The Mammals of the Guiana Region

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GENERAL ENVIRONMENT AND FAUNISTIC TREATMENT

The American Museum of Natural History has recently concluded its third expedition[1] to the Guiana Highlands of South America. Each of these expeditions, though its main objectives were to obtain collections of mammals and birds, has brought back notes and specimens bearing upon a wide variety of biological and geological subjects, upon which a number of reports have been published or are in course of preparation. Descriptions of some new species of mammals have already been published, and it now seems desirable to review the mammalogy of the entire region in a single report.

In the present paper eight new forms[2] are described. Colors in the descriptions printed with capitals refer to Ridgway's "Color Standards and Nomenclature," 1912.

The conclusions set forth in the paper are founded upon studies of all orders of mammals in the region, excepting the bats. Pressure of other work prevented completion of the systematic studies of those animals, which are left for a future paper. A selected list of references, not all of them cited however, is offered.

In the broadest sense the Guiana region can be considered as the whole of that part of South America embraced by the connected waters of the Orinoco, Cassiquiare and Amazon Rivers. Five countries, Venezuela, Brazil and British, French and Dutch Guianas, contribute to its composition. The term Guiana Highlands represents a more restricted usage: Characteristically it refers to those mountains (and included valleys) of the area composed of sandstones and quartzites. Chapman (1931) in his treatment of the birds of Duida further limits the term by confining it to those parts of the area reaching 4000 feet or more above sea-level. In practice it has been found that many species of plants and animals are more closely associated with the actual distribution of the sandstones (particularly the unforested portions) than with the usual major factors in distribution—temperature and humidity. A surprisingly large number of plants and animals found at altitudes of 6000 to 8500 feet above sea-level occur also as low as 2000 to 3000 feet in environments with essentially the same geological formation but differing in temperature and rainfall. The sandstone formation, now so greatly eroded and dissected that only fragments are left, once covered an enormous area. Originally it reached at least from the most westerly part of the Orinoco River to the Potaro and probably continued to an outlier in Dutch Guiana; and from about level with the mouth of the Paragua River south to the Humirida ("Pacaraima") Mountains forming the boundary between Brazil and Venezuela. Sandstones have also been reported from the eastern side of the Colombian Andes. Though they may be homologous with the Guiana series, little seems to be known about them.

The sandstones of the eastern portion of the highlands are relatively level-bedded (Roraima), or thrown into gentle slopes (Auyan-tepui), whereas those of the western portion (Duida) are tremendously contorted.

Outside the sandstone area one finds the low mountains of igneous origin of the Guianas and near-by Brazil (imperfectly explored), and the volcanics of the true Parima and Vijigua ranges which separate the headwaters of the Orinoco from those of the River Uraricoera and some north-bank tributaries of the Río Negro. Both

[1] The undertakings were made possible through the coöperation and generosity of the following persons: Lee Garnet Day, Expedition to Mt. Roraima, 1927–1928; Sidney F. Tyler, Expedition to Mt. Duida, 1928–1929; W. H. Phelps, Expedition to Mt. Auyan-tepui, 1937–1938.

[2] *Marmosa tyleriana phelpsi; Proechimys cayennensis hoplomyoides; Myoprocta exilis demararae; Akodon (Chalcomys) aerosus saturatus; Oecomys auyantepui; Oecomys phelpsi; Thomasomys macconnelli subnubis; Nasua candace dichromatica.*

the sandstone area and the igneous areas just mentioned are penetrated deeply by a lowland biota of characteristic neotropical facies to be remarked upon beyond.

Though in geographical position on the map Auyan-tepui is intermediate between Roraima and Duida, this is seen not to be the case when dispersal of non-volant organisms is considered, as the height of land passes from Auyan-tepui to Roraima, southward around the headwaters of the R. Caroni, and then west to Mt. Duida. This explains the closer affinities of the fauna and flora of Auyan-tepui to those of Roraima rather than to those of Duida.

The botanical aspect of the higher levels of the region is peculiar. Gleason (1931) has pointed out the high degree of endemism, not only of species but of genera, that occurs upon those areas. The soil of the plateaus consists principally of humus and sand in various mixtures lying upon beds of quartzite. The whole area is watered copiously by the enduring northeast trade-winds, interrupted only from January to March by a brief dry season.

In areas other than those whose country rock is sandstone, normal neotropical conditions are found. The ancient igneous or metamorphosed rocks underlying the land break down to red or yellow clays. In dry, exposed places, concentrates of accretionary lateritic nodules show on the surface.

A full report on the vegetation of the Duida plateau has been published by Gleason (1931). The conditions on and about Mt. Roraima are described in a number of different papers. And a report upon the somewhat less complete collections made by the American Museum at Mt. Auyan-tepui, in which a summary of the floral realm of the Guiana highlands will appear, is in course of preparation.

In several papers (see references) I have attempted a rough description of the general ecological backgrounds in which the specialized biota of the region are at home.

Tropical forest occupies almost all of the area not taken up by savanna and sandstone plateau. It covers the coastal Guianas and extreme east of Brazil north of the Amazon as far as the principal divide, with the exception of the Rupununi area, in which the height of land falls almost to sea-level and the Brazilian grasslands invade British Guiana extensively. It is said to be continuous along the coast strip, across the islands of the Orinoco delta to the forest of eastern Sucre, but inland it terminates a little north of the Cuyuni.

West from the Cuyuni, a belt some fifty miles wide crosses the Caroni and connects with the Caura forests, which in turn follow the foothills of the mountains adjoining the right bank of the Orinoco until they connect with the interminable Negro-Amazonian forests. These last are apparently continuous eastward (except a few tiny areas of savanna at the base of Duida) over the Parima Mountains to near the Branco, where the north Brazilian savannas commence.

On the south side of the Guiana uplands a thin and very broken band of forest extends from the Parima range, along the north side of the Uraricoera and Surumu Rivers to join the Guiana forest mass.

The interior of the mountain area may be thought of as chiefly forested west of the Caura, and to the east of it as chiefly savanna land.

Savannas occupy only about one-sixth of the Guiana region. On the northern edge of the Guiana region the llanos of Venezuela cross the Orinoco and extend, particularly at their eastern end, south almost to the Cuyuni and Yuruan.[1] The great area east of the Branco lying between the Amazon and the Guiana mountains is also chiefly savanna-covered. Both the north Brazilian savannas and the llanos give off branches which reach considerable altitudes under suitable conditions; possibly at a few places they almost unite. These higher savanna areas occur all about Roraima and Auyan-tepui. The "Grand Sabana" of the upper Caroni belongs to the high savanna system. The high savannas (3000–4500 feet) have their principal biotic affinities with the Brazilian grasslands.

The mammalian population of the Guiana region is far from homogeneous throughout. Not only does segregation of groups appear on account of conditions of

[1] Mr. M. A. Carriker, who visited the Yuruan in 1910, has described the locale to me recently.

temperature (altitude) and of soil and rainfall (savanna and forest), but two large faunas, the eastern and western, are linked apparently to the two major forest areas of that part of the continent—the east-Guiana forest and the much larger Negro-Amazonian forest. Each forest area contains many indigenous species of mammals.

It may be argued that the large group of archaic mammals, about half of the lowlands population, which occurs indiscriminated through both areas, controverts the above. But I look upon that group which is composed only of ancient, stable types as representing the residue of a previous condition upon which a newer one has been imposed. For among the said two mutually exclusive groups there is scarcely a case of even partial penetration. And if the half of the mammal fauna just mentioned had dispersed recently and dispersal were yet in process among the remainder, all degrees of interpenetration ought to be observable. This is not the case.[1]

A small group of forest animals of Guiana is linked to Panama and northern Colombia by way of the Caquetá region. It crosses to eastern Guiana, apparently by way of the southern forest belt. Only *Neacomys* and the marmosets, *Seniocebus*, belong to it. Perhaps *Alouatta senicula* and *Cebus apella* should be classed with this same group, but they extend also from north Colombia eastward through the coast range almost to Trinidad (*Alouatta* reaches Trinidad). A second pair of species with variant range are *Echimys semispinosus* and *Rhipidomys venezuelae*, both markedly arboreal rats living in hollow thorn trees in xerophytic areas, margining the llanos. They reach only the dry northern margin of Guiana. Finally *Oryzomys trinitatis*, which seems to have much the same range as the last, is a terrestrial species with some predilection for semi-open country or for monsoon-type forest.

The lowland faunal picture is completed by inclusion of certain endemic species treated beyond.

[1] The "red"-tailed agutis *Myoprocta exilis* of the east have one representative, *parva*, in eastern Ecuador.

The mammal fauna of the middle altitudes is also derived from several sources. Again a large part of it is made up of ancient, stable types. The large part of the remainder consists of lowland species, little or not at all differentiated, but drawn entirely from the eastern forest source, none coming from the fauna of the Negro-Amazonian forest, and this in spite of the strong element from that forest present in the western lowlands. (For example, squirrels of the middle altitudes on Duida are a race of *Guerlinguetus aestuans* of British Guiana and specifically different from *Guerlinguetus gilvigularis* at the base of the mountain.)

Another region with representatives in the middle altitudes of Guiana, is the Andean slope, more or less at corresponding heights above sea-level. Examples of this class of animals are *Oryzomys macconnelli*, *Chalcomys aerosus* and *Mustela frenata*. In the first case the animal is restricted in northward extent in the Andes, but apparently extends to Bolivia and the Brazilian uplands. In the second, the range extends from the highlands of east Venezuela through the Andes to Bolivia and Brazil. In the third, an immense northward extension occurs with only limited penetration toward the south.

Finally the middle altitudes of Guiana seem themselves to be a fruitful focus of endemism. This applies especially in the genera *Oecomys* and *Rhipidomys*. Even *"Thomasomys" macconnelli*, though it was named first from the plateau race, may in reality be classified as endemic in the mid-altitudes, spreading upward to the summits.

At high altitudes (the plateaus, 6000–9000 feet) a fraction of the same old, more or less immutable, fauna persists. But then the total fauna is also numerically small. *Didelphis marsupialis*, *Marmosa cinerea*, *Tamandua tetradactyla*, though not found on every mountain visited, are still present on some of the plateaus and scarcely distinguishable from the same species near sea-level.

A second element comprises saturate races of species present in the next lower zone. Forms with either Andean or low-

land affinities are included (*Chalcomys* is of Andean; *Thomasomys macconnelli* of lowland origin).

The final element of the plateau fauna includes one strictly endemic genus (*Podoxymys*) of Andean origin, the plateau species *Marmosa tyleriana* (lowland origin), and *Nasua candace dichromatica* of Andean origin.

In Chapman's discussion of the birds of Duida (1931), it was inferred that the larger number of species with Andean affinities on Duida compared with Roraima, was correlatable with the distance of each mountain from the Andes range. It seems quite as probable that the reduced numbers on Roraima are consequent on the reduction of habitats, Roraima being a much smaller mountain (though even higher above sea-level), with virtually no soil and little vegetation. With nearly level strata and related to Roraima physiographically, Auyan-tepui has a surface area even greater than Duida (the strata of Duida area strongly folded). And because of its greater size Auyan-tepui has much larger accumulations of humus than Roraima and a far richer flora. The peculiar species of *Marmosa, M. tyleriana* known first from Duida, and absent from Roraima, has been taken in more saturate coloring on the Auyan-tepui plateau. Other organisms are common to the two larger mountains, while absent from the smaller one.

My interpretation of the plateau conditions postulates a more or less homogeneous flora and fauna all over the ancient upland, derived partly from the lowlands and partly from the Andes. Local omissions of species (as at Roraima) I regard as chiefly due to elimination of proper habitats. But there is more in the matter than this. Representative forms very distinct from each other (a number are listed by Chapman) occur in the east (Roraima) and the west (Duida). In most instances the corresponding Auyan-tepui form is similar to the Roraima race, as may be expected when the connecting line of high mountains between the two is recalled. There exists no good explanation of these differences. In most cases, perhaps all, they seem to consist of one- or two-factor mutations. And they occur among enough species for the assumption to be made that a considerable period of time must have passed to permit them all to have taken place.

That space of time is most logically thought of as reaching from termination of the last glacial period (the Wisconsin) to the present—currently placed at 30,000 to 50,000 years. Some of those contrasting geographical species indeed may hark back to one of the previous Pleistocene glaciations. But if it can be assumed that some at least of the subspecific divergences took place since the last ice period, a slight conception of the rate of evolution under such conditions is had. And further, if that fauna became established in the highlands of Guiana, 30,000 years ago, what was then the condition of the mountains themselves and of their climate? Erosion at those altitudes and in the present climate is very rapid. Were at least some of the mountains less widely separated by erosive action from each other than they are today? Rise and fall of the earth's surface is generally imperceptible. Nevertheless the altitudes above sea-level of some of the strata today may be widely different from their positions 30,000 years ago. Also the sea-level itself must be several hundreds of feet higher in relation to the present equatorial coast-lines taken as a whole than it was when enormous quantities of water were withdrawn from the oceans and concentrated as Polar ice caps.

The final act in the history of the neotropical region as we now know it seems to begin with the slow emergence from the last glacial period. At that time climates about the equator may still have been many degrees (7° to 15° have been variously estimated) cooler. The shorelines were drawn along the outer edges of the continental shelves. Successive climatic zones were depressed thousands of feet. The real tropics (temperature 78° to 90°) perhaps withdrew to the exposed continental shelves, delta areas and lower valleys of the Amazon and Orinoco, while lower subtropics (65° to 75°) perhaps occupied the greater part of the present equatorial lowlands and next-colder zones descended the mountain slopes correspondingly.

The distinct faunas of the east Guiana region and of the upper Amazon, at the time of the ice period, may have been even more sharply separated geographically than they are today. Each had to retire into warm storage (if I may coin such a term). Each had to wait somewhere for the then inclement climate of their present areas of distribution to become warmer. The Guiana fauna can be thought of as withdrawing to the uncovered continental shelf, but where did the upper Amazonian faunal complex, with its host of delicate primates and rodents, take refuge? The hypothesis that no Antartic ice cap existed when Arctic ice developed would perhaps permit this fauna to retire to the Beni-Madeira region, or even to the Argentine. In the Amazon valley a relatively large number of species (especially among the primates) are known yet only south of the river.

And what also became of the biota of the coast ranges at Caracas and Cumana—and of the savanna fauna of the llanos? Both are relatively poor in species (other than archaic types) derived from Amazonia, and both now contain a substantial northern element which entered through the Isthmus of Panama (e.g., *Urocyon*, *Heteromys*, *Sigmodon*). Conditions there were perhaps more rigorous than farther south in Guiana.

The effect on the mid-altitude faunas of the ice period was analogous to, though geographically very different from, that on the torrid zone assemblages. Both on the Andes and on the Guiana mountains, mid-zone species worked downward as the climate cooled. As the areas lower down became progressively more suited to their needs, those behind them got more and more unfavorable. As they descended they approached one another, especially in the Guaviare, Caquetá, Cassiquiare region. Perhaps they mingled and exchanged forms; which went east and which went west may never be known. Although *Oryzomys macconnelli*, *Neacomys* and *Chalcomys*, with others, crossed over, many species known to live along the Andes today at 5000 feet above sea-level never passed to Guiana, or if they did, they failed to establish themselves.

Some of the plateau mammals (I again except old types like *Didelphis*) seem not to have descended far enough to have been able to cross the lowlands. At least *Podoxymys*, *Marmosa tyleriana* and *Thomasomys macconnelli* have no very close relatives in the Andes. During climax of the cold period, they probably occupied most of the territory of Guiana down to perhaps 3000 feet, leaving the relatively frigid uplands of 7000 to 8000 feet untenanted by mammals. With the return toward modern conditions of temperature, they gradually withdrew to the highlands.

As warmer conditions reëstablished themselves, the mid-mountain species of Guiana severed intercourse with those of the Andes, while the Amazonian tropical fauna (which we have supposed waiting in Bolivia and the Argentine) extended an exploratory tentacle northward between them.

At the same time the Guiana fauna out on the Atlantic shelf and the llanos biota, which perhaps resided temporarily at the mouth of the Orinoco, began to move westward toward their present-day areas of distribution.

The foregoing picture of faunal movements, postulated to have taken place with the ending of the glacial period, though it may seem extravagant, fits the facts fairly well. But it takes into account only the lowering and subsequent slow raising of temperatures. It does not consider possible changes in topography or of climate due to topographic change. Such additional changes, if they occurred, may have influenced the subsequent dispersal of many species and may explain thus some of the anomalies. The organisms themselves may have changed internally, evolving new sets of requirements for which they had to find suitable environments.

In the pages which follow I have set forth in greater amplitude the characters of the several elements making up the total mammal fauna of Guiana.

The tropical Guiana fauna for practical purposes may be considered to include all species found below 2500 feet. The number of forms (about 100) is high. Geographical races and mutually exclusive species are

numerous. Many of the forms extend to the middle altitudes zone and a very few, unmodified or but slightly modified, to the high plateaus of 8000 feet.

Mammals of generalized character and stable organization occur throughout the area. These may be considered first. About twenty-five generalized types of wide geographic range, with or without faintly differentiated races: *Didelphis marsupialis, Chironectes, Metachirops opossum, Metachirus nudicaudatus, Marmosa cinerea, Dasypus novemcinctus, Cyclopes didactylus, Tamandua, Myrmecophaga tridactyla, Choloepus didactylus, Cuniculus paca, Hydrochoerus hydrochoeris, Oryzomys laticeps, Potos flavus, Procyon cancrivorus, Lutra enudris, Conepatus, Tayra, Felis* (all species), *Tapirus terrestris, Tagassu tajacu, Tagassu pecari.*

A second, much smaller group of only four species occurs, which has similar generalized structure but does not extend north of Panama: *Proechimys cayennensis, Icticyon venaticus, Grison vittata, Mazama americana.*

A third group, a large and important one with fourteen full species, is derived from the Amazonian basin. In it are included only those Amazonian species with wide range from the Andes to the mouth of the Amazon: *Marmosa murina, Monodelphis brevicaudatus, Priodontes giganteus, Mesomys hispidus, Echimys armatus, Isothrix bistriatus, Holochilus sciureus, Nectomys squamipes, Pteronura brasiliensis, Cebus fatuellus, Saimiri sciureus, Callicebus torquatus, Pithecia monacha, Aotus trivirgatus.*

The fourth group of eleven species, almost as large as the third, finds its relations in upper Amazonia and the Andean foothills. These species are confined to the western portion of Guiana: *Caluromys laniger, Hadrosciurus igniventris* with its off-shoots *duida* and *flammifer, Myoprocta acouchy, Dasyprocta fuliginosus, Oecomys* (*benevolens* group, with *rex*), *Oecomys* (least group, with *rutilus*, etc.), *Rhipidomys* (*leucodactylus* group, with *bovallii*), *Tamarin apiculatus* group,[1] *Cebus albifrons* group, *Ateles belzebuth* group, *Pithecia chiropotes.*

The fifth or eastern group contains twelve species. It may extend northward through the delta of the Orinoco to Trinidad, but its chief affinities are with the fauna of east and south Brazil: *Lutreolina crassicaudata, Caluromys philander, Sciurillus,*[2] *Guerlinguetus,*[3] *Echimys chrysurus* and allies, *Myoprocta exilis, Dasyprocta cayanus, Coendou prehensilis*, some *Oecomys* and *Rhipidomys* possibly.

The sixth group to be segregated comprises nine species of mammals associated with savannas. The principal savanna area is the vast llanos region of Venezuela. A second very large one, cut off to a great extent from the llanos by mountains and bands of forest, is the north Brazilian savannas. Small patches of grass occur near Duida and elsewhere. The Rupununi savannas are an extension of the north Brazilian area of grass: *Cabassous unicinctus,*[4] *Cavia guianae,*[4] *Zygodontomys stellae* and *microtinus, Sigmomys savannarum,*[4] *Mazama nevorivaga, Odocoileus gymnotis, Dusicyon t. thous*[4] and *apollanaris.*

The species *Sylvilagus orinoci* and (perhaps) *Conepatus gumillae*, though common all over the llanos, seem to cross the Orinoco only in the neighborhood of the lower rapids.

Two Primate species-groups exhibit a principal distribution area that includes northern South America, north of Amazonia but including Guiana: *Cebus apella* group and *Alouatta senicula* group.

Two species of arboreal rodents of rather similar distribution reach only the northern edge of Guiana. They are animals of the semi-arid zone which avoid the humid center of Guiana: *Echimys semivillosus* and *Rhipidomys venezuelae.*

An unusual type of distribution occurs in *Neacomys: N. guianae* is affiliated with species of eastern and central Colombia and Panama. The much larger *N. spinosus*

[1] *Apiculatus* may not extend quite as far northeast as our region.

[2] These squirrels are present in Tapajoz and Peru.

[3] *G. aestuans* in east Guiana, is represented through the highlands by *G. a. macconnelli. G. gilvigularis* extends throughout along the southern edge of the Guiana uplands from Duida to Kanuku Mountains. South of the Amazon *G. alphonsei* represents the genus.

[4] Not known from Duida savannas.

of Ecuador and Peru fails to extend to Guiana but instead reaches along the south of the Amazon to the River Tapajoz.

Finally there remain between ten and fifteen forest species which show a greater or lesser degree of endemism in the Guiana area:

Marmosa parvidens (eastern)
Dasypus kappleri (eastern and southern, reaching west to Duida)
Bradypus tridactylus (eastern[1])
Several species of *Oecomys* and *Rhipidomys* (mainly eastern)
Nasua phaeocephala (general)
Tamarin midas (east and south)
" *bicolor* (southwest)
" *martinsi* (south)
Ateles ater (east)
" *paniscus* (southeast and south)
Pithecia pithecia (general)

Of those endemic species, only *Marmosa parvidens* can be related to Andean forms. Its nearest allies occur in the *Marmosa noctivaga* species group, of which it constitutes a new section. The marmosets of the *Seniocebus–Oedipomidas* branch of *Tamarin* are of western origin and even now occur only in the southwest and south of the Guiana area. The eastern part seems to be a region of differentiation in cricetid genera *Rhipidomys* and *Oecomys*.

One more type of lowland distribution comprises geographical races of species derived from eastern Guiana. I have stated earlier that species of the Guiana and Rio Negro faunas exhibit virtually no geographical intermingling. Yet all around the forested base of the Guiana uplands, species exist which are represented in different parts of that range by slightly differentiated local races. I believe that in each case the species can be shown as a variable member of the several widespread, generalized, archaic faunas which I have stated make up about fifty per cent of the total fauna of Guiana. Species showing such modifications often with their ranges incompletely known, as shown in Table I.

In the mid-mountain region of Guiana (2500–5000 feet) the number of recognizable forms compared with the number of lowland forms falls by three-fifths to approximately forty. They are distributed through the orders as follows: marsupials, 6; edentates, 4; rodents, 17; carnivora, 6; primates, 2; ungulates, 4.

Less than one per cent (*Akodon, Thomasomys*) are zonal representatives of plateau animals; one and one-half per cent (*Akodon*, near *chapmanii; Oryzomys maccon-*

TABLE I

Species	Range	Species or Subspecies of East Guiana	Species or Subspecies of West Guiana
Marmosa cinerea	Neotropics to Costa Rica	*demararae*	*esmeraldae*
Marmosa murina	Amazonia	*murina*	*duidae*
Monodelphis brevicaudatus	Amazonia	*brevicaudatus*	*orinoci*
Guerlinguetus	East Amazonia and all Guiana	*aestuans*	*gilvigularis*
Proechimys cayennensis	Northern South America	*cayennensis* (north of Guiana lowlands)	*o'connelli* (extreme southwest Guiana)
Echimys armatus	Amazonia	*armatus* (north and east)	*macrura* (south and west)
Nectomys squamipes	Amazonia	*palmipes*	*rattus*
Potos flavus	Neotropics	*flavus*	near *chapadensis*
Felis concolor	America	*wavula*	*anthonyi*
Tamarin midas	All of Guiana	*midas*	*egens* and *thomasi* (south Guiana)
Cebus apella	S. America: Guiana north to Coast range, avoiding llanos	*apella*	*apiculatus* (Caura to Duida)
Alouatta senicula	As. *C. apella*	*macconnelli*	*stramineus*
Saimiri sciureus	Amazonia	*sciureus*	*cassiquiarensis*
Pithecia pithecia	All Guiana	*pithecia*	*chrysocephala*
Pithecia monacha	Amazonia	*monacha* (extreme southeast, *capillimentosa*)	*milleri*

[1] See Thomas under the discussion of species.

nelli; Oligoryzomys delicatulus) are representatives of extra-territorial species at corresponding altitudes in Colombia and Venezuela. About half of the forty species represent widespread or Amazonian species (*Didelphis marsupialis, Metachirops opossum, Marmosa cinerea, Marmosa murina roraimae* and *M. m. duidae, Monodelphis brevicaudatus, Dasypus* sp., *Tamandua tetradactyla, Myrmecophaga tridactyla, Proechimys cayennensis, Oryzomys laticeps velutinus, Nectomys squamipes, Potos flavus, Felis concolor,* and *F. onca, Tapirus terrestris, Tagassu pecari,* and *Mazama americana*).

