin 17166, y.ad.?; Berlin 1847, male; Leyden (3) ?].

The type of *elegans*, described in much detail by Waterhouse, is now very brown and faded.

In fresh material the dorsal color is rather darker than hair brown (R.) with a mottled appearance, the face markedly paler; lateral color a brownish cast of mouse gray (R.). Ventrally white, or in some individuals slightly creamy, the self-colored area usually strongly narrowed by gray-based hairs, which in worn specimens show through very pronouncedly, both at the throat and posterior to the hind limbs; chest usually rather broadly self-colored. Glandular throat patch discolored to tawny olive (R.). Pelage exceedingly long and limp. Eye-rings only slightly developed; vibrissæ very long for the group, black; ears very large and broad, light fuscous. Feet buffy white; small proportionately to body (group character). Tail very strongly bicolor, especially noticeable at the season when not incrassated,—dorsally fuscous, ventrally gray-white.

In a nursing female the ventral region is near capucine buff (R.). An unusually marked disparity between the sizes of the sexes occurs. The mammæ are apparently 7–1–7, extending from abdomen to chest, but often only 6–1–6 or 5–1–5 become functional.

Skull.—Skull of type (young adult) with well-broadened zygomata. Nasals practically unexpanded at base; interorbital region less narrowed than in adults, with no trace of supraorbital ridges. Brain case proportionately larger than in adulthood. Palate rather narrow, highly fenestrated, canines close together. Bridge very narrow. Bulla large, with process.

An adult skull, B.M. 0.10.2.7, has a more pronounced postorbital constriction, proportionately small brain case, and a broader palate, with canines more widely separated. It is, of course, considerably larger. Cusp of P^3 higher than that of P^2.

Distribution.—Only certainly known from the provinces of Aconcagua, Valparaiso, and Santiago.

Marmosa elegans coquimbensis Tate

Plate XII, Figure 109; Plate XXV, Figure 231

1931. *Marmosa elegans coquimbensis* TATE, Amer. Mus. Novitates, No. 493, p. 14. Type description.

TYPE LOCALITY.—Paiguano, Province Coquimbo, Chile, 3300 feet.

TYPE SPECIMEN.—F.M.N.H. 23302. Young adult female. Coll. C. C. Sanborn, No. 408, June 20, 1923. Type in F.M.N.H.

MATERIAL EXAMINED.—The type only.

A considerably paler form than typical *elegans* from Valparaiso.

Median dorsal color nearest to hair brown (R.). Lateral color near drab (R.), paler and darker in patches; a pale brownish-drab median line from the frontal point of the dark dorsal area down the muzzle almost to the tip. Rest of face very pale, whitish drab. Both fore and hind limbs and underparts white, the ventral parts posterior to the neck very faintly tinged with yellowish. Gray-based hairs occurring on hind limbs, as far as "elbow" of fore limbs and down each side of body from fore limb posteriorly, bordering a median self-colored fascia 17 mm. in width. Feet and hands clothed on their dorsal surfaces with very short, white hairs. Eye-rings even more narrow than in *e. elegans*, the black color only about .5 mm. in width. As in *e. elegans*, the vibrissæ short, ears large, and tail rather short, in state of incrassation. The feet are unusually small, but this may be an age character.

SKULL.—Closely similar to that of *e. elegans*, and the measurements, although those of a small female, within the range of female *e. elegans*. The only exception appears in the proportionately slightly larger and more approximated bullæ. The teeth appear identical in size and position.

DISTRIBUTION.—Known from the type locality only. This form is apparently the arid country representative of true *elegans* which occurs some 200 miles south of Coquimbo.

Marmosa elegans soricina (Philippi)

1894. *Didelphis soricina* R. A. PHILIPPI, Archiv für Naturgeschichte, Berlin, I, p. 36. Type description.

1898. *Peramys soricina* TROUESSART, 'Cat. Mamm. viv. foss.,' II, p. 1244. Listed.

1902*a*. *Didelphis soricina* THOMAS, Ann. Mag. Nat. Hist., (7) X, p. 159. Mention.

1910. *Didelphys soricina* WOLFFSOHN, Bol. Mus. Nac. Santiago de Chile, II, p. 85. Syn. of *elegans*. Corrects statements of Philippi.

1916. *Dromiciops soricina* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 271. Listed.

1919. *Thylamys soricina* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 40. Listed as syn. of *elegans*.

TYPE LOCALITY.—Valdivia, southern Chile.

TYPE SPECIMEN.—A very young animal, sex (?), recently inspected by Dr. W. H. Osgood in the museum of Santiago de Chile. Coll. R. A. Philippi.

MATERIAL EXAMINED

The type only.

The following notes, which are published here by his kind permission, were made by Dr. Osgood while in Santiago.

Type existing in rather poor condition. Skull inside. Although Wolffsohn has regarded this as a synonym of *elegans*, I think it is probably a recognizable subspecies characterized at least by darker color. It is rather a young specimen but it has a full set of teeth and its color is probably not very reliable. The upperparts are but a few shades darker than in *elegans* although the upper side of the tail is very blackish and the under side only a few shades paler. On removing the specimen from its stand, however, it is seen that the underparts are darker with practically all the hairs with extensive dark bases. In *elegans*, the underparts are pure white and only on the sides do the hairs have dark bases, the entire broad central area from the chin to the anus being pure white to the roots of the hairs. In *soricina* the underparts are buffy and all the hairs, except possibly a few short ones on the chin, have darker plumbeous bases. There are four specimens of *elegans* in the Santiago Museum, three of which are old and faded and may be the ones Philippi used for comparison, in which case most of his statements would be justified. There is one fresh one, however, with which a fair comparison can be made with the type of *soricina*. The form should be recognized as *Marmosa elegans soricina*.

It becomes evident that the subspecies must be based upon a single young animal in poor condition from a region from which no other representatives of *elegans* are known. The specimen is generally darker above than *elegans*, and buffy beneath. Yet it is evidently closely similar to *elegans*, since Wolffsohn considers it synonymous. The entirely gray-based under-pelage seems to constitute a good distinctive character, a median band of self-colored hairs being commonly present in ture *elegans*.

DISTRIBUTION.—Known only from Valdivia.

REMARKS.—A single skull, A.M.N.H. 92148, taken from an owl cast is unmistakably *elegans* subspecies. It comes from Angol, Province of Concepcion, intermediate between Valdivia and Valparaiso.

Marmosa marmota (Oken)

(Synonymy under subspecies)

The large-sized widespread species of thick-tailed *Marmosa* of Paraguay and the pampas of extreme northern Argentina.

Pelage gray, with strongly contrasting darker dorsal pattern; underparts white to cream-buff. Fur either long, or rather thin and crisp. Ears moderate to very large. Eye-rings usually narrow; vibrissæ rather

short. Feet very small compared with size of animal (a group character). Tail rather short to moderately long, bicolor, (in *m. marmota* also particolored with distal third or fourth cream-colored.

SKULL.—Skull with spreading zygomata; moderately developed supraorbital region; distinct, but small temporal ridges which may converge on the interparietal; well separated, rather large, rounded bullæ with process; well-broadened palate.

TEETH.—Generally not greatly compressed antero-posteriorly (except in *verax*).

Two subspecies, one of which is the much-discussed fourth opossum of Azara, are easily recognizable. These are readily keyed out by means of the key to the *elegans* section and occupy distinct regions as shown by Thomas under his type description of *verax*.

Marmosa marmota marmota (Oken)

Plate XII, Figures 110, 111; Plate XXV, Figures 232, 233

1801. Micouré à queue longue AZARA, 'Essais Quadr. Paraguay,' I, p. 290. Original description without specific name. Locality "Tapoua."

1802. *Colilargo* AZARA, 'Apuntamientos Nat. Hist. Quadr. Paraguay,' I, p. 251. Slight alteration of above. Locality given "country house."

1809. *Colilargo* AZARA, 'Voyages S. America' (Paris), I, p. 291. Brief résumé of above.

1816. *Didelphys marmota* OKEN, 'Lehrbuch der Naturg.,' Pt. 3, (Zool.), II, p. 1140. Use of name "Colilargo." First application of scientific name. Abridged description based upon Azara.

1827. *Didelphis grisea* DESMAREST, 'Dict. Sciences Natur.,' LXVII, p. 398. Brief description based upon Azara.

1846. *Didelphys grisea* WATERHOUSE, 'Nat. Hist. Mamm.,' I, p. 504. He confused *marmota* with *incana*.

1902*a*. *Marmosa marmota* THOMAS, Ann. Mag. Nat. Hist., (7) X, p. 158. Under *cinderella*. Compares supraorbital ridges of *marmota* and *elegans*.

1912. *Marmosa marmota* THOMAS, Ann. Mag. Nat. Hist., (8) IX, p. 409. Under *citella*. Thomas for the first time recognizes the much greater size of true *marmota*.

1921. *Marmosa marmota* THOMAS, Ann. Mag. Nat. Hist., (9) VII, p. 520. Under *verax*. Further reference to the large size of *marmota*. Its distribution.

1926. *Marmosa marmota* THOMAS, Ann. Mag. Nat. Hist., (9) XVII, p. 608. Under *cinderella*. Further mention of supraorbital ridges.

TYPE LOCALITY.—". . . Casal sent me from Tapoua[1]" [1801] and ". . . Casal took [it] in his country house . . . " (1802).

TYPE SPECIMEN.—None designated. Description based upon a male kept in a cage. The specimen mentioned below from Sapucay is nearly a topotype.

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[1]Tapua is found at 25° 10′ 25″ lat., and 0° 9′ 11″ long., taking Asuncion as a meridian of 0°. (See R. R. Schuller, Anales Mus. Nac., Montevideo, Secc. Hist.—Filosoph., Tomo 1, p. 152.) This information places Tapua some few miles northeast of Asuncion.

MATERIAL EXAMINED (3 specimens)

PARAGUAY.—"Paraguay" (native skin), (F.M.N.H. 26760, o.ad.male ?); Sapucay (B.M. 3.4.7.21, o.ad.female); Asuncion (B.M. 99.11.17.1, y.ad.female).

The largest and stoutest member of the *elegans* group east of the Andes; as yet excessively rare in collections.

Color dorsally fuscous (R.); outer dorsal and lateral color hair brown (R.). Ventral color only slightly deeper than cartridge buff (R.). Throat gland highly developed, and hairs surrounding it discolored to cream-buff (R.). Face drab (R.). Eye-rings quite narrow and only slightly produced in front of the eyes. Characteristic dorsal pattern of the group; the mid-dorsal part widened to 30 mm., and the frontal projection of dark color between the ears carried halfway down the face as an indistinct median line. Self-colored ventral hairs almost throughout; in the male a very small portion of each hair gray-based at the outer edges of the abdominal region. Ears very large, deep fuscous, pigmented. Vibrissæ moderately long. Latero-dorsal color carried to wrist and halfway down shank. Hands and feet creamy. Tail both bicolor and particolor; the basal two-thirds fuscous dorsally and grayish ventrally; the distal third creamy. The shorter tail in the male is apparently due to the "make" of the skin.

In the female the inguinal color is near light pinkish cinnamon (R.), and this color is extended well forward on to the chest, implying the presence of numerous mammæ.

SKULL.—Large, stoutly built, with broad zygomata. Nasals not broadened, rounded behind. Supraorbital ridges especially prominent by reason of the pronouncedly narrow postorbital constriction; anterior part of interorbital region unusually broad, especially in the male; ridges posteriorly becoming strongly convergent as they pass into temporal ridges on the parietals. In the male the temporal ridges produce an incipient crest on the interparietal; in the female, however, they maintain themselves at a distance of 2 to 3 mm. Brain case moderately broad. Palate moderately broad, highly fenestrated as usual in the group.

TEETH.—Large; premolars subequal; canines short. Tooth rows well convergent. Bridge narrow. Bullæ large, with processes. Anterior edge of coronoid nearly straight, tip falcate.

DISTRIBUTION.—Paraguay, limits unknown.

Marmosa marmota verax Thomas

Plate XII, Figure 112; Plate XXV, Figure 234

1921. *Marmosa verax* THOMAS, Ann. Mag. Nat. Hist., (9) VII, p. 520. Type description.

TYPE LOCALITY.—Mision, west of Concepcion, Chaco Paraguay, 100 meters.

TYPE SPECIMEN.—B.M. 20.12.18.34. Old adult female. Coll. Marquis de Wavrin, 1918. Type in B.M.

MATERIAL EXAMINED (3 specimens)

PARAGUAY.—Mision, Chaco (B.M. 20.12.18.34, type, o.ad.female; B.M. 20.12.18.33, ad.female); Bermalcue, Chaco (Basle 1068, ad.male).

Size much as in *pusilla;* much smaller than *marmota.*

Dorsal color of type fuscous (R.); dorso-lateral color benzo brown (R.). Ventrally buff-white; under pelage scantier and shorter than in *pusilla* and *marmota.*

Compared with *pusilla,* the skull is broad and short and shows little variation. Nasals similar; interorbital region narrow; supraorbital ridges approximated, beaded, converging at temporal ridges posteriorly on the parietals; not forming a crest; palate longer; bullæ smaller proportionately. Molars are more compressed antero-posteriorly than in either *pusilla* or *marmota.*

DISTRIBUTION.—Known certainly only from the Chaco region in northwestern Paraguay. Thomas's specimen, B.M. 26.2.13.178, from Vipos, Tucuman (Ann. Mag. Hat. Hist., (9) XVII, p. 609) certainly has a slightly more ridged interorbital region than the average *pallidior,* but in other particulars of pelage, etc., it corresponds perfectly with that form. *Verax* may extend westward as far as the easterly limit of the allied *janetta.*

Marmosa janetta Thomas

Plate XII, Figure 113; Plate XXV, Figure 235

1926. *Marmosa janetta* THOMAS, Ann. Mag. Nat. Hist., (9) XVII, p. 327. Type description.

TYPE LOCALITY.—Carlazo, Tarija, southern Bolivia, 2300 m.

TYPE SPECIMEN.—B.M. 26.1.1.167. Old adult male. Coll. E. Budin, No. 1888, February 26, 1925. Type in B.M.

MATERIAL EXAMINED (11 specimens)

BOLIVIA.—Carlazo, Tarija (B.M. 26.1.1.167, type, o.ad.male; B.M. 26.1.1.166, 26.1.1.168, males; B.M. 26.1.1.169–170, females); Piño, Tarija (B.M. 26.1.1.171, female); Tablada, Tarija (B.M. 26.1.1.163–165, males); "Tarija" (F.M.N.H. 29170, male; F.M.N.H. 29169, female).

General superficial likeness to the brownish *v. venusta* or *v. cinderella* dorsally, but ventral color dull whitish. A much larger animal allied to *marmota.*

Dorsal color of type between Prout's brown (R.) and mummy brown (R.), with sides and dorso-lateral parts browner than hair brown (R.). Ventrally dirty white, the hairs thin and rather coarse. Face drabby gray. Greatest width of dark dorsal patch 20 mm. Ventrally the hairs from the chest posteriorly with very short gray bases (absent in other material). Large throat gland. Vibrissæ rather long. Eye-rings reduced. Ears very large. Feet gray-white. Tail bicolor, dorsally light fuscous.

A female shows entire mammary region—abdomen to chest—self-colored dull pale yellow-orange (R.). B.M. 26.1.1.171, another female, has the gray of the underparts more pronounced than in the type, and the unicolorous area restricted to a width of 10 mm.

SKULL.—Skull very like that of *marmota verax*, but with anterior part of interorbital region narrower than in either *m. marmota* or *m. verax*. Zygomata well-expanded in type; a small, but appreciable expansion of the nasals at the maxillo-frontal suture; distinctly angular supraorbital ridges which as temporal ridges do not tend to become confluent on parietals and interparietal; a rather small brain case. Palate moderately broad; bridge narrow; bullæ large and wide apart.

DISTRIBUTION.—Known only from the Tarija region of southern Bolivia.

This is the mountain representative of the *marmota* radiation. It can be treated as a subspecies of *marmota*, for its skull is practically indistinguishable from that of *marmota verax*, but for the present it is retained as a full species because of its distinct coloration.

MAMMÆ.—The female, B.M. 26.1.1.170, collected on March 10, has 7–1–7 mammæ, three pairs of which are thoracic.

Marmosa pusilla (Desmarest)

Plate XII, Figure 114; Plate XXV, Figure 236

1801. Micouré nain AZARA, 'Essais Quadr. Paraguay,' I, p. 290. Original description without specific name. Locality "Saint-Ignace-Gouazou."

1802. Enano AZARA, 'Apuntamientos Nat. Hist. Quadr. Paraguay,' I, p. 262. Slightly modified description.

1805. *Didelphis pusilla* DESMAREST, 'Nouv. Dict. d'Hist. Nat.,' 1st Ed., XXIV, Tabl. Mamm. p. 19. The "micouré nain d'Azara."

1809. *Enano* AZARA, 'Voyages S. America' (Paris), I, p. 291. Brief résumé.

1811. *Didelphis nana* ILLIGER, Abhandl. Akad. Berlin, p. 107. Listed (*nomen nudum*).

1816. *Didelphis nana* OKEN, 'Lehrbuch der Naturg.,' Pt. 3 (Zool.), II, p. 1140. First use of *nana* (syn. of *pusilla*).

1817. *Didelphis pusilla* DESMAREST, 'Nouv. Dict. d'Hist. Nat.,' 2nd. Ed., IX, p. 430. Description based upon Azara.

1820. *Didelphys pusilla* DESMAREST, 'Mammalogie,' Parts 1–2, p. 261. Description based upon Azara.

1824. *Didelphis pusilla* DESMOULINS, 'Dict. Class. d'Hist. Nat.,' V, p. 493. Description based upon Azara.

1846. *Didelphys pusilla* WATERHOUSE, 'Nat. Hist. Mamm.,' I, p. 514. Based upon Azara.

1854. *Didelphys pusilla* BURMEISTER, 'Thiere Brasil,' p. 140. Description based upon Azara.

[1888*a*. *Didelphys pusilla* THOMAS, 'Cat. Marsupials,' p. 348. The first reference made is to Azara, but the description is of a member of the *microtarsus* group. No Paraguayan material listed.]

1894. *Marmosa marmota* THOMAS, Ann. Mag. Nat. Hist., (6) XIV, p. 184. Rediscovery and redescription of *pusilla*, referred, however, to micouré a queue longue (*marmota*).