Nine species of the middle altitudes represent either llanos species or arboreal forms peripheral to the llanos region (*Cabassous, Zygodontomys stellae, Oryzomys trinitatis, Sigmomys alstoni, Dusicyon thous apollinaris, Mustela frenata meridana, Cebus apella olivaceus, Alouatta seniculus, Odocoileus gymnotis*).

Three more are species whose nearest relatives are disposed remotely and exceptionally:

Dasyprocta fuliginosus	Andean foothills and upper Amazonia
Cavia guianae	Colombia, Bolivia
Oryzomys macconnelli	Colombia, Brazil

Four are species endemic to lowland Guiana whose upper limits extend to between 3000 and 5000 feet (*Marmosa parvidens, Guerlinguetus aestuans, Oecomys nitedulus, Mazama nemorivaga*).

In the case of the mid-mountain fauna, endemism, confined chiefly to arboreal forest types, occurs apparently only in species derived from lowlands ancestry (except *Marmosa parvidens*, an upper limits record).

The fauna of the summit zone of the Guiana mountains (5000–8600 feet) comprises nine types of animals: *Didelphis marsupialis, Marmosa cinerea* (s.l.), *Marmosa tyleriana, Tamandua tetradactyla, Coendou,* near *melanurus, Akodon aerosus, Podoxymys roraimae, Thomasomys macconnelli* and *Nasua candace dichromatica.*

Of these nine species three, *Marmosa tyleriana, Podoxymys roraimae* and *Thomasomys macconnelli,* or 33 per cent, are positively endemic to the region. Three more species, or a further 33 per cent, namely, *Coendou* (sp.), *Akodon aerosus, Nasua candace,* are specialized relatives of species occurring at corresponding altitudes on the Andes. The final third of the plateau fauna includes *Didelphis marsupialis, Marmosa cinerea* and *Tamandua tetradactyla.* These three are ancient, very stable types of mammals with immense geographical ranges and, seemingly, wide tolerance of varying climatic conditions. Two of them, notwithstanding, are represented by slightly differentiated highland races: *Marmosa cinerea areniticola,* and *Tamandua tetradactyla longicaudata. Didelphis marsupialis,* besides displaying its usual two color types (those with white guard hairs and those with black), exhibits little response to highland conditions, except a slight increase in density of the pelage.

Of the three representatives of Andean groups, the *Coendou* (not studied) may perhaps be unchanged. But *Akodon aerosus saturatus* represents a saturate phase of *Akodon aerosus,* near *chapmani,* of the Colombian Andes, 8000 feet, which on Auyan-tepui occurs as low as 3500 feet. The subgenus of *Akodon* to which these mice belong is *Chalcomys.* Its geographical distribution includes the subtropical humid forest belt of the Andes from Matto Grosso, through the Andes to Trinidad, between altitudes of 3000 to 8000 feet. It is abundant throughout Guiana at similar altitudes and under similar conditions. The coati, *Nasua candace dichromatica,* as explained elsewhere seems to be sexually dichromatic. The structure of its skull, however, links it very closely with *Nasua candace* of the Colombian Andes and with slightly more distant relatives in the mountains of Ecuador and Peru.

The three endemic species (one of them also an endemic genus) are related to their nearest allies as follows: *Marmosa tyleriana* of Duida, with its more saturate race *phelpsi* of Auyan-tepui, is a derivative of the stock that gave rise to the Amazonian *Marmosa murina. Podoxymys roraimae,* endemic on Roraima, is an offshoot of the *Akodon* (*Chalcomys*) stem. Though colored much as *Chalcomys* it has a narrowed head, reduced eyes and elongated claws suitable

for its life in the heart of the moss-cushions of the Roraima plateau. *Thomasomys macconnelli* with its paler representative at middle altitudes (3000–5000 feet) seems placed near the base of the stem that gave rise to *Rhipidomys* and *Thomasomys*. Though *Thomasomys*-like in general structure, it has a well-developed caudal pencil of hairs present in most species of *Rhipidomys*.

Thus of the endemic species two are rather remotely derived from lowland ancestors, while three find their nearest allies (also remote in the case of *Podoxymys*) in the Andes. The four non-endemic forms are all of lowland origin.

Of the endemic mammals of Guiana which show undoubted Andean affinities, *Podoxymys*, *Chalcomys*, *Nasua candace* on the plateaus; *Chalcomys* of the middle zone; and *Marmosa parvidens* of the lowlands, only *Podoxymys* and the *Marmosa* are strongly differentiated. Even the *Nasua* appears to have changed but little anatomically, though physiologically to a marked degree. *Chalcomys* (and the unstudied *Coendou*) can be classed as organisms very recently arrived (?) in the Guiana highlands, probably in company with non-endemic Andean species. That event took place long enough ago to allow the saturate race of *Chalcomys* on Auyan-tepui to develop.

The differentiated *Podoxymys* and *Marmosa parvidens* probably result from a more ancient faunal movement.

The non-endemic forms with Andean affinities (*Mustela frenata*, *Cebus apella*, *Alouatta senicula*, *Cavia guianae*, *Oryzomys macconnelli* and *Oligoryzomys*) constitute a compact fauna that probably reached Duida or other western outlier of the Guiana mountains during the last glaciation. It should be noted that no animals of very high altitudes—*Caenolestes*, true *Thomasomys*, *Phyllotis*, etc.—crossed over. Nor did *Reithrodontomys*, *Cryptotis* nor *Sigmodon*, animals commonly thought to have entered South America at the time of the last ice period.

In concluding this part of this paper I would like to point out that the evidence provided by mammals, birds, reptiles and plants is somewhat at variance. At an informal meeting of students of various branches in biology recently, it was brought out that though the mammals and reptiles of the Guiana uplands show relatively low percentage of endemism and birds furnish a rather higher percentage, the vegetation of the highlands has a very high percentage, namely, about 65 per cent. The Guiana highlands plants, beside providing very many endemic species, have a number of endemic genera and one endemic family.

In all of the zoölogical groups discussed attention was called to a substratum of what I have called "archaic genera," which persisted to the summit, greatly reduced, it is true, in numbers, though scarcely at all in percentage of the fauna at selected altitudes.

The reverse was stated for the vegetation, the Amazonian or tropical genera and families being almost totally supplanted by a quite different flora, generally of even more archaic type. It was further shown that a number of such genera or families found their nearest relatives in remote parts—south Brazil, Costa Rica, Cuba and, in the case of the pitcher-plants, Florida.

To a very mild degree this was to be observed also with the birds, although it applied only to subspecies and species. Not one distinctive, autochthonous genus of birds was known from the Guiana highlands.

The flora, then, appears to have had a far higher capability of survival on those isolated plateaus than has the fauna. The plants reflect many archaic stages of development, that elsewhere on the American continent have passed away, while the vertebrates tell only the last few chapters, fragmentary too, except the last. Those old vegetational forms have indeed held on so well, have adapted themselves so completely to their exceptional environment that they may have shut out a part of the flora that would otherwise have entered Guiana during the late Pleistocene.

SYSTEMATIC TREATMENT OF THE MAMMALIAN FAUNA

DIDELPHIDAE

DIDELPHIS[1] LINNAEUS

Didelphis LINNAEUS, 1758, Syst. Nat., 10th Ed., p. 54.

GENOTYPE.—By subsequent designation, *D. marsupialis* Linnaeus.

GENERIC REVISION.—J. A. Allen, 1902, Bull. Amer. Mus. Nat. Hist., XVI, pp. 249–279.

Allen distinguished two South American species of *Didelphis*, each with several races by the physical characters, as shown in Table II.

The American Museum material cited by Allen has been reëxamined. Neither the dental nor the zygomatic character appears to be as conclusive as he supposed. On the other hand, the consistently greater size of the molars of *D. marsupialis* (m^{1-4}, inclusive, 17–20 mm.) compared with those of *paraguayensis* (m^{1-4}, 15–16 mm.) is valuable as a diagnostic character—particularly because (comparing adults of the same sex) the teeth have different crown proportions individually (e.g., *marsupialis* m^3, 5.1 × 5.0; *paraguayensis* m^3, 4.4 × 4.8).

Allen showed that *D. paraguayensis* extends into the northern half of South America only along the Andes by which it reaches Mérida, Venezuela.

The score of specimens included in our collections from the Guiana sandstone region comprises only narrow-headed animals, referable to *marsupialis*. With the exception of the usual wide range of color variation of the guard hairs (hairs white in some specimens, black in others) and a slight difference in the fineness of the pelts (finer and softer at higher levels), perhaps due to somatic adjustments, no indication of racial variation exists.

The affinities of *D. marsupialis* are with *Didelphis* of the surrounding lowlands—the Amazonian and Orinoco basins. Animals from the highlands (up to 7000 feet), readily picked out by their denser fur, seem directly derived from the lowland form.

Didelphis marsupialis Linnaeus

(Reference under subspecies)

Didelphis marsupialis marsupialis Linnaeus

D. marsupialis LINNAEUS, 1758, Syst. Nat., 10th Ed., p. 54.

TYPE LOCALITY.—America (Linnaeus); restricted (Allen, *op. cit.*, p. 258) to Guiana.

MATERIAL.—Mt. Duida (6); Mt. Roraima (4); Mt. Auyan-tepui (9).

CHIRONECTES ILLIGER

Chironectes ILLIGER, 1811, Prodromus, p. 76.
GENOTYPE.—*Lutra minima* Zimmermann.

No specimen of the water opossum was collected by our expeditions. The genus, however, is present in the coastal strip and probably, considering the widely scattered records in the Neotropics, all through the Guiana lowlands.

Chironectes minimus (Zimmermann)

Lutra minima ZIMMERMANN, 1780, Geographische Geschichte, II, p. 317.

TYPE LOCALITY.—Cayenne.

MATERIAL.—None.

Zimmermann applied the name *minimus* to the "Petite Loutre de l'eau douce de Cayenne" of Buffon.[2] Buffon's specimen probably was young, as he states that the length of the body was only seven inches.

TABLE II

	D. marsupialis Linnaeus	*D. paraguayensis* Oken
Pinna of ear	primarily black	primarily flesh-colored
Dimensions of animal	larger	smaller
Markings on head	relatively indistinct	strongly contrasted black and white
Skull	relatively elongate and narrow	short and broad
$p^{\frac{4}{4}}$	relatively small	relatively large
Superior border of zygoma	formed posteriorly by posterior extension of malar	formed posteriorly by squamosal

[1] On "Official List," Opinion 91, International Commission Zoological Nomenclature.

[2] 1776, Hist. Nat., Suppl. 3, p. 159, Pl. XXII.

METACHIROPS MATSCHIE[1]

(Four-eyed opossums with pouches)

Philander BRISSON, 1762, Regnum Animale, p. 207.

Metachirops MATSCHIE, 1916, Sitz.-ber. Ges. Naturf. Freunde, p. 268.

Holothylax CABRERA, 1920, Genera Mammalium, Mus. Nac. Cien. Nat. Madrid (1919), p. 47.

GENOTYPE.—"*Le philandre*" Brisson = *Didelphis opossum* Linnaeus.

In Opinion 37 of the International Commission of Zoological Nomenclature the generic names in Brisson's "Ornithologia," 1760, were accepted by the International Commission on Zoological Nomenclature. It follows that the genera of the similarly prepared "Regnum Animale," 1762, should also be accepted.

Brisson listed eight kinds of "*Philander*," including also members of the genera *Phalanger*, *Monodelphis*, *Didelphis*, etc. Of these he had personally examined only one, *le philandre*, against which name the mark** appears (see bottom of third page of his preface) to so indicate. His detailed specific description, "*Pili saturati spadicei partem corporis superiorem obtegunt; qui vero oris ambitum, ventrem, et crura cooperiunt, sunt flavi. Caput pilis fuscis vestitur*, et, *supra utrumque oculum macula inest flava.* Habitat in America," may indicate either *Metachirus* Burmeister or *Metachirops* Matschie, the only two genera whose species have pale spots over the eyes. Besides the specimen studied by him, Brisson's principal citation was to Seba, I, p. 56, Pl. XXXVI, figs. 1, 2, 3. The one (and only) reference (omitting the juvenal specimen, fig. 3) was cited by Linnaeus (1758) for his *Didelphis opossum*. Thus there is good reason for placing "*le philandre*" Brisson in the synonymy of *opossum* Linnaeus.

Allen[2] held the opinion that the name *Philander* Brisson was not tenable, because Linnaeus had applied *Didelphis* to a group of marsupials of "practically the same species as those of Brisson." But *Didelphis* has long been limited to the Virginia opossum group by designation of *marsupialis* Linnaeus as its type. Also the other four species given by Linnaeus comprise *philander*, a true woolly opossum; *opossum*, a four-eyed opossum; and *murina* and *dorsigera*, murine opossums. Therefore *Didelphis* Linnaeus and *Philander* Brisson were by no means similarly constituted. Allen's view that they are synonymous cannot be maintained.

When Matschie,[3] 1916, reviewed among other genera the four-eyed opossums, he divided them into *Metachirus* Burmeister (type *quica* Temminck) and *Metachirops* Matschie (= *Philander* Brisson). The original species *opossum* Linnaeus was assigned to *Metachirops*. Cabrera, 1920, disregarding Matschie's *Metachirops* erected *Holothylax* with type *D. opossum* Linnaeus. Thus both *Metachirops* and *Holothylax* are pure synonyms of *Philander* Brisson, all three having *opossum* Linnaeus for genotype. *Metachirus* Burmeister may be treated as a subgenus of *Philander* Brisson or not according to the views of the student.

Of the several races of the wide-ranging, pouched, four-eyed opossums described only two belong in eastern South America:

opossum Linnaeus (=Seba's specimens)	Brazil (not Paramaribo as stated by Matschie)
quica Temminck	Sapitiba, Rio de Janeiro (Matschie). Temminck gives only Brazil

All other names apply to Andean and Central American forms. It is thus possible that *quica* may be synonymous with *opossum*, and material from northeastern South America, if separable, remains unnamed.

Metachirops opossum (Linnaeus)

Didelphis opossum LINNAEUS, 758, Syst. Nat., 10th Ed., p. 55.

TYPE LOCALITY.—Brazil (Seba).

MATERIAL.—Foot of Mt. Duida, 350 feet, 2 adults.

METACHIRUS BURMEISTER

(Four-eyed opossums without pouches)

Metachirus BURMEISTER, 1856, Erläut. Fauna Brasil, p. 135.

[1] Although it appears from evidence revealed in this paper that *Philander* is the correct name for the larger four-eyed opossums, the generally used term is here retained pending some opinion from the International Commission.

[2] Allen, 1900, Bull. Amer. Mus. Nat. Hist., XIII, p. 188.

[3] Matschie, 1916, Sitz.-ber. Ges. Naturf. Freunde, pp. 259–272.

GENOTYPE.—By subsequent designation (Palmer, 1904) "*Didelphys myosurus* Temminck (= *D. nudicaudata* Geoffroy)."

Thomas's[1] earlier designation, though correct in result, violated in its form Art. 30 of the International Rules of Zoological Nomenclature.

The original description of *nudicaudata* Geoffroy[2] is not available for examination. But in the next citation (by Desmarest[3]) the animal, compared with *opossum* Linnaeus, is stated to be of smaller size, to have a longer tail, no pouch, and to come from Cayenne.

Although recent authors have synonymized *myosurus* with *nudicaudatus*, Temminck[4] was dubious on the point but only because he thought Geoffroy might have erred in thinking *nudicaudatus* pouchless. Geoffroy must be assumed to be right until proved in error.

Matschie's views of the distinctness of this genus from his *Metachirops*, based upon the presence or absence of pouch, on the degree of pilation of the base of the tail, on the absence or presence of postorbital processes are indisputable. Both genera, however, appear to be monotypic; and the numerous "species" and subspecies referred to each should be regarded as weakly differentiated geographical races. The presence of a supraciliary spot in each genus is perhaps not to be held as constituting very close relationship.

No named forms other than *nudicaudatus* are recorded from the Guiana area. A number have been described from Brazil and from western South America, as well as one, *dentaneus*, from Panama. The Guiana members of the species can then remain provisionally identified with *nudicaudatus*.

Metachirus nudicaudatus (E. Geoffroy)

Didelphys nudicaudatus E. GEOFFROY, 1803, Cat. Mus. Paris, p. 142.

TYPE LOCALITY.—Cayenne.

MATERIAL.—Foot of Mt. Duida, 300 feet, 1 juv. ♂; Auyan-tepui, 1500 feet, 5 specimens, and at 3500 feet, 1 specimen; from Kartabo, British Guiana, one very young animal.

The Duida specimen is considerably browner in general tone, and particularly along the sides, than any of the individuals from farther east.

LUTREOLINA THOMAS

Lutreolina THOMAS, 1910, Ann. Mag. Nat. Hist., (8) V, p. 247.

GENOTYPE.—*Didelphis crassicaudata* Desmarest.

The peculiarities of the broken distribution of *Lutreolina* have been pointed out by Thomas.[5] The Guiana race must be excessively rare, since but one specimen seems to have been captured since Turner obtained the type in 1879.

Lutreolina crassicaudata (Desmarest)

Lutreolina crassicaudata turneri (Günther)

Didelphys turneri GÜNTHER, 1879, Ann. Mag. Nat. Hist., (5) IV, p. 108.

TYPE LOCALITY.—Better Hope, British Guiana.

MATERIAL.—None.

CALUROMYS ALLEN[6] (Woolly opossums)

Caluromys ALLEN, 1900, Bull. Amer. Mus. Nat. Hist., XIII, p. 188.

GENOTYPE.—*Didelphis philander* Linnaeus.

Philander Brisson, 1762, refers to one of the species of *Metachirus* Burmeister and not to *D. philander* Linnaeus at all.

After setting up *Caluromys*, Allen (*loc. cit.*) properly referred to it nine forms, and erroneously a tenth, *cinereus* which was a *Marmosa*.

Philander Tiedemann,[7] the reference which for years was cited as including the opossums related to *D. philander* Linnaeus is untenable. Tiedemann placed under his *Philander* only three species: *P. virginianus* (a *Didelphis*), *P. murinus* (a *Marmosa*) and *P. brachyurus* (a *Monodelphis*). These facts were pointed out by Thomas[8] and by Allen (*loc. cit.*). The latter author then

[1] Thomas, 1888, Cat. Marsup. and Monotr., p. 329.
[2] E. Geoffroy, 1803, Cat. Mus. Paris, p. 142.
[3] Desmarest, 1817, Nouv. Dict. d'Hist. Nat., (2) IX, p. 424.
[4] Temminck, 1827, Monogr. Mamm., I, pp. 38–40.
[5] Thomas, 1923, Ann. Mag. Nat. Hist., (9) XI, pp. 583–585.
[6] See footnote under *Metachirops*.
[7] Tiedemann, 1808, Zoologie, I, pp. 426–428.
[8] Thomas, 1888, Cat. Marsup. and Monotr., p. 336.

proposed *Caluromys* for the woolly opossums. Revivals of the name *Philander* fall as homonyms to *Philander* Brisson, 1762 (a four-eyed opossum).

Under the generic headings *Micoureus* Lesson and *Caluromys* Allen, Matschie[1] emphasized the distinctness of the two types of woolly opossums referable, respectively, to the *laniger* and *philander* species groups. Under *Micoureus* he listed fifteen names in the former paper (*op. cit.*, p. 269) and in the latter (*loc. cit.*) he added seven names. His *Caluromys* (*loc. cit.*), however, was composite, and, following J. A. Allen, included members both of *Caluromys* (type *philander*) and of the *cinerea* group of *Marmosa*.[2] Four years after Matschie wrote, Thomas[3] pointed out that he himself (1888) had designated *cinerea* (a *Marmosa*) type of *Micoureus* Lesson, and proposed the name *Mallodelphys* with the type *D. laniger* as a subgenus of "*Philander*." In his recent treatment of the marsupials of Brazil, Miranda Ribeiro[4] treats *Caluromys* and *Mallodelphis* as full genera.

Contrary to the case in *Metachirus* and *Metachirops*, *Caluromys* and *Mallodelphis* appear to be definitely congeneric. In both the pouch is reduced to simple lateral folds; the skulls in their primary structure, dentition and osteological proportions are essentially similar. The features by which the species *laniger* and *philander* can be differentiated include quality of pelage, extension of body fur along dorsal surface of tail, size and weight of adult animals, and are of the order of specific rather than generic characters.

Caluromys philander (Linnaeus)

Didelphis philander Linnaeus, 1758, Syst. Nat., 10th Ed., p. 54.

Type Locality.—Brazil.

Material.—One adult ♂ from Esmeralda, foot of Mt. Duida.

Linnaeus based *philander* solely upon the "Tlaquazin seu Tai-ibi brasiliensibus" in Seba.[5] Both text and plate show unmistakably a woolly opossum of the *philander* species group (with longitudinal frontonasal stripe and but slight extension of body fur along the tail).

This species extends all over the eastern half of South America from Trinidad to Santa Catharina and westward at least as far as Mt. Duida.

Several subspecific names have been applied: *trinitatis* Thomas to the Trinidad form; *venezuelae* Thomas to the mainland form near Cumaná; and *affinis* Wagner to a race from Cuyabá, Matto Grosso. The species appears to be restricted to the lowlands, and to be rare in Guiana.

Caluromys laniger (Desmarest)

Didelphis laniger Desmarest, 1820, Mammalogie, p. 258.

Type Locality.—Paraguay.

The names for forms of *laniger*-like opossums whose ranges border upon the Duida region are:

Form	Type Locality
jivaro Thomas, 1913	Sarayacu, Oriente, 400 meters, Ecuador
ochropus Wagner, 1842	Barra, Rio Negro, 100 meters
meridensis Matschie, 1917	Sierra de Mérida, 2500 meters

Of the three, *ochropus*, more fully described by Wagner in 1855, seems to agree well with our specimens from western Guiana. Ours lack the strongly contrasting pattern of material from the Caquetá River, Colombia.

Caluromys laniger ochropus (Wagner)

Didelphis ochropus Wagner, 1842, Archiv für Naturg., p. 359; 1855, Säugethiere, Suppl. 5, pp. 236–237.

Type Locality.—Barra (west of Manaos), Rio Negro.

Material.—One adult ♂ (trunk in alcohol; skull cleaned), from Esmeralda, foot of Mt. Duida, 100 meters; a second slightly smaller ♂ from mouth of River Ocamo, a few miles up-river from Esmeralda. The second specimen is considerably grayer than the first, whose general color is dull rufous brown.

[1] Matschie, 1916, Sitz.-ber. Ges. Naturf. Freunde, pp. 259–272; *op. cit.*, 1917, pp. 280–294.

[2] Tate, 1933, Bull. Amer. Mus. Nat. Hist., LXVI, Art. 1, p. 50.

[3] Thomas, 1920, Ann. Mag. Nat. Hist., (9) V, p. 195.

[4] Miranda Ribeiro, 1936, Revista. Mus. Paulista, XX. pp. 353–360.

[5] Seba, 1734, Thesaurus, I, p. 57, Pl. xxxvi, fig. 4.

MARMOSA GRAY

Marmosa GRAY, 1821, London Med. Repository, XV, p. 308.

GENOTYPE (by monotypy).—*Didelphis murina* Linnaeus.

Three of the five principal groups[1] of *Marmosa* are represented in the Guiana highlands:

M. cinerea group:	
M. demararae areniticola Tate	Roraima; Auyan-tepui
M. demararae esmeraldae Tate	Duida
M. murina group:	
M. murina roraimae Tate	Roraima: Auyan-tepui
M. murina duidae Tate	Duida
M. tyleriana Tate	Duida; Auyan-tepui
M. noctivaga group, *M. fuscata* section:	
M. parvidens Tate	Auyan-tepui

Marmosa demararae Thomas[2]

(Reference under subspecies)

Marmosa demararae demararae Thomas

Marmosa demararae THOMAS, 1905, Ann. Mag. Nat. Hist., (7) XVI, p. 313.