1896. *Marmosa marmota* THOMAS, Ann. Mag. Nat. Hist., (6) XVIII, p. 313. Footnote under *fuscata*.

1912. *Marmosa citella*[1] THOMAS, Ann. Mag. Nat. Hist., (8) IX, p. 409.
Type description of the specimen previously (1894) referred to *marmota*.

1916. *Grymæomys pusilla* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 270. Listed.

1916. *Thylamys citella* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 271. Listed.

1919. *Marmosa pusilla* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 39. Listed.

1919. *Thylamys citella* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 40. Listed.

TYPE LOCALITY.—Saint-Ignace-Gouazou, Paraguay.[2]

TYPE SPECIMEN.—None in existence. Description based upon two males seen by Azara.

MATERIAL EXAMINED (6 specimens)

ARGENTINA.—Goya, Corrientes (B.M. 98.8.19.9, type of *citella*, y.ad.male; B.M. 98.8.19.10–11, y.ad.females; B.M. 98.8.19.12 o.ad.female); Estancia Coropa, Goya, Corrientes (B.M. 94.6.30.1, juvenile); La Paz, Entre Rios (B.M. 23.12.12.16, juv. female).

A much smaller form than *marmota* with perfectly white instead of creamy underparts.

Color above chaetura drab (R.), the outer and lateral color paler. Ventrally white, the white extending out on legs and on to cheeks. Pattern with mid-dorsal portion very broad (up to 32 mm.). Throat gland well developed. Tail strongly bicolor—fuscous and gray-white; rather long.

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[1]The type of *citella* is B.M.98.8.19.9, young adult male, coll. Richard Perrens, No. 10, July, 1885. In B.M.

[2]Saint-Ignace-Gouazou, "Established 1610 . . . lat. S. 26° 57′ 53″, long. W. 59° 20′ 49″ . . . after 18 years transferred to Saint Ange, 12 degrees south where fixed 40 years later." (Azara, 'Voyages,' II, p. 322). It is shown on Stieler's 'Atlas,' 1925, map 107 as "S. Ignacio," approximately S. 24°, W. 57°, 34½ leagues S¼ S.E. of the city of Asuncion.

SKULL.—Short and broad in outline. Nasals scarcely broadened at base, rounded behind. Slightly pointed, scarcely beaded supraorbital ridges, confluent with the temporal ridges on the brain case, essentially as in *marmota*, but perhaps slightly less convergent. No trace of crest. Ventrally much smaller but otherwise with palate and teeth essentially as in *pallidior*, except palate rather shorter.

DISTRIBUTION.—Definitely known only from southern Paraguay and the Provinces of Corrientes and Entre Rios, east of the Rio Paraguay. Probably extends into Misiones and eastward into western Uruguay.

Pusilla bears a considerable likeness to *pallidior*, but can be distinguished by its longer tail, much greater size in adulthood, larger feet and ears,—besides the cranial characters pertaining to the section in which the animals belong, as interorbital breadth, etc.

Probably the complicated nomenclatural history of this form would have been cleared up years ago had not Thomas in the 'Catalogue of Marsupials' diverted the name *pusilla* to cinnamon-colored animals from southeastern Brazil which were really *microtarsus*. When at length a specimen of *pusilla* was collected in 1885 near Goya, Corrientes, he concluded that it must be the "micouré quatrième" or *marmota*. This decision he only reversed in 1912, when, specimens of true *marmota* being at hand (collected in 1899 and 1903), he proposed for the Goya specimen the name *citella*.

Azara's descriptions of both opossums are very clear; the gray color and the mention of the external white eye-ring and median dark triangular area on the brows leaves little doubt as to their being members of the *elegans* group. Even the rather long tail of *pusilla* is brought out by Azara.

Pallidior-venusta Section

Very small to moderate-sized animals, which are either gray-bellied or white-bellied with skulls of much greater brain capacity than in *elegans* section and comparatively slight interorbital narrowing. Supraorbital ridges, which are never so pronounced in the present section as they are in some forms of *marmota*, are present or absent according to species.

The section is rather heterogeneous. It includes what appear to be four rather incipient lines of radiation: *pallidior*, *venusta*, *bruchi*, and *velutina*, which perhaps ought each to be accorded equal rank with the *elegans* section.

KEY TO *venusta* SECTION

1.—Hind feet very short and thick, with extremely short toes. Southeastern Brazil to Minas Geraes.....*velutina.*
Hind feet, although proportionately small (as in whole of elegans group) not thickened and without extreme shortening of fingers.....2.
2.—Size small to moderately large. (Head and body from 75 mm. up. Fur usually long—8 to 13 mm.).....3.
Size exceedingly small. (Head and body less than 75 mm. Fur short—5 to 10 mm.).....6.
3.—Dorsal color predominantly grayish. Ventral surface snowy white, without gray-based hairs. Bullæ large.....*pallidior.*
Dorsal color predominantly brownish. Ventral surface buffy white, commonly with broad borders of gray-based hairs. Bullæ smaller.....(*venusta*) 4.
4.—Maxillary tooth row, M^{1-3}, 5.0 mm. or less. From Bolivia..*venusta venusta.*
Maxillary tooth rows from 4.8 to 5.4 mm. From Argentina.....5.
5.—Zygomatic breadth in full adults usually 16 mm. or more. From Prov. Tucuman. *venusta cinderella.*
Zygomatic breadth in full adults usually less than 16 mm. From Prov. Jujuy. *venusta sponsoria.*
6.—Underparts pale buffy-white.....*bruchi.*
Underparts light grayish-brown.....*formosa.*

Marmosa venusta Thomas

(Synonymy under subspecies)

In this species are included the three subspecies, true *venusta*, *cinderella*, and *sponsoria*. *Venusta* is distinguished at once by having the greater part, especially the posterior part of the ventral surface, clothed with gray-based, buffy-tipped, or whitish-tipped hairs.

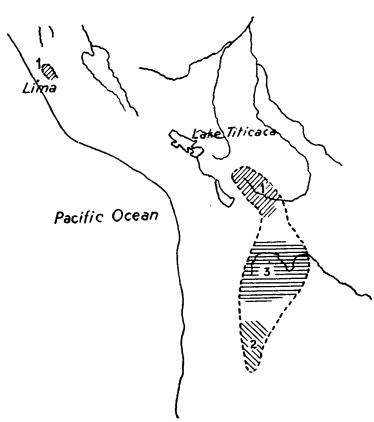

Fig. 28. Distribution of *M. venusta*.
1, *M. venusta venusta;* 2, *M. venusta cinderella;* 3, *M. venusta sponsoria.*

The fundamental dorsal color in all three forms of *venusta* is brown, modified in conformity with the dorsal pattern; in *pallidior*, *elegans*, and *marmota* it is gray—perhaps with a brownish wash. The only form which approaches *venusta* in dorsal coloration is *janetta*, and it is much larger, and possesses dull white ventral pelage, usually little or no gray at the roots of the belly hairs, and a cranium with narrowed interorbital region.

SKULL.—Moderately broad to well broadened. Brain case large and smooth; muzzle rather slender; a wide interorbital region; no post-orbital constriction; palate narrow to broad; bullæ small and far apart.

Compared with *pallidior* it has the bullæ smaller and much more widely separated; the width from the inner surface of one bullæ to that of the other is about twice the width of the single bulla in *venusta;* in *pallidior* it is about one and one half times or even less.

Venusta differs from the *marmota* section in having an interorbital region quite unconstricted posteriorly.

DISTRIBUTION.—From south Bolivia through Jujuy at least to Tucuman and probably on into Catamarca. (Map, Fig. 28, p. 224.)

Marmosa venusta venusta Thomas

Plate XIII, Figure 115; Plate XXV, Figure 237

1902. *Marmosa elegans* THOMAS, Ann. Mag. Nat. Hist., (7) IX, p. 143. Record from "Parotani."

1902*a*. *Marmosa elegans venusta* THOMAS, Ann. Mag. Nat. Hist., (7) X, p. 159. Type description.

1905. *Marmosa elegans venusta* TROUESSART, 'Cat. Mamm. viv. foss.,' Suppl. p. 856. Listed.

1916. *Marmosa elegans venusta*, OSGOOD, Field Mus. Nat. Hist., X, p. 200. Note on specimens from Parotani.

1916. *Thylamys venusta* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 271. Listed.

1919. *Marmosa* (*Thylamys*) *elegans venusta* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 40. Listed.

TYPE LOCALITY.—Parotani, Cochabamba, Bolivia, 2800 m.

TYPE SPECIMEN.—B.M. 2.1.1.120, adult female. Coll. P. O. Simons. Type in B.M.

MATERIAL EXAMINED (14 specimens)

BOLIVIA.—Parotani, Cochabamba (B.M. 2.1.1.120, type, adult female; B.M. 2.1.1.118, male; B.M. 2.1.1.119, 21.1.1.121, A.M.N.H. 40790, females; A.M.N.H. 40789, juv.female; A.M.N.H. 21553, male; A.M.N.H. 21554, female); Vermejo (A.M.N.H. 38996, female); "Cochabamba" (B.M. 2.1.1.122, female); "Sucre" (B.M. 2.2.2.114, male; B.M. 2.2.2.115, female).

PERU.—Matucana, Rimac Valley, 7700 feet (F.M.N.H. 24141, juv.male); Surco, Rimac Valley, about 6700 feet (B.M. 0.5.7.66, juv.female).

The mountain-inhabiting representative of the species in Bolivia and Peru.

Dorsal color of type near benzo brown (R.), tips of individual hairs wood brown (R.); lateral band a brownish shade of drab (R.); ventral color light buff; on chin, throat, and center of chest unicolorous; else-

where the gray-based hairs with so little buffy at the tips that the color is yellowish gray or buffy gray. Inguinal color cinnamon-buff (R.). Eye-rings reduced. Vibrissæ rather short. Ears large, light fuscous. Feet buffy white. Tail bicolor.

In a general way specimens of *venusta venusta* are browner than *v. cinderella*, and rather smaller. The lateral bands may be strongly tinged with cinnamon (A.M.N.H. 38996 from Vermejo). Ventrally the self-colored hairs may occur only on throat and neck, and even there they may be much constricted by gray-based hairs.

SKULL.—Skull of type with arches moderately expanded. Supra-orbital ridges scarcely developed. Interorbital region rather narrow. Palate narrow in front, but broadening abruptly at P^3; not greatly broadened posteriorly. Molars compressed antero-posteriorly. Bullæ moderate to small for group and far apart.

DISTRIBUTION.—The Cochabamba region of Bolivia, extending into the Province of Sucre and south to the headwaters of the Rio Vermejo. Also in the Rimac Valley above Lima.

The appearance of *venusta* in the upper part of the Rimac Valley is interesting. The two juveniles, one from Matucana, 7700 feet, the other from Surco, 6700 feet, which provide the evidence, are too young for close determination, and are referred provisionally to *venusta venusta*. The presence of any member of the *elegans* group so far north is unexpected, the usual northern limit occurring at about S. lat. 16°. These animals of the Upper Rimac may represent an isolated colony, or the species may eventually be found all the way southward to the north of Chile at suitable elevations. The British Museum specimen has much less gray-based hair than the other, which makes it resemble a young *pallidior*.

Marmosa venusta cinderella Thomas

Plate XIII, Figure 116; Plate XXVI, Figure 238

1902. *Marmosa elegans cinderella* THOMAS, Ann. Mag. Nat. Hist., (7) X, p. 159. Type description.

1905. *Marmosa elegans cinderella* TROUESSART, 'Cat. Mamm. viv. foss.,' Suppl., p. 857. Listed.

1916. *Thylamys cinderella* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 271. Listed.

1918. *Marmosa elegans cinderella* THOMAS, Ann. Mag. Nat. Hist., (9) I, p. 193. Records from Leon, Jujuy.

1919. *Marmosa (Thylamys) elegans cinderella* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 40. Listed.

1920. *Marmosa elegans cinderella* THOMAS, Ann. Mag. Nat. Hist., (9) V, p. 196. Records from Jujuy.

1925. *Marmosa elegans cinderella* THOMAS, Ann. Mag. Nat. Hist., (9) XV, p. 582. Records from Carapari.

1926. *Marmosa elegans cinderella* THOMAS, Ann. Mag. Nat. Hist., (9) XVII, p. 608. Records and remarks on Tucuman specimens.

1926*a*. *Marmosa* sp. (near *verax*) THOMAS, Ann. Mag. Nat. Hist., (9) XVII, p. 609. Record from Rio Vipos, Tucuman.

TYPE LOCALITY.—Tucuman, Argentina, 450 m.

TYPE SPECIMEN.—B.M. 0.7.9.20. Adult female. Coll. Dinelli. Type in B.M.

MATERIAL EXAMINED (68 specimens)

ARGENTINA.—"Tucuman" (B.M. 0.7.9.20, type, ad.female); Norreo-Vipos, Tucuman (F.M.N.H. 29168, o.ad.female; B.M. 26.2.13.173–175, 2.1.5.16, males); Villa Nouges, S. Pablo, Tucuman (B.M. 26.2.13.176–177, 2.1.5.17, females); Cerro de Tafi Viejo, Tucuman (B.M. 26.2.13.172, male); Concepcion, Tucuman [B.M. 25.12.13.20, 25.12.13.33–36, males; F.M.N.H. 30199–200, 30202–03, y.ad.females; F.M.N.H. 30201, ad.male; B.M. 26.8.3.12–23 (Alcs.), males; B.M. 26.8.3.24 (Alc.), female]; Trancas, Cerro de Raco, Tucuman (Dickey 16573, y.ad.male; Dickey 16571, y.ad.female); Cerro del Campo, Burruyacu, Tucuman (B.M. 26.2.13.167–168, males; B.M. 26.2.13.169–171, females); Serra de Tucuman, Tucuman (A.M.N.H. 41707–09, 41712, 41715, 41717, 41719, juv.males; A.M.N.H. 41718, v.y.ad.male; A.M.N.H. 41702, y.ad.female; A.M.N.H. 41703–06, 41710–11, 41713–14, 41716, juv.females); Cerro de Tafi Viejo, Tucuman (Dickey 15063, ad.male; Dickey 15066, y.ad.male; Dickey 15062, y.ad.female); Jujuy, 1258 m. (B.M. 20.1.7.135–137, males; B.M. 20.1.7.138–139, females); Leon, Jujuy, 1500 m. (B.M. 18.1.1.47–50, males; B.M. 18.1.1.51, female); Carmencito, Jujuy, 400 m. (B.M. 21.1.2.17, male).

BOLIVIA.—Carapari, 100 m. (B.M. 25.2.1.72–74, males; B.M. 25.2.1.75–76, females).

Fur above quite close to that of *janetta* in appearance; dorsal and lateral colors and patterns very similar. A smaller animal.

Generally a dirty buff ventrally with much gray of the gray-based hairs showing through (*janetta* is generally without gray-based hair). Self-colored hair anterior to throat and a median patch on chest. Some specimens with a very faint greenish-sulphur tint washed over the normal gray-white of the under surface. Throat gland well developed. Pelage thick and long. Ears fuscous, large. Feet gray-white. Tail bicolor, fuscous above.

SKULL.—Skull of type larger than in *venusta* and palate narrower and more elongate. Zygomata quite widely flaring, especially in old animals. Traces of supraorbital beading; no postorbital constriction; temporal ridges well separated. Palate with premolar portion narrow, but widening considerably at the back. Bullæ well separated. In old adults, especially males, the palate is relatively short and broad; the skull very broad across the arches; and with well-developed projecting supraorbital ridges.

DISTRIBUTION.—Only certainly known from the province of Tucuman, but it probably extends southward into Catamarca and Salta in the southern part of Jujuy. A series of *venusta* subspecies from Carapari, Bolivia, is referred to *v. cinderella.*

Marmosa venusta sponsoria Thomas

Plate XIII, Figure 117; Plate XXVI, Figure 239

1921*a*. *Marmosa elegans sponsoria* THOMAS, Ann. Mag. Nat. Hist., (9) VII, p. 186. Type description.

1921*b*. *Marmosa elegans sponsoria* THOMAS, Ann. Mag. Nat. Hist., (9) VIII, p. 617. He is inclined to synonymize *sponsoria* with *cinderella.*

TYPE LOCALITY.—Sunchal, Sierra de Santa Barbara, southeast Jujuy, Argentina, 1200 m.

TYPE SPECIMEN.—B.M. 21.1.1.85. Adult male. Coll. E. Budin, June 23, 1920. Type in B.M.

MATERIAL EXAMINED (30 specimens)

ARGENTINA.—Sunchal, Sierra de Sta. Barbara, Jujuy (B.M. 21.1.1.85, type, ad.male; B.M. 21.1.1.81–84, 21.1.1.86–87, males; B.M. 21.1.1.88–90, females); Higuerilla, Jujuy (B.M. 21.11.1.99–102, males; B.M. 21.11.1.103–104, females); Near Vala, Jujuy (F.M.N.H. 22354, male); Calilegua, Jujuy (F.M.N.H. 22352–53, females); "Jujuy" (B.M. 20.1.7.135–137, males; B.M. 20.1.7.138–139, females); Leon, Jujuy (B.M. 18.1.1.47–50, males; B.M. 18.1.1.51, female); Carmencito, Jujuy (B.M. 21.1.2.17, male).

Color of median dorsal region of type between natal brown (R.) and fuscous (R.); lateral dorsal area and sides from cinnamon-brown (R.) to snuff brown (R.). Underparts dirty gray-white or gray-buff. Self-colored hairs on chin and cheeks and a small median area of chest only. A faint median facial stripe. Ears fuscous. Tail fuscous and slightly bicolor. Feet gray-white.

SKULL.—Skull of type elongate, narrow of muzzle; the zygomatic arches not greatly expanded; supraorbital ridges slightly developed, not sharp or beaded. Palate rather long; distance from posterior edge of palate to anterior borders of bullæ less in *sponsoria* than in *cinderella.* Coronoid with anterior edge straight, the tip falcate.

DISTRIBUTION.—The type region, Sierra de Santa Barbara, Jujuy.

The distinctness of *sponsoria* from *cinderella* is problematical. Thomas's claim is that the skull is "more elongate," which means also proportionately narrower. But apparently he only compared his specimens with unusually old, wide-skulled specimens of *cinderella.* Numerous younger individuals of the latter from Tucuman fit the description of *sponsoria* perfectly. Certain individuals of *cinderella* with unusually flaring zygomata are found in collections, but these are in each case

extremely old; so it seems probable that with more collecting, specimens of *sponsoria* corresponding with the large skulls from Tucuman will be discovered. Provisionally *sponsoria* is retained as a distinct subspecies.

Marmosa pallidior Thomas

Plate XIII, Figure 118; Plate XXVI, Figure 240

1898*b*. *Marmosa elegans* THOMAS, Boll. Mus. Zool. Anat. Comp., Univ. Torino, XIII, No. 315, p. 4. Mention.

1902. *Marmosa elegans* THOMAS, Ann. Mag. Nat. Hist., (7) IX, p. 230. Records from Bolivia.

1902*a*. *Marmosa elegans pallidior* THOMAS, Ann. Mag. Nat. Hist., (7) X, p. 161. Type description.

1905. *Marmosa elegans pallidior* TROUESSART, 'Cat. Mamm. viv. foss.,' Suppl., p. 856. Listed.

1913. *Marmosa elegans pallidior* THOMAS, Ann. Mag. Nat. Hist., (8) XI, p. 143. Record from Maimara.

1916. *Thylamys pallidior* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 271. Listed.

1919. *Marmosa (Thylamys) elegans pallidior* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 40. Listed.

1919. *Marmosa elegans pallidior* THOMAS, Ann. Mag. Nat. Hist., (9) III, p. 118. Records from Chumbiche, Catamarca.

1920*a*. *Marmosa elegans pallidior* THOMAS, Ann. Mag. Nat. Hist., (9) VI, p. 422. Records from La Invernada and Potrerillo.

1921*b*. *Marmosa elegans pallidior* THOMAS, Ann. Mag. Nat. Hist., (9) VIII, p. 617. Record from Alfarcito, 15 km. northeast of Maimara.

1926*a*. *Marmosa elegans pallidior* THOMAS, Ann. Mag. Nat. Hist., (9) XVII, p. 609. Record from Vipos, Tucuman. "Near *verax*."

1926*c*. *Marmosa elegans pallidior* THOMAS, Ann. Mag. Nat. Hist., (9) XVIII, p. 195. Record from Yuruma, Bolivia.

1926*d*. *Marmosa elegans pallidior* THOMAS, Ann. Mag. Nat. Hist., (9) XVIII, p. 641. Record and remarks on animals from Nequen.

1927*a*. *Marmosa elegans pallidior* THOMAS, Ann. Mag. Nat. Hist., (9) XIX, p. 657. Records and remarks on animals from Nequen.

TYPE LOCALITY.—Challapata, east of Lake Poopo, Prov. Cochabamba, Bolivia, 3800 m.

TYPE SPECIMEN.—B.M. 2.2.2.116. Young adult male. Coll. P. O. Simons, No. 1650. October 26, 1901. Type in B.M.

MATERIAL EXAMINED (64 specimens)

BOLIVIA.—Challapata, Cochabamba (B.M. 2.2.2.116, type, y.ad.male; B.M. 2.2.2.117, male; B.M. 2.2.2.118–121, females; U.S.N.M. 121157, y.ad.female); La Paz (Berlin 17165, male); St. Cruz de la Sierra (B.M. 23.12.12.15, male); Est. Yuruma, Tarija (B.M. 26.6.12.90, female).

ARGENTINA.—Maimara, Jujuy (B.M. 12.12.12.54–55, males); Abropampa, Jujuy (B.M. 19.8.1.female); Casabindo, Jujuy (B.M. 19.8.2.35–36, 19.8.2.39, males; B. M. 19.8.2.40–44, females; 90 km. N.N.W. of Tucuman (B.M. 20.7.6.13, male);

Tafi del Valle, Tucuman (A.M.N.H. 41720, male; A.M.N.H. 41723, v.y.male; A.M.N.H. 41725–26, 41728, males; A.M.N.H. 41724, 41727, females); Estacion Vipos, Tucuman (B.M. 26.2.13.178, y.ad.male); Tapia, Tucuman (U.S.B.S. 236332, female); La Valle, Stgo. del Estero (A.M.N.H. 41721–22, y.ad.males); Esteros, Chaco, Stgo. del Estero (Munich 1926/278, y.ad.male); Villa Montes, Chaco, Stgo. del Estero [Munich 1926/262, female (?)]; Otro Cerro, Catamarca (B.M. 20.3.17.74–75, males); Chumbiche, Catamarca (B.M. 18.11.11.72–74, males; B.M. 18.11.11.75, female; B.M. 20.3.15.17, male); Gualfin, Catamarca (B.M. 26.1.9.19, male); La Invernada, Famatina Range, Rioja, 3800 m. (B.M. 20.8.4.66, male); Potrerillo, Famatina Range, Rioja (B.M. 20.8.4.68, female); Tupungato, Mendoza (B.M. 21.7.5.25, male); Colonia Alocar, Rio Atuel, Mendoza [B.M. 10.5.12.1, juv. (?)]; Chos Malal, Nequen (B.M. 26.10.11.98–104, males; B.M. 26.10.11.105, female); Collon Cura, Nequen (B.M. 27.6.4.57–60, 27.6.4.79, females); Las Lajas, Nequen (B.M. 26.10.11.106, male; B.M. 26.10.11.107–108, females); General Roca, Rio Negro (U.S.B.S. 236331, y.ad.female).

A rather small, grayish species with white or creamy-white underparts and short tail; a miniature of *elegans*.

Dorsal color of type near cinnamon-drab (R.) (probably rather faded) with dark bases of hairs showing through; lateral color to either side of median dorsal area between cinnamon-drab (R.) and light drab (R.); ventral color white, only a very narrow fringe of gray-based hairs on each side behind the arms. Face light drab (R.). Eye-rings much reduced. Pelage very long and lax. Ears very large, light fuscous. Vibrissæ rather long. Feet very small, grayish white to pure white. Tail short, bicolor; light fuscous above, whitish beneath.

In fresh material the dorsum is between benzo brown (R.) and hair brown (R.), with a darker tone imparted by the fuscous bases of the hairs showing through. The intermediate shade between the mid-dorsal color and the white underside is a brownish shade of drab (R.). Due to wear of the light tips of the hairs, individuals such as U.S.B.S. 236332 may have the mid-dorsal color very dark.

Skull.—Skull of type with broad brain case and moderately expanded zygomata; muzzle narrow, pointed; nasals practically unexpanded basally. Supraorbital ridges smooth and rounded; postorbital constriction not pronounced. Palate narrow in front, the canines approximated, broad behind. Bridge very narrow. Bullæ very large and exceptionally close together (compared with forms like *cinderella* and *marmota*). Coronoid straight, falcate, narrow at the top. A female has the ventral color dull orange-yellow.

Noticeable variation occurs through the distributional range. Compared with lowland forms the type has zygomatic breadth very narrow in proportion to the breadth of brain case; the animal from La

Paz, Bolivia, has the creamy white underparts slightly narrowed at chest to 13 mm. B.M. 20.7.6.13 and B.M. 26.2.13.178, the latter referred doubtfully to *verax* by Thomas, both from the province of Tucuman, have slightly developed supraorbital ridges, nasals pointed behind, and shorter, broader skulls. Specimens from Nequen Province have slightly larger skulls, longer tooth rows, and even larger bullæ than northern animals. Material from the eastern pampas is scanty and mainly immature. It appears to constitute a slightly smaller race, but it is quite as heavily furred as western forms.

Perhaps when larger series from many localities have been assembled, *pallidior* may be found to consist of several races; at present, although the British Museum possesses some good series, not enough provinces are well represented for this point to be definitely determined.

DISTRIBUTION.—*Pallidior* has a very wide range, both horizontally, and vertically: eastern and southern Bolivia, all western Argentina, at least as far south as Nequen and the Rio Negro, and to the eastward appearing more or less bounded by the lower Pilcomayo, Rio Paraguay, and Rio de la Plata. It may not reach the eastern portions of the provinces of Buenos Aires, Pampa, and Rio Negro.

Marmosa bruchi Thomas

Plate XIII, Figure 119; Plate XXVI, Figure 241

1921. *Marmosa bruchi* THOMAS, Ann. Mag. Nat. Hist., (9) VII, p. 519. Type description.

TYPE LOCALITY.—Alto Pencoso, just west of San Luis City, San Luis, Argentina.

TYPE SPECIMEN.—B.M. 21.4.21.8, young adult male. Coll. Dr. Carlos Bruch, February, 1914. Skinned from alcoholic specimen. Type in B.M.

MATERIAL EXAMINED (2 specimens)

ARGENTINA.—Alto Pencoso, San Luis (B.M. 21.4.21.8, type, young adult male); Villa Valeria, San Luis [B.M. 23.12.12.23 (Alc.), adult male].

Two things may have contributed to make the type description of *bruchi* very slightly misleading: the color seems to have been affected by the preserving fluid; and the specimen is still very young. The second specimen, still in spirit, is appreciably larger, with length of head and body at least 80; tail at least 100; and hind foot at least 12 mm.

Present color of type dorsally benzo brown (R.), the lateral dorsal color light drab. Ventrally pure white, without gray at the bases of the hairs. Eye-rings greatly reduced. Vibrissæ proportionately rather long. Ears moderately large. Feet white. Tail moderately long, slightly swollen, grayish above, beneath white.

SKULL.—Short and broad with very large, broad brain case; muzzle short and quite narrow anteriorly, but expanding abruptly at the commencement of the zygomata. Interorbital region quite broad, without trace of postorbital constriction, and very short, in accordance with the general shortness of the skull. No supraorbital ridges developed. Zygomatic process of squamosal only slightly extended laterally. Palate short, narrow anteriorly, with short canines close together, broadening posteriorly; extending only a short distance behind last molars. Bullæ large; width of bulla equals about two-thirds of distance between their inner sides (as in *pallidior*).

DISTRIBUTION.—Recorded so far only from near San Luis City, San Luis.

REMARKS.—Although nearly as small as *formosa*, *bruchi* appears in color, body proportions, and cranial characters more nearly allied to *pallidior*.

Marmosa formosa Shamel

Plate XIII, Figure 120; Plate XXVI, Figure 242

1930. *Marmosa muscula* SHAMEL, Journ. Wash. Acad. of Sci., XX, p. 83. Type description. Pre-occupied by *Didelphis* (*Marmosa*) *musculus* CABANIS.

1930*a*. *Marmosa formosa* SHAMEL, Journ. Mammalogy, XI, p. 311. Renaming of *muscula*.

TYPE LOCALITY.—Riacho Pilaga, 10 mi. northwest of Kilom. 182, Province of Formosa (central), Argentina.

TYPE SPECIMEN.—U.S.N.M. 236330. Rather young adult male. Coll. Dr. A. Wetmore, No. 101, August 9, 1920. Type in U.S.N.M.

MATERIAL EXAMINED

The type only.

Dorsally nearer warm sepia (R.) than colonial buff (R.); but with a mottling of light brown caused by the grouping of the penultimate color bands resulting in a light brown nearest to chamois (R.) or clay color (R.). Lateral shade lighter, caused by the fuscous tips of the hairs being absent or nearly so. Dorsal pattern of group, however, very indistinct. Ventral color a dingy grayish yellow, near chamois (R.) or cream-buff (R.)—deeper on throat and paler posteriorly. "Colonial buff" appears too clear a yellow to describe the dull hue of the fur. Self-colored hairs on chin only; cheeks with coloring of neck, but the hairs with short, gray bases. Vibrissæ exceptionally short (only 12 mm.). Eye-rings much reduced generally, but prolonged to bases of vibrissæ. Ears very small for group—recalling what little is known of the ear in *velutina*. Feet very small. Tail not swollen, unusually short, five-sixths

of length of body—again like *velutina;* bicolor, above light fuscous, beneath buffy.

SKULL.—Skull of peculiar appearance on account of the interorbital region. Zygomata moderately expanded; muzzle short, pointed at tip and broad at base. Nasals only very slightly widened at maxillo-frontal suture, slightly pointed behind, and with small points of the frontals inserted between them for ½ mm. Interorbital portion of cranium smooth, without ridges, but with posterior and anterior constrictions, between which the frontals swell out quite markedly. Anterior constriction (3.5) slightly narrower than posterior. Brain case smooth, rounded; temporal ridges practically invisible. Palate narrow in front, broad behind; scarcely prolonged at all behind M^4. Canines moderately long; premolars appearing greatly crowded. Bridge narrow and short. Bullæ moderately large; proportion of width of single bulla to width between the two bullæ slightly greater than 1: 2.

DISTRIBUTION.—Probably throughout Formosa, Argentina.

REMARKS.—The relationship of this, the smallest known *Marmosa,* is obscure. Certain characters mentioned above together with the restriction of self-colored pelage to the chin suggest *velutina,* but the unusual character of the interorbital region (to which an analogy may be observed in certain specimens of *M. caucæ oroensis*) is very different from the evenly constricted frontals of *velutina.* The relatively small, well-separated bullæ and colored ventral pelage again distinguish it from the white-bellied *bruchi.*

Marmosa velutina (Wagner)

Plate XIII, Figures 121, 122; Plate XXVI, Figures 243, 244

1842. *Didelphys velutina* WAGNER, Wiegmann Archiv für Naturgeschichte, I, p. 360. Type description. Locality Ypanema.

1847. *Didelphys velutina* WAGNER, Abh. Ak. Wiss. München, V, p. 155. Redescription, apparently from a single specimen.

1849. *Didelphys pimelura* REINHARDT, Vidensk. Medd., p. 5.

1855. *Didelphys velutina* WAGNER, Schreber 'Säugeth., Suppl.,' V, p. 247. Description and measurements.

1856. *Microdelphys velutina* BURMEISTER, 'Erläut. zur Fauna Brasilien,' p. 86.

1883. *Didelphys velutina* PELZELN, 'Brasil. Säugethiere,' Verhandl., Kaiserl. Königl. Zool. Bot. Gesell., Wien, Suppl. to XXXIII, p. 115. Amplifies Wagner's description and measurements.

1888*a*. *Didelphys velutina* THOMAS, 'Cat. Marsup. Monotr. Brit. Mus.,' p. 352. Additional description based upon Thomas's examination of the type. Doubts distinctness from "*grisea.*"

1893. *Grymæomys velutinus* WINGE, E. Mus. Lundii, II, p. 29. Detailed analysis based (?) on Copenhagen material.

1905. *Marmosa velutina* TROUESSART, 'Cat. Mamm. viv. foss.,' Suppl., p. 856. Listed.

1916. *Thylamys velutina* MATSCHIE, Sitzungsber. Gesellsch. Naturforsch. Freunde, Berlin, p. 271. Listed.

1919. *Marmosa velutina* CABRERA, 'Gen. Mamm.,' Mus. Nac. Cien. Nat., Madrid, p. 39. Listed.

TYPE LOCALITY.—Ypanema (Pelzeln, 1883) São Paulo, Brazil.

TYPE SPECIMEN.—Vienna 81. Adult male. Coll. Natterer, No. 81, June 10, 1821 (Pelzeln). Type in Vienna Museum.

The type has now no locality marked upon it; when Thomas saw it in Vienna ('Cat. Marsup.') it was mounted with the skull inside. Dr. Pohle (Berlin Museum) has had it made into a study skin and caused the skull to be cleaned (1929). From these the measurements given here were secured.

MATERIAL EXAMINED (7 specimens)

BRAZIL.—Ypanema, São Paulo (Vienna 81, type, ad.male); Lagoa Santa, Minas Geraes [Halle 360 (148) male; Copenhagen 164 (25), type of *pimelura*, male; Copenhagen 166 (15), 167, males; Copenhagen 168, male (?); Copenhagen 165 (L19), (?)].

Monodelphis-like in general appearance, but the Copenhagen material, in some of which the tails are at maximum thickness, suggests at once the affinity of *velutina* and the *elegans* group.

Color of type, which has probably altered from its original shade, now a slightly reddish tone of brown, without a trace of dorsal pattern; ventrally buffy-brown, the hairs gray-based everywhere except under chin. Face paler. Vibrissæ short. Eye-rings narrow and rather uniform. Ears damaged, but apparently originally small. Remnant of scrotum present. Tail short and tapering, thickest near base; greatest diameter 5.5 mm. Feet short and thick; toes short; claws tiny, appear greatly worn.

SKULL.—Skull with zygomata not greatly expanded; nasals very narrow; interorbital region very narrow; no supraorbital ridges, but a well-marked postorbital constriction. Lateral posterior palatal foramina large. Teeth moderately worn; canines short. Bridge narrow. Bullæ not very large, with process; mandible relatively deep through from alveoli to underneath. This specimen labeled Ypanema; all others from Lagoa Santa.

A description of Halle 360 is practically identical with that of the type. Copenhagen 168 has, to quote rough notes, "short muzzle, marked postorbital constriction, rather large round bulla with process, narrow nasals, seemingly no temporal ridges." Its tail is thick and curved; its feet very small.

Copenhagen 164, apparently representing Reinhardt's *pimelura*, is labeled "*D. pimelura*, Rhdt. male, Feb. 6, '49, No. 25," and on the back

of the label, "*D. velutina*, Natt. 164." The skin is now faded to a brown-gray; the face is paler, but shows on the frons the pointed projection of darker dorsal color from between the ears, characteristic of the *elegans* group. Eye-rings reduced; absent beneath eyes. Ventrally deep gray-buff, the hairs throughout gray-based, except tiny median region of throat beneath chin. Only trace of *elegans* pattern is the frontal mark already mentioned. Ears rather small, fuscous pigmented, with slightly yellowish bases. Feet very small. Tail very thick, broken off and separate from skin. Skull in skin, but canines small and straight.

Copenhagen 167, a spirit specimen labeled "*Gr. elegans*," is reddish brown above; beneath buff. Only chin self-colored. A large adult male. Tail thickened. Feet thick; fingers very short. Muzzle short and broad.

DISTRIBUTION.—Lagoa Santa and Ypanema, Brazil.

REMARKS.—Apparently no recently collected specimens of *velutina* exist. A summary of the foregoing descriptions is as follows: The original color remains problematical; hairs of all specimens, however, are gray-based ventrally, excepting throat or chin. Ears clearly rather small, thus differing from most of the *elegans* group. Feet short, thick, with very short toes. Tail very short, subject to incrassation.