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

Marmosa demararae areniticola Tate

Marmosa demararae areniticola TATE, 1931, Amer. Mus. Novit., No. 493, p. 2; 1933, Bull. Amer. Mus. Nat. Hist., LXVI, p. 63.

MATERIAL.—The original series of eight from Mt. Roraima (1300 m.); from Auyan-tepui, 460 meters (8), 1100 meters (13), 1850 meters (one and an extra skull).

The race appears to be morphologically uniform both at Roraima and at Auyan-tepui. At the latter locality through a vertical range of 1390 meters no definable difference can be seen.

Marmosa demararae esmeraldae Tate

Marmosa demararae esmeraldae TATE, 1931, Amer. Mus. Novit., No. 493, p. 2; 1933, Bull. Amer. Mus. Nat. Hist., LXVI, p. 64.

MATERIAL.—The original 17 species from Duida (100 meters to 2000 meters).

[1] Tate, 1933, Bull. Amer. Mus. Nat. Hist., LXVI, Art. 1.

[2] *Demararae* and allies may well be only subspecifically separable from *cinerea*. In the faunal discussions (earlier) the species is written of as *cinerea*.

Marmosa murina (Linnaeus)

(Reference under subspecies)

Marmosa murina murina (Linnaeus)

Didelphis murina LINNAEUS, 1758, Syst. Nat., 10th Ed., p. 55.

TYPE LOCALITY.—Surinam (restricted by Thomas).

MATERIAL.—None.

Marmosa murina roraimae Tate

Marmosa murina roraimae TATE, 1931, Amer. Mus. Novit., No. 493, p. 4; 1933, Bull. Amer. Mus. Nat. Hist., LXVI, p. 98.

MATERIAL.—The original series of 14 from Roraima (1400 meters); from Auyan-tepui, 460 meters (8), 1100 meters (only 1).

The Auyan-tepui material conforms precisely with that from Roraima, differing from *M. m. duidae* and *M. m. klagesi* by the characters given previously (*loc. cit.*). Probably, however, it intergrades with the latter.

Marmosa murina duidae Tate

Marmosa murina duidae TATE, 1931, Amer. Mus. Novit., No. 493, p. 5; 1933, Bull. Amer. Mus. Nat. Hist., LXVI, p. 99.

MATERIAL.—The original specimen from the Duida area at 100 meters.

Marmosa tyleriana Tate

Marmosa tyleriana TATE, 1931, Amer. Mus. Novit., No. 493, p. 6; 1933, Bull. Amer. Mus. Nat. Hist., LXVI, p. 105.

MATERIAL.—The type only (Mt. Duida, 1500 meters).

A most interesting series from the Auyan-tepui plateau, morphologically indistinguishable from *tyleriana* but far more saturate in dorsal color, may be described as:

Marmosa tyleriana phelpsi, new subspecies

TYPE.—No. 130502, Amer. Mus. Nat. Hist.; adult ♂; Auyan-tepui plateau, 1850 meters, southern Venezuela; collector G. H. H. Tate (field No. 5502). Type is a skin with skull in good condition.

GENERAL CHARACTERS.—A dark race of the somewhat rufous *M. tyleriana*.

DESCRIPTION.—Color dorsally near Prout's Brown;[3] ventrally with the identical fawn shade

[3] Colors capitalized refer to Ridgway's "Color Standards and Nomenclature."

of true *tyleriana;* quality of pelage, characters of th tail and ears as *tyleriana* but feet rather darker. Skull not distinguishable from that of *tyleriana.*

MEASUREMENTS.—Taken in flesh: length of head and body, 112 mm.; tail, 162; hind foot (s.u.), 19; ear from crown to tip of pinna, 19. Skull: basal length, 33.2; zygomatic breadth, 19.6; palatal length, 19.6; least breadth across pteryoid wings of alisphenoid, 3.9; breadth of bulla, 2.7; greatest breadth of palate across outer corners of m^3, 10.8; length m^{1-3}, 6.1.

Besides the holotype the collection from Auyan-tepui includes seven paratypes and an additional specimen from 2200 meters.

It is a pleasure to name this interesting race for Mr. W. H. Phelps who originated and supported the expedition to Mt. Auyan-tepui.

Marmosa fuscata section

In working out this section[1] no form was recognized from the Guiana region. The general facies of the three specimens of *parvidens* (see beyond) taken at Auyan-tepui was so reminiscent of the *fuscata* group that the type of *parvidens* was borrowed from the Field Museum for comparison. Apart from some fading and discoloration of the ears and ventral surface (probably due to its having been degreased or skinned from alcohol), the type is essentially identical to our new material. Although female, the mammary count of the type could not be ascertained. It can now be seen from the new material that the mammary formula is 3–1–3 = 7. There is no doubt that *parvidens* should be transferred from the *murina* group to the *noctivaga* group, *fuscata* section of *Marmosa.* It possesses the general characters of cranium, the type of audital bullae, the microcharacters of the tail and slender structure of the pes which all members of the *fuscata* section share. The unique form of the canine, common to all four individuals, coupled with its reduced size, is sufficient for its maintenance as a full species, apparently endemic to the Guiana region.

Marmosa parvidens Tate

Marmosa parvidens TATE, 1931, Amer. Mus. Novit., No. 493, p. 13: 1933, Bull. Amer. Mus. Nat. Hist., LXVI, p. 208.

TYPE LOCALITY.—Hyde Park, 30 miles up Demarara River, British Guiana.

MATERIAL.—Two adults (♂ and ♀) from Auyan-tepui, 460 meters, and one adult (♂) from 1100 meters. (Also the type, F.M. 18545.)

The rediscovery of this interesting species known hitherto only by the type specimen which was collected in 1906 is of great interest. The animals were all trapped in tropical to lower forest in traps set on or under logs.

MONODELPHIS BURNETT

Monodelphis BURNETT, 1830, Quart. Journ. Sci. Lit. and Art, XXVIII, p. 351.

Peramys LESSON, 1842, Nouv. Tabl. R. A. Mamm., p. 187.

GENOTYPE.[2]—*Brachyura* = *brachyuros* Schreber = *brevicaudatus* Erxleben (by subsequent designation Matschie,[3] Thomas[4]).

Both Schreber's and Erxleben's descriptions are founded upon Seba's illustrations.[5] Schreber's colored plate (151) is a colored replica of the Seba drawing. However, it seems likely Schreber had an actual Guiana specimen, for he writes,[6] "Die Ohren, eine Theile der Nase . . . . sind asch grau"; and the buffy gray facial area of eastern specimens is clearly shown in his plate.

Erxleben's[7] chief reference is also to Seba (*loc. cit.*) but from the latter's description nothing can be gathered regarding the facial color.

Named races of *brevicaudatus* as listed by Cabrera[8] are the typical form from "Guayanas"; *M. b. dorsalis* Allen, 1904, from Venezuela; and *M. b. orinoci* Thomas, 1899, from Caicara, River Orinoco. In addition Cabrera places a long series of names in the synonymy of *brevicaudatus.* The species taken as a whole is present throughout the Guiana region from 3500 feet downward.

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[1] Tate, 1933, Bull. Amer. Mus. Nat. Hist., LXVI, pp. 168–185.

[2] Burnett included "*dorsigerens*" (a *Marmosa*) and *brachyura* in his *Monodelphis.*

[3] Matschie, 1916, Sitz.-ber. Ges. Naturf. Freunde, p. 271.

[4] Thomas, 1920, Ann. Mag. Nat. Hist., (9) V, p. 195.

[5] Seba, Thesaurus, I, p. 50, Pl. XXXI, fig. 6.

[6] Schreber, 1777, Säugethiere, III, p. 549.

[7] Erxleben, 1777, Syst. Regn. Animal, I, p. 80.

[8] Cabrera, 1919, Genera Mamm., Monotremata, Marsupialia, p. 42.

Miranda Ribeiro[1] reviewing the Brazilian marsupials attempted to show the generic term *Monodelphis* a homonym of the ordinal term *Monodelphia*, a procedure entirely at variance with Art. 34, International Rules of Zoological Nomenclature. He appeared also unaware that the type of *Monodelphis* was properly designated by Matschie. His revival of *Peramys*, therefore, was uncalled for.

Monodelphis brevicaudata (Erxleben)

(Reference under subspecies)

MATERIAL.—The type of *M. b. dorsalis* Allen and two paratypes—all three young; a series of specimens from Mt. Auyan-tepui, 460 meters (one from 1100 meters); two juvenals from Suapure (probably representing *M. b. orinoci* whose type locality was Caicara); 17 from Duida; three from River Ocamo, some ten miles up the Orinoco from Duida; one from Limao, River Cotinga, fifty miles south of the Brazilian edge of the Guiana sandstone escarpment; seven from Mt. Roraima, 3800 feet; two from Anundabaru, above Kaieteur Falls, British Guiana; one from Kartabo, British Guiana.

Besides the foregoing we have material from Casiquiare Canal and considerable series from the rivers along the south shore of the middle Amazon.

The localities represented give a fairly good representation of the geographical range in Guiana of *brevicaudatus*. Eastern specimens (notably those of Roraima) are distinguishable at sight from western and northern ones by the presence of a well-defined buffy facial area, extending usually from the rhinarium to the top of the head. This patch is reduced in some specimens but is entirely absent in only one (juvenal). The animals from Anundabaru, east of Roraima, have the buff area slightly reduced. There is no trace of it in the juvenal from Kartabo. It is slightly developed in two of the Auyan-tepui animals and in one specimen from Duida. In the remainder it is lacking. The animal from Limao (in much-worn pelage) exhibits no trace of a face patch.

[1] Miranda Ribeiro, 1936, Revista Mus. Paulista, XX, p, 320.

There are also slight but unstable color differences in the ventral pelage which for the present study can be ignored. Juvenal animals are invariably darker than adults.

I am unable to detect the differences by which Allen distinguished *dorsalis* from *orinoci*. Even differences between the eastern and western animals appear to be transitional.

On the basis of Schreber's description and plate the eastern material in our collection is referred to *M. b. brevicaudatus*. Material from the Orinoco of the west-northwest and northern sides of the Guiana Highlands is considered referable to *M. b. orinoci* (of which *dorsalis* is a synonym). An area of transition seems to extend from Auyan-tepui southwest to Duida.

Monodelphis brevicaudata brevicaudata (Erxleben)

Didelphis brevicaudatus ERXLEBEN, 1777, Syst. Regn. Anim., I, p. 80.

TYPE LOCALITY.—"In America australis sylvis" (restricted by Matschie, 1916, p. 271, to Surinam).

MATERIAL.—See under *brevicaudata*.

Monodelphis brevicaudata orinoci (Thomas)

Peramys brevicaudatus orinoci THOMAS, 1899, Ann. Mag. Nat. Hist., (7) III, p. 154.

Peramys brevicaudatus dorsalis ALLEN, 1904, Bull. Amer. Mus. Nat. Hist., XX, p. 327.

TYPE LOCALITY.—Caicara, middle Orinoco, Venezuela.

MATERIAL.—See under *brevicaudata*.

DASYPODIDAE

The typical genus of the family, *Dasypus* Linnaeus, 1758, Syst. Nat., 10th Ed., p. 50, contained six "species." Of these *novemcinctus* is here considered the genotype. In Opinion 90, the International Commission of Zoological Nomenclature ruled against a proposal to make *novemcinctus* type of *Euphractus*.

Setting aside *Scleropleura* Milne-Edwards of which little is known, though judging from the carapace figured by its author it must be primitive, the armadillos, in spite of their uniform appearance, present a remarkable assemblage of progres-

sive and unspecialized characters. Individual genera in their skulls differ from one another in a number of striking ways.

Cabassous, one of the most primitive of the genera, retains the free ring-like form of the tympanic bone, maxillary toothrows that still extend forward to the premaxillary sutures; unwidened posterior nares, with simple blade-like pterygoids; five manual digits; anterior and posterior dorsal shields with plates which, though fused, are essentially undifferentiated from those plates contained in the movable bands; head plates forming the head shield, large and unspecialized; tail simple, freely movable, its armor formed of single isolated plates not grouped into specialized or telescoping rings.

The giant armadillo, *Priodontes*, apart from its much greater size, agrees to a remarkable degree with the foregoing diagnosis. The following distinctions from *Cabassous* may be pointed out: the proportionally heavier ossification of the skull; increase in the number of teeth (secondary ?); widening of the posterior nares, with thickening of the pterygoids; increase in the facial area of the lacrimal.

Dasypus, the nine-banded armadillo, shares the primitive tympanic structure of *Cabassous* and *Priodontes* but diverges in many other respects, namely: the absence of teeth from that part of the maxillary adjoining the premaxillary suture and from the maxillary behind the maxillo-palatal suture; the partial flooring of the posterior narial opening by extensions of the pterygoids; the development of a deep groove and masseteric ridges on the malars; the vertical (instead of horizontal) trend of the malar-squamosal suture; the apparent reduction of manual digits to four (the first digit is still observable); marked differentiation of the anterior and posterior dorsal and head plates from those composing the movable bands; fusion of tail plates into groups, each group functioning as a ring-shaped plate articulating with and partly telescoping into the one immediately in front of it.

Euphractus and *Zaedius* are sharply differentiated from all of the foregoing by the transformation of the tympanic ring into a tubular spout or meatus, completely fused with the audital bulla.

Euphractus appears primitive in retaining one premaxillary tooth and in the fact that the toothrow continues backward far behind the palato-maxillary suture. The pterygoids are simple and compressed; the zygoma appears secondarily simplified in its lack of a postorbital process (present in all other genera). The plates of scapular, lumbar and head shields are comparatively unspecialized in relation to those forming movable bands; fusion of tail plates into "rings" is incipient. These animals are the large, flat-headed armadillos of the east Bolivian region.

Zaedius, besides being smaller, is distinguished from *Euphractus* by its lack of premaxillary teeth, and proportionally much deeper zygoma with partial retention of the postorbital process. The malar-squamosal suture in both is horizontal. Both are hairy armadillos, but while the hairs in *Euphractus* attain only 1 to $1^1/_2$ plate lengths on the back those of *Zaedius* reach lengths from 3 to 5 plate lengths. The underparts and limbs of the former are relatively hairless, while those of *Zaedius* are densely pilose.

Although the extraordinary specializations of the genus *Chlamydophorus* set it far apart from other genera, it may well be studied in the light of the characters used above. The audital meatus, unfused with the bullae, is extended as an elongated tube which reaches upward and forward above the root of the squamosal process of the zygoma and terminates about the middle of the temporal fossa. The frontals have developed two large, blunt cornua. Teeth, palate and pterygoids have remained unspecialized. There are no premaxillary teeth. The hands retain five toes. But the relation of the pelvic shield to the pelvis has undergone great specialization. The distal portion of the tail is broadened and specialized.

Undue importance may perhaps be imputed in this paper to the differences in the audital region employed above to separate the armadillos. But similar or analogous differences form one of the fundamental characters generally used to dis-

tinguish such major groups as the Platyrrhine from the Catarrhine Primates.

It has been customary to divide living armadillos into three subfamilies: Dasypodinae (with *Dasypus* and "*Praopus*"), Euphractinae and Chlamydophorinae. In view of the pronounced differences in the tympanic prevalent in the family I feel that some adjustment of that classification is required:

The primitive armadillo from which living genera sprang may be imagined as having the tympanic bone ring-shaped and free from the bulla; the teeth already armadillo-like, but with one or more premaxillary teeth still present; the armor relatively unspecialized, with the plates of anterior and posterior carapaces of type similar to those of movable bands (the number and completeness of the bands variable), and with those of the tail not yet grouped in armored rings.

From the foregoing a branch developed in which the armor and the pterygoids tended toward specialization. It gave rise to the *Dasypus*. Part of the remainder, the Cabassouinae, changed hardly at all from the primitive type. It gave rise to the small *Cabassous* and the giant *Priodontes*. A pair of genera, *Euphractus* (the *sexcinctus* group) and *Zaedius*, developed from an ancestor strongly specialized in the region of hearing. The tympanic became tubular and intimately fused with the bulla.

Finally, in *Chlamydophorus* the quite extraordinary audital characters already mentioned suggest that it took a line of development entirely independent from those of the groups earlier discussed.

In the Guiana region the armadillos seem limited to three full genera: *Cabassous*, *Priodontes*, *Dasypus* and its possible subgenus "*Praopus*."[1] The genera with specialized tympanic bones are not known to occur north of the Amazon.

CABASSOUS McMURTRIE

"Le Cabassou" G. CUVIER, 1823, Rechérches Ossem. Foss., 3rd Ed., V, 1re parte, p. 120.

Cabassous McMURTRIE, 1831, Cuvier's Animal Kingdom, I, p. 164.

Xenurus WAGLER, 1830, Nat. Syst. Amph., p. 36.

Ziphila GRAY, 1873, Hand. Edentates, p. 22.

Lysiurus AMEGHINO, 1891, Revista Argent., I, p. 254.

GENOTYPE.—*Dasypus unicinctus* Linnaeus.

The several "species" of *Cabassous* represented in our collections—*unicinctus*, *gymnurus*, *lugubris* and *loricatus*—are very closely related to one another. *Gymnurus* and *loricatus* differ slightly from the other two in the somewhat more fully developed postorbital process and deeper zygoma.

Cabassous unicinctus (Linnaeus)

Dasypus unicinctus LINNAEUS, 1758, Syst. Nat., 10th Ed., p. 50.

TYPE LOCALITY.—"Africa." (Restricted by custom to British Guiana.)

This species was founded upon the description in Syst. Nat., 1748, 6th Ed., p. 6; Seba, I, p. 47, Pl. xxx, figs. 3, 4.

Cuvier's description and figures apply undubitably to the animals of which I have written earlier as *Cabassous*. Regarding the identity of the Linnean *unicinctus*, the figure in Seba agrees well with Cuvier's "*cabassou*." But why did Linnaeus name an animal with some fifteen movable bands, "*unicinctus*"?

The sole reference in the sixth edition, under "Dasypus cingulo simplici," is to the "Tatu mustelinus," Ray, Syn. Anim. Quadr., p. 235, where that animal is described as having eighteen movable bands. Ray's description appears also to refer to *Cabassous*. No locality is given.

MATERIAL.—British Guiana, several specimens.

At Mt. Auyan-tepui many small holes, probably the work of this armadillo, were observed in open, sandy places. Neither we, nor the Indians who were offered a substantial bonus for specimens, ever managed to secure one.

PRIODONTES F. CUVIER

"Priodonte" F. CUVIER, 1822, Hist. Nat. Mamm., IV, livr. XXVIII, p. 2.

Priodontes CUVIER, 1825, Dents des Mamm., pp. 198–199, 257, Pl. xxxi.

GENOTYPE.—*Priodontes giganteus* (= *Dasypus gigas* Cuvier).

[1] Although *Praopus* Burmeister was undoubtedly a nine-banded armadillo, I have not been able to determine whether its genotype had the palatopterygoid structure of *kappleri* or of *novemcinctus*. In the latter event *Praopus* is a synonym of *Dasypus*.

Priodontes giganteus (E. Geoffroy)

Dasypus giganteus E. Geoffroy, 1803, Cat. Mus. Paris, p. 207

Type Locality.—South America.

Material.—British Guiana (2 specimens).

The Indians of Auyan-tepui were familiar apparently with the giant armadillo; and André mentions (p. 269) a giant armadillo up the Caura River. One was taken by Beebe in British Guiana. The species is widely distributed both north and south of the Amazon.

Dasypus Linnaeus

Dasypus Linnaeus, 1758, Syst. Nat., 10th Ed., p. 50 (part).

Tatu Frisch, 1775, Natur.-syst. vierfüss. Thiere in Tabellen, Pl. v. (See Palmer, 1904, p. 664.)

Praopus Burmeister, 1854, Uebersicht. Thiere Brasiliens, I, pp. 295–301.

Genotype.—*Dasypus novemcinctus* Linnaeus.[1]

Dasypus kappleri, though superficially like *Dasypus novemcinctus*, differs in the pterygoid-palatal relationships. It is less specialized in that its pterygoids do not take a part in forming the floor of the posterial narial opening. That is formed wholly by the palatine bones, which are cut squarely off at the back. The line of the pterygoids in *kappleri* is extended forward as pronounced sharp-edged ridges along either side of the palate as far as the toothrows.

Whether *D. kappleri* should be retained as a full genus or reduced to a subgeneric division of *Dasypus* is a matter of opinion among individual students.

The type of *Praopus* Burmeister (monotypy) is *Dasypus longicaudatus* Wied, a relative seemingly not of *kappleri* but of *novemcinctus*. But *longicaudatus* Wied, 1826, was a homonym of *Dasypus longicaudatus* Turton, 1802, Linnaeus, Syst. Nat., I, p. 34, described as "Bands nine, tail long, jointed. Inhabits America. About size of cat."

It seems likely that *Cryptophractus*, *Muletia* and *Dasypus* are at best only subgenerically separable, with *kappleri* forming a distinct fourth section. All four, however, share the principal characters of *Dasypus* earlier indicated. Gray's illustration of *Muletia* indicates a palatal condition substantially equal to that of *novemcinctus*. *Kappleri*, on account of its simpler pterygoid-palatal structure, appears somewhat less advanced than *novemcinctus* or *septemcinctus*.

[1] In Opinion 90, the International Commission failed to grant a request for application of *Dasypus* to the *sexcinctus* group, thus leaving *Euphractus* Wagler for that group.

Dasypus kappleri Krauss

Dasypus kappleri Krauss, 1862, Archiv für Naturg., I, p. 24, Pl. III, fig. 1, 2.

Type Locality.—Marowini River, Surinam.

Material.—Foot of Mt. Duida (one).

This large member of the *novemcinctus* group is readily distinguished from true *novemcinctus* by the characters of the pterygoids and palate previously pointed out.

Its distribution apparently extends along the wooded southern slopes of the Guiana mountains from Dutch Guiana at least to Mt. Duida. Not one of the many *Dasypus* armadillos in our collection procured in British Guiana by Beebe is referable to this species. All are *novemcinctus*.

Gray's repeated use of *Praopus* Burmeister for this species seems unwarranted.

Dasypus novemcinctus (Linnaeus)

Dasypus novemcinctus Linnaeus, 1758, Syst. Nat., 10th Ed., p. 51.

Type Locality.—South America.

Material.—British Guiana (many specimens).

MYRMECOPHAGIDAE

Although the skulls of the three genera of anteaters at first glance appear much alike, there are certain important differences which indicate, at least for *Cyclopes*, a distinctness of great antiquity.

In both *Tamandua* and *Myrmecophaga* the palatines and pterygoids have grown together to extend the floor of the posterior narial canal as far back as the level of the mastoids. In *Cyclopes* no such osseous floor has been developed for the narial canal, though the top and sides of an equally extensive sulcus indicate that a non-osseous canal of similarly functioning

type is present. Instead, the palatines terminate posteriorly in a manner essentially like those of most other mammals, while the inconspicuous pterygoids provide scarcely a trace of the structures that form the canal floor in the other two genera.

The facial exposure of the lacrimal in *Cyclopes* and *Tamandua* is relatively small, while in *Myrmecophaga* it extends forward on the face for a considerable distance.

The rostrum of *Myrmecophaga* is so elongated that the length of the maxilla exceeds the distance from the back of the maxilla to the condyle. The reverse of this condition is the case in both *Cyclopes* and *Tamandua*.

In the arrangement of the anterior digits *Myrmecophaga* is least and *Cyclopes* most specialized. *Myrmecophaga* and *Tamandua* retain all five hind toes. *Myrmecophaga* lacks only anterior D 1; *Tamandua*, D 1 and D 5. *Cyclopes*, however, has lost the first hind digit and anterior D 1, D 2 and D 5. It appears that in each case D 4 carries the largest claw.

The tails of *Cyclopes* and *Tamandua* only are prehensile.

The reduction of the toes appears correlated with long-continued climbing habits, as does prehension with the tail. In the case of *Myrmecophaga* the tendency to enter upon an arboreal habitus was arrested (?).

The enlargement of the claws probably preceded taking to the trees and was perhaps correlated with the specialized diet and the specialization of pterygoids, hyoid apparatus, tongue and rostrum in connection therewith.

The development of a bony floor under the extended narial canal is probably a response of some kind to total restriction of diet in nature to termites or similar insects.

From the standpoint of locomotion *Myrmecophaga* may be primitive, though its peculiar mode of holding the fore foot doubled over on one side may result from a secondary terrestrial existence following an arboreal one. (This view opposed by the non-arboreal tail.)

From the standpoint of food, however, *Cyclopes* with its simple palate and unlengthened rostrum is perhaps most primitive.