Skull with only moderately broad zygomatic arches, a blunt muzzle, much narrowed, smooth, interorbital region, narrow bridge, and rather small bullæ.

Velutina appears related to *marmota* on account of its cranial characters. On the other hand, forms of *marmota* are generally rather large, have rather longer tails proportionately, and large ears. *Velutina* is retained provisionally with the *pallidior* section.

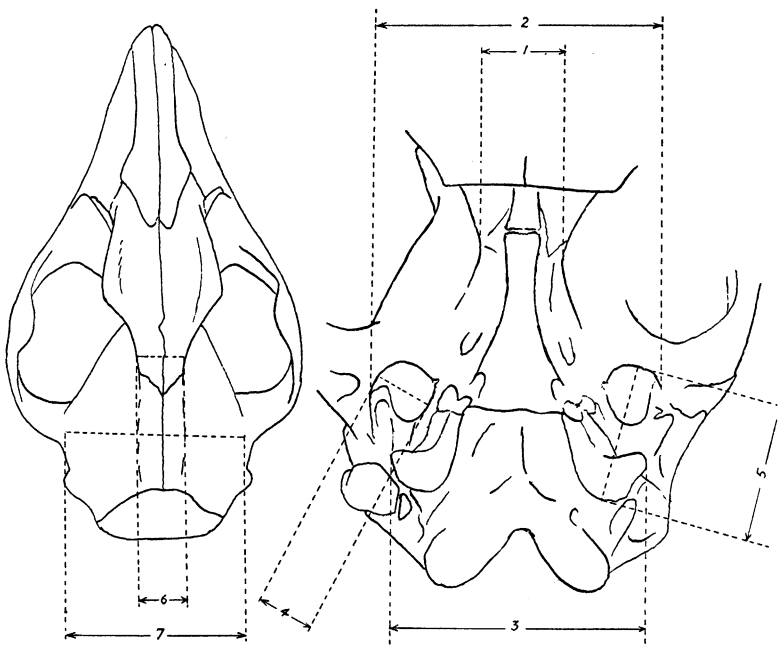

Fig. 29. Diagram to show points at which certain cranial measurements are taken:

1. Least breadth of "bridge" (least breadth across pterygoid wings of alisphenoid).
2. Breadth across bullæ.
3. Breadth across styliform processes of petrosals.
4. Breadth of single bulla.
5. Inclusive length from bulla to petrosal.
6. Breadth of postorbital constriction of supraorbital ridges measured where they merge with temporal ridges.
7. Breadth of brain case measured immediately above root of zygomatic process of squamosal.

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INDEX

Main references are in **heavy-faced** type.

PLATES I TO XXVI

PLATE I

1.—*M. cinerea cinerea.*
2.—*M. cinerea paraguayana.*
3.—*M. limæ*, type.
4.—*M. demararæ demararæ*, type.
5.—*M. demararæ areniticola*, type.
6.—*M. demararæ esmeraldæ*, type.
7.—*M. demararæ meridæ*, type.
8.—*M. alstoni alstoni*, type.
9.—*M. alstoni nicaraguæ*, type.

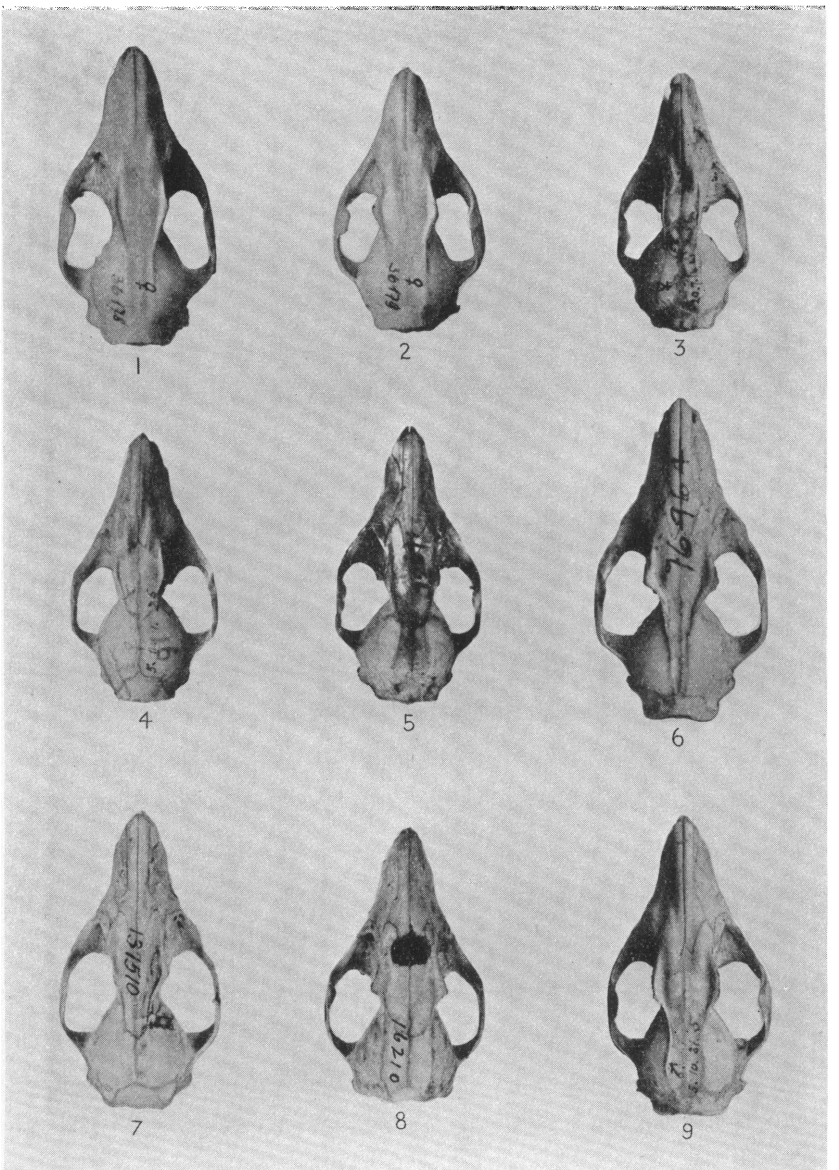
1
2
3
4
5
6
7
8
9

PLATE II

10.—*M. domina*, type.
11.—*M. constantiæ constantiæ*, type.
12.—*M. constantiæ constantiæ* (Bolivia).
13.—*M. constantiæ budini*, type.
14.—*M. mapiriensis*, type.
15.—*M. rapposa*, type.
16.—*M. germana germana*, type.
17.—*M. germana rutteri*, type.
18.—*M. germana parda*, type.

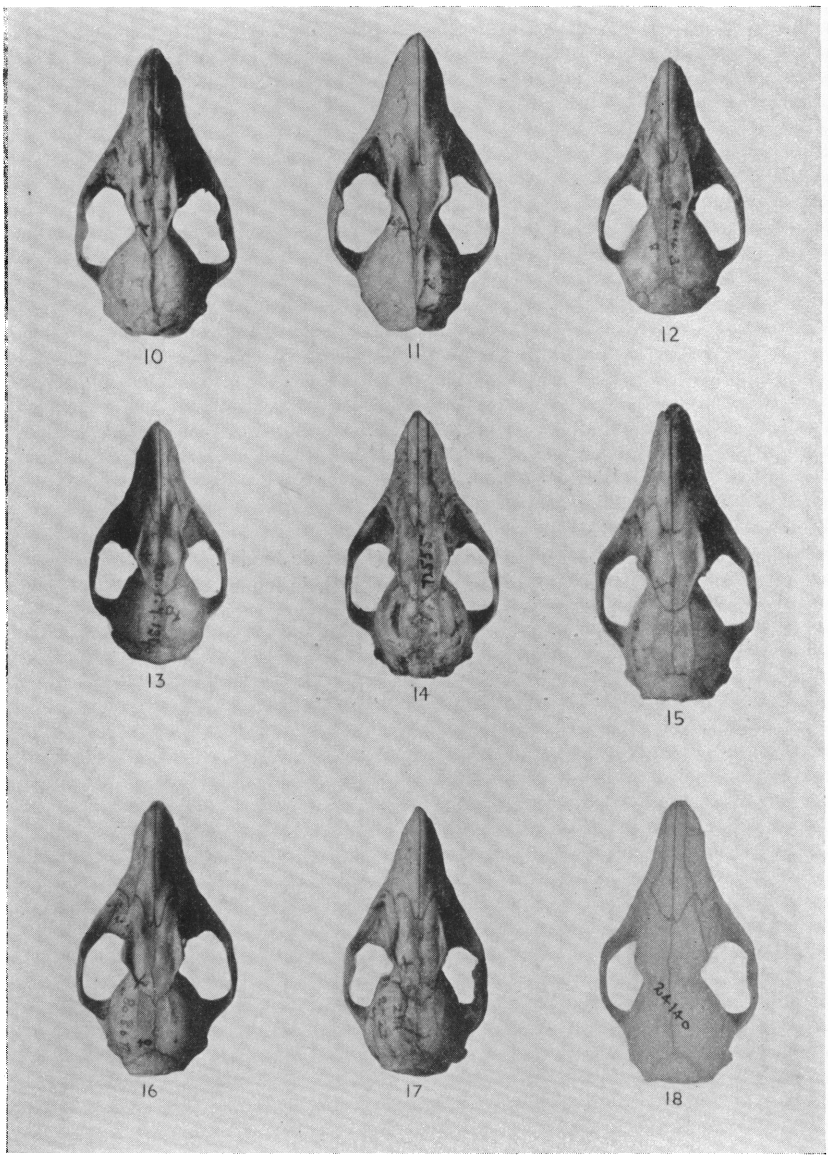
10
11
12
13
14
15
16
17
18

PLATE III

19.—*M. regina*, type.
20.—*M. phaea*, type.
21.—*M. perplexa*, type.
22.—*M. murina murina* (Lidth de Jeude).
23.—*M. murina murina* (Lidth de Jeude).
24.—*M. parata*, type.
25.—*M. murina muscula*, type.
26.—*M. chloe*, type.
27.—*M. murina roraimæ*, type.

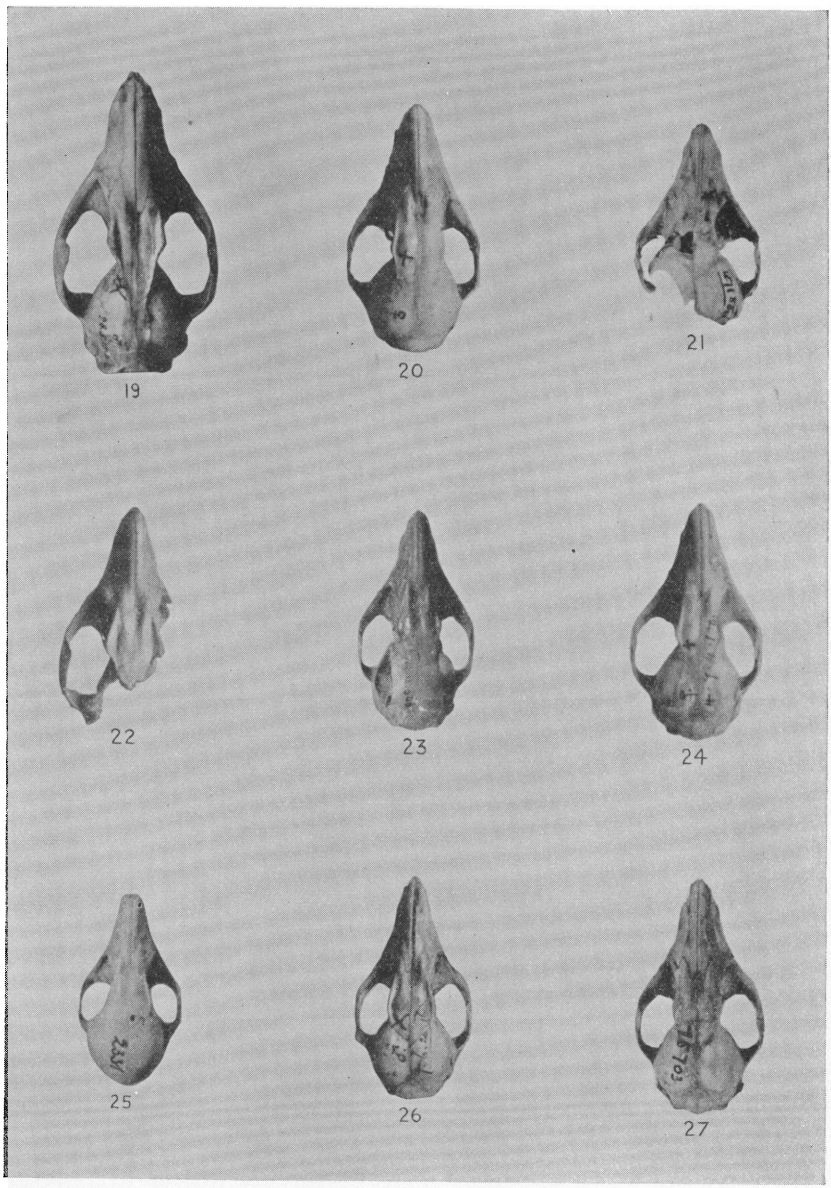
19
20
21
22
23
24
25
26
27

PLATE IV

28.—*M. murina klagesi*, type.
29.—*M. murina duidæ*, type.
30.—*M. murina madeirensis*, type.
31.—*M. murina maranii*, type.
32.—*M. murina waterhousei*, type.
33.—*M. bombascaræ*, type.
34.—*M. rubra*, type.
35.—*M. tyleriana*, type.
36.—*M. quichua*, type.

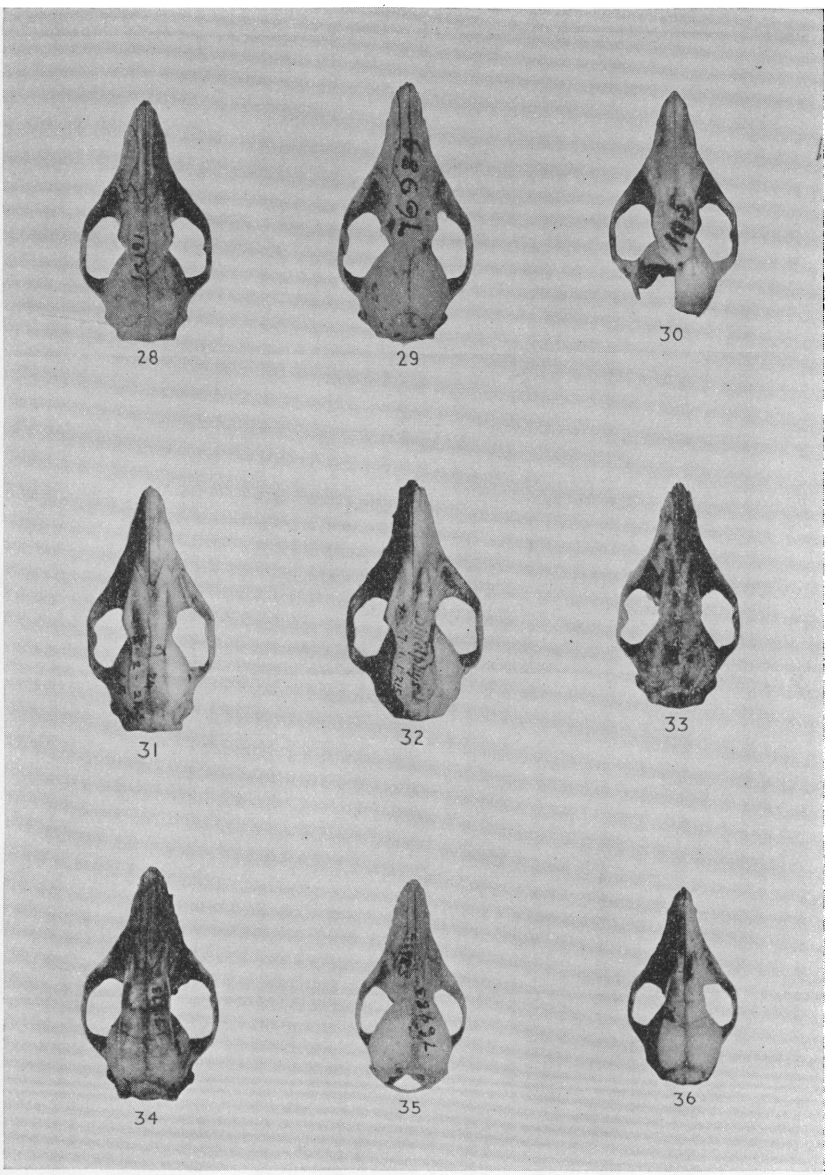
28
29
30
31
32
33
34
35
36

PLATE V

37.—*M. quichua.*
38.—*M. musicola*, type.
39.—*M. mitis mitis.*
40.—*M. mitis casta*, type.
41.—*M. mitis pallidiventris*, type.
42.—*M. mitis fulviventer.*
43.—*M. mitis robinsoni.*
44.—*M. chapmani*, type.
45.—*M. nesaea*, type.

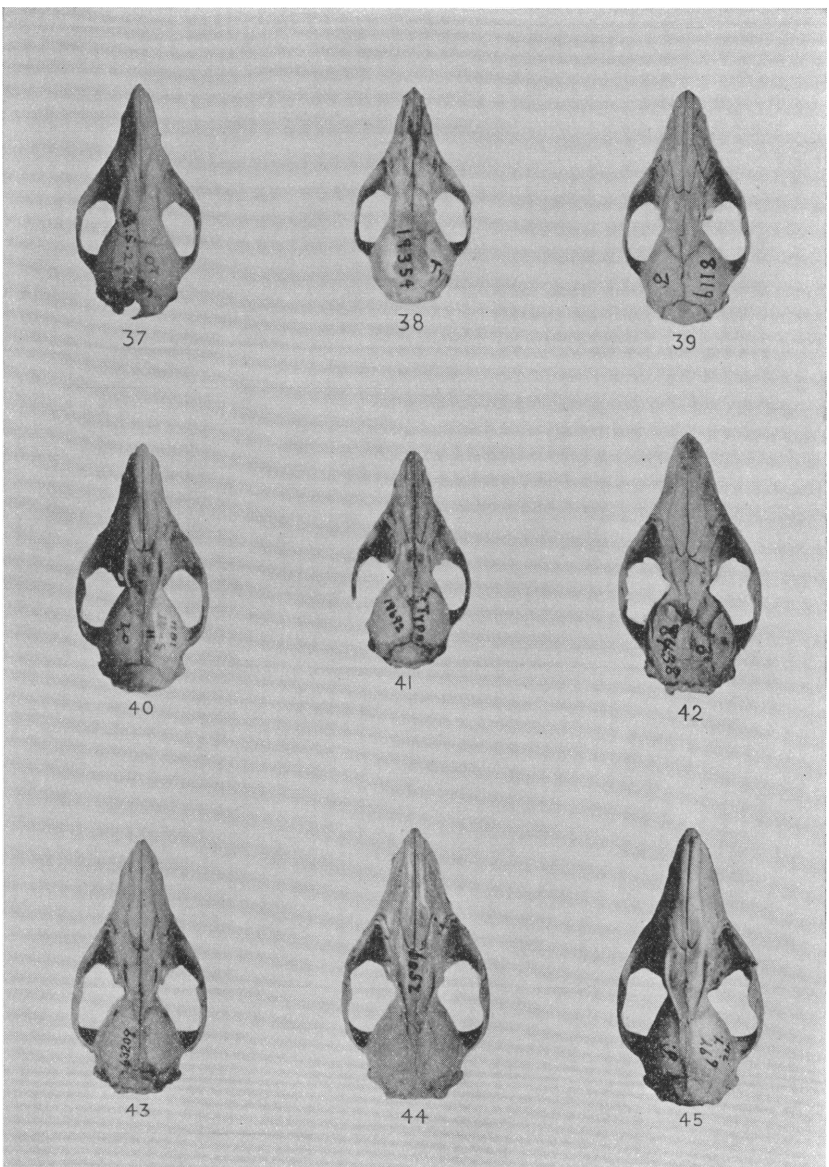
37
38
39
40
41
42
43
44
45

PLATE VI

46.—*M. grenadæ*, type.
47.—*M. simonsi*, type.
48.—*M. simonsi*.
49.—*M. ruatanica ruatanica*, type.
50.—*M. ruatanica isthmica*, type.
51.—*M. ruatanica mimetra*, type.
52.—*M. mexicana mexicana*, type.
53.—*M. mexicana mexicana* (Cajabon).
54.—*M. savannarum*, type.

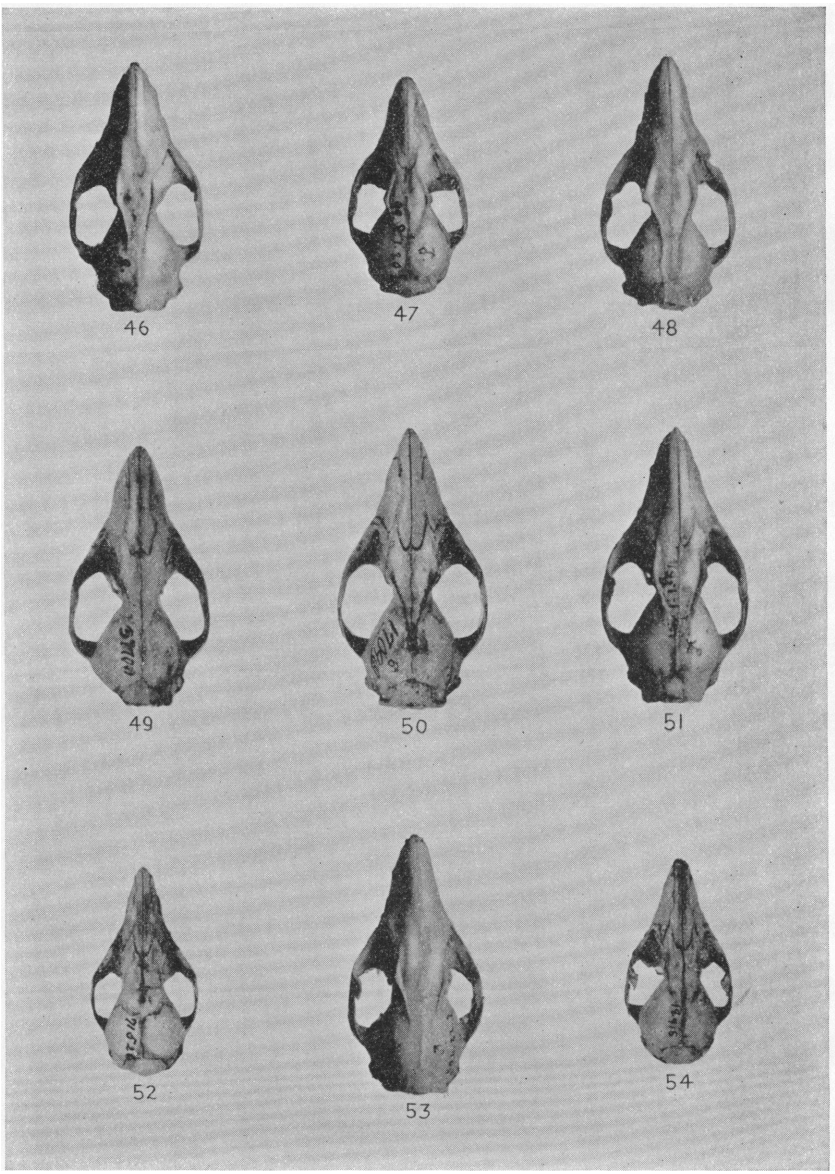
46
47
48
49
50
51
52
53
54

PLATE VII

55.—*M. mexicana mayensis*, type.
56.—*M. mexicana zeledoni*, type.
57.—*M. canescens canescens*, type.
58.—*M. gaumeri*, type.
59.—*M. canescens sinaloæ*, type.
60.—*M. canescens oaxacæ*, type.
61.—*M. canescens insularis*, type.
62.—*M. noctivaga* (Tschudi, co-type?).
63.—*M. noctivaga noctivaga*.

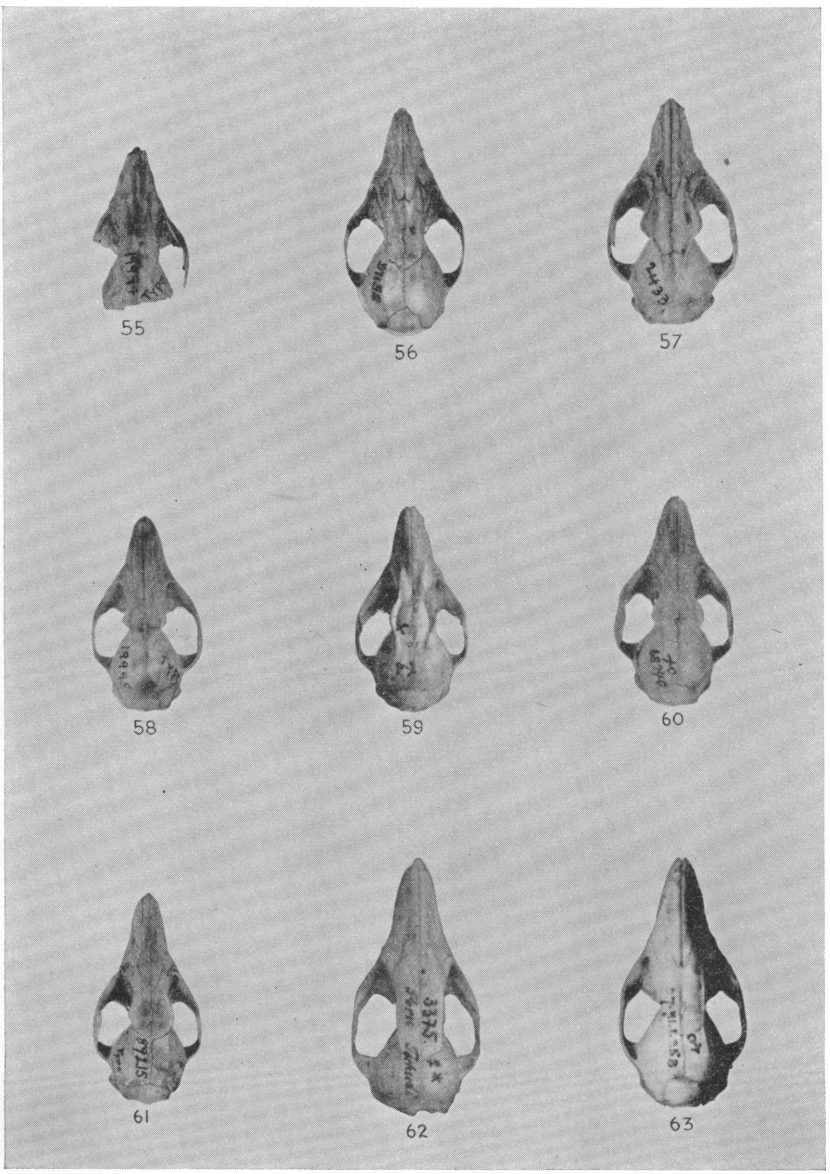
55
56
57
58
59
60
61
62
63

PLATE VIII

64.—*M. noctivaga polita.*
65.—*M. noctivaga collega*, type.
66.—*M. noctivaga lugenda*, type.
67.—*M. noctivaga keaysi*, type.
68.—*M. noctivaga neglecta*, type.
69.—*M. noctivaga dorothea*, type.
70.—*M. yungasensis*, type.
71.—*M. leucastra*, type.
72.—*M. ocellata*, type.

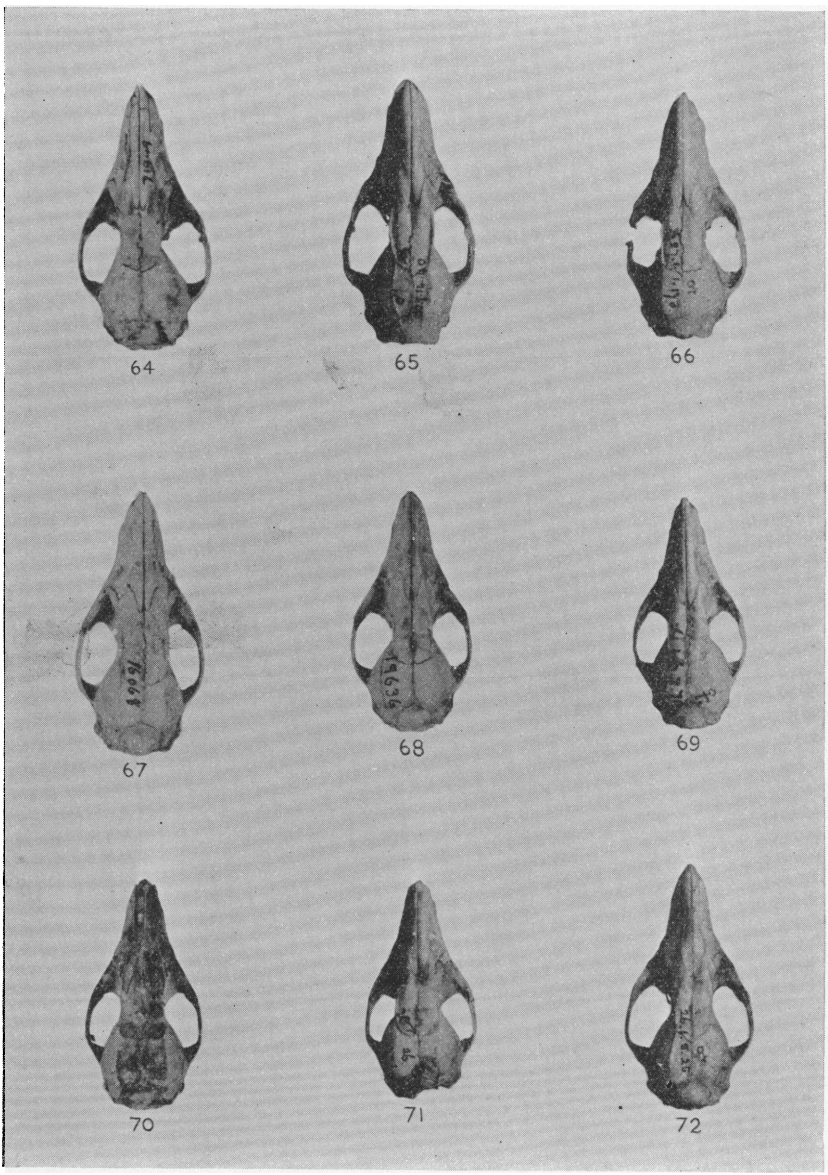
64
65
66
67
68
69
70
71
72

PLATE IX

73.—*M. ocellata.*
74.—*M. incana* (Lund, co-type).
75.—*M. incana paulensis*, type.
76.—*M. scapulata*, type.
77.—*M. carri*, type.
78.—*M. invicta*, type.
79.—*M. fuscata*, type.
80.—*M. perfusca*, type.

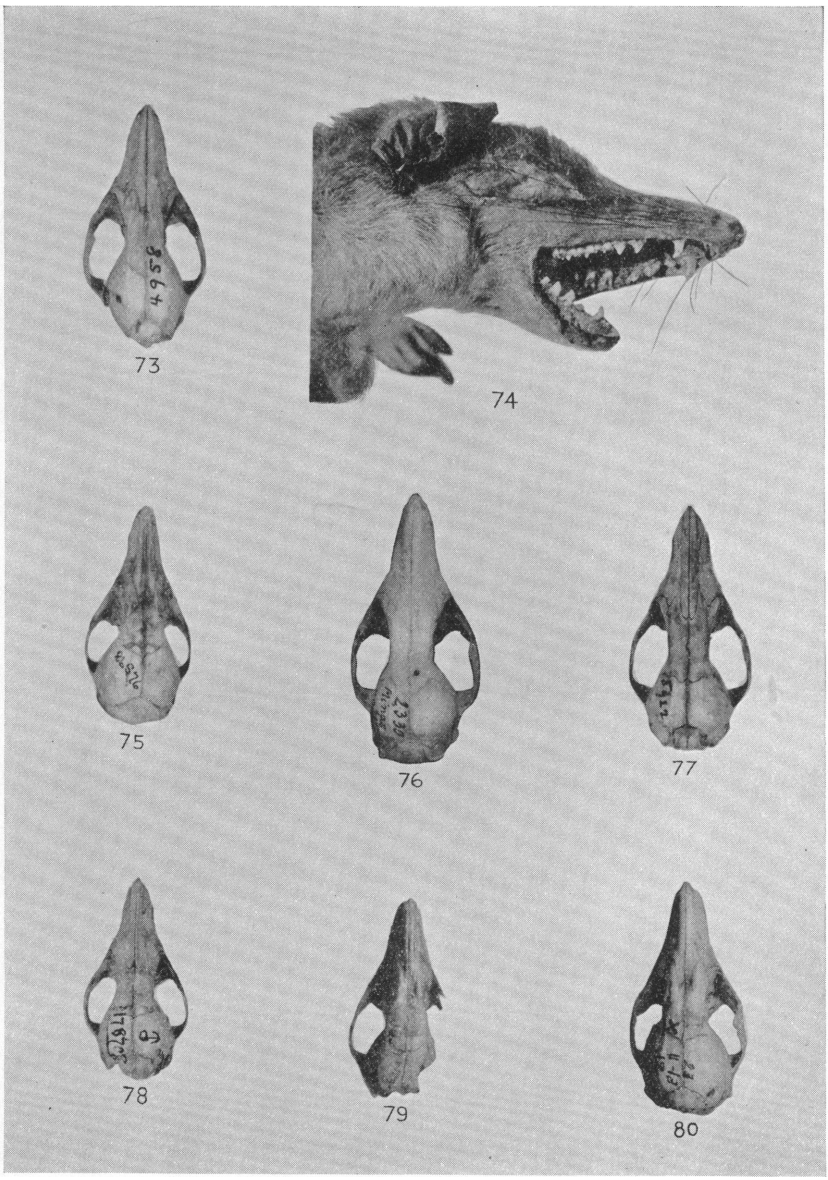
73
74
75
76
77
78
79
80

PLATE X

81.—*M. caucæ caucæ*, type.
82.—*M. caucæ sobrina*, type.
83.—*M. caucæ oroensis*, type.
84.—*M. celicæ*, type.
85.—*M. caucæ madescens*, type.
86.—*M. caucæ albiventris*, type.
87.—*M. caucæ ucayaliensis*, type.
88.—*M. caucæ purui*, type.
89.—*M. emiliæ*, type.