There remain other criteria: for example, the methods of reproduction and the mammary formula, which have not yet been considered but which may throw light upon the probable structure of the prototype of the Myrmecophagidae.

CYCLOPES GRAY

Cyclopes GRAY, 1821, London Med. Repository, XV, p. 305.

GENOTYPE.—*Myrmecophaga didactyla* Linnaeus.

This monotypic genus extends from Mexico to Bolivia and south Brazil, wherever sufficiently warm climate prevails. It is locally common, though because of its arboreal habits not often found. Several slightly variant races have been named.

I have examined skulls of silky anteaters from Mexico to Brazil without discovering a satisfactory character upon which to base a second species. The named geographical races are based upon slight variations of color and length of tail: *mexicanus* (Oaxaca), *eva* (N.W. Ecuador), *ida* (eastern Ecuador), *melini* (Rio Negro), *catellus* (Bolivia).

Cyclopes didactylus (Linnaeus)

(Reference under subspecies)

Cyclopes didactylus didactylus (Linnaeus)

Myrmecophaga didactyla LINNAEUS, 1767, Syst. Nat., 12th Ed., p. 51.

TYPE LOCALITY.—Guiana.

MATERIAL.—A few collected by Dr. W. Beebe in British Guiana.

Cyclopes didactylus melini Lönnberg

Cyclopes didactylus melini LÖNNBERG, 1928, San Gabriel, R. Negro, Arkiv f. Zoologie, 20A, No. 10, p. 15.

MATERIAL.—Mt. Duida (2), collected in the low country at the foot of the mountain only a few hundred feet above sea-level. Unknown either at Auyan-tepui or Roraima.

TAMANDUA FRISCH

Tamandua FRISCH, 1775, Natur.-syst. vierfüss. Thiere in Tab., Pl. v.

GENOTYPE.—*Myrmecophaga tetradactyla* Linnaeus.

Although the validity of the name *Tamandua* Frisch was questioned by Thomas and Miller[1] in 1905, when they concluded that Frisch's names were "hopelessly non-Linnaean" and untenable, it was and still is in current use. Allen[2] had derived the name from Cuvier, 1829; Trouessart, 1904, "Catalogus, Suppl.," p. 803, attributed it to Frisch. There appears, moreover, to have been no opinion expressed on the matter by the International Commission on Zoological Nomenclature, nor does the name show on the "Official List." Therefore the general usage of *Tamandua* Frisch for the *tetradactyla* anteaters is here followed.

The eastern Guiana form, which is grayish with pale hair tips but lacks the pronounced dark stripes of Central American *Tamandua*, is characterized by very considerable inflation not only of the lateral portions of the specialized pterygoids, but also by some degree of rounding of the tympanics. This enlargement produces considerable broadening of the *basis cranii* in relation to the width of the braincase.

In the striped Central American *Tamandua*, the pterygoid inflations are reduced and relatively flat; the palatine inflations may be present but more often are weak, resulting in a definite narrowing of the posterior width of the combined palatines; the tympanic is slightly less rounded than in *tetradactyla*.

Further differences appear in the squamosal and maxillary. In Central American animals the squamosal, just beneath its zygomatic process, projects forward between the parietal and the tympanic (plus alisphenoid) for several millimeters; in *tetradactyla* no such projection develops. In *chiriquinus*, etc., a broadly wedge-shaped or angled process of the maxilla enters between the lacrymal and frontal; in *tetradactyla* that process is not developed.

In the Mexican *Tamandua* the inflated portions of the skull are like those of *chiriquinus* but the characters in the maxilla and squamosal are those of *tetradactyla*. The same applies in the case of the striped anteaters of Bolivia and Brazil south of the Amazon.

The unstriped, straw-colored form, commonly designated *longicaudata* Wagner,[3] is the dominant if not the sole form in the Guiana mountains area. It is also dominant at the Rio Tocuyo, north Venezuela (though the striped *Tamandua* occurs both east and west of that arid area), and is common along the eastern Andes of Ecuador and Colombia.

The occurrence of that pallid form, though in a general way regional, seems unrelated to conditions of climate or forestation. It is equally prevalent among the dwarfed woods of the Auyan-tepui plateau, in the arid cactus belt at Rio Tocuyo, and in the heavy rain forests of eastern Ecuador. The pale form does not occur, so far as I can discover in Central America or west of the Andes. In the Matto Grosso (?) it was described as *sellata* Cope.

The striped *Tamandua*, divided by Allen into several subspecies, is the *Tamandua* of middle America and western Ecuador. It is present (with *longicaudata*) along the eastern foot of the Andes and extends south and east to Bolivia and eastern Brazil. In British Guiana *Tamandua*, though it lacks the strongly defined shoulder stripes of the Central American forms of *tetradactyla*, yet shows incipient striping and is much grayer than *longicaudata* of the nearby highlands region.

True *tetradactyla* appears to be limited to Guiana east of the range of *longicaudata*, with which, on the basis of skull characters, it is very closely allied. Our British Guiana material differs from our specimens of *longicaudata* only in having the straw-colored pelage provided with dark bases.

Tamandua tetradactyla (Linnaeus)

(Reference under subspecies)

Tamandua tetradactyla tetradactyla (Linnaeus)

Myrmecophaga tetradactyla LINNAEUS, 1758, Syst. Nat., 10th Ed., p. 35.

TYPE LOCALITY.—Guiana.

[1] Thomas and Miller, 1905, Ann. Mag. Nat. Hist., (7) XVI, pp. 461–464.

[2] Allen, 1901, Proc. Biol. Soc. Washington, XIV, pp. 91–93.

[3] Wagner, 1844, Schreber's Säugethiere, Suppl., IV, p. 211.

MATERIAL.—A good series from several localities in the lowlands of British Guiana.

Tamandua tetradactyla longicaudata (Wagner)

Myrmecophaga longicaudata WAGNER, 1844, Schreber's Säugethiere, Suppl., IV, p. 211.

TYPE LOCALITY.—"Northern part of South America."

MATERIAL.—Mt. Roraima (1); Mt. Auyan-tepui (4); Mt. Duida (4).

This form of anteater is quite as common on the plateaus of Duida and Auyan-tepui between 6000 and 8000 feet as it is at altitudes between 2000 and 3000 feet. The Roraima specimen was brought in by an Indian to the base camp, and consequently was probably taken at about 4000 feet.

MYRMECOPHAGA LINNAEUS

Myrmecophaga LINNAEUS, 1758,[1] Syst. Nat., 10th Ed., p. 35.

GENOTYPE.—*Myrmecophaga tridactyla* Linnaeus.

Myrmecophaga tridactyla Linnaeus

Myrmecophaga tridactyla LINNAEUS, 1758, Syst. Nat., 10th Ed., p. 35.

TYPE LOCALITY.—Brazil (apparently unrestricted).

MATERIAL.—Mt. Roraima (1); Mt. Auyan-tepui (1 and pick-up skull).

A full-grown giant anteater was seen at "Tree Savannas," foot of Mt. Duida, but was not captured. These animals apparently range all over the Guiana savanna region up to about 5000 feet. They are met with in forest, though usually near savannas. Thomas[2] records a specimen from "Mount Roraima, 5000 feet."

BRADYPODIDAE

The taxonomy of the sloths appears to be badly muddled, although Thomas's[3] paper (1917) on the three-toed sloths did much to clarify the situation. *Bradypus* Linnaeus, 1758, Syst. Nat., 10th Ed., p. 34, was based upon *B. tridactylus* and *B. didactylus*.

B. tridactylus (1758), with "throat yellow," was based upon Linnaeus, 1745, Syst. Nat., 6th Ed., p. 3; Amoen. Acad., I, p. 487; Mus. Adolph. Fredericae, p. 4; as well as on references to Gesner, Marcgrave, Clusius, Seba and Olearius [references in the 6th edition pointed only to Marcgrave and Seba].

B. didactylus (1758) with "ferruginous undulant hair, round head" . . . was founded also upon the 6th edition of the "Systema Naturae"; Mus. Adolph. Fredericae, p. 4; and Seba.

The International Commission on Zoological Nomenclature in Opinion 91 placed *Bradypus* on the Official List of *nomina conservanda*, with genotype *B. tridactylus* Linnaeus.

Illiger, 1811, "Prodromus . . .," pp. 108–110, proposed *Choloepus* for the two-toed sloths, providing an adequate generic definition and including therein two species: *Bradypus didactylus* Linnaeus and *B. torquatus* new species (then). The latter stood (*op. cit.* p. 108) as a *nomen nudum*, but immediately (p. 110) became established by the description "collar blackish; head rufescent; soles longer than head."[4]

According to Illiger *torquatus* was a two-toed sloth. Yet by Trouessart, "Catalogus," 1899 and 1904, it was placed among the sloths with three claws on the hand.

Gray, 1849, Proc. Zool. Soc. London, pp. 65–73, recognized *Choloepus*, *Bradypus* and *Arctopithecus*. The last name, probably taken from Gesner, was a three-toed group distinguished from *Bradypus* by "pterygoids swollen, hollow, vesicular."

Tardigradus Lesson, 1762, included the three-toed and two-toed sloths of Linnaeus. It is eliminated by designation (at this time) of "Tardigradus pedibus anticis and posticis tridactylis" as its genotype.

The American Museum possesses no *Bradypus* with inflated pterygoids. The pterygoids of most *Choloepus* are of course inflated, but Gray's figures (Pl. x, figs. 1c and 2c) show a *Bradypus*-type of dentition in combination with inflated pterygoids.[5]

The species listed by Gray under *Arcto-*

[1] Nomen conservandum, Opinion 91.

[2] Thomas, 1901, Ann. Mag. Nat. Hist., (7) VIII, p. 153.

[3] Thomas, 1917, Ann. Mag. Nat. Hist., (8) XIX, pp. 352–357.

[4] Thomas (1917, *op. cit.*) stated *torquatus* to be a *nomen nudum*. But Mr. Morrison-Scott in a recent communication informs me that in Thomas's personally marked copy of the paper the statement is withdrawn. In the same marked copy the words "South-western" (*op. cit.*, p. 353, line 3) are corrected to "South-eastern."

[5] Mr. Morrison-Scott has kindly confirmed the characters of *crinitus* and *affinis* Gray for me.

pithecus come variously from Bolivia, Guiana, Brazil, "tropical America," Venezuela and Pará. The two "*Bradypus*," *crinitus* Gray and *affinis* Gray, come, respectively, from "British Guiana" and "tropical America." We shall never know whether the Linnaean "*tridactylus*" had inflated or compressed pterygoids. But the latter must be assumed to conform with Thomas's[1] designation of "*tridactylus*" (with compressed pterygoids) type of *Bradypus*.

Peters, 1864, Monatsber. Akad. Berlin, footnote, p. 678, proposed the generic term *Scaeopus* for "*Bradypus torquatus*." He differentiated *Scaeopus* from "*Bradypus*," "among the species of which an increase in cervical vertebrae customarily of two, seldom of one or three takes place," through "the distinctive structure of the skull, hyoid bones and humerus." But *torquatus* Illiger, which as already pointed out was a *Choloepus*, needed no further distinction from *Bradypus* and certainly called for no new generic name. Besides Peters, when he proposed the name *Scaeopus*, was describing primarily a new species of two-toed sloth, *Choloepus hoffmani*. It seems likely, therefore, that he regarded *Scaeopus*, which he compared only with the three-toed *Bradypus*, as also three-toed. It seems possible, too, that Illiger and Peters were dealing with different species of animals.

Anthony, 1906, Comptes Rendus, Paris, 142, pp. 292–294, concluded that the Linnaean *Bradypus* was probably equal to *Arctopithecus* Gray rather than *Bradypus* Gray. He set aside *Scaeopus* Peters as "insufficiently characterized"; and synonymized *Arctopithecus* Gray with *Bradypus* Linnaeus, proposing the name *Hemibradypus* to include three-toed sloths with inflated pterygoids, and markedly reduced fourth metacarpals.

Ménègaux, 1909, Bull. Soc. Zool. France, XXXIV, pp. 27–32, although he drew attention to Anthony's failure to use *Scaeopus* for *Hemibradypus*, missed the fact that Illiger's *torquatus* was apparently a two-toed sloth.[2] Furthermore his view (p. 28) that successive authors have definitely established the characters of *torquatus* Illiger appears open to question. We have no assurance that Illiger, Temminck, Cuvier and the others successively studied sloths of the *same species*.

Quite apart from the generic confusion just portrayed, numerous specific names were proposed from time to time under *Choloepus* and *Bradypus*. The limitations of the present paper make it impossible to try to evaluate those names, nor indeed can it be done without access to existing type specimens.

That the generic groups *Bradypus* and *Choloepus* have long been separated from their common ancestors is shown by many important structural characters: the great breadth of the muzzle in *Choloepus;* its enlarged shearing anterior molars (or premolars); its lack of the enlarged posterior process of the malar; the inflation of the pterygoids; retention of the separate tympanic ring; spout-shaped symphysis of the mandibular rami; in the manus of *Choloepus*, the retention of the splint-like remains of metacarpals 2 and 5 (in *Bradypus* total absence of the 5th metacarpal, but retention of entire second digit—this combined with fusion of scaphoid and lunar); great proportional elongation of both metacarpals and carpals in *Choloepus;* in the foot, retention in *Choloepus* of metatarsal splints one and five; elongation of metatarsals and tarsals (in *Bradypus* the metatarsals greatly shortened, and second and third metatarsals fused with bones of foot); in *Choloepus* the bones of foot mostly separate (in *Bradypus* mostly fused); calcaneum in *Choloepus* proportionally much shorter than in *Bradypus*. The general reduction in the number of cervical vertebrae in *Choloepus* and increase in *Bradypus* from the normal seven, is also to be remembered.

BRADYPUS LINNAEUS

Bradypus LINNAEUS,[3] 1758, Syst. Nat., 10th Ed., p. 34.

GENOTYPE.—*Bradypus tridactylus* Linnaeus.

Bradypus tridactylus Linnaeus

Bradypus tridactylus LINNAEUS, 1758, Syst. Nat., 10th Ed., p. 34.

[1] Thomas, 1911, Proc. Zool. Soc. London, p. 132.

[2] It is important, if the type of *torquatus* exists, that some person with adequate experience in taxonomy publish a careful report upon it. From Thomas's paper (*loc. cit.*) it appears that Illiger may have erred in placing *torquatus* under *Choloepus*.

[3] *Nomen conservandum*, Opinion 91.

TYPE LOCALITY.—South America. (Restricted by Thomas to British Guiana.)

MATERIAL.—Mt. Duida region (2); British Guiana (series).

Sloths appear to be rare in the Guiana highlands country. The specimen marked Duida was taken in the lowlands adjoining the upper Orinoco. Also a good series from the Caura River and from British Guiana.

Tridactylus is here used for these sloths in the broad sense. The British Guiana specimens, commonly named *cuculliger* Wagler, are by Thomas held synonymous with *tridactylus* Linnaeus.

CHOLOEPUS ILLIGER

Choloepus ILLIGER, 1811, Prodromus Syst. Mamm. Avium., p. 108.

GENOTYPE.—*Bradypus didactylus* Linnaeus.

Choloepus didactylus (Linnaeus)

Bradypus didactylus LINNAEUS, 1758, Syst. Nat., 10th Ed., p. 35.

TYPE LOCALITY.—"Ceylon." (Type locality unrestricted?)

MATERIAL.—A short series from British Guiana; several specimens from Mt. Duida.

LEPORIDAE

SYLVILAGUS GRAY

Sylvilagus GRAY, 1867, Ann. Mag. Nat. Hist., (3) XX, p. 221.

GENOTYPE.—*Lepus sylvaticus* Bachman.

The South American hares of this genus apparently enter the Guiana region only in the Maipures area. The animals of Maipures have received the name *orinoci* Thomas. In all likelihood *orinoci* is conspecific with *valenciae*, *cumanicus* and *margaritae*, as "rabbits" occur throughout the region of the llanos.

A single topotype of *orinoci* exists in the collection of this museum. The Arecunas of Auyan-tepui and the Maquiritares at Duida expressed ignorance of "rabbits."

Sylvilagus orinoci Thomas

Sylvilagus orinoci THOMAS, 1900, Ann. Mag. Nat. Hist., (7) V, p. 356.

TYPE LOCALITY.—Maipures, upper Orinoco.

MATERIAL.—One topotype.

SCIURIDAE

The "genera" of squirrels found in the Guiana region are *Guerlinguetus*, *Urosciurus*, *Hadrosciurus* and *Sciurillus*. The last is known north of the Amazon only in French Guiana and at the Great Falls of the Demarara River, British Guiana. The several important papers on South American squirrels by J. A. Allen (1914, 1915) have gone far toward clearing up the difficulties in that family.

Guerlinguetus is readily distinguished from the similar-appearing *Microsciurus*, *Mesosciurus* and *Leptosciurus* by its possession of eight pairs of mammae instead of six. Its geographical range also is perfectly separate.

Urosciurus has now been synonymized with *Hadrosciurus*.

Sciurillus, revised recently by Anthony and Tate (1935), is distinguished by such a diversity of characters from all other New World squirrels that it might better be regarded as marking a distinct subfamily.

SCIURILLUS THOMAS

Sciurillus THOMAS, 1914, Proc. Zool. Soc. London, pp. 415–417.

GENOTYPE.—*Sciurus pusillus* Desmarest.

Sciurus pusillus (Desmarest)

(Reference under subspecies)

Sciurillus pusillus pusillus (Desmarest)

Sciurus pusillus DESMAREST, 1817, Nouv. Dict. d'Hist. Nat., X, p. 109.

TYPE LOCALITY.—Cayenne.

MATERIAL.—None.

Sciurillus pusillus glaucinus Thomas

Sciurillus pusillus glaucinus THOMAS, 1914, Ann. Mag. Nat. Hist., (8) XIII, p. 575.

TYPE LOCALITY.—Great Falls, Demarara River.

MATERIAL.—None.

GUERLINGUETUS GRAY

Guerlinguetus GRAY, 1821, London Med. Repository, XV, p. 304.

GENOTYPE.—*Myoxus guerlingugus* Shaw = *Sciurus guerlinguetus* Gray = *Sciurus aestuans* Linnaeus.

After making very careful comparisons of the ample material on hand from British

Guiana, Mt. Auyan-tepui, the Caura area, Mt. Duida, Cassiquiare Canal and the R. Negro as far as Manaos, the conclusion seems inevitable that but two kinds of guerlinguet exist in the Guiana region. The large-toothed *G. aestuans aestuans* extends from Cayenne (possibly Surinam too) westward into the Guiana mountains and thence across to Duida, where in the lowlands it is replaced by the much smaller *G. gilvigularis*. The latter occurs all about Duida below 2700 feet, and extends westward and northward around the course of the Orinoco Valley at least as far as the Caura (material correctly identified by Allen as *gilvigularis*). In the reverse direction it extends down the Negro and throughout the Amazon area adjoining the Madeira River and Manaos. It is probably represented by *S. quelchii* of the foot of the Kanuku Mountains, which similarly lacks ear patches and has small teeth. The geographical distribution of *Guerlinguetus* is still essentially that shown in Allen's map.[1]

Under true *aestuans* should be placed *macconnelli* as a barely separable mountain-dwelling representative. *G. aestuans* of Duida is very slightly smaller than the same squirrel of Guiana, Roraima and Auyan-tepui.

The standing of *G. venustus* from the lowlands of Duida (the type locality, R. Cunucununa, forms the northwest boundary of Duida) needs some explanation. The skull is that of a young *Mesosciurus*—probably of *M. griseimembra*, as can be seen from the large teeth, unreduced third molar and relatively unshortened nasals. How the present skull became matched with the Duida skin is not known. No skull of *Guerlinguetus* appears among those of the *Mesosciurus* collected (at a different date) by the Miller Duida expedition. The fact remains, however, that the supposed skull of the type of *venustus* is not referable to *Guerlinguetus*. The type should be restricted to the skin only. Fortunately, the skin appears readily comparable to our series of *gilvigularis* from the Duida lowlands.

G. aestuans then appears as an indigenous Guiana species with mountain and lowlands representatives, margined along the west and south by *gilvigularis* and to the southeast (near the mouth of the Amazon) by whitish-bellied *alphonsei*.

The distinction between *gilvigularis* and *aestuans* is to be noted in Table III.

Guerlinguetus aestuans (Linnaeus)

(Reference under subspecies)

Guerlinguetus aestuans aestuans (Linnaeus)

Sciurus aestuans LINNAEUS, 1766, Syst. Nat., 12th Ed., I, p. 88.

TYPE LOCALITY.—Surinam.

MATERIAL.—British Guiana lowlands (13).

Guerlinguetus aestuans macconnelli (Thomas)

Sciurus macconnelli THOMAS, 1901, Ann. Mag. Nat. Hist., (7) VIII, p. 148 (footnote).

TYPE LOCALITY.—"Mt. Roraima, near its base."

MATERIAL.—Topotypes (3); Kaieteur Falls (1); Mt. Auyan-tepui (16); Mt. Duida, 2000 to 4700 feet (9).

Guerlinguetus gilvigularis (Wagner)

Sciurus gilvigularis WAGNER, 1843, Archiv für Naturg., II, p. 43; 1845, Archiv für Naturg., I p. 148; 1850, Abhand. Akad. München, V, p. 283.

Guerlinguetus aestuans venustus J. A. ALLEN, 1915, Bull. Amer. Mus. Nat. Hist., XXXIV, p. 260.

TYPE LOCALITIES.—*Gilvigularis*, Borba, mouth of R. Madeira; *venustus*, mouth of R. Sine, R. Cunucunuma, west of Mt. Duida, 400 feet.

TABLE III

	G. aestuans	*G. gilvigularis*
Ear patches	weakly or strongly developed	obsolete
Length p^4–m^3 [2]	7.2–8.1 mm.	6.5–7.1 mm.
Dimensions of m^2	1.9–2.1 by 2.3–2.6	1.6–1.8 by 2.0–2.2

[1] J. A. Allen, 1915, Bull. Amer. Mus. Nat. Hist. XXXIV, p. 301.

[2] If milk p^4 is retained the toothrow is correspondingly shortened. The crown dimensions of the tooth are about 1.5 by 1.5 mm.

MATERIAL.—Nearly topotypical (20); mouth of R. Caura (8); Cassiquiare Canal (12).

HADROSCIURUS J. A. ALLEN

Hadrosciurus J. A. ALLEN, 1915, Bull. Amer. Mus. Nat. Hist., XXXIV, p. 265.

Urosciurus J. A. ALLEN, 1915, Bull. Amer. Mus. Nat. Hist., XXXIV, p. 267.

GENOTYPE.—Of *Hadrosciurus*, *Sciurus flammifer* Thomas; of *Urosciurus*, *Sciurus tricolor* Poeppig.

After comparing the very extensive series of topotypes of *Sciurus duida, ignifer, pyrronotus, cocalis, toedifer* and *flammifer* now in the collections of The American Museum of Natural History, I can find no valid reason for continued generic separation of *flammifer* from the remaining "giant squirrels" of South America. The characters adduced by Allen for generic separation seem unstable and insufficient. *Flammifer*, northernmost outpost of its group, is a highly variable member in so far as its coloration is concerned. Structurally it is barely to be distinguished from the adjoining *duida*. No evidence is at present available to show where *flammifer* gives place to *duida* and whether the transition is abrupt or gradual.

Duida is represented now in our collections by ample specimens not only from the type area, but also down the Cassiquiare and Negro as far as the Cerro de Curicuriari, and westward to the foothills of the Colombian Andes. The material from the Colombian lowlands (Florencia, La Murelia), referred by Allen to true *igniventris*, is instead strictly referable to *duida*.

At the time of writing his paper Allen had before him no true *igniventris* (*op. cit.*, p. 272). From between the Curicuriari hills and Muirapenima, lower down the R. Negro, we also lack material. But from the latter locality we have a good topotypical series of the red-backed race, *igniventris igniventris*.

The four forms of *Hadrosciurus igniventris* bordering upon the Guiana region are the following:

flammifer	Middle R. Orinoco
igniventris duida	Upper Orinoco west to Colombian foothills and south to Upper R. Negro
igniventris toedifer	Colombian Andes
igniventris igniventris	Lower R. Negro

Toedifer and *duida* appear, respectively, to be mountain and lowland phases of the same race. The unstable *flammifer* may intergrade with *duida*. *Duida* and *igniventris* appear at the time of writing to be separable only on the basis of color.

It appears that both *igniventris* and *pyrrhonotus* have black phases. We have black forms both from the lower R. Negro and from the Amazonian area.