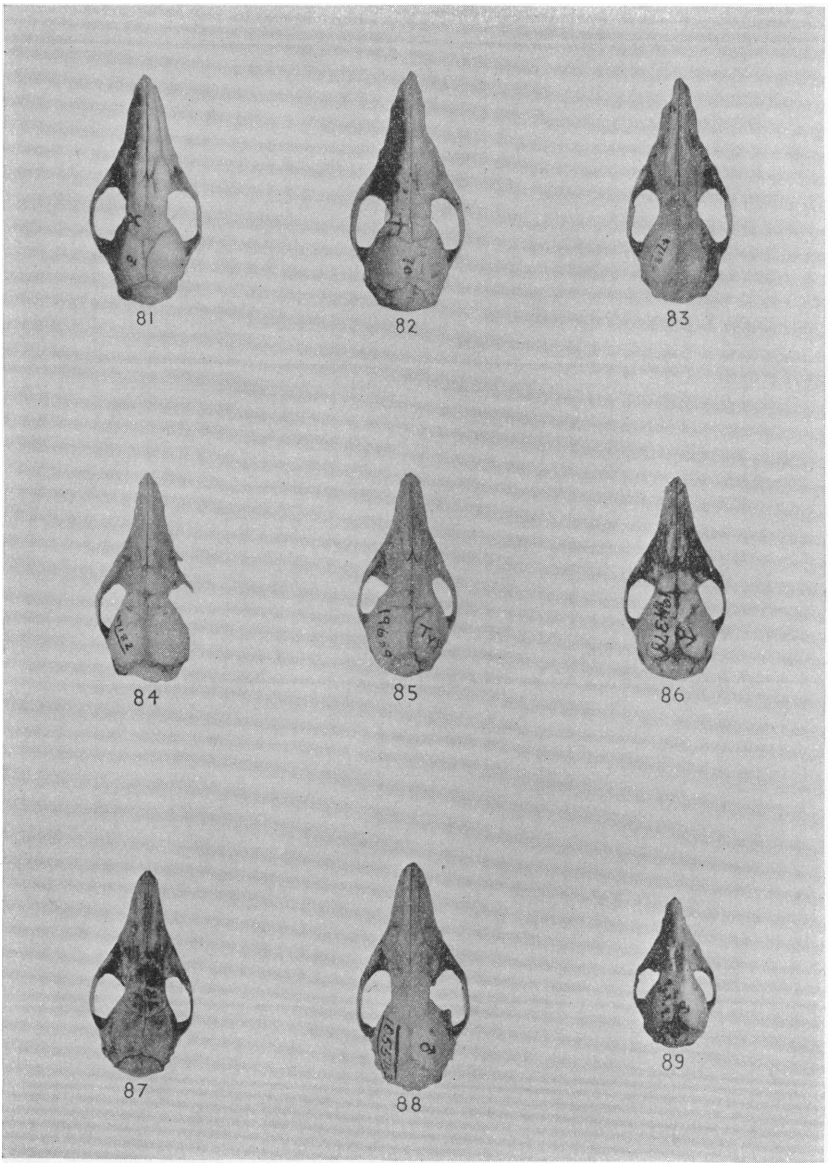
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Plate XI

90.—*M. microtarsus* (Natterer, co-type?).
91.—*M. microtarsus* (Natterer, co-type?).
92.—*M. microtarsus guahybæ*, type.
93.—*M. microtarsus guahybæ.*
94.—*M. agilis agilis* (Paraguay).
95.—*M. agilis beatrix*, type.
96.—*M. agilis chacoensis*, type.
97.—*M. agilis buenavistæ.*
98.—*M. agils peruania*, type.
99.—*M. marica*, type.
100.—*M. unduaviensis*, type.
101.—*M. aceramarcæ*, type.
102.—*M. dryas*, type.
103.—*M. lepida lepida*, type.
104.—*M. lepida grandis*, type.
105.—*M. juninensis*, type.

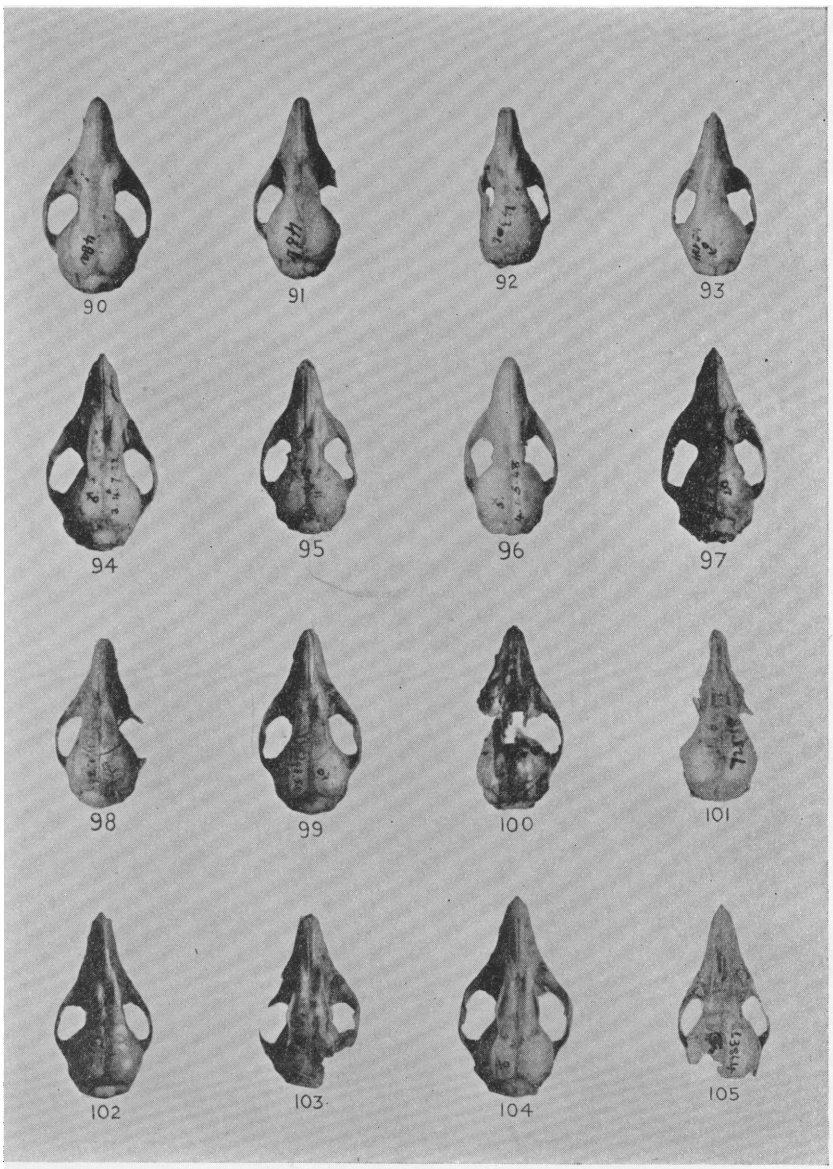
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PLATE XII

106.—*M. parvidens*, type.
107.—*M. elegans elegans*, type.
108.—*M. elegans elegans*.
109.—*M. elegans coquimbensis*, type.
110.—*M. marmota marmota*.
111.—*M. marmota marmota*.
112.—*M. marmota verax*, type.
113.—*M. janetta*, type.
114.—*M. citella*, type.

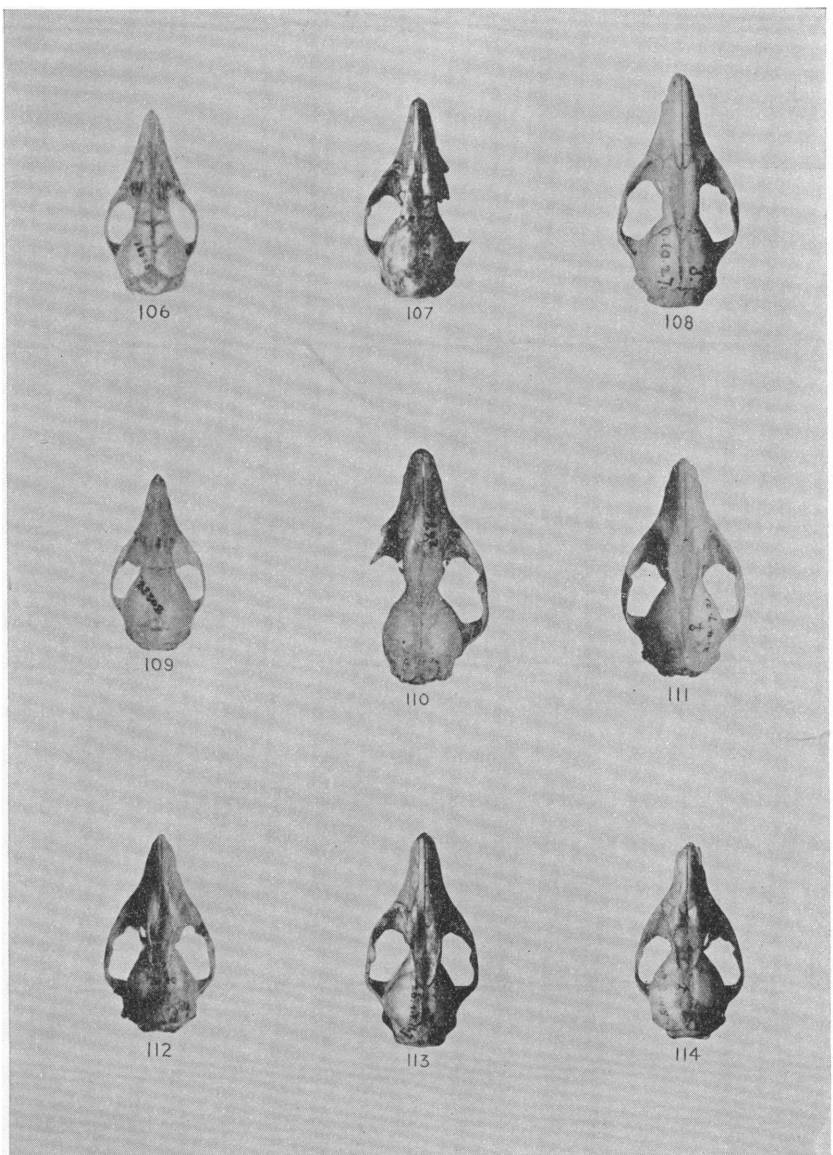
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PLATE XIII

115.—*M. venusta venusta*, type.
116.—*M. venusta cinderella*, type.
117.—*M. venusta sponsoria*, type.
118.—*M. pallidior*, type.
119.—*M. bruchi*, type.
120.—*M. formosa*, type.
121.—*M. velutina*.
122.—*M. pimelura*.

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PLATE XIV

123.—*M. cinerea cinerea.*
124.—*M. cinerea paraguayana.*
125.—*M. limæ*, type.
126.—*M. demararæ demararæ*, type.
127.—*M. demararæ areniticola*, type.
128.—*M. demararæ esmeraldæ*, type.
129.—*M. demararæ meridæ*, type.
130.—*M. alstoni alstoni*, type.
131.—*M. alstoni nicaraguæ*, type.

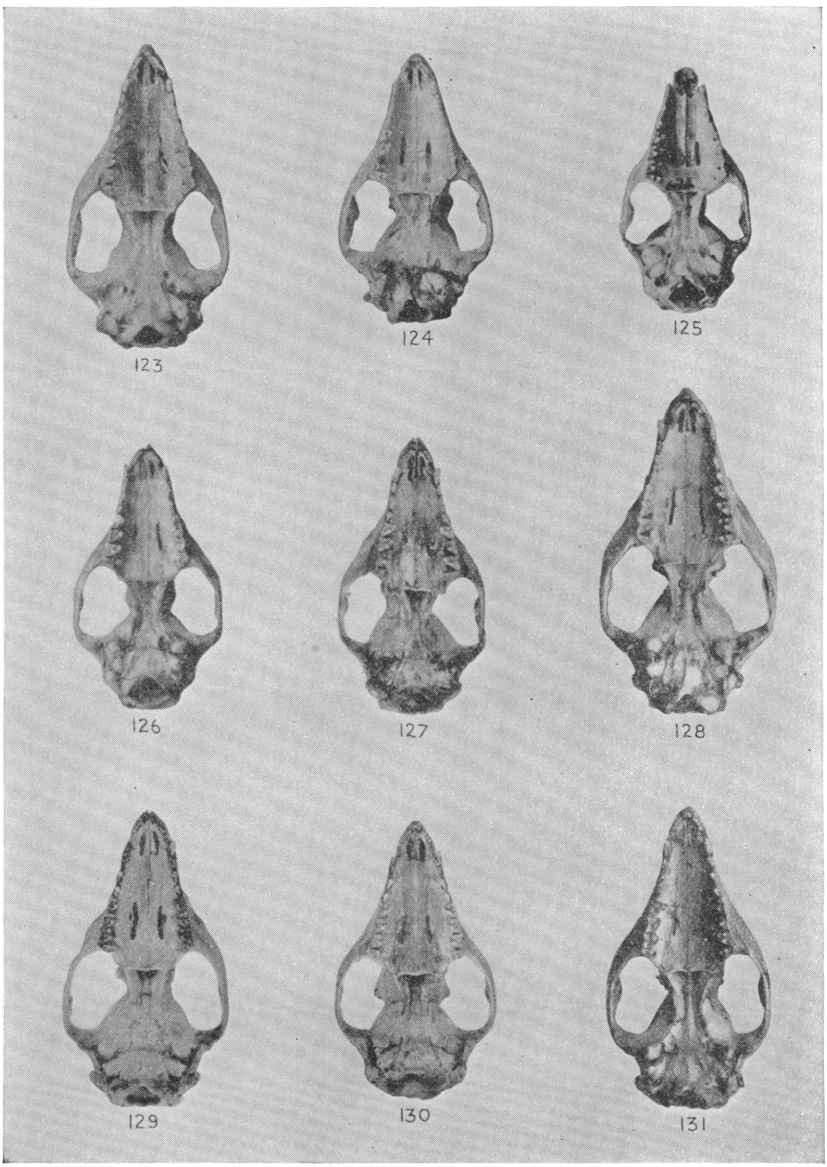
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PLATE XV

132.—*M. domina*, type.
133.—*M. constantiæ constantiæ*, type.
134.—*M. constantiæ constantiæ* (Bolivia).
135.—*M. constantiæ budini*, type.
136.—*M. mapiriensis*, type.
137.—*M. rapposa*, type.
138.—*M. germana germana*, type.
139.—*M. germana rutteri*, type.
140.—*M. germana parda*, type.

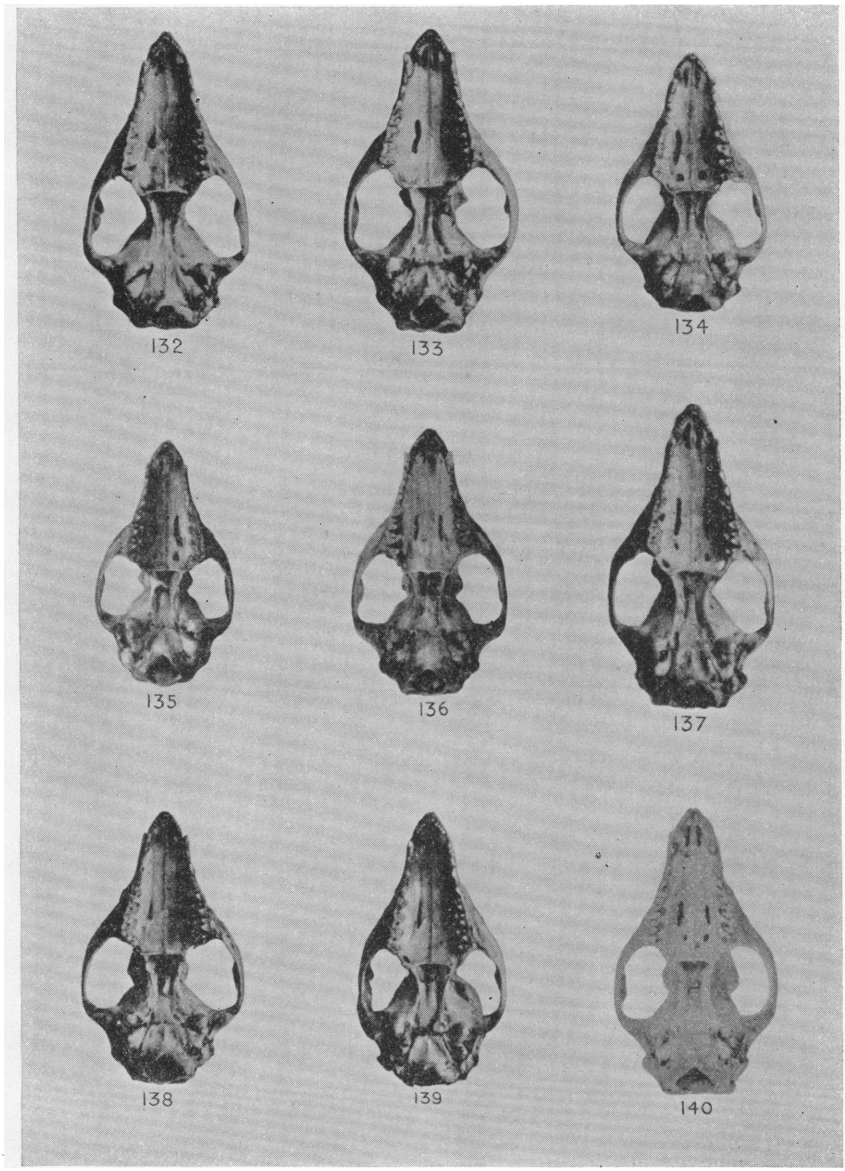
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PLATE XVI

141.—*M. regina*, type.
142.—*M. phaea*, type.
143.—*M. perplexa*, type.
144.—*M. murina murina*, co-type?
145.—*M. murina murina*, co-type?
146.—*M. parata*, type.
147.—*M. muscula*, type.
148.—*M. chloe*, type.
149.—*M. murina roraimæ*, type.

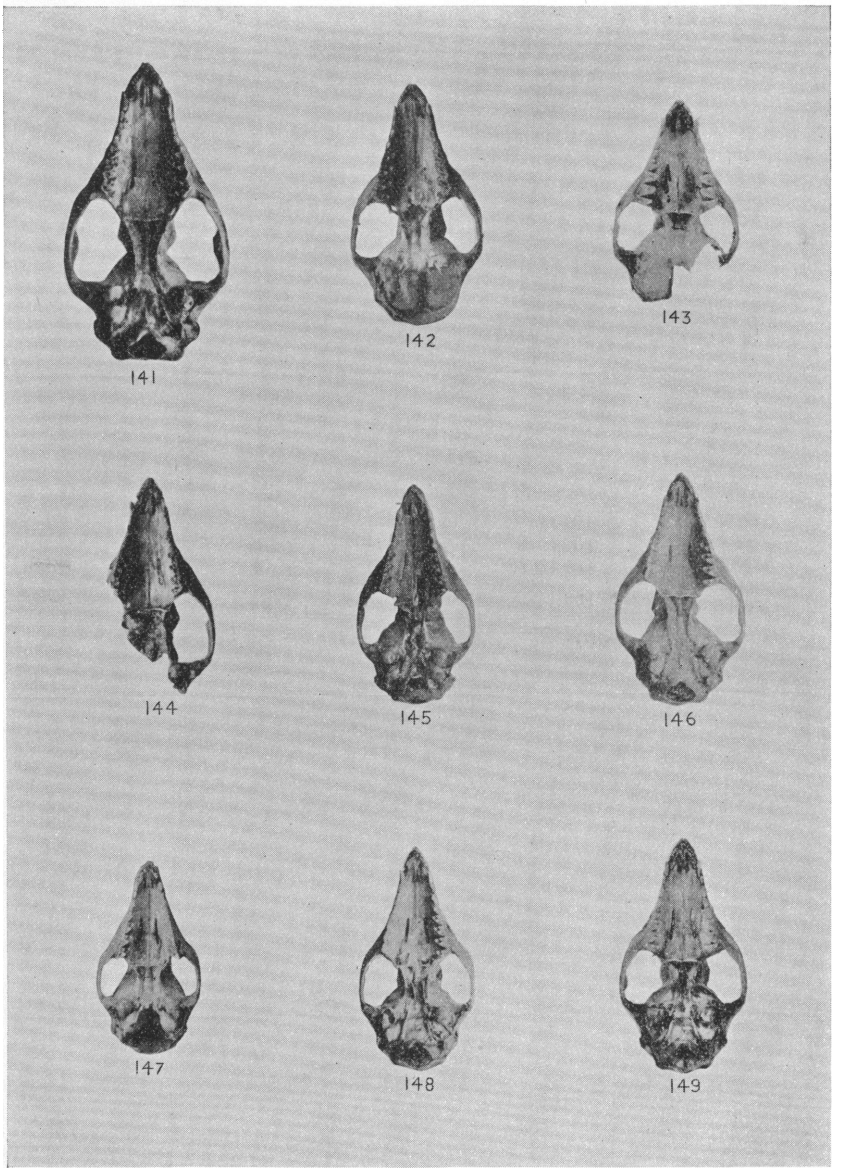
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PLATE XVII

150.—*M. murina klagesi*, type.
151.—*M. murina duidæ*, type.
152.—*M. murina madeirensis*, type.
153.—*M. murina maranii*, type.
154.—*M. murina waterhousei*, type.
155.—*M. bombascaræ*, type.
156.—*M. rubra*, type.
157.—*M. tyleriana*, type.
158.—*M. quichua*, type.