Hadrosciurus igniventris (Wagner)

(References under subspecies)

Hadrosciurus igniventris igniventris (Wagner)

Sciurus igniventris WAGNER, 1842, Archiv für Naturg., p. 360.

TYPE LOCALITY.—Marabitanas, R. Negro.

MATERIAL.—Extra-territorial series from right bank of Rio Negro.

Hadrosciurus igniventris duida (J. A. Allen)

Sciurus duida J. A. ALLEN, 1914, Bull. Amer. Mus. Nat. Hist., XXXIII, p. 594; 1915, XXXIV, p. 270.

TYPE LOCALITY.—R. Cunucunuma, sw. side of Mt. Duida, 700 feet.

MATERIAL.—The type with two original topotypes; additional material from Duida up to 750 feet (10); Cassiquiare Canal (1); Rio Uaupes (6); Cerro de Curicuriari (4); Florencia, Colombia (4); Murelia, Caquetá, Colombia (1); Villavicencio (1); R. Lengupa (1); Guaycaramo (1). The last three places are in E. Colombia.

Hadrosciurus flammifer (Thomas)

Sciurus flammifer THOMAS, 1904, Ann. Mag. Nat. Hist., (7) XIV, p. 33.

TYPE LOCALITY.—La Union, Caura district, R. Orinoco, Venezuela.

MATERIAL.—Topotypes (6); El Llagual (2); Ciudad Bolivar (1); Rio Mocho (1); Suapure (5).

The remarkable degree of color variation in this species of squirrels is mildly reminiscent of the condition to be observed in *Callosciurus sladoni* of Burma. At present

I have formed no opinion as to whether the white-footed, the rufous and the melanistic forms of *flammifer* can be correlated with their geographical distribution, though I suspect the variable color may be due rather to genetic instability.

ECHIMYIDAE

PROECHIMYS ALLEN

Proechimys ALLEN, 1899, Bull. Amer. Mus. Nat. Hist., XII, p. 264.

GENOTYPE.—*Echimys trinitatis* Allen and Chapman.

Proechimys is one of those genera of somewhat variable species and great abundance of individuals of which Thomas, after proposing no less than 23 names himself, wrote in 1928, "The bewildering instability of these spiny rats makes it at present impossible to sort them according to locality into separate species, subspecies of local races."

It is not improbable that all of the *Proechimys* of Guiana may be referable specifically to the first member of the genus ever described, *cayennensis* Desmarest, 1817. Two additional names have been proposed for *Proechimys* in eastern Guiana: *vacillator* Thomas, 1903 (Kanuku Mts.); and *warreni* Thomas, 1905 (Demarara River).

At the western end of our region occur *cherriei* Thomas, 1899 (upper Orinoco) and *o'connelli* J. A. Allen, 1913 (Villavicencio, eastern Colombia). Along the north coast are *trinitatis*, *urichi*, *guairae* and *ochraceus*. All other names east of the Andes were applied to animals from south of the Amazon river.

Proechimys is common almost everywhere up to 4000 feet where forest grows, and in Peru reaches even higher. In an attempt to establish the extent of the changes in dentition (if any) due to growth, our paratypical material of *trinitatis* (genotype) has been restudied. From 16 males and 16 females the following conclusions were reached: in specimens with occipito-incisive length less than 40 mm. $m\frac{4}{4}$ are not fully erupted. Sixteen specimens come under the foregoing category. The remainder comprises seven males and nine females.

In the males the occipito-incisive length varies from 45.5 mm. to 51.2, with m^{1-4} varying from 8.7 to 9.3. In the females the same measurements are 43.3 to 52, and 8.4 to 8.9. Increased skull size and increased toothrow length are not interrelated (as is the case in *Cavia*).

A corresponding survey of *urichi* from the near-by mainland showed fourteen out of the nineteen to have the fourth molars unerupted or not yet in place. The type specimen, as it happens, is the smallest and youngest of the adults in the series, producing a deceptive contrast to the Trinidad series, of which the type happens to be one of the largest. In the four measurable specimens of *urichi* the occipito-incisive length ranges from 40 mm. to 44.1, while the length of m^{1-4} varies from 7.7 to 8.6. It is entirely probable that the type series lacks fully grown individuals, for in a collection of nearly forty specimens obtained later by myself from near the type locality of *urichi* there are numbers of individuals whose measurements correspond to those of *trinitatis*.

Our few specimens of *cayennensis* have m^{1-4} 7.6 mm. to 8.0. Two are juvenals, one subadult and the fourth adult, but with the hinder part of the skull missing. They appear essentially like *urichi* and *trinitatis*.

Of *cherriei* we have five males and two females from the Yuruan region, not very far removed from the type locality. In that series (omitting one juvenal) m^{1-4} varied from 7.4 to 8.1 mm., somewhat smaller than the *trinitatis* series.

In the type series of *o'connelli* from Villavicencio the lengths of the molar series vary from 8.4 mm. to 9.5. The type specimen, an old male, has the teeth 9.3. In other material from east Colombia m^{1-4} varies from 8.9 to 9.7. Thus the teeth seem to be slightly larger than those of the eastern animals.

As between *trinitatis*, *urichi*, *cayennensis* (?), *cherriei* and *o'connelli* the first four appear subspecifically identical; the fifth diverges slightly in possessing larger teeth, less broadened palatal foramina and larger flatter audital bullae. The rostrum, too,

of *o'connelli* is much broader and heavier than in the other forms.

Large-toothed *Proechimys* very similar to *o'connelli*, though with rather slenderer rostra, occur down the middle and lower Rio Negro and westward to Ecuador. From the mouth of the R. Uaupes we have both large and small-toothed specimens. Material from the Cassiquiare Canal and the base of Mt. Duida has the molars very much larger than east Guiana forms and only slightly smaller than *o'connelli*. Our large series from Auyan-tepui, Roraima and Rio Cotinga include only animals with small teeth.

The greatest width of the body of m^3 (not the partly worn or hyper-worn crown-surface) in *o'connelli* is 3 mm.; in R. Uaupes specimens 3.0 and 2.4; Duida, 2.6 to 2.8; *cherriei* (El Llagual), 2.3; Auyan-tepui, 2.2 to 2.4; Roraima, 2.2 to 2.3; R. Cotinga, 2.1; Kartabo, British Guiana, 2.4; *urichi*, 2.3 to 2.4; *trinitatis*, 2.4.

The local forms at Auyan-tepui, R. Yuruan and Rio Cotinga, both have remarkably short palatal foramina—5 to 6 mm.; those at Roraima, 6 to 7 mm., which corresponds closely to *cayennensis* and *trinitatis*.

Regarding the color of the pelts, *o'connelli* is rufous brown, material from Duida and Roraima slightly less rufous and darker, Auyan-tepui considerably darker, and the series from the Cotinga plains a light grayish brown. Specimens from the British Guiana side are indistinguishable in color from those of Duida and Roraima.

This discussion of the *Proechimys* of Guiana seems to point to the presence of a single, somewhat variable, species distributed through Guiana up to 4000 feet, northward through Sucre to Trinidad, and southward into the upper R. Branco savannas. Also it shows the above-mentioned species replaced west and southwest of Guiana by a large-toothed species. The Guiana species should probably bear the name *cayennensis*.

The distributional picture presented by *Proechimys cayennensis* with its faintly distinguishable local representatives is that of a forest-inhabiting species with upper distributional limit about 4000 feet, frequenting the vicinities of rivers down to quite small streams, and spreading by means of forest and brush-fringed drainage systems into unforested savanna areas. Where the species enters continuous rain forest it is rather dark and rufous; where it is restricted to the tree-bordered streams of savanna areas it is apt to be somewhat paler and grayer. The rufous type is probably *cayennensis*, the paler representative, *cherriei*. It is quite possible that the observed color differences are somatic or even due to fading.

Proechimys cayennensis (Desmarest)

(References under subspecies)

Proechimys cayennensis cayennensis (Desmarest)

Echimys cayennensis DESMAREST, 1817, Nouv. Dict. d'Hist. Nat., 2nd Ed., X, p. 59.

Echimys trinitatis ALLEN AND CHAPMAN, 1893, Bull. Amer. Mus. Nat. Hist., V, p. 223.

Echimys urichi ALLEN, 1899, Bull. Amer. Mus. Nat. Hist., XII, p. 198.

Echimys cherriei THOMAS, 1899, Ann. Mag. Nat. Hist., (7) IV, p. 381.

Proechimys vacillator THOMAS, 1903, Ann. Mag. Nat. Hist., (7) II, p. 490.

Proechimys warreni THOMAS, 1905, Ann. Mag. Nat. Hist., (7) XVI, p. 312.

MATERIAL FROM GUIANA REGION.—Mt. Roraima, 3500–4200 feet (32); Mt. Auyan-tepui, 1500 feet (44); R. Cotinga savannas, 500 feet (64); R. Yuruan, ±1500 feet (6); lower R. Caura, 1000 feet, (9); Esmeralda, Mt. Duida, 300 to 500 feet (67); lowlands of British Guiana (10).

The names above are grouped in the synonymy of *cayennensis* provisionally only. It is possible that a reviser with sufficient material to close the geographical gaps of the region will be able to pick out races that at present are not distinguishable by me.

Proechimys cayennensis o'connelli J. A. Allen

Proechimys o'connelli J. A. ALLEN, 1913, Bull. Amer. Mus. Nat. Hist., XXXII, p. 479.

TYPE LOCALITY.—Villavicencio, eastern Colombia, 1600 feet.

MATERIAL.—The type series; and a large series from Duida and Cassiquiare region.

Proechimys cayennensis hoplomyoides, new subspecies

TYPE.—No. 75633, Amer. Mus. Nat. Hist.; adult ♀; Rondon Camp, Mt. Roraima, Venezuela, 6800 feet; collector, G. H. H. Tate, December 2, 1927. The type is a skin with skull in fair condition.

GENERAL CHARACTERS.—A blackish-brown, heavily spinose *Proechimys* with slightly larger teeth than lowland forms.

DESCRIPTION.—General dorsal color Bone Brown with few flecks of reddish. The deeping of the dorsal color occasioned by exposure of the black-tipped spines combined with shortening or obsolescence of the reddish interspinous hairs, nearly concealed in the lowlands race; sides scarcely paler than dorsum; underparts pure white; legs and arms Bone Brown; the inner sides of legs white; wrists smoky all the way round; feet and hands whitish; ears fuscous; tail dark brown above, flesh colored beneath.

Skull with the characters and proportions of the *Proechimys* of the base of Roraima, but with the molar teeth somewhat broader (breadth of m^3, 2.7 mm.).

MEASUREMENTS.—Head and body, 218 mm.; tail, 158; hind foot (c.u.) 48, (s.u.) 45; skull, condylo-incisive length, 44.8; zygomatic width, 25.6; palatal length, 24.2; length nasals, 18; breadth braincase, 19.7; palatal foramina, 5.1; length m^{1-4}, 8.7.

The type specimen represents the highest altitudinal record for *Proechimys* in Guiana. A second individual male, from 4200 feet on Roraima, matches the type closely. No correspondingly spinous, dark-colored animals were found at Auyantepui nor at Duida.

MESOMYS WAGNER

Mesomys WAGNER, 1845, Archiv für Naturg., I, p. 145.

GENOTYPE.—*Mesomys ecaudatus* Wagner = *Echimys hispidus* Desmarest.

The earliest described member of the genus *Mesomys* was *Echimys hispidus* Desmarest, 1817, from "South America." In 1916 Thomas wrote that he had studied the type skull of *hispidus* and found it a *Mesomys*, "apparently quite similar to *M. ecaudatus* Wagner." He synonymized *ecaudatus* with *hispidus*.

The type locality of *hispidus*, which has not been settled, I propose to restrict to Borba, Rio Madeira, Brazil, the place at which the type of *ecaudatus* was collected.

Not improbably *didelphoides* and *obscura*, whose points of origin are unascertained, could be eliminated by selection of type localities but the type specimens ought first to be studied.

The range of the genus *Mesomys* from west to east extends from Ucayali and Huallaga Rivers in Peru as far east as the Tocantins River. Northward it appears not to extend beyond the portion of the upper Orinoco adjoining Mt. Duida. It has not been reported from the Caura region or from east Guiana. Southeast it apparently reached Bahia (Pictet, 1841). The altitudinal limit is shown by *leniceps* from 6500 feet.

The named forms that approach our Duida material most closely geographically are *ecaudatus* = *hispidus* of Borba and *ferrugineus* from the Rio Huallaga, Peru. It should be noted that the range in western Amazonia is continuous, as this Museum possesses material from eastern Ecuador and all along the Rio Negro and Cassiquiare Canal. Moreover after comparing a number of individuals from localities as much as two thousand miles apart I am compelled from the obvious morphological stability throughout the known range to consider *Mesomys* a monotypic genus with possibly a few weakly differentiated races.

The skulls are characterized by their large cerebral development and proportionately small facial portion. The molars are all rooted.

Mesomys hispidus (Desmarest)

Echimys hispidus DESMAREST, 1817, Nouv. Dict. d'Hist. Nat., 2nd Ed., X, p. 58.

Mesomys ecaudatus WAGNER, 1845, Archiv für Naturg., I, p. 145.

TYPE LOCALITIES.—Borba, Rio Madeira, Brazil (*hispidus*, by restriction, see above).

MATERIAL.—Foot of Mt. Duida, 300–350 feet (5).

ECHIMYS CUVIER

Echimys CUVIER, 1809, Bull. Soc. Philom., XXIV, p. 394.

GENOTYPE.—*Myoxus chrysurus* Zimmermann.

In 1935[1] I suggested that *Echimys* was separable into two chief groups of species: the large, hairy-tailed group which included the genotype *chrysurus*, and smaller,

[1] Bull. Amer. Mus. Nat. Hist., LXVIII, pp. 428–432.

naked-tailed forms such as *punctatus*, *guianae*, *longirostris*, etc.

The distribution of the second of these groups only, touches the Guiana highlands region, though *chrysurus* whose type locality was Surinam may eventually be shown to enter the British Guiana hinterlands.

I have collected representatives of both *carriker* and *flavidus* near their type localities. The animals affect the hollow trunks of dwarfed trees in arid or semi-arid cactus belts of northern Venezuela. It seems probable that members of the group taken as a whole occur chiefly in xerophytic areas—or savanna-like areas sparsely dotted with trees or gallery forests.

The named forms entering the Guiana area are *punctatus*, *longirostris*, *guianae*, *armatus* and possibly *macrourus* of Jentinck the first from the mouth of the Caura River, the remainder from near the Guiana seaboard.

The molar teeth of *Echimys* are rooted. In rather young individuals the crowns, though showing ample wear, are insufficiently erupted for the roots to be visible; in mature specimens, on the other hand, the roots, particularly those of the premolars, are well exposed. Concurrently with the gradual exposure of the roots, tooth-wear changes the shape of the crowns from an elongate pattern with transverse ridges to a shorter, more oval outline.

Two chief types appear among the bare-tailed *Echimys:* rats with incisors yellowish white; pelage strongly punctate and heavily spined, and with the head and face gray instead of russet; and rats with well-pigmented orange incisors, less spinous pelage which if punctate is yellow rather than white-spotted, and russet to rufous head and face.

The first group includes *E. carrikeri* from the Barquisimeto district and *E. punctatus* from the Caura district; the second comprises *castaneus* of Trinidad, *flavidus* of Margarita Island, *guianae* of British Guiana, *longirostris* of British Guiana, *armatus* from Cayenne, as well as all the members of the group from Mt. Duida west and south to the middle and upper Amazon.

It is probable that *semivillosus* from "New Granada" belongs with *carrikeri.*

Old specimens of *punctatus* are slightly larger and have larger bullae and teeth than individuals of *carrikeri* of similar age (the type of *carrikeri* was rather young. We have now a series of nearly twenty specimens in the collection). Both have the inferior process of the jugal expanded downward and strongly hooked. The typical bulla in *carrikeri* measures 11.5 × 8; in *punctatus* 12.2 × 7.5 (longer and narrower).

Of the russet-headed *Echimys*, the bulla in the Trinidad race *castaneus* measures 11.5 × 7.5 (that of a mainland specimen from Cumanacoa, 11.3 × 8.0). The posterior palatal notch in *castaneus* becomes narrowly V-shaped. The next locality recorded for this class of *Echimys* is Guiana (*longirostris*, *guianae*, *armatus* and possibly *macrourus* Jentinck).

Finally we have numerous specimens of orange-toothed, rufous-headed *Echimys*, extending in range from eastern Ecuador to Mt. Duida and southeastward to the lower Amazon, whose identification will not be dealt with in this paper. In them the hook-like inferior process of the malar bone is weakly developed.

It is open to question whether the differences just pointed out qualify the *Echimys* in question for specific separation. Provisionally perhaps they may be shown as follows:

E. semivillosus semivillosus	New Granada
E. semivillosus carrikeri	San Esteban, Venezuela
E. semivillosus punctatus	Caura, Venezuela
E. armatus armatus (= *guianae* = *longirostris*)	Guiana
E. armatus castaneus (= *flavidus*)	Trinidad and Sucre, Venezuela
E. armatus macroura?	East and south of Duida to Surinam

Echimys chrysurus (Zimmermann)

Myoxus chrysurus Zimmermann, 1780, Geogr. Gesch., II, pp. 352–353.

Echimys cristatus Desmarest, 1817, Nouv. Dict. d'Hist. Nat., 2nd Ed., X, pp. 54–60.

Type Locality.—Surinam.

Material.—None.

Echimys armatus I. Geoffroy St. Hilaire
(References under subspecies)

Echimys armatus armatus
I. Geoffroy St. Hilaire

Echimys armatus I. GEOFFROY ST. HILAIRE, 1838, Ann. Sci., Nat. Paris, (2) X, pp. 122–127.
Echimys guianae THOMAS, 1888, Ann. Mag. Nat. Hist., (6) II, p. 326.
Echimys longirostris ANTHONY, 1921, Amer. Mus. Novit., No. 19, pp. 5–6.

TYPE LOCALITY.—Guiana.

MATERIAL.—A few specimens of *guianae;* the type of *longirostris.*

Echimys armatus macroura Jentinck (?)

Echimys macrourus JENTINCK, 1879, Notes Leyden Museum, I, note 23, pp. 97–98.

TYPE LOCALITY.—Dieperinck, Surinam.

MATERIAL.—A series of three specimens from the Duida region.

I have used this name provisionally only. In 1935, I placed *macroura* Jentinck under *Proechimys*, but its greatly elongated tail and rather short foot (41 mm.) suggest rather *Echimys*. *Macroura* is not invalidated by *macrura* Wagner; at least the "rules" and "opinions" on homonyms take no account of such a case.

The use of *macroura* for western *Echimys* is admittedly open to doubt and is based upon the assumption that *macroura* extends westward along the southern front of the Guiana mountains. The whole matter of determination of the naked-tailed *Echimys* from Amazonia requires further working out.

Echimys semivillosus
I. Geoffroy St. Hilaire

Echimys semivillosus punctatus
(Thomas)

Loncheres punctatus THOMAS, 1899, Ann. Mag. Nat. Hist., (7) III, p. 153.

TYPE LOCALITY.—Caicara, R. Orinoco.

MATERIAL.—A few specimens from near the type locality.

ISOTHRIX WAGNER

Isothrix WAGNER, 1845, Archiv für Naturg., I, pp. 145–146.

GENOTYPE.—*Isothrix bistriata* Wagner.

Only *bistriatus* of the few known species of *Isothrix* extends as far northward as the Guiana region. *I. b. negrensis* and *I. b. orinoci* are the two races adjoining Guiana. The distinctions between them are very slight.

Orinoci Thomas, 1899, was compared with *b. bistriatus:* "the bright yellow frontal line dulled to grizzled gray. . . . behind each ear a prominent whitish patch. . . ."

Negrensis Thomas, 1920, differed from *orinoci* by "more suffused with ochraceous, rump more ochraceous than body, ear-patches buffy instead of whitish, median crown patch distinct and buffy instead of being whitish and only vaguely indicated, and by the under surface being strong ochraceous buffy throughout. The tail with basal two-fifths buff ochraceous instead of a quarter or less. . . ."

Our considerable series from the Duida region agrees closely with the latter description.

Isothrix bistriatus Wagner

Isothrix bistriatus orinoci (Thomas)

Loncheres (Isothrix) bistriatus orinoci THOMAS, 1899, Ann. Mag. Nat. Hist., (7) IV, p. 382.

TYPE LOCALITY.—Maipures, Upper Orinoco, Venezuela.

MATERIAL.—Mt. Duida region, lowlands (25).

Isothrix bistriatus negrensis Thomas

Isothrix bistriatus negrensis THOMAS, 1920, Ann. Mag. Nat. Hist., (9) VI, p. 277.

TYPE LOCALITY.—Acujutuba, Lower R. Negro.

MATERIAL.—Good series from R. Negro.

CAVIIDAE

MYOPROCTA THOMAS

Myoprocta THOMAS, 1903, Ann. Mag. Nat. Hist., (7) XII, p. 464.

GENOTYPE.—*Cavia acouchy* Erxleben from "Cayenne."

Myoprocta is essentially a genus of the rain forests of the Amazonian basin. Its known northern limits reach from the R. Caquetá and base of Mt. Duida, eastward south of the sandstone area to French Guiana.

The "reddish" and "greenish" *Myoprocta* probably represent two distinct species. The greenish forms or "*pratti* group" alone reach Mt. Duida. The "reddish" and "greenish" forms, though so divergently colored, are distinguished only with considerable difficulty by their skulls. The apparent sizes of the teeth vary with age and growth. Consequently until detailed studies of large series of specimens can be made the characters shown by the teeth appear instable. The short table (Table IV) demonstrates four cranial characters which, so far as tested, serve to separate the two otherwise closely allied species.

Erxleben's words "corpore olivaceo. . . ." and "colore olivaceo" are applicable only to one of the "greenish" acouchis. The presence of greenish acouchis in eastern Guiana has yet to be proved. The acouchi actually known from British Guiana is a member of the reddish group. As shown by Thomas and Lönnberg, *leptura* and *exilis* are both "reddish." They may really be synonymous, especially since Wagner, writing thirteen years later than Wagler, omitted all mention of *exilis*. Lönnberg (1925) stated that his *parva* from R. Curaray is a member of the "reddish group." The division of *Myoprocta* then must stand as follows:

"greenish" acouchis	"reddish" acouchis
M. acouchy	*M. exilis*
M. a. milleri	*M. e. lepture*
M. a. pratti	*M. e. parva*
M. a. limanus	*M. e.* subsp. of British Guiana
M. a. archidonae	
M. a. caymanum	
M. a. puralis	

The Guiana "reddish" acouchi is thus left unnamed. As Thomas pointed out (1917) the Guiana animals are very much duller in tone than the Amazonian *exilis* (or *leptura* ?).

It is open to question how many of the named "greenish" acouchis will hold under a revisional study.

Myoprocta exilis (Wagler)

Myoprocta exilis demararae, new subspecies

TYPE.—No. 36493, Amer. Mus. Nat. Hist.; adult ♂; Bonasica, Essequibo River, British Guiana; collector F. O. McConnell, no date. The type is a skin and skull, the back of the latter broken, acquired originally from the British Museum in exchange.

GENERAL CHARACTERS.—A dull-colored member of the red group lacking the markedly rufous coloring of the sides of the neck and the scapular region. (We have large series of *exilis* and *leptura* from both sides of the Amazon for comparison.)

DESCRIPTION.—Dorsal pelage Ochraceous Tawny with from one to two blackish bands on each hair. Rump hairs elongate and carry from four to six black bands. A few rump hairs uniformly black. Underparts, post-auricular streaks, hands and feet a dull shade of Ochraceous Orange.

Skull with the general characters and the widened palatal foramina of the reddish group of *Myoprocta*.

MEASUREMENTS.[1]—Head and body, 320 mm.; tail, 50; hind foot (s.u.), 83. Skull: zygomatic width, 37.5; nasals, 26 × 10.5; interorbital width, 23.2; palatal length, 40.9; palato-incisive length, 36; palatilar length, 31.7; palatal foramina, 5.4 × 2.5; p^4–m^2, 9.3; p^4 crown, 3.2 × 3.3. Mandible, length to condyle, 43.5; p_4–m_3, 13.4. The skin of a second specimen, without skull collected by Beebe (probably at Kartabo), agrees closely with the type.

Myoprocta acouchy (Erxleben)

Myoprocta acouchy milleri J. A. Allen

Myoprocta milleri J. A. ALLEN, 1913, Bull. Amer. Mus. Nat. Hist., XXXII, p. 476.

TYPE LOCALITY.—La Murelia, Caquetá, Colombia.

TABLE IV

"REDDISH" AND "GREENISH" ACOUCHIS COMPARED (ADULTS)

	"Reddish" acouchis	"Greenish" acouchis
Relation length of nasals to length of parietals	approx. 29: 25 mm.	approx. 25: 25 mm.
Form of palatal foramina	approx. 5 to 6 × 2.3 to 3	approx. 5.3 to 6 × 1.5 to 2
Audital bulla	approx. 17 to 18 × 10.5 to 11	approx. 15 to 16 × 9.5 to 10
Angular process of mandible	little prolonged; posterior margin little excised	markedly prolonged; posterior margin strongly excised

[1] From the dried skin.

MATERIAL.—Foot of Mt. Duida, 350–750 feet (3).

These animals match the type of *milleri* almost exactly. In one of the three the narrow white mid-ventral line is obsolete. The Duida specimens appear slightly older than the Caquetá animal from the fact that in the last the roots of p^4 are not yet exposed.

An alternative relationship is with *limanus* or *archidonae*.

DASYPROCTA ILLIGER

Dasyprocta ILLIGER, 1811, Prodromus Syst. Mamm. Avium, p. 93.

GENOTYPE.—*Mus aguti* Linnaeus.

In 1935[1] I arranged the agutis tentatively in three groups: the "Central American," the "Eastern" and the "dark gray" agutis. In the Guiana region the last two groups alone are present. The eastern, or red-rumped agutis take up the major part of the region, while the dark gray agutis of the west extend across the Rio Negro and the Cassiquiare Canal and apparently occupy the pocket of lowlands south of Duida and its adjoining mountains and west of the Parima range. These two groups in the modern sense probably represent two full species.

The name used by Lacépède (1802), *cayanus*, is probably applicable to all of the red-rumped agutis of the Guiana region. If those agutis are conspecific with the Brazilian agutis south and east of the Amazon then *aguti* Linnaeus will apply.

Of the dark gray group the oldest name appears to be *fuliginosa* Wagler, 1832, from "near the Amazon River, Brazil." Its type locality was fixed by J. A. Allen, 1915, as Borba, Rio Madeira.

Besides their sharply differing color patterns the two types of agutis are readily distinguishable by the fact that in the gray agutis a considerable portion of the margin of the ante-orbital canal is formed by the lacrimal bone, whereas in the eastern group the lacrimal is excluded from the margin of the canal by the maxilla. Also, the western agutis have heavier molars with fewer enamel lakes than the eastern, larger skulls, and proportionally broader basi-occipital bones separating the bullae. The Central American agutis agree more closely with the red-rumped than with the gray agutis.

[1] Bull. Amer. Mus. Nat. Hist., LXVIII, Art. 5, pp. 317–333

Dasyprocta cayanus (Lacépède)

Agouti cayanus LACÉPÈDE, in Didot edition of Buffon, 1802, III, p. 78, Pl. VI.

Dasyprocta lucifer THOMAS, 1903, Ann. Mag. Nat. Hist., (7) XI, p. 491.

Dasyprocta lucifer cayennae THOMAS, 1903, Ann. Mag. Nat. Hist., (7) XI, p. 492.

Dasyprocta aguti lunaris THOMAS,[2] 1917, Ann. Mag. Nat. Hist., (8) XX, p. 259.

TYPE LOCALITIES.—Those of *cayanus* and *cayennae* are in French Guiana; *lunaris*, British Guiana; and *lucifer*, Caicara, mouth of Caura River, Orinoco River, Venezuela.

MATERIAL.—British Guiana lowlands, numerous specimens: R. Yuruan (1); Mt. Auyan-tepui, 2000 feet (1), 3500 feet (1); El Llagual, mouth of Caura River (1).

I can find no record of the red-rumped agutis reaching the western end of Guiana. They are replaced there by *D. fuliginosa*.

Dasyprocta fuliginosa Wagler

Dasyprocta fuliginosa WAGLER, 1832, Isis, XXV, p. 1220.

Dasyprocta nigricans WAGNER, 1842, Archiv für Naturg., I, p. 362.

TYPE LOCALITY OF BOTH.—Borba, mouth of River Madeira, Brazil.

MATERIAL.—Foot of Mt. Duida (2). Additional specimens from R. Cassiquiare and R. Negro. Ample material from the eastern foot of the Andes representing the forms *zamorae*, *mesetia*, *variegata*, etc.

CUNICULUS BRISSON[3]

Cuniculus BRISSON, 1762, Regnum Animale, p. 98.

GENOTYPE.—*Mus paca* Linnaeus.

With the exception of the "mountain pacas" separated by Thomas as *Stictomys*, the animals of this genus appear to be restricted to the tropical zone between Mexico and south Brazil. The genus in this restricted sense is apparently monotypic,

[2] Not improbably *flavescens* of Sucre, Venezuela, and *rubrata* of Trinidad should be included in this synonymy.

[3] Opinion 90, International Commission on Zoological Nomenclature.

with a few slightly variant color forms. The anatomical features of the skull are remarkably stable.

The chief difficulty in studying the pacas lies, as in many other mammals, in our uncertain evaluation of growth changes. If it is borne in mind, however, that in the pacas rooted milk premolars are still present when the last permanent molars have already developed fairly extensive wear surfaces, and at that period in the animal's life the male skull has the condylo-incisive length between 110 and 130 mm., the animals of northern South America can be rather easily arranged. The prolonged growth and wear of the molars throughout life produces marked changes in the convolutions of the enamel. As the animals grow older the internal and external fluting tends to grow out, leaving at length teeth whose palatal faces are little or not at all grooved. The first true molar is usually the first of the molar series from which the internal flutings disappear.

The pacas of Central America and the west coast of Colombia and Ecuador are in general somewhat more robust and have larger teeth.

As between fully adult males of equivalent growth groups the differences are shown in Table V.

In the table the figures showing reduction of the crown dimensions of the first molar in the South American pacas are particularly important. The specimen shown in the third position is the only one secured at Camarata, foot of Mt. Auyan-tepui. It probably represents the typical *paca* from French Guiana upon which Brisson founded the genus *Cuniculus*. *Stictomys taczanowskii*, the mountain paca, is a species distinct from *paca* and provisionally may be left generically separate. It may be distinguished (employing individuals of corresponding age groups and similar sexes) by the more acutely folded dental lamellae and by the thickening of the bony flanges of the premaxillae on either side of the anterior palatal foramina. The ante-orbital foramen is proportionately large and the ante-orbital bar is much narrowed. The mountain pacas which occur between 7000 and 10,000 feet probably do not come into direct contact with the lowland animals.

The pacas of the Guiana region are all referable to *C. p. paca*, the widely distributed typical paca of northern South America west and south of the Andes.

Cuniculus paca (Linnaeus)

Mus paca Linnaeus, 1766, Syst. Nat., 12th Ed., I, p. 81.

Type Locality.—French Guiana.[1]

Material.—Mt. Auyan-tepui, 1500 feet (1); British Guiana, several; Mt. Duida, several.

Cavia Pallas

Cavia Pallas, 1766, Misc. Zool., pp. 30–33.

Genotype.—*Cavia cobaya* Pallas = *Mus porcellus* Linnaeus.

In the restricted sense, i.e., excluding the cavy-like *Galea*, *Caviella*, *Monticavia* and *Nannocavia*, the genus *Cavia*, exemplified by a fairly wide range of "species," is morphologically one of the most stable of South American genera.

Study of our material, especially of our very fine age-series of *Cavia anolaimae*, suggests that many of the supposed species described from time to time may at the best represent slightly variant geographical races of one or two widely dispersed species.

The animals clearly become mature sexually at an early age, developing at the same time their full set of teeth. Due to the fact that the teeth are rootless and

Table V

Species	p^4	m^1	m^2	m^3	Condylo-incisive length
C. p. virgata, Nicaragua	7.2 × 7.2	6.7 × 6.8	7.4 × 7.6	8.7 × 7.1	140 mm.
C. p. paca, R. Tapajoz	7.0 × 6.5	5.6 × 6.7	7.0 × 7.4	9.0 × 6.8	135 mm.
C. p. paca, Auyan-tepui (slightly younger)	6.7 × 6.2	4.9 × 6.0	6.0 × 6.8	8.2 × 6.6	135 mm.

[1] See remarks, 1935, Bull. Amer. Mus. Nat. Hist., LXVIII, p. 315.

grow from persistent pulps they are just as free to change their shape and size with the increase in size of the animals, as the bones of skull and skeleton are to modify their size and proportions.

In order to make proper comparisons of cavies collected in different parts of the generic range of the genus it is necessary first to determine the ages of the specimens, because otherwise direct comparisons between animals of different stages of development are apt to produce misleading results. Virtually nothing is known in terms of years and months of the development of wild cavies, so it is always necessary in order to have a proper understanding of specimens to arrange skulls in size series running from juvenals with comparatively open sutures to very large old specimens in which rugosities have developed about the muscle ridges.

In the *anolaimae* series the following growth phenomena are observable: The rostrum becomes deeper in proportion to its width, the maxillary root of the zygoma becomes very deep vertically, the "flare" of both maxillary and lacrimal attachments of the zygomatic arch becomes accentuated, the molar series increases in length until in an old animal it is nearly double the length of a juvenal, the incisors change in character progressively from orthodont to proödont, the inter-incisive projections from the premaxillae at the same time extending more and more beyond the tips of the nasals.

From the foregoing it is clear that many of the characters once considered diagnostic represent in reality only growth stages. I have found no marked differences in the crania related to sex.

The cavies in our collections which combine the usual "ticked" gray pelage with skulls practically indistinguishable from the *anolaimae* series are from the east slopes of the Peruvian and Bolivian Andes, 3000 to 6000 feet, the lowlands of Paraguay and eastern Brazil, and the Matto Grosso. To these must be added the type of *venezuelae* Allen and four females from Mt. Auyantepui, 1500 feet.

A color race is probably represented by a uniformly glossy gray-black series from Serra Caparao in south Brazil, whose skulls, however, match the general series closely.

This discussion is intended solely to preface the identification of the Guiana cavies and to determine, if possible, their affinities. It is not intended here to suggest any revision of the present confused nomenclatorial situation. In 1935[1] I showed some of the names that have been applied to animals of the genus *Cavia*. Probably some are not determinable. Apparently the ranges of *anolaimae*, *venezuelae*, *guianae* and *leucopyga* (of Schomburgk) are nearly continuous. And apparently also the geographical range of that group of named forms is not continuous with the cavies south of the Amazon. Since it may well be shown that the latter are separable anatomically from the Guiana-Colombia guinea-pigs it seems advisable now to use for them the oldest valid name—*guianae*.

It must not be forgotten that the primitive people of South America have long domesticated the cavies and used them for food. Though the domesticated strains do not include "wild" or "ticked" animals, so far as I am aware, the Indians may sometimes have carried those animals about with them, possibly introducing them into regions remote from their place or origin.

This brings us incidentally to the problem of the origin of the domestic guinea-pig. Miller[2] has drawn attention to Oviedo's description of the colors of what surely must have been the domestic guinea-pig in Santo Domingo between 1536 and 1546. But there was ample time prior to that for the animal to have been introduced by the conquerors themselves. The local name "cori" is singularly like the present Arecuna word "acuri," the name for the wild form of the Camarata savannas. Finally, though supposed to have come from south Brazil (Marcgrave, 1648, etc.) there apparently exists no evidence that polychrome guinea-pigs were found there at any time wild.

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[1] 1935, Bull. Amer. Mus. Nat. Hist., LXVIII Art. 5, pp. 343–344.

[2] 1929, Smithsonian Misc. Coll., LXXXII, No. 5, p. 14.

Cavia guianae Thomas

Cavia leucopyga Cabanis (not Brandt), 1848, in Schomburgk, Reisen in Britisch Guiana, III, p. 780.

Cavia porcellus guianae Thomas, 1901, Ann. Mag. Nat. Hist., (7) VIII, p. 152.

Cavia porcellus venezuelae J. A. Allen, 1911, Bull. Amer. Mus. Nat. Hist., XXX, pp. 239–293.

Type Localities.—*Guianae*, Kanuku Mountains, British Guiana; *venezuelae*, Altagracia, Imataca district, se. Venezuela. The locality of *leucopyga* Brandt was in south Brazil, collector Langsdorff, so for the present Cabanis' determination will not be followed.

Material.—Camarata savannas, foot of Mt. Auyan-tepui, s. Venezuela, three adults, one juvenal, females.

Hydrochoerus Brisson

Hydrochoerus Brisson, 1762, Regnum Animale, pp. 80–81.

Genotype.—*Sus hydrochaeris* Linnaeus.

The capybara is present in the lowlands surrounding Guiana wherever large enough streams with sufficient succulent vegetation occur. At Camarata the natives stated that no capybaras occurred, but lower down the river where the Carao joined the Caroni, as well as along the main valley of the Caroni, the animals were said to be plentiful. Capybaras continue up the Caroni into the grand savanna country but do not approach the more elevated Roraima area. South of the Pacaraima range we found capybaras in the Cotinga and Surumu Rivers. At Duida they were stated to be in the Orinoco River and its tributaries. We observed several in the Cassiquiare Canal.

There appears to be no racial divergence between eastern and western Guiana animals, nor indeed between those and capybaras from the right bank tributaries of the Amazon. If *isthmius* is a valid race, perhaps the material recorded by Osgood from Lake Maracaibo may have to be referred to it.

Hydrochoerus hydrochaeris (Linnaeus)

Sus hydrochaeris Linnaeus 1766 Syst. Nat., 12th Ed., p. 103.

Type Locality.—Brazil?[1]

Material.—Specimens from British Guiana, Cotinga region, Caura and Duida regions. The "chiguiri" was said by the Arecunas of Auyan-tepui to be common in the Caroni.

ERETHIZONTIDAE

Coendou Lacépède

Coendou Lacépède, 1799, Tableau des Div. . . . des Mammifères, p. 11.

Genotype.—*Hystrix prehensilis* Linnaeus.

Although specific identification is impossible it seems well to mention the presence of a small porcupine (*pruinosus* ?) on Mt. Duida at about 6000 feet. The Indian workmen who caught the animal killed and ate it, so the record is based upon the word of an overseer.

The Arecuna Indians at Auyan-tepui seemed to understand what was meant when asked about porcupines but stated that they were very rare.

The large *prehensilis* group is apparently represented in French Guiana (*longicaudatus* Lacépède). It is probably widely dispersed through the eastern forested lowlands.

CRICETIDAE

Akodon (Chalcomys) Thomas

Akodon Meyen, 1832, Nova Acta Acad. Leopoldina, p. 600.

Chalcomys Thomas, 1916, Ann. Mag. Nat. Hist., (8) XVIII, p. 339.

Genotypes.—(Of *Akodon*) *boliviense* Meyen; (of *Chalcomys*) *Akodon aerosus* Thomas.

The genus *Akodon* has been split up into a large number of subgeneric groups and allied so-called genera. *Chalcomys*, the only one which reaches Guiana, is one of the better defined of those groups.

Most *Chalcomys* are blackish-brown mice with dark feet and short tails. Their vertical range seems to reach up to 8000 feet; their horizontal distribution in rain forest throughout the northern half of South America. Specimens from the upper, wetter areas are generally very dark; those from lower, relatively drier regions are washed with brown or grayish brown.

[1] I discussed this in 1935, Bull. Amer. Mus. Nat. Hist., LXVIII, pp. 354–355.

Nine forms, ranging down the Andes between Trinidad and Bolivia, have been named. They exhibit remarkable homogeneity of form. The northwestern *chapmani*, *tolimae* and *meridensis* (which may be synonymous) appear to be rather smaller and have slightly narrower molars than the remainder (except *dayi* in which the molars also are narrow).

Chalcomys in Guiana appears to be a subgenus which gives definite color responses to local conditions of environment. The specimens of the Duida and Auyan-tepui plateaus (none was taken on the Roraima tableland) are, as stated above, very dark—almost smoky; those from 3500 feet and 2000 feet are much paler. Although there is variation in the sizes and proportions of the skulls taken together, I have been unable to detect constant differences correlatable with altitude.

I am at present unable to determine whether the affinities of the Guiana *Chalcomys* are with *aerosus* of the west, or northward with *venezuelensis* and *urichi*. It appears as though we dealt with a long-established, widely distributed species whose descendants had varied to a slight degree locally. The paler lowlands race nearly matches *chapmani*, *meridensis* and *tapirapoanus* in color. It may also come close to *fuscinus* of Marajó. The factor controlling the degree of color saturation probably is humidity rather than altitude. It can thus closely resemble *chapmani* which, however, came from 8500 feet.

The dark form of the plateau represents a distinct race of the Guiana highlands in which the brown subterminal bands of the dorsal hairs almost disappeared. It may be designated a new form.

Chalcomys aerosus (Thomas)

Chalcomys aerosus saturatus, new subspecies

TYPE.—No. 131020, Amer. Mus. Nat. Hist.; adult ♂; Mt. Auyan-tepui plateau, middle R. Caroni, Venezuela, 6000 feet; collector G. H. H. Tate, January 26, 1938. The type is a skin with skull in good condition.

GENERAL CHARACTERS.—A nearly black representative of the species, due to reduction of the brown subterminal bands of the dorsal pelage.

DESCRIPTION.—General dorsal color from Bone Brown to Chaetura Drab; ventral color only slightly paler. Individual hairs of back fuscous with subterminal bands clay color, but so greatly reduced as to influence the general tone scarcely at all. Hands, feet, ears and tail fuscous, the latter slightly paler beneath.

Skull with the characters of *aerosus*.

MEASUREMENTS.—Head and body, 110 mm.; tail, 93; hind foot (s.u.), 22; ear from crown, 13; condylobasal length of skull, 28.2; zygomatic width, 14.6; breadth of braincase, 13; interorbital width, 6.2; length of nasals, 11.0; width zygomatic plate, 2.4; palatal length, 15.1; palatal foramina, 6.8; m^{1-3}, 5.0; length of crown of m^1, 2.5; of m^3, 1.0.

Besides the type we have four paratypes and three specimens from 7500 feet on the same plateau. Much of the material from Mt. Duida (4500 to 7500 feet) is referable to the saturate form just described. From the "Savanna Hills Camp," 4500 feet, in the center of that tableland the material becomes slightly more *aerosus*-like, though it by no means approaches the gray-brown shade of our material from Auyan-tepui at 3500 and 2000 feet. From the Duida plateau we have 45 specimens. Although no specimens were taken high on Roraima, two strongly saturate individuals must be recorded from wet forest near Arabupu camp at 4200 feet.

Chalcomys aerosus near **chapmani** J. A. Allen

Akodon chapmani J. A. ALLEN, 1913, Bull. Amer. Mus. Nat. Hist., XXXII, p. 600.

MATERIAL.—Mt. Auyan-tepui, 3500 feet (12); 2000 feet (1). Mt. Roraima: Arabupu, 4200 feet (2); Philipp Camp, 5200 feet (10); Paula Camp, 4000 feet (2).

PODOXYMYS ANTHONY

Podoxmys ANTHONY, 1929, Amer. Mus. Novit., No. 139, p. 4.

GENOTYPE.—*Podoxymys roraimae* Anthony.

A member of the *Akodon* mice, near *Chalcomys*, which, however, is specialized for tunneling through moss, etc.

Podoxymys roraimae Anthony

Podoxymys roraimae ANTHONY, 1929, Amer. Mus. Novit., No. 139, p. 4.

TYPE LOCALITY.—Summit of Mt. Roraima.

MATERIAL.—The original series of five.

Podoxymys roraimae is a specialized member of the *Akodon* division of the South American Cricetidae. It is characterized by its narrow, elongate skull, reduced eyes and semi-fossorial claws.

The animals live amid deep cushions of moss on the Roraima plateau. They have not been discovered elsewhere.

ZYGODONTOMYS ALLEN

Zygodontomys ALLEN, 1897, Bull. Amer. Mus. Nat. Hist, IX, pp. 31–34.

GENOTYPE.—*Oryzomys cherriei* Allen.

The genotype *cherriei* (from Costa Rica) is by no means representative of the characteristic *Zygodontomys* of northern South America. *Cherriei* is long-haired and relatively dark along the back. Typically South American *Zygodontomys* are gray with a strong brownish cast dorsally. In regard to cranial characters *cherriei* can be grouped with the South American *Zygodontomys*.

The genus contains two primary types north of the Amazon:

1.—Large species with m^{1-3}, 4.8 to 5.1 mm. *seorus*, *brevicaudatus* and *brunneus*.
2.—Small species with m^{1-3}, 3.8 to 4.3 mm.

The first group appears only in Panama (San Miguel Island), northern Colombia (Cundinamarca) and Trinidad. Named forms belonging in the second section are *cherriei*, *ventriosus*, *griseus*, *fraterculus*, *sanctaemartae*, *stellae*, *thomasi* and *microtinus*. The last three alone are closely allied to our specimens from Guiana. The oldest name of the three is *microtinus* Thomas.

The forms from south of the Amazon typified by *tapirapoanus* are not *Zygodontomys* but *Akodon*. They can be distinguished easily by their blackish instead of whitish feet and by the extension of the palatal foramina backward as narrowed, pointed slits.

Our material from the Cotinga River and from Mt. Roraima appears referable to *microtinus*. The series from Auyan-tepui, on the other hand, matches *stellae* closely. An anomaly appears among our specimens from the Esmeralda savannas at the foot of Mt. Duida, in that though some individuals have the normal m^{1-3}, length 4.2 mm., others display the shortest known toothrow for *Zygodontomys*, 3.7 to 3.8 mm. Allen's *thomasi* from Sucre matches *cherriei* very closely indeed, more nearly than *microtinus*.

The South American *Zygodontomys* appear to be a grassland-inhabiting group of mice. I have little doubt they extend southward from Sucre across the llanos to the Orinoco and continue into Guiana wherever savannas exist. They ought also to be abundant in the grass country of eastern Colombia. Their upper zonal limit appears to be about 4500 feet. They were not trapped at our 5200 foot camp on the slopes of Roraima where an upward extension of the savanna occurred.

Zygodontomys microtinus (Thomas)

(Reference under subspecies)

Zygodontomys microtinus microtinus (Thomas)

Oryzomys microtinus THOMAS, 1894, Ann. Mag. Nat. Hist., (6) XIV, p. 358.

TYPE LOCALITY.—Surinam.

MATERIAL.—Mt. Roraima, Arabupu, 4200 feet (43); R. Cotinga Limao, about 1500 feet (75).

Zygodontomys microtinus stellae Thomas

Zygodontomys stellae THOMAS, 1899, Ann. Mag. Nat. Hist., (7) IV, p. 380.

TYPE LOCALITY.—Maipures, Upper Orinoco, Venezuela.

MATERIAL.—Mt. Auyan-tepui, 3500 feet (7), 2000 feet (48). Mt. Duida Esmeralda Savannas, 350 feet (21).

ORYZOMYS BAIRD

Oryzomys BAIRD, 1859, Mammals of North America, pp. 457–458.

GENOTYPE.—*Hesperomys palustris* (Harlan).

In the Guiana region members of three distinct groups of *Oryzomys* occur: large, brightly colored, long-footed *Oryzomys* (*macconnelli*) the size of a small rat, with tail somewhat longer than body; much smaller, dark to fulvous, short-tailed, long-footed mice of the *laticeps* group; and medium-sized, long-haired *Oryzomys* with relatively short feet, belonging in the *trinitatis* group.

The first is of tropical origin and is widely distributed from Costa Rica to South Brazil; the second occurs from eastern Guiana west to Colombia below 4000 feet and possibly represents the Brazilian subgenus *Delomys;* the third is of more limited distribution, reaching from Costa Rica through northern Colombia to Trinidad and southward across the llanos to Caquetá and the Guiana region. Apparently it ascends to 5000 feet.

The *albigularis* group equals the *devius* group of Goldman. Characteristically the rats of this group are large, dark, reddish to fuscous, with hind foot (s.u.) 30 to 35 mm. and heavy dentition (width of m^1 approaching 2 mm.). Most of the mountain-inhabiting races have a patch of hair, white to the roots on the chest which in *maculiventer* expands to include almost the whole of the underparts.