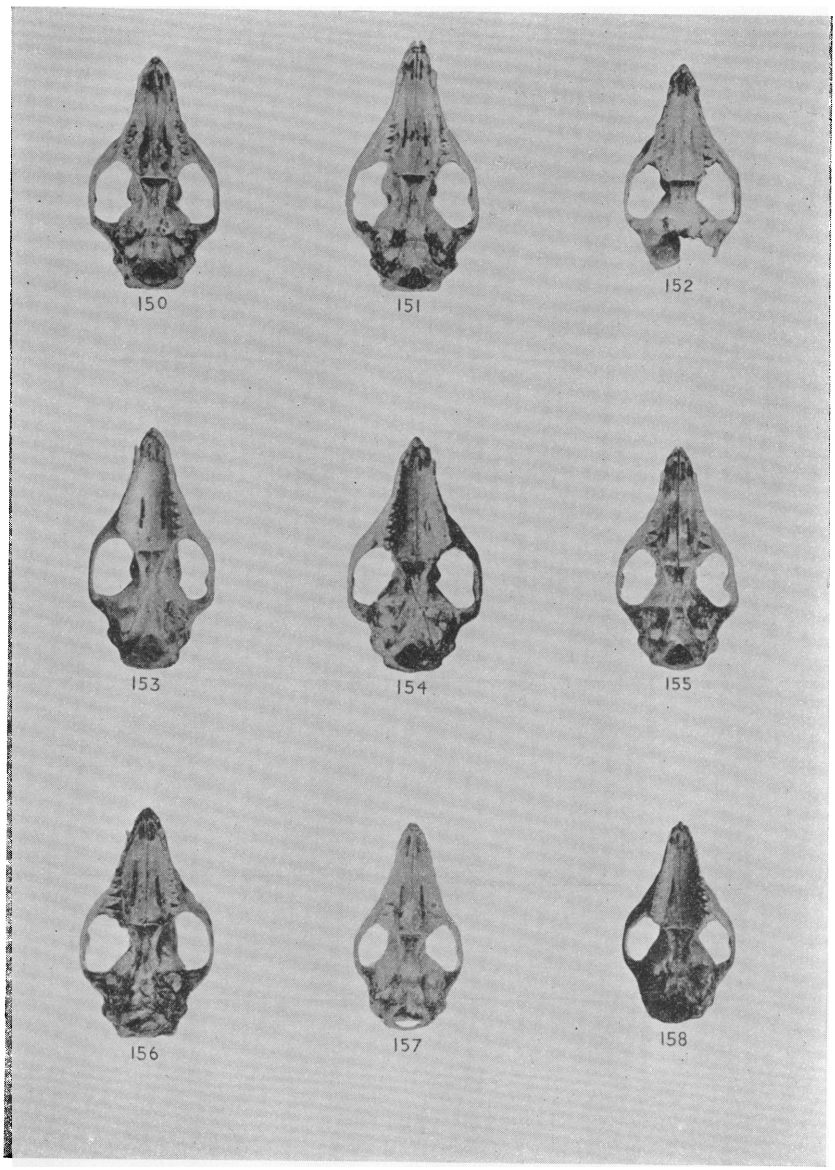
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PLATE XVIII

159.—*M. quichua.*
160.—*M. musicola*, type.
161.—*M. mitis mitis.*
162.—*M. mitis casta*, type.
163.—*M. mitis pallidiventris*, type.
164.—*M. mitis fulviventer.*
165.—*M. mitis robinsoni.*
166.—*M. chapmani*, type.
167.—*M. nesaea*, type.

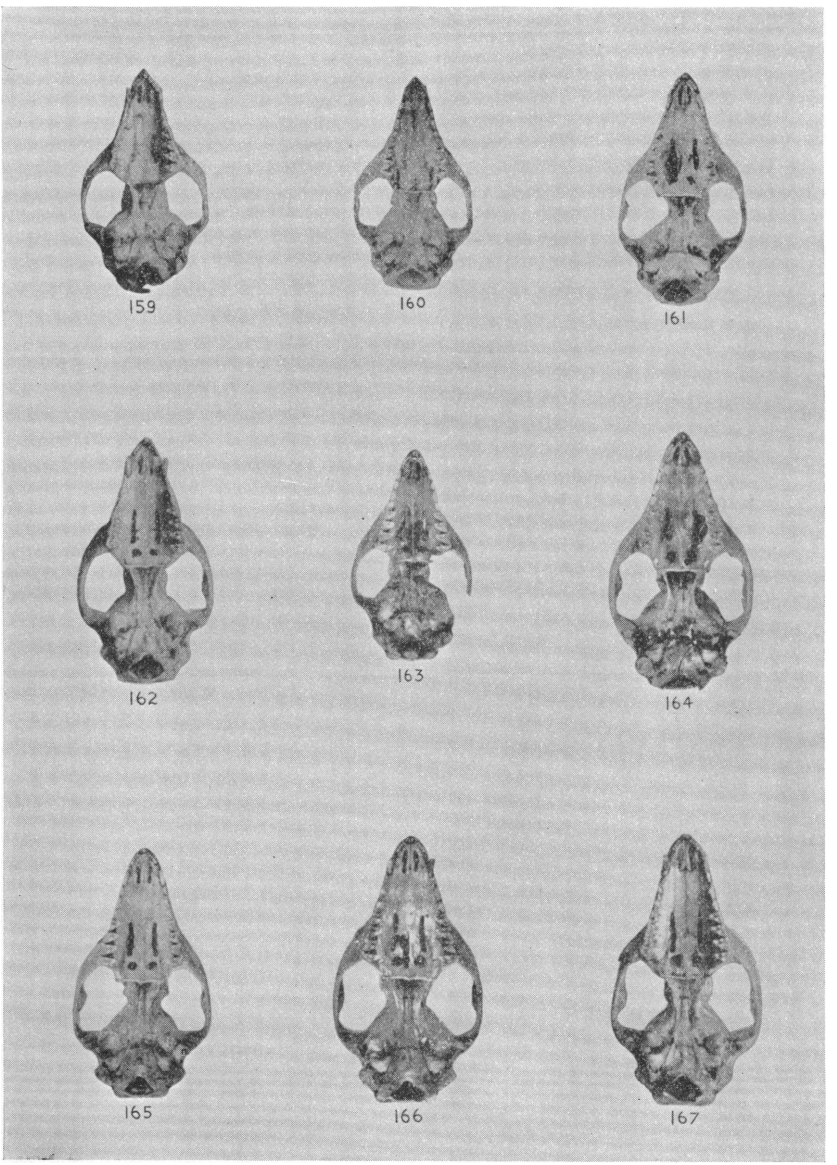
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PLATE XIX

168.—*M. grenadæ*, type.
169.—*M. simonsi*, type.
170.—*M. simonsi*.
171.—*M. ruatanica ruatanica*, type.
172.—*M. ruatanica isthmica*, type.
173.—*M. ruatanica mimetra*, type.
174.—*M. mexicana mexicana*, type.
175.—*M. mexicana mexicana* (Cajabon).
176.—*M. savannarum*, type.

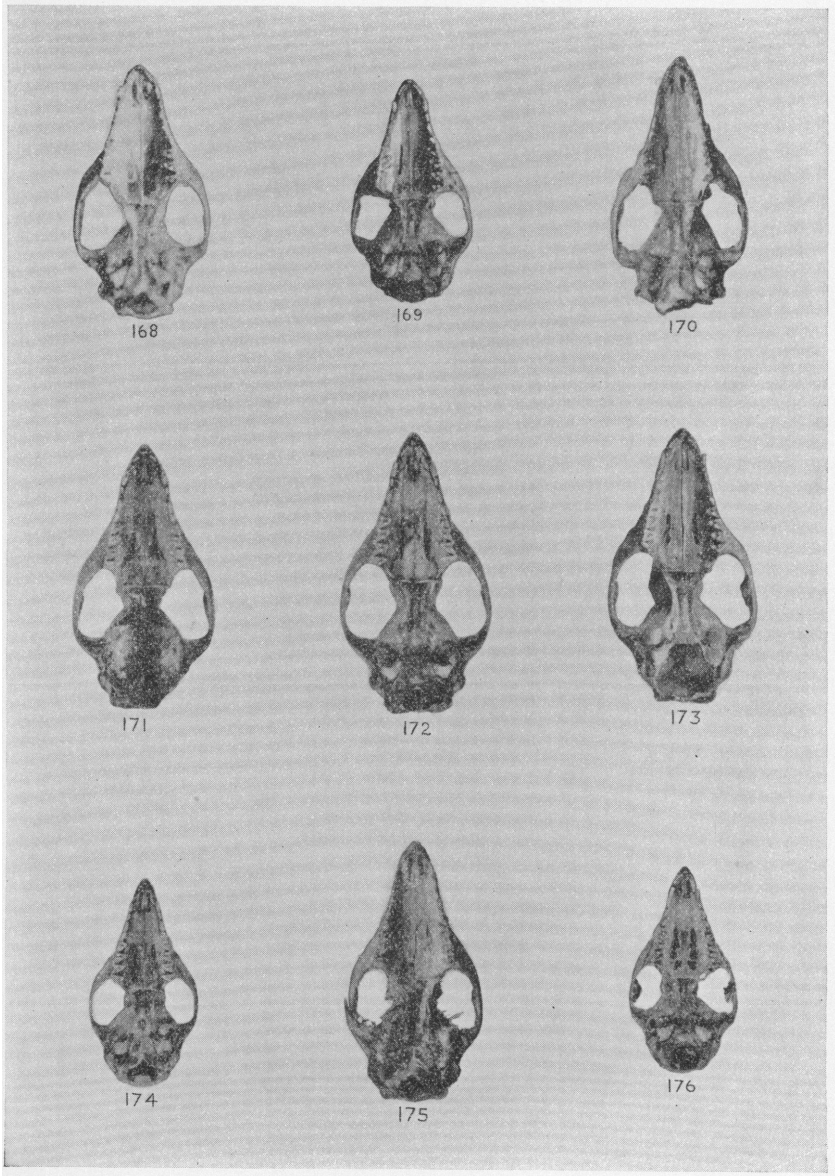
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PLATE XX

177.—*M. mexicana mayensis*, type.
178.—*M. mexicana zeledoni*, type.
179.—*M. canescens canescens*, type.
180.—*M. canescens gaumeri*, type.
181.—*M. canescens sinaloæ*, type.
182.—*M. canescens oaxacæ*, type.
183.—*M. canescens insularis*, type.
184.—*M. noctivaga*, co-type?
185.—*M. noctivaga noctivaga.*

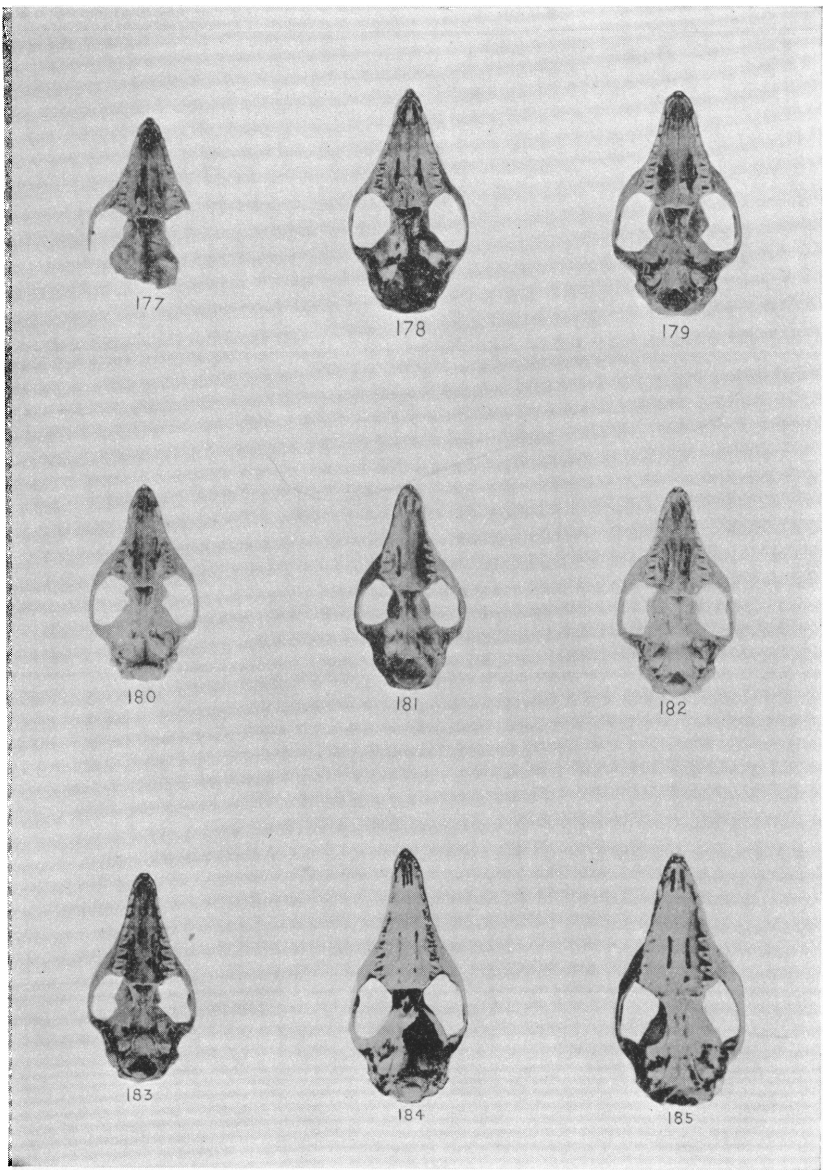
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PLATE XXI

186.—*M. noctivaga polita.*
187.—*M. noctivaga collega*, type.
188.—*M. noctivaga lugenda*, type.
189.—*M. noctivaga keaysi*, type.
190.—*M. noctivaga neglecta*, type.
191.—*M. noctivaga dorothea*, type.
192.—*M. yungasensis*, type.
193.—*M. leucastra*, type.
194.—*M. ocellata*, type.

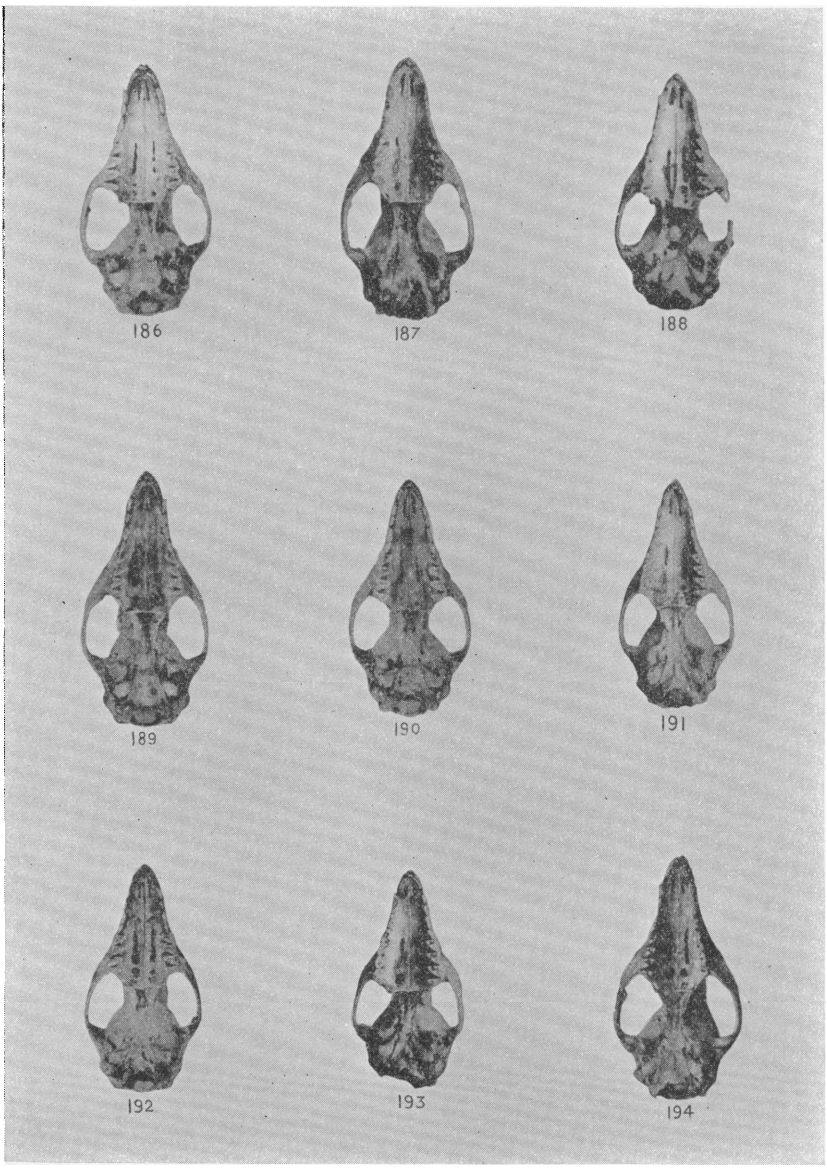
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PLATE XXII

195.—*M. ocellata.*
196.—*M. incana paulensis*, type.
197.—*M. scapulata*, type.
198.—*M. carri*, type.
199.—*M. invicta*, type.
200.—*M. fuscata*, type.
201.—*M. perfusca*, type.
202.—*M. caucæ caucæ*, type.
203.—*M. caucæ sobrina*, type.