Species definitely referable to the *albigularis* group (*sensu stricto*) are:

childi Thomas	Bogotá, Colombia
polius Osgood	Tama, Colombia
meridensis Thomas	Mérida, Venezuela
albigularis Tomes	Pallatanga, Ecuador
moerex Thomas	Mindo, Ecuador
o'connelli J. A. Allen	Buena Vista, Colombia
pectoralis J. A. Allen	40 miles west of Popayan, Colombia

No member of the typical group has been discovered in Guiana. Atypical species more or less bordering on the Guiana area are:

mureliae J. A. Allen	Caquetá, Colombia
perenensis J. A. Allen	Perené R., Peru
keaysi J. A. Allen	Inca Mines, Peru
obtusirostris J. A. Allen	(Juvenal and synonym of *keaysi*)
macconnelli Thomas	British Guiana

The forms *auriventer* and *nimbosus* of the mountains of Ecuador and *pirrensis* and *devius* of Panama and Costa Rica need not be considered.

Of the "atypical" rats (lacking white pectoral spot), only *mureliae* and *macconnelli* bear upon the identity of the series of specimens from Auyan-tepui. The type skin of *mureliae* (no skull was described) exactly matches the older specimens of the Auyan-tepui series, while Thomas's description of *macconnelli* from the River Supinaam, though compared with *intermedius* from Brazil, also agrees with our specimens, particularly in the long hind foot, and length of molar toothrow. Its palatal foramina are 1 mm. longer, however. Both *mureliae* and *macconnelli* were taken from less than 1000 feet above sea-level. They represent probably the geographical extremes of a single species existing between the Amazon and Orinoco, with extension southward into Brazil. Thomas's genus *Delomys* which he compared with *Rhipidomys* and allies rather than with *Oryzomys* embraced the forms *dorsalis, sublineatus* and *collinus.* Possibly it should be extended to include *intermedius, murelia* and *macconnelli* (which lack the strong dorsal line). At best it appears to be a section of *Oryzomys.*

Oryzomys macconnelli Thomas

Oryzomys macconnelli Thomas, 1910, Ann. Mag. Nat. Hist., (8) VI, p. 186.

Oryzomys incertus J. A. Allen, 1913, Bull. Amer. Mus. Nat. Hist., XXXII, p. 598.

Oryzomys mureliae J. A. Allen, 1915, Bull. Amer. Mus. Nat. Hist., XXXIV, p. 630.

Type Localities.—Of *macconnelli,* R. Supinaam, Lower R. Essequibo, British Guiana; of *mureliae,* La Murelia, R. Bodoquera, Caquetá, Colombia.

Material.—Mt. Auyan-tepui, 3500 feet (15), 2000 feet (5).

These fine, large *Oryzomys* were trapped only in forest. They were very much scarcer than *Oryzomys laticeps* which occupied the same environment.

The *laticeps* group of *Oryzomys* equals *talamancae* group of Goldman.[1] This is probably the most universally distributed of the tropical groups of *Oryzomys.* In spite of the large number of forms that have received names there exists remarkable uniformity of structure throughout the group. The pelage is usually rather short and glossy; underparts white or grayish white with gray bases. The hind foot length (s.u.) varies from 26 to 30 (rarely exceeded). The foot is of narrow, terrestrial type. The length of the tail is usually less than the head and body (sometimes equal). The length of the molar toothrow varies between 4.6 and 5.2 mm.

In this division of *Oryzomys* I tenta-

[1] Possibly the *melanotis* group forms the northern extension of the *laticeps-talamancae* group.

tively group *latipes, goeldi, yunganus, nitidus, sylvaticus, castaneus, bolivaris, palmirae, dracilis, mollipilosus, villosus, magdalenae, medius, modestus, velutinus, panamensis, talamancae.* It will be seen that the names are greatly concentrated in localities where American and British zoölogists have been most active, namely, in the north and northwest of the South American continent. It may be taken as almost axiomatic that mice of this group occur in forests throughout the northern half of South America up to 5000 feet above sea-level.

None of the named Colombian and Ecuadorean forms come from the eastern side of the Andes, in consequence of which the nearest names *nitidus* (Peru), *goeldi* (Tapajoz) and *velutinus* (= *modestus* = *medius*) alone are available as subspecific terms. The correct specific name for these mice is probably *laticeps* Lund, 1841. *Nitidus* was a rather dark, rain-forest race, while the north-coast *velutinus* was slightly more fulvous. *Goeldi* was also a forest form.

In our Roraima-Duida-Auyan-tepui series, as well as those from British Guiana and the Cotinga R., in north Brazil, all color variations can be found. Juvenal animals are slate-colored, gradually assuming the rufescent hue of maturity.

In view of this wide variation, the great distance from the type locality of *nitidus* and the relative closeness of *velutinus*, it seems best to name the mice for the latter.

Oryzomys laticeps (Lund)

(Extra-territorial)

Oryzomys laticeps velutinus Allen and Chapman

Oryzomys velutinus Allen and Chapman, 1893, Bull. Amer. Mus. Nat. Hist., V, p. 214.

Oryzomys modestus Allen, 1899, Bull. Amer. Mus. Nat. Hist., XII, p. 212.

Oryzomys medius Robinson and Lyon, 1901, Proc. U. S. Nat. Mus., XXIV, p. 142.

Type Localities.—*Velutinus*, Princestown, Trinidad; *modestus*, Campo Alegre, Sucre, Venezuela; *medius*, San Julian, 8 miles east of La Guaira, Venezuela.

Material.—Mt. Roraima (35); Kartabo, British Guiana (22); Mt. Auyantepui (95); Mt. Duida (33).

This is the commonest of the forest-dwellers among the Guiana oryzomine mice.

The *trinitatis* group of *Oryzomys* equals the *tetus* group of Goldman. This group is an assemblage of comparatively restricted distribution. The animals composing it are commonly larger than those of the *laticeps* division, with somewhat heavier dentition and proportionately shorter feet. As Goldman has pointed out they may be transitional between *Oryzomys* and *Oecomys*. The range extends from Costa Rica to Venezuela, Trinidad, Guiana and northern Colombia, up to 5000 feet. They are often associated with xerophytic or semi-open forest condition.

The forms comprising the groups are the following:

flavicans Thomas	Mérida, Venezuela
illectus Bangs	Pueblo Viejo, Santa Marta, Colombia
subluteus Thomas	Western Cundinamarca, Colombia
trichurus J. A. Allen	Near Bonda (juv. and synonym of *illectus*)
caracolus Thomas	Caracas, Venezuela
helvolus J. A. Allen	Villavicencio, E. Colombia
vicencianus J. A. Allen	(Juv. and synonym of *helvolus*)
klagesi J. A. Allen	El Llagual, R. Caura, Venezuela
palmarius J. A. Allen	Quebrada Seca, Sucre, Venezuela
fulviventer J. A. Allen	Sucre, Venezuela (synonym of *palmarius*), Quebrada Seca
trinitatis Allen and Chapman	Princestown, Trinidad

Oryzomys trinitatis Allen and Chapman

Oryzomys trinitatis Allen and Chapman, 1893, Bull. Amer. Mus. Nat. Hist., V, p. 213.

Oryzomys palmarius J. A. Allen, 1899, Bull. Amer. Mus., Nat. Hist., XII, p. 210.

Oryzomys fulviventer J. A. Allen, 1899, Bull. Amer. Mus. Nat. Hist., XII, p. 212.

Material.—Mt. Roraima, Arabupu, 4200 feet (1); British Guiana, Bartica (1); also ample material from the Province of Sucre, Venezuela, and from Trinidad; from Mt. Duida (Aguita, 3200 feet), a single quite young individual, apparently a member of the *trinitatis* group; British Guiana (Bartica), a skin without skull (A.M. 41908).

Oryzomys klagesi (J. A. Allen)

Oryzomys klagesi J. A. ALLEN, 1904, Bull. Amer. Mus. Nat. Hist., XX, p. 327.

TYPE LOCALITY.—El Llagual, Venezuela.

MATERIAL.—The type only.

OLIGORYZOMYS BANGS

Oligoryzomys BANGS, 1900, Proc. New England Zool. Club, I, p. 94.

GENOTYPE.—*Oligoryzomys navus* Bangs.

TYPE LOCALITY.—*O. navus*, Pueblo Viejo, Sta. Marta, Colombia, 8000 feet.

The characteristics of *O. navus* are its *Oryzomine* zygomatic plate and its extremely large posterior palatal pits. But Bangs included in his genus *dryas* Thomas and *humilior* Thomas, both of them *Thallomyscus*, with narrow, vertical zygomatic plate and quite small pits.

The forms occurring on the Andes nearest adjoining *navus* are *griseolus* (Osgood) from Páramo de Tama 6000 to 7000 feet and *tenuipes* from Mérida.

Griseolus was compared to *vegetus*, *navus*, *humilior* and *dryas*. The zygomatic plate projected forward strongly and the palatal foramina were long (4.1). The molar toothrow was 3.1 mm.

The type of *tenuipes* of Mérida agrees cranially with the genotype except in the palatal pits which are less enlarged, as does *delicatulus* of Trinidad.

Southward along the east side of Andes no more described forms are found until Peru is reached. There a number of names, *maranonicus*, *andinus*, *stolzmanni*, *destructor*, *melanostoma* appear.

Maranonicus and *stolzmanni* also belong in the group with broad zygomatic plates.

In the Guiana region Thomas named *Oryzomys navus messorius* from the Kanuku Mountains, with hind foot (s.u.) 21, palatal foramina 4.1 and upper molar series 3.1. He omitted mention of the zygomatic plate. The measurements of *messorius*, *tenuipes*, *delicatulus*, *griseolus* and *navus* are closely comparable. Moreover, with the exception of *griseolus*, which I have not seen, the skulls of all have the well-developed palatal pits mentioned previously in *navus*.

South of the Amazon *microtis* occurs at the "Lower R. Solimoes (about 60 miles from its mouth)," and *utiaritensis* and *mattogrossae* (synonyms) come from Utiarity, Matto Grosso. Both belong with *navus*. All Central American forms seen b me appear referable to *Oligoryzomys*.

Of the very distinct Andean genus *Thallomyscus* with zygomatic plate much narrowed, its anterior edge practically vertical as in *Oecomys* there appears to be no representation in Guiana, although it is present in the Venezuelan Andes and on Mt. Turumiquire.

Without first working out a detailed revision of this group of mice (when probably a number of so-called species will pass into synonymy) it is difficult definitely to link our representation of Guiana *Oligoryzomys* to a single named species. At present it appears to me that *griseolus*, *tenuipes*, *delicatulus* and *messorius* may be conspecific. In *navus* the teeth appear to be slightly broader. It seems advisable then to employ the earliest name—*delicatulus*— to designate the species.

Oligoryzomys delicatulus
(Allen and Chapman)

Oryzomys delicatulus ALLEN AND CHAPMAN, 1897, Bull. Amer. Mus. Nat. Hist., IX, p. 19.

Oryzomys navus messorius THOMAS, 1901, Ann. Mag. Nat. Hist., (7) VIII, p. 151.

TYPE LOCALITIES.—*Delicatulus*, Caparo, Trinidad; *messorius*, Kanuku Mountains, Guiana.

MATERIAL.—Mt. Roraima, 3500 to 6500 feet (41); Mt. Auyan-tepui, 3500 feet (27), 2000 feet (1).

These mice were found most commonly in rather open environments where shrubs grew instead of trees. Occasional specimens, however, were met with in the forest.

HOLOCHILUS BRANDT

Holochilus BRANDT, 1835, Mem. Acad. St. Petersburg, (6) III, p. 428.

GENOTYPE.—*Mus* (*Holochilus*) *leucogaster* Brandt (by subsequent designation, Miller and Rehn, 1902).

Though without the swimming modifications of *Nectomys*, *Holochilus* seems usually to be associated with streams. Unlike *Nectomys* it appears not to extend to

northern Venezuela and Trinidad, but to have spread from Amazonia, around the higher parts of Guiana, as far as the Kanuku Mountains on the east (*guianae* and *berbicensis*) and around the west into the Orinoco (*venezuelae*). It was taken by our expeditions only in lowlands of the Rio Negro. Probably it nowhere reaches above 3000 feet.

The named forms with which our animals need comparison are *venezuelae*, *amazonicus*, *incarum*, *guianae* and *berbicensis*.

Holochilus appears to me a monospecific genus. The views of authors on this point were well set forth recently by Morrison-Scott.[1] The problem of revising a genus such as *Holochilus* in which geographical forms, if recognizable at all, differ in such slight degree, must depend upon the accumulation of practically the world's collections in one place of study, to the end that representatives from as many localities as possible, both sexes and all ages, collected through all the months of the year, may be compared.

Morrison-Scott (*loc. cit.*) points out the differences between *berbicensis* (based on a series of eight, collected in June) and *guianae* (based on four specimens from the Kanuku Mountains in November). Part at least of the color differences indicated may be attributable to differences in season. The Kanuku savannas, part of the north Brazilian system of savannas, undergo well-defined dry and wet seasons, when pelages of animals living there may well change considerably.

Holochilus sciureus (Wagner)

Holochilus sciureus WAGNER, 1842, Archiv für Naturg., I, p. 14.

TYPE LOCALITY.—Rio San Francisco.

MATERIAL.—Rio Negro (4); none taken at Duida area; other localities recorded are R. Orinoco (*venezuelae*) and those signified above.

In using the specific name *sciureus* for these animals I am keeping on neutral ground. It may well be that after full revision of the genus we may have to write the type species of *Holochilus* in the form *Mus* (*Holochilus*) *leucogaster* Brandt = *Mus brasiliensis* Desmarest.

[1] Morrison-Scott, 1937, Ann. Mag. Nat. Hist., (10) XX, pp. 536–538.

NEACOMYS THOMAS

Neacomys THOMAS, 1900, Ann. Mag. Nat. Hist., (7) V, p. 153.

GENOTYPE.—*Hesperomys spinosus* Thomas.

There appear to be two chief divisions of the spiny mice: large forms (m^{1-3} ±3.1), and small forms (m^{1-3} ±2.6). In the former division comes *spinosus* with its subspecies; in the latter *pusillus*, *pictus* and *guianae*. In *pusillus* and *pictus* which appear to me to be conspecific, the zygomatic plate is slightly wider than in *guianae*. Our specimen from the forested foothills of Duida agrees almost exactly with an individual of *guianae* from Kartabo, British Guiana.

The *pusillus* group has not been recorded south of Colombia. The *spinosus* group replaces the first named from Ecuador to Bolivia. Recently a specimen was taken from Fordlandia, on R. Tapajoz.

Neacomys guianae Thomas

Neacomys guianae THOMAS, 1905, Ann. Mag. Nat. Hist., (7) XVI, p. 310.

TYPE LOCALITY.—Demarara River, British Guiana.

MATERIAL.—British Guiana: Kartabo, 100 feet (1). S. Venezuela: foot of Mt. Duida, 700 feet (1).

Our Duida specimen, adult female, is slightly more delicate in build and not quite so dark-colored when compared with the unsexed individual from Kartabo. The two are so close, however, that lacking a series to demonstrate color differences it seems better to treat them as one form.

Neacomys has never been found by me except in very dense, dark, humid forest. It is usually trapped under some rotting log.

OECOMYS THOMAS

Oecomys THOMAS, 1906, Ann. Mag. Nat. Hist., (7) XVIII, p. 444.

GENOTYPE.—*Rhipidomys benevolens* Thomas.

Oecomys bicolor from the eastern foothills of the Ecuadorean Andes in the morphological sense is centrally placed in the genus. The length of toothrow of

bicolor is about 4.2 mm. Two groups of larger *Oecomys*, *caicarae*, etc. (toothrow, 4.7 to 5.0 mm.), and *palmeri* (toothrow 5.5 to 6.0 mm.), and one of smaller species, *rosilla*, etc. (toothrow, 3.5 to 3.8 mm.), are known in our region. The group containing the largest species of *Oecomys*, including *benevolens*, is known as yet only from the western slopes of the Andes from Ecuador to Bolivia, and British Guiana.

The generic position of the Guiana species *rex* is to be questioned, as its describer expressly mentioned its oryzomine zygomatic plate.

The distribution of the *caicarae* group includes middle Amazonia, Guiana (in broadest sense) and Trinidad (*splendens*) species. The animals are more heavily built than *bicolor*, though white-bellied and otherwise essentially similar.

The fourth group, though rare, is widely dispersed from Guiana to Matto Grosso. In it I place *rosilla*, *nitedulus*, *rutilus* and *milleri*.

Besides the foregoing, *klagesi* appears to be more or less transitional between *Oecomys* and *Oryzomys*, in that the skin appears oryzomine while the skull resembles that of *Oecomys*.

NOTE.—*Oryzomys speciosus* J. A. Allen from Trinidad is not an *Oryzomys* but an *Oecomys*. The pelage of the underparts is white to the roots; the mammary formula, 2–2 = 8; the hind feet (s.u.) = 23. The skull shows typical *Oecomys* characters—short rostrum, palatal pits, widely diverging supra-orbital ridges, and nearly vertical zygomatic plate, scarcely thrown forward. The length of m^{1-3} = 4.5 mm.

This fact does not necessarily invalidate *O. splendens* Hayman which is stated to have gray-based ventral pelage and a molar series of 5 mm.

Oecomys auyantepui, new species

TYPE.—No. 131156, Amer. Mus. Nat. Hist.; adult ♂; south slopes of Mt. Auyan-tepui, Caroni River, Venezuela, 3500 feet; collector G. H. H. Tate, February 9, 1938. Skin and skull in good condition.

GENERAL CHARACTERS.—Somewhat aberrant for *Oecomys* in possessing gray-based ventral pelage (compare *superans* and *milleri*). Possibly intermediate between *Oecomys* and *Oryzomys* but possessing the small teeth, rather narrow, upright zygomatic plate and posteriorly diverging supra-orbital ridges of *Oecomys*. The feet are short and the tail is slightly tufted. It is possibly allied to the *trinitatis* group of *Oryzomys* as the feet and skulls show characters in common.

DESCRIPTION.—Greater part of dorsal area blackish brown caused by black tips to cinnamon-brown hairs; only the rump more rufous, the black there nearly suppressed. Underparts dull white with gray bases. Pelage of moderate length, dorsally 10 to 12 mm., ventrally 3 to 4 mm.; ears small, dark brown; feet, though short not broadened, lacking any dorsal mark. Tail uniform dark brown above and below, with well-developed hair pencil 8 mm. in length.

Skull nearest to that of *Oryzomys klagesi*, but palatal foramina slightly shorter and broader, and toothrows slightly shorter. Both with posterior palatal pits. (The skull of type of *klagesi* shows deformity of the interlacrimal region.)

MEASUREMENTS.—Head and body,[1] 126 mm.; tail, 133; hind foot (s.u.), 23; ear from crown, 15; condylo-basal length, 28.6; palatal length, 16.1; zygomatic width, 16.5; length nasals, 10.6; width of zygomatic plate, 2.7; palatal foramina, 5.3 × 2.2; length upper molar series, 4.6; length of m^1, 2.0.

The form is based upon two adult males from the same locality. Females ought to have the mammary formula 2–2 = 8 but the point has yet to be settled. The animals taken in humid forest were assumed when captured to be *Rhipidomys*.

Oecomys guianae Thomas

(References under subspecies)

Oecomys guianae guianae Thomas

Oecomys guianae THOMAS, 1910, Ann. Mag. Nat. Hist., (8) VI, p. 187.

TYPE LOCALITY.—R. Supinaam, lower R. Essequibo, British Guiana.

MATERIAL.—None.

Oecomys guianae caicarae J. A. Allen

Oecomys caicarae J. A. ALLEN, 1913, Bull. Amer. Mus. Nat. Hist., XXXII, p. 603.

TYPE LOCALITY.—Caicara, Orinoco, Venezuela.

MATERIAL.—The type and three paratypes; Mt. Duida and Cassiquiare Canal (up to 2250 feet), 7 specimens.

This species is distinguishable from *bicolor* of the Andean foothills chiefly by its larger size. The hind foot (s.u.) varies

[1] Taken in flesh from fresh specimen.

from 24 to 26 mm. (in *bicolor* from 21 to 23 mm.). The underparts though creamy white rather than pure white are similarly self-colored. The teeth, palatal foramina and general cranial features are all markedly larger than those in *bicolor*.

The range of *caicarae* seems to be the lowlands of the western end of the Guiana region. It is the only species of *Oecomys* found occurring at Duida.

The alliance of *caicarae* with *guianae* is dictated by the close similarity to Thomas's description of *guianae*. Our material from Kartabo, though probably including *guianae*, cannot safely be employed as a basis of study on account of the transposition of skulls that seems to have taken place between specimens of *guianae*, *nitedulus* and *rutilus*.

Oecomys phelpsi, new species

TYPE.—No. 131164, Amer. Mus. Nat. Hist.; young adult ♀; south slope Mt. Auyan-tepui, 3500 feet; collector G. H. H. Tate, February 10, 1938. Skin with patches of hair missing, skull in good condition.

GENERAL CHARACTERS.—A peculiarly aberrant mouse with external features, except the mark on the dorsum of foot, common in *Rhipidomys*. Tail with distinct pencil. Skull, however, with rostrum and portion between zygomatic plates much narrowed; toothrows convergent posteriorly; m^3 reduced; supra-orbital region with weak, though divergent ridges, as in *Oecomys;* braincase large.

DESCRIPTION.—A small, *Rhipidomys*-like mouse, with long rufous dorsal pelage; underparts pure white to the roots; ears small; feet small, without dorsal mark; tail dark brown above and below, with well-developed pencil of hairs (8 mm.).

Skull partly described above. Interparietal greatly reduced in size (6.2 × 2.3); zygomatic plate rather broad, its anterior edge slightly throwing forward; palatal foramina long and narrow; a pair of palatal pits between m^{2-2} (posterior pits absent, as in *Rhipidomys* and *Thomasomys*).

Anterior lamina of m^1 much narrower than middle and posterior laminae (1.1:1.35:1.3 mm.); posterior margin of mandible, between angular and articular processes, moderately excised; coronoid process falcate.

MEASUREMENTS.—Head and body, 90 mm.; tail, 123; hind foot (s.u.), 21; ear, 13; cond lobasal length, 25.9; palatal length, 13.7; zygomatic width, 14; breadth zygomatic plate, 2.4; length nasals, 8.1; m^{1-3}, 4.6; crown of m^1, 2.3; crown of m^3, 0.9 mm.

It is unfortunate that this unusual mouse is founded upon a single individual. It was trapped in heavy forest.

Oecomys marmosurus (Thomas)

Rhipidomys marmosurus THOMAS, 1899, Ann. Mag. Nat. Hist., (7) IV, p. 378.

TYPE LOCALITY.—Maipures, Upper R. Orinoco.

MATERIAL.—None.

Oecomys rex Thomas

Oecomys rex THOMAS, 1910, Ann. Mag. Nat. Hist., (8) VI, p. 504.

TYPE LOCALITY.—R. Supinaam, lower R. Essequibo, British Guiana.

MATERIAL.—None.

Oecomys nitedulus Thomas

Oecomys nitedulus THOMAS, 1910, Ann. Mag. Nat. Hist., (8) VI, p. 505.

TYPE LOCALITY.—Thirteen miles from mouth of Essequibo River, British Guiana.

MATERIAL.—None.

Oecomys rutilus Anthony

Oecomys rutilus ANTHONY, 1921, Amer. Mus. Novit., No. 19, p. 4.

TYPE LOCALITY.—Kartabo, British Guiana.

MATERIAL.—The type only.

THOMASOMYS Coues

Thomasomys COUES, 1884, Amer. Nat., XVIII, p. 1275.

GENOTYPE.—*Hesperomys cinereus* Thomas.

The only species of the Guiana area is *T. macconnelli* (de Winton).

Thomasomys macconnelli (de Winton)

(Reference under subspecies)

Thomasomys macconnelli macconnelli (de Winton)

Rhipidomys macconnelli DE WINTON, 1900, Trans. Linn. Soc., (2) VIII, p. 52.

TYPE LOCALITY.—Summit of Mt. Roraima, 8600 feet.

MATERIAL.—Mt. Roraima (summit) (21); slopes, 6000 feet (27); Mt. Duida (summit), 4500 to 7600 feet (135); Mt. Auyan-tepui (summit), 1800 to 2200 feet (35).

I have been unable to distinguish be-

tween the above-listed series from the summit of the three mountains studied. On the other hand the few individuals taken on much lower levels (3500 feet) at Roraima and Auyan-tepui are paler and have considerably shorter pelage than the typical form. I have distinguished them as a zonal race.

Thomasomys macconnelli subnubis, new subspecies

TYPE.—No. 131154, Amer. Mus. Nat. Hist.; adult ♀; south slope Mt. Auyan-tepui, 3500 feet; collector G. H. H. Tate, February 1, 1938. Type is a skin with skull in good condition.