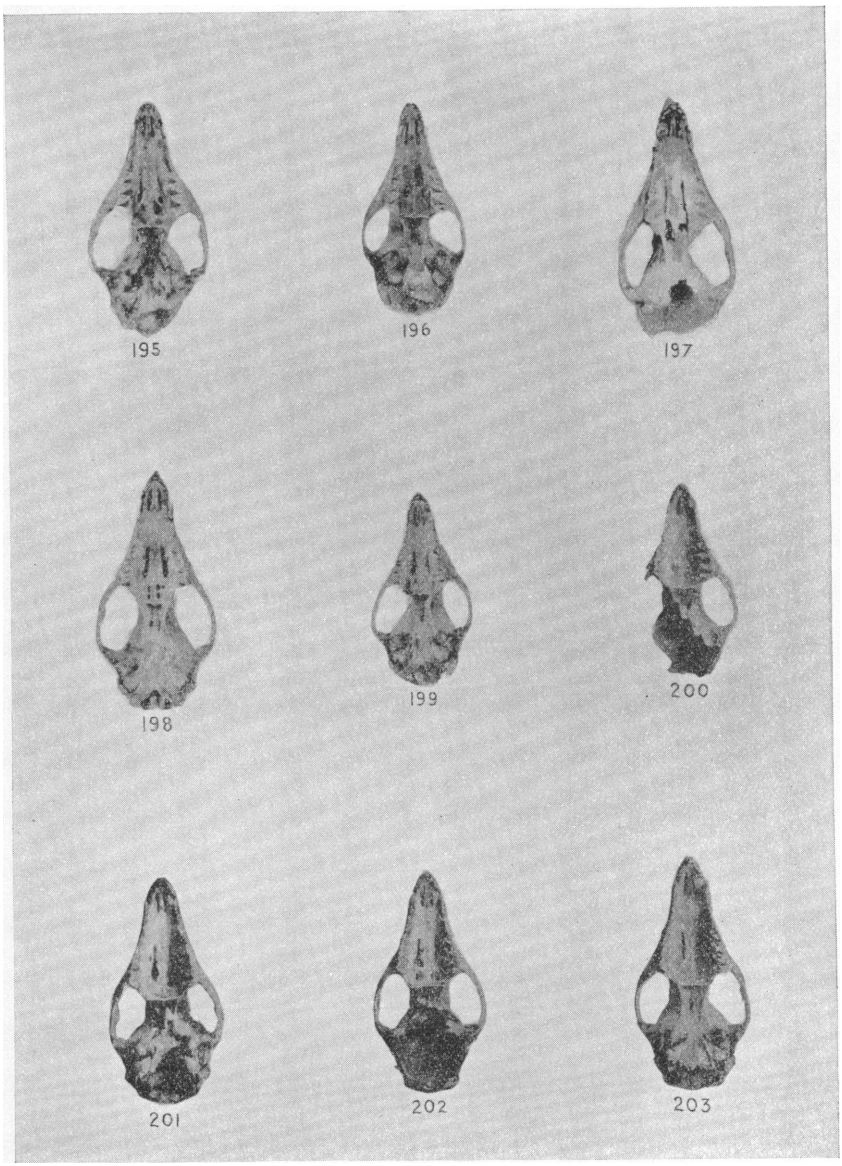
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PLATE XXIII

204.—*M. caucæ oroensis*, type.
205.—*M. caucæ celicæ*, type.
206.—*M. caucæ madescens*, type.
207.—*M. caucæ albiventris*, type.
208.—*M. caucæ ucayaliensis*, type.
209.—*M. caucæ purui*, type.
210.—*M. emiliæ*, type.
211.—*M. microtarsus microtarsus*, co-type.
212.—*M. microtarsus microtarsus*, co-type.

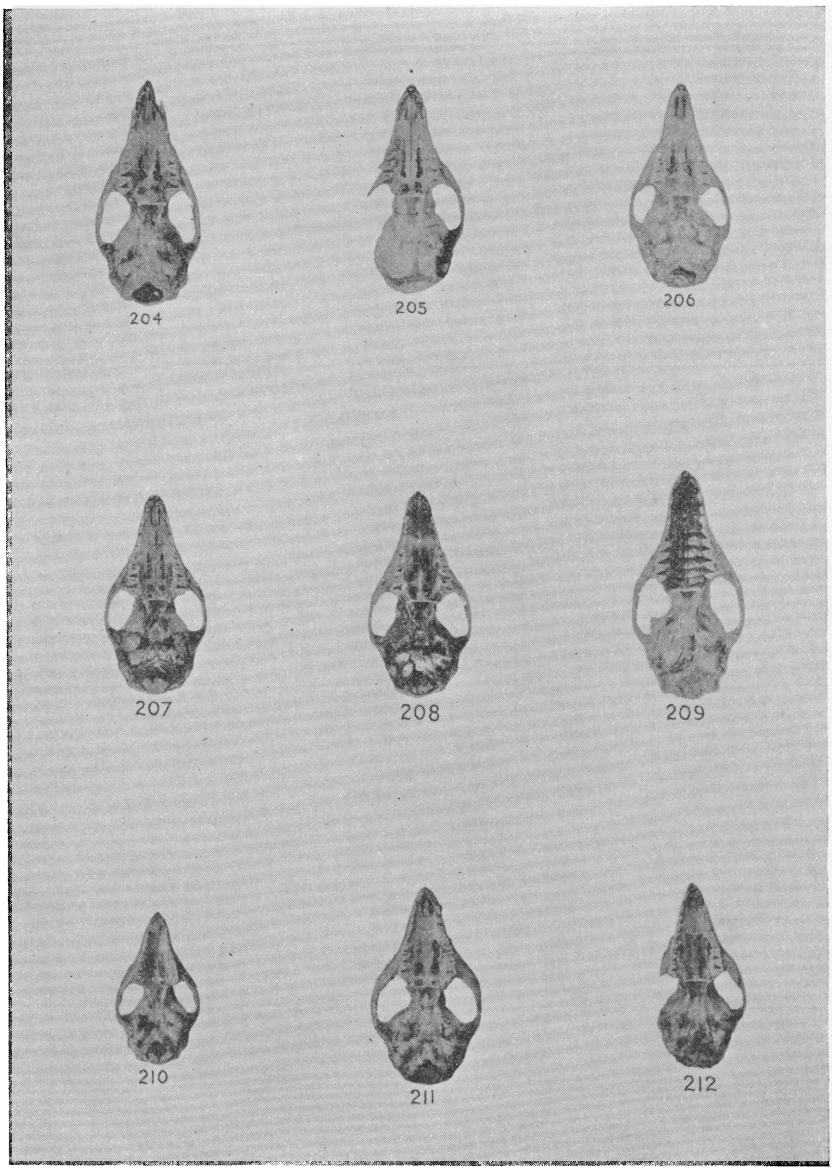
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PLATE XXIV

213.—*M. microtarsus guahybæ*, type.
214.—*M. microtarsus guahybæ*.
215.—*M. agilis agilis*, type.
216.—*M. agilis agilis* (Paraguay).
217.—*M. agilis beatrix*, type.
218.—*M. agilis chacoensis*, type.
219.—*M. agilis buenavistæ*.
220.—*M. agilis peruana*, type.
221.—*M. marica*, type.
222.—*M. unduaviensis*, type.
223.—*M. aceramarcæ*, type.
224.—*M. dryas*, type.
225.—*M. lepida lepida*, type.
226.—*M. lepida grandis*, type.
227.—*M. juninensis*, type.
228.—*M. parvidens*, type.

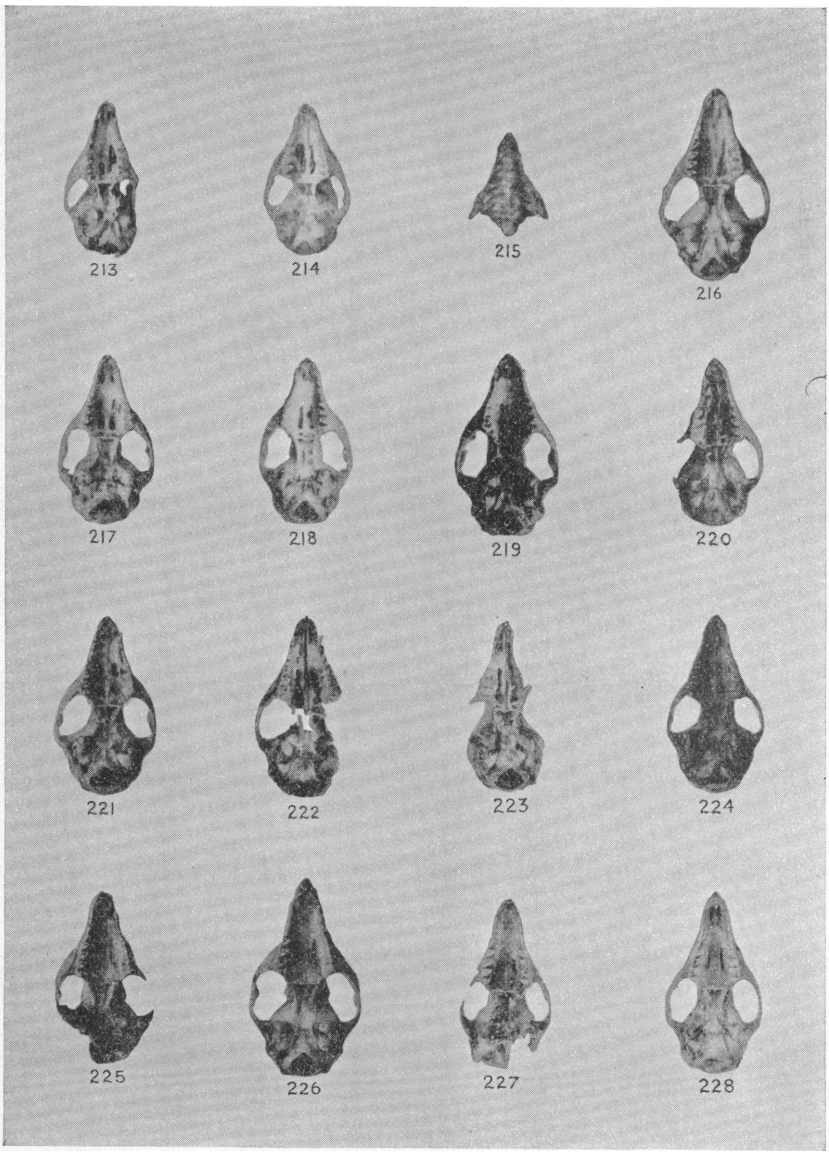
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PLATE XXV

229.—*M. elegans elegans*, type.
230.—*M. elegans elegans.*
231.—*M. elegans coquimbensis*, type.
232.—*M. marmota marmota.*
233.—*M. marmota marmota.*
234.—*M. marmota verax*, type.
235.—*M. janetta*, type.
236.—*M. citella*, type.
237.—*M. venusta venusta*, type.

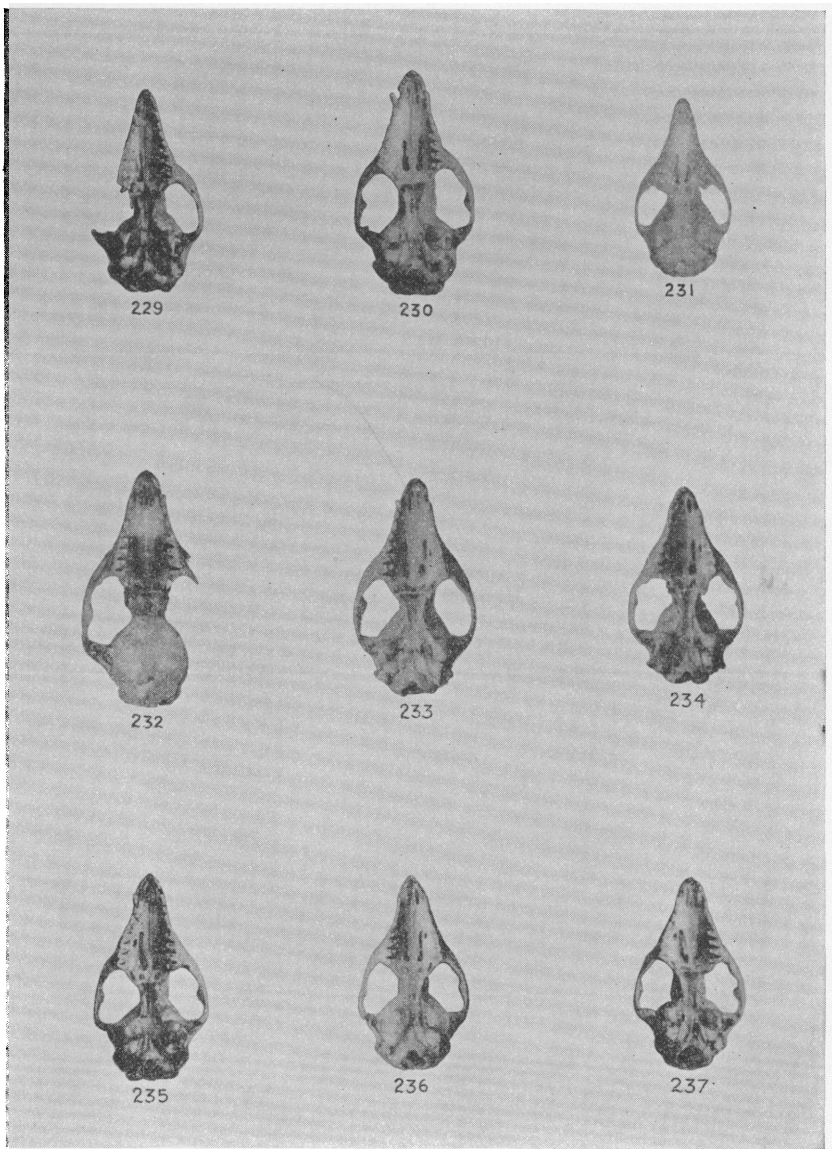
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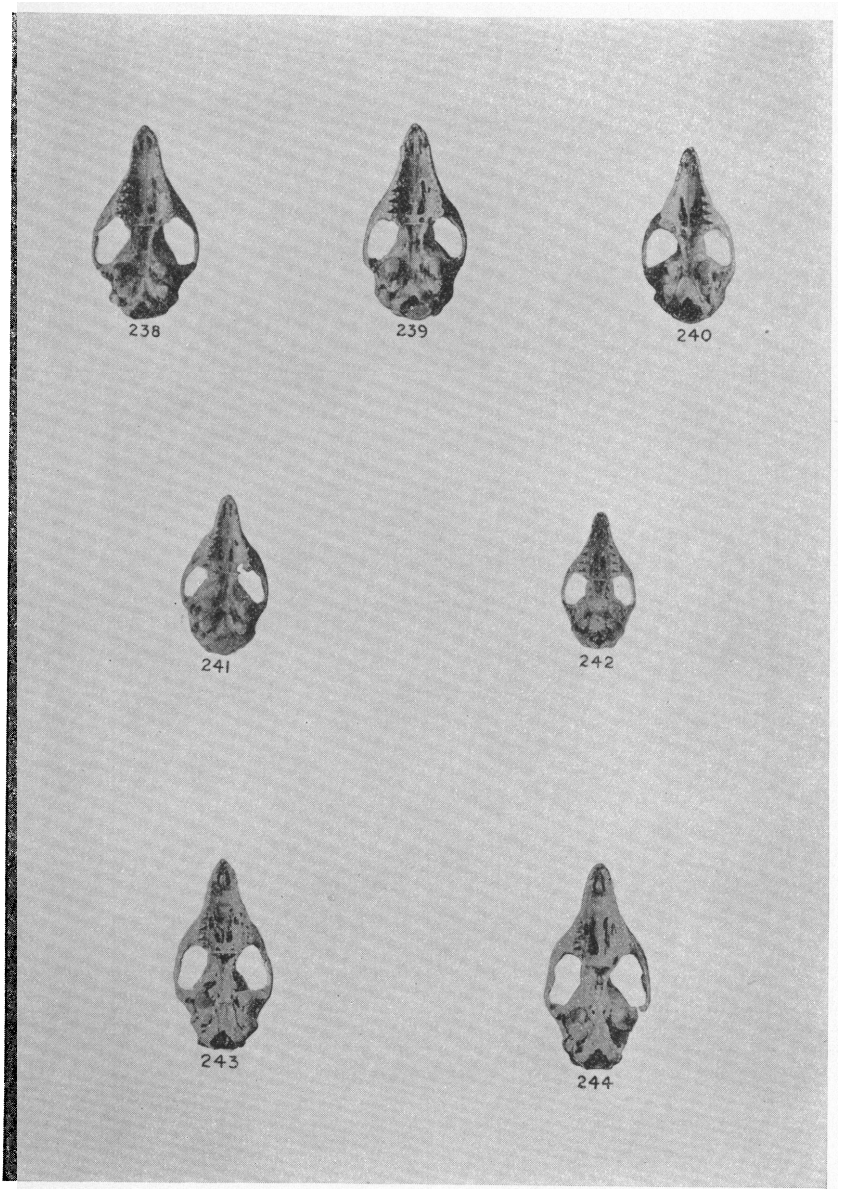
PLATE XXVI

238.—*M. venusta cinderella*, type.
239.—*M. venusta sponsoria*, type.
240.—*M. pallidior*, type.
241.—*M. bruchi*, type.
242.—*M. formosa*, type.
243.—*M. velutina*.
244.—*M. pimelura*.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