GENERAL CHARACTERS.—A paler, browner, short-furred, zonal race of *macconnelli*.

DESCRIPTION.—Dorsal color Verona Brown to Bister, with slight admixture of blackish (dorsal color of upland race, on the other hand, is from Mummy Brown to Fuscous); underparts dull grayish white, with bases of hairs gray, much as in the highland form. Length of dorsal pelage 8 to 9 mm. (in *macconelli*, 11 to 12 mm.). Feet, tail, ears and skull characters essentially undifferentiated.

MEASUREMENTS.—Head and body, 107 mm.; tail, 171; hind foot (s.u.), 26; ear from crown, 16; condylo-basal length, 28; palatal length, 14.8; zygomatic width, 16.6; nasal length, 10.7; width zygomatic plate, 2.35; ant. palatal foramina, 6.1 × 2.3; molar tooth series, 4.8; length of m^1, 2.1; length of m^3, 1.15.

We have besides the type three paratypes of this race. In addition, the two individuals collected by me in the forest of Weitipu, some five miles from the slopes of Roraima, should be referred here. The animals at 3000 to 4000 feet are far scarcer, or at least more difficult to collect, than the upland blackish race.

RHIPIDOMYS TSCHUDI

Rhipidomys TSCHUDI, 1845, Fauna Peruana, pp. 356–363.

GENOTYPE.—*Hesperomys* (*Rhipidomys*) *leucodactylus* Tschudi.

Rhipidomys in the strictest sense (section 1 beyond) comprises large animals with long, densely brushed tails. In old adult males the hind foot (s.u.) exceeds 30 mm. The color is dark grayish brown, underparts whitish with short gray bases. The skulls are strongly formed with interorbital area rather narrow, supra-orbital ridges scarcely developed; palatal foramina very considerably longer than m^{1-3}, and m^{1-3} exceeding 6.0 mm.

1.—In this typical section may be placed the type *leucodactylus*, *collinus*, *austrinus*, *lucullus*, *rex*, *modicus* and *goodfellowi*. *Pyrrhorhinus* may belong here. *Ochrogaster* which has enlarged bullae, *bovallii* and *equatoris* probably go with the above forms also. There are several slightly atypical sections:

2.—In which the hind foot is even more shortened and thickened for arboreal life, including *venezuelanus*, *fervidus*, *yuruanus* and *couesi* (= *cumananus*).

3.—More delicately formed species with moderately broadened foot, which has well-marked fuscous brown patch dorsally. Toothrow m^{1-3} about 5.0 mm. Color usually rufous dorsally. Some members with, others without gray bases to ventral fur. Examples: *latimanus*, *cocalensis mollissimus*, *similis*, *quindianus* (young of *similis*), *venustus*, possibly *macrurus*. The group appears to be characteristic of the Andean subtropics.

4.—A group of smaller-sized mice otherwise similar to section 3, with molar series ±4.7. It includes *fulviventris*, *elatturus*, *microtis* and *pictor*, as well as a small series from 5000 feet in the mountains of Sucre, eastern Venezuela. These also are Andean. The group with grayish pelage, *milleri*, *nitela* and *cearanus* from eastern Guiana and the mouth of the Amazon appear to be allied.

5.—The smallest known *Rhipidomys* have the toothrow from 4.1 to 4.4 mm. Its members are seldom caught. *Caucensis*, *tenuicauda* (J. A. Allen) and a small species from Anandabaru, upper Potaro River, British Guiana, appear to be geographically representative. All three have strongly rufous pelage dorsally and buffy white, gray-based pelage ventrally.

Our Guiana highlands collections include chiefly specimens of *milleri*, of which we have the type in the American Museum for comparison. They were taken at Auyan-tepui, 3500 feet, and Roraima at about the same altitude. The series of specimens (*yuruanus*) taken by Carriker at the Yuruan River is unrepresented elsewhere in Guiana except by *fervidus* near the mouth of the Caura. These two records probably represent the extreme southerly extension of the markedly arboreal species *venezuelae*, widely distributed in northern Venezuela.

The high mountains form *macconnelli* (already considered) which occurs as low as 3500 feet, variously treated as a *Rhipidomys* and a *Thomasomys*, is aberrant. It may be the descendant of a type of mouse ancestral to both genera.

Rhipidomys nitela Thomas

Rhipidomys nitela THOMAS, 1901, Ann. Mag. Nat. Hist., (7) VIII, p. 148.
Rhipidomys milleri J. A. ALLEN, 1913, Bull. Amer. Mus. Nat. Hist., XXXII, p. 602.

TYPE LOCALITIES.—Kanuku Mountains (Kwaimatta), British Guiana (*nitela*) and Essequibo River (Minnehaha Creek), British Guiana (*milleri*).

MATERIAL.—The type series of *milleri;* Limao (5000 feet), R. Cotinga, north Brazil (7); Mt. Auyan-tepui (3500 feet), s. Venezuela, a series; Arabupu (3500 feet), Mt. Roraima, Venezuela (1).

This mouse was taken in the forests at Auyan-tepui, in gallery woods about Roraima and Limao. It seems to affect the drier phases of the forests of the localities in which it occurs. Apparently an east Guiana representative of one of the less specialized groups of *Rhipidomys*.

Rhipidomys venezuelae Thomas

(Extra-territorial, northern Venezuela)

Rhipidomys venezuelae fervidus Thomas

Rhipidomys venezuelae fervidus THOMAS, 1904, Ann. Mag. Nat. Hist., (7) XIV, p. 34.

TYPE LOCALITY.—La Union, River Caura, Orinoco, Venezuela.

Rhipidomys venezuelae yuruanus J. A. Allen

Rhipidomys venezuelae yuruanus J. A. ALLEN, 1913, Bull. Amer. Mus. Nat. Hist., XXXII, p. 601.

TYPE LOCALITY.—Rio Yuruan, tributary of R. Cuyuni, se. Venezuela.

MATERIAL.—The type material collected by Carriker.

Mr. Carriker has informed me that his specimens, which have the dusty brown appearance of true *venezuelae*, were trapped at the bases of trees in quite dense forest.

Rhipidomys sclateri Thomas

(*Rhipidomys*) *sclateri* THOMAS, 1887, Proc. Zool. Soc. London, p. 152.

TYPE LOCALITY.—Macassima, British Guiana.

MATERIAL.—None. The type series only at British Museum.

Rhipidomys bovallii Thomas

Rhipidomys bovallii THOMAS, 1911, Ann. Mag. Nat. Hist., (8) VII, p. 114.

TYPE LOCALITY.—Potaro Highlands, British Guiana.

MATERIAL.—The type only in the British Museum.

SIGMOMYS Thomas

Sigmomys THOMAS, 1901, Ann. Mag. Nat. Hist., (7) VIII, p. 150.
GENOTYPE.—*Reithrodon alstoni* Thomas.

The three described forms of grooved-toothed cotton rats are *alstoni* from the Cumaná region, *venester* from the neighborhood of Lake Valencia and *savannarum* from the savannas at the foot of Kanuku Mountains.

The American Museum possesses large series of topotypical *alstoni* and ample material from the lower Cotinga River savannas, which must nearly represent the smaller *savannarum*. In addition it contains a series of 19 individuals from the grasslands at the base of Mt. Roraima which are indistinguishable from *alstoni* of Sucre.

A series of three specimens from Caracas lacks the grooving of the incisors and must be referred to *Sigmodon*.

Although the species was trapped for consistently, no representatives of the genus were taken at Mt. Auyan-tepui or Mt. Duida.

Selected measurements made from examples of *alstoni*, of the Roraima series and of the Cotinga series definitely indicate from the tooth dimensions that the first two are separable from the third.

Venester, in spite of its geographical remoteness from *savannarum*, seems to be closer anatomically to that species than to *alstoni*. The length, "$m^{1-3} = 5$," given by Thomas is matched in our series of *savannarum* as is "width of $m^1 = 1.9$." Thomas, though he spoke of the smaller bulla of *venester*, omitted to give its dimensions. He was dealing with an immature female, however.

Though *alstoni* of Roraima and typical *alstoni* may be continuously distributed across the eastern end of Venezuela we have no evidence to that effect. Carriker

did not take *Sigmomys* in the Imataca region or at the Yuruan River.

In the Guiana highlands we can only record the large species *alstoni*, restricted, so far as appearances go, to the eastern end.

Savannarum not improbably reaches northward to the foot of the Pacaraima escarpment but fails to ascend it. It should probably not be listed in the mountain area.

Sigmomys alstoni (Thomas)

Reithrodon alstoni THOMAS, 1880, Proc. Zool. Soc. London, p. 691.

Sigmomys alstoni THOMAS, 1901, Ann. Mag. Nat. Hist., (7) VIII, p. 150.

TYPE LOCALITY.—Cumaná, Sucre, Venezuela (restricted, Thomas, 1901).

MATERIAL.—Mt. Roraima, 4000 feet (19); topotypical series (41).

Sigmomys savannarum Thomas

Sigmomys savannarum THOMAS, 1901, Ann. Mag. Nat. Hist., (7) VIII, p. 150.

TYPE LOCALITY.—Savannas at foot of Kanuku Mountains.

MATERIAL.—Large series from savannas about lower Rio Cotinga.

As in the related *Sigmodon*, the rats of the genus *Sigmomys* are partly diurnal. It is not unusual to trap animals as late as 8 A.M. or as early as 4 P.M. They tend to form runways in the grass, which are shared by *Zygodontomys* and *Oligoryzomys*.

NECTOMYS PETERS

Nectomys PETERS, 1860, Monatsber. Ak. Berlin, p. 135.

GENOTYPE.—*Mus squamipes* Brants.

Many names have been given supposed species of these neotropical water rats—more than twenty. Probably many must eventually drop into synonymy. After segregation of the small red Central American group, termed by J. A. Allen *Sigmodontomys*, the remainder show a remarkable degree of uniformity over the South American continent. *Nectomys* apparently occurs as far south as the Chaco wherever there are streams, and vertically may reach about 6000 feet.

A race, *garleppi*, in which the teeth are exceptionally large, extends along the eastern slope of the Andes and apparently turns the corner of the Mérida ranges and enters the Magdalena Valley (*magdalenae, grandis*). These large-toothed *Nectomys* are not represented in the collections from either east or west Guiana. Animals with smaller teeth are present throughout the Orinoco and Amazon lowlands extending to the higher country of Brazil and on to the Guiana highlands as high as 4500 feet. A race with exceptionally small teeth occurs in Paraguay.

The species (or races) which probably bear the closest relationship to our material from Guiana are *N. rattus* (Pelzeln), *N. palmipes* and *M. s. melanius*.

The Duida specimens have somewhat smaller teeth than those from Roraima and Auyan-tepui. We may therefore refer them, respectively, to *N. s. rattus* and *N. s. palmipes* (= *melanius*). In determining relative tooth-sizes the sexes must be checked separately as in most series from given localities the m^{1-3} dimension is smaller in females than males.

It is interesting to note here the multi-rooted condition of m^1 in *Nectomys* which recalls the similar phenomenon which Wood Jones found in the unrelated Australian water rat, *Hydromys*.

Rats of this genus have large feet which are slightly webbed to assist in swimming. The marginal row of hairs on the hind foot, supposed to expand with the swimming stroke, is so small as to have little functional value.

Nectomys are trapped along streams, in flood-forest, or in hollow logs that lie half submerged.

Nectomys squamipes (Brants)

(Extra-territorial)

Nectomys squamipes rattus (Pelzeln)

Hesperomys rattus PELZELN, 1883, Verhandl. Zool.-Bot. Gesselsch. Wien, XXXIII, p. 73.

TYPE LOCALITY.—Marabitanas, Rio Negro, north Brazil.

MATERIAL.—Series from Mt. Duida (4) and Cassiquiare Canal (3).

Nectomys squamipes palmipes
Allen and Chapman

Nectomys palmipes ALLEN AND CHAPMAN, 1893, Bull. Amer. Mus. Nat. Hist., V, p. 209.
Nectomys squamipes melanius THOMAS, 1910, Ann. Mag. Nat. Hist., (8) VI, p. 185.

TYPE LOCALITIES.—Princestown, Trinidad (*palmipes*); lower R. Essequibo, 12 miles from mouth, British Guiana (*melanius*).

MATERIAL.—Mt. Auyan-tepui, 3500 feet (6); Mt. Roraima, 3500 feet (2).

PROCYONIDAE

BASSARICYON ALLEN

Bassaricyon ALLEN, 1876, Proc. Acad. Nat. Sci. Philadelphia, IV, p. 20.
GENOTYPE.—*Bassaricyon gabbii* Allen.

Forms bordering upon Guiana area:

B. alleni Thomas, Sarayacu, Bobonasa R., Ecuador
B. beddardi Pocock "Bastrica" [Bartica ?] woods, Essequibo River, British Guiana

The accuracy of the locality of this latter species has been questioned (see original description).

No specimen of *Bassaricyon* has been found by the American Museum Expeditions in Guiana. A number of individuals are now known from the eastern slope of the Andes of Colombia and Ecuador. Taking these into consideration with the dubious *beddardi* from British Guiana, it is quite possible that *Bassaricyon* may occur in our region.

POTOS G. CUVIER AND E. GEOFFROY

Potos G. CUVIER AND E. GEOFFROY, 1795, Magasine Encyclop., II, p. 187.
GENOTYPE.—*Lemur flavus* Schreber.

Thomas[1] concluded that there were five geographical races of *P. flavus*. Of these *P. f. flavus* only is indicated as inhabiting Guiana, the form geographically nearest being *P. f. meridensis* from Mérida. Thomas ignored the kinkajous from south of the Amazon River and *P. f. chapadensis* J. A. Allen.[2]

The comparisons between skulls of *aztecus*, *megalotus*, *meridensis*, *flavus* and *modestus*, which Thomas made (p. 270), showed the Guiana *flavus* female to be as large as the big Central American *aztecus*. Our specimen from British Guiana (A.M. 41942) on the contrary has the basal length 69 mm. and the combined five upper cheek teeth only 16.1 mm. In the same way the "markedly smaller" *modestus* of western Ecuador is represented in our collections by two adult males with basal lengths 76.5 and 77.5, and cheek teeth series 20.5 and 19.5 (in the type, 77.5 and 18.5, respectively). Thus the skulls of kinkajous from given localities within rather wide limits appear variable both in size and proportions. But discounting those facts there yet remain certain definable distinctions. The series examined by me from south of the Amazon has teeth generally much smaller than those from Central America. The small- and large-toothed animals are compared in Table VI.

The majority of animals from Central America have large teeth, from south Amazonia, small teeth. Most material from Santa Marta; the western side of the Colombia and Ecuadorean Andes; from the mountains of Sucre, Venezuela, has large teeth (also the specimen from British Guiana cited by Thomas). Small-toothed animals occur in the Mérida region; in the Guiana area (with Duida) and southward. Both types are included in material from the eastern side of the Andes from the latitude of Bogatá down into Ecuador.

In addition to having smaller teeth the corresponding animals are customarily smaller in size. They tend also to have less

TABLE VI

	South of Amazon	Central America
p^3 (length)	2.7–3.3 mm.	2.7–3.6 mm.
p^4 (length)	2.8–3.3 mm.	3.1–4.2 mm.
m^1 (length × width)	3.3–3.9 × 4.5–4.8 mm.	3.6–4.9 × 4.7–6.2 mm.
m^2 (length × width)	3.5–4.5 × 4.6–5.2 mm.	4.0–4.6 × 5.0–6.0 mm.
m^3 (length × width)	2.6–3.7 × 3.6–4.4 mm.	3.3–4.0 × 4.3–5.3 mm.

[1] Thomas, 1902, Ann. Mag. Nat. Hist., (7) IX, pp. 266–270.

[2] J. A. Allen, 1904, Bull. Amer. Mus. Nat. Hist., XX, p. 76.

flattened bullae; though in the small, narrow-skulled animals from Mérida the bullae are unusually flat. Moderately rounded bullae are found in Guiana material (with Duida); in specimens from south of the Amazon; in certain of the central Colombian and Honduras animals examined. The infra-orbital foramen and postorbital processes seem to vary individually. In short, there appear to be at best only a few recognizable forms of *Potos flavus* which may (improbably) overlap without interbreeding. A synopsis follows:

1.—Large forms with large teeth, sagittal crest commonly developed in males, bullae slightly inflated to flat—*aztecus, megalotus, chiriquinus, isthmicus;* the large forms in western Ecuador; in Sucre, Venezuela; in British Guiana (Thomas).

2.—Small forms with narrowed zygomata, flat bullae, small teeth—*meridensis* and A.M. 34607 from Fusagasuga, Colombia, 5000 feet.

3.—Small forms with unnarrowed zygomata, moderately inflated bullae, small teeth (especially the premolars and m^3)—*chapadensis;* our large series from south of the Amazon; Mt. Duida; A.M. 41942 from Kalacoon, British Guiana; A.M. 37477 from Benevides near Pará; A.M. 73674 from Guaicaramo, Colombia.

It seems possible that the kinkajous of the Guiana region (two specimens are far too little evidence) belong with the small-toothed division of the genus. The specimen (B.M. 97.7.24.1) from British Guiana with large teeth referred to by Thomas may represent an influx by way of the forested delta country from Sucre where I shot the three specimens furnishing evidence of the character of the *Potos* of that area. The affinities of those small Guiana animals are with the west and south, to some extent with *meridensis* but definitely not with Central American and n.e. Venezuelan *Potos*.

Potos flavus (Schreber)

(Reference under subspecies)

Potos flavus flavus (Schreber)

Lemur flavus Schreber, 1775, Säugethiere, I, Pl. xlii (marked *Lemur simia-sciureus*, but see index, p. 187 in text, Vol. 1).

Type Locality.—"Jamaica." I have not traced the process whereby Thomas (*loc. cit.*) changed the type locality to British Guiana. It may be accepted provisionally.

Material.—None (if *flavus flavus* is one of the larger races of *flavus*).

Potos flavus near **chapadensis** J. A. Allen

Potos flavus chapadensis J. A. Allen, 1904, Bull. Amer. Mus. Nat. Hist., XX, p. 76.

Type Locality.—Chapada, Matto Grosso, Brazil.

Material (Guiana highlands).—Mt. Duida, 2500 feet (1).

Nasua Storr[1]

Nasua Storr, 1780, Prodromus Meth. Mamm., p. 35.

Genotype.—*Viverra nasua* Linnaeus.

Hollister divides the former *Nasua*, introducing a new genus "*Nasuella*" with type *Nasua olivacea meridensis* Thomas. Important papers by J. A. Allen,[2] Hollister[3] and Lönnberg[4] afford an excellent introduction to the study of the coatis.

The genus contains several very distinct forms which can only be regarded as species. They may be listed as follows:

1.—Very large animals with heavy dentition: p^4–m^2, 21.5 to 23 mm.; p^3, width 4.3 to 5 mm. bullae deep and very round, 12.5 × 9 or larger; zygoma with postorbital process obsolete; face white, *narica, panamensis*, etc.

2.—Dentition heavy: p^4–m^2, 21 to 22 mm.; p^3, width 4.3 to 5 mm.; bullae deep and rounded, 12 to 14 × 9 to 10 mm.; zygoma with well-developed postorbital process; postorbital portion of zygoma much shallower than ante-orbital part; face not white. This section includes *nasua, solitaria, socialis, cinerascens, henseli*, specimens from the southern run-off of the Amazon (*juruana, mexiana*), Matto Grosso, the Andean foothills from Bolivia to R. Curaray (*mephisto*) and probably *manium* of western Ecuador. Only slightly smaller and probably to be included in the same group is *phaeocephala* of Guiana, the R. Uaupes area and the Caura River.

3.—Animals of smaller size with smaller teeth, p^4–m^2, 17.5 to 19 mm.; p^3, width 3.0 to 3.5; bullae small, not very deep, the anterior part nearly obscuring the eustachian meatus (12 to 13 × 7.5 to 8.5 mm.); zygoma with small postorbital process, its posterior half weak (3 mm. deep); m^2, 5.6 × 6.4, *candace* and the

[1] On "Official List," Opinion 91, International Commission Zoological Nomenclature.

[2] Allen, 1879, Bull. U. S. Geol. Geogr. Survey Territories, V, No. 2, pp. 153–174.

[3] Hollister, 1916, Proc. U. S. Nat. Mus., XLIX, pp. 142–150.

[4] Lönnberg, 1912, Arkiv für Zool., Stockholm, XIV, No. 4, pp. 30–33, 97–104.

small coati of the summit of Mt. Auyan-tepui. Probably also referable to this group comes *quichua*, though in it m^2 is larger proportionally, 6.5 × 6.0; others are *judex*, *jivaro*, *gualea*, *montana*, *dorsalis*.

4.—The last and by far the most distinct group (*Nasuella* Hollister) is distinguished by its small weak teeth, p^4–m^2 only about 12 mm.; compressed premolars, p^3, width only 1.4 mm.; very slender muzzle; small, low bullae (12 to 13 × 7 to 8 mm.); soft, fine pelage. It includes *olivacea*, *lagunetae*, *meridensis* and *quitensis*.

The foregoing constitutes but a rapid review of *Nasua*. Groups 1 to 3 are more closely associated to each other than any one of them is to *Nasuella*. The *candace-quichua* group is primarily Andean in distribution. Its presence in the Guiana highlands shows yet another significant linkage of the fauna of those mountains with that of the Andes.

The *Nasua* of the lowlands of Guiana is *N. phaeocephala*.

Nasua phaeocephala J. A. Allen

Nasua phaeocephala J. A. Allen, 1904, Bull. Amer. Mus. Nat. Hist., XX, p. 334.

Type Locality.—Suapure, R. Caura, s. Venezuela.

Material.—R. Caura (3); R. Mocho (1); British Guiana (Kartabo) (3).

Nasua candace dichromatica, new subspecies

Type.—No. 131166, Amer. Mus. Nat. Hist.; young adult ♂ (?); plateau of Mt. Auyan-tepui, s. Venezuela, at approximately 6000 feet; collector J. A. Dillon, Phelps Venezuela Expedition, January 23, 1938; Field No. 5560. The type is a pick-up skeleton with relatively few parts missing, the skull complete except certain teeth (shown by crosses): incisors, $\frac{xx1—1xx}{xxx—xxx}$; premolars, $\frac{4, 3, 2, x—x, 2, 3, 4}{4, 3, 2, x—1, 2, 3, 4}$; molars, $\frac{2, 1—1, 2}{2, 1—1, x}$.

General Characters.—Very near *Nasua candace* of the Andes of Colombia, though the permanent teeth are slightly smaller. The proportions of m^2 (wider than long) agree with *candace* rather than with *quichua*. The bulla has precisely the same structure as that of *candace*. The new race is separated on the basis of its smaller teeth and its peculiar sexual dichromatism, observed in other specimens not captured. Small quantities of yellow hair associated with the bones of the type skeleton suggest it had yellow hair in life.

Description of Type.—Braincase full as in young specimens, rostrum narrow as in *candace*, with dorsal nasal trough; zygomata weak but with distinct postorbital processes and orbital portion much deeper than postorbital (4.7:2.6 mm.); bullae small, moderately deep and rounded, with definite overhang of eustachian meatus as in *candace;* teeth approximately as those of *candace*, but narrower and slightly shorter.

Measurements.—Skull: Greatest length, 100 mm.; condylo-basal length, 95; zygomatic breadth, 48; p^4–m^2, 17; mandible length, 69.5; p_4–m_2, 19.6.

This most interesting coati is unfortunately founded upon a skeleton. No less than eight living animals were seen at one time or another on the plateau, usually far away, though at times nearer when no means of shooting them was at hand. The first six observed were colored some shade of straw or yellow. It was thought at first the entire race was yellow, until a female accompanied by a young one was observed. Both of those animals were rufous, hence the view that the Auyan-tepui coati may be sexually dichromatic.

The descriptions of these elusive animals seen by various members of the party, though necessarily vague, combine to give a clear impression of a buff-colored coati, probably male, and rufous female and young:

1.—Buffy colored, with patch of light gray on scapular region (side view) (Tate).

2.—Straw-colored, with tail heavily ringed with blackish. Seen clearly in afternoon sunlight (Tate).

3.—Flanks marked by gray-black patches . . . remainder appeared brownish yellow (Gilliard).

4.—Head, ears, tail, black; legs dusky; rest of body faded golden yellow (Gilliard).

5.—A large, straw-buff animal, with deep blackish stripe from withers to tail, which also appeared dark (Tate and Dillon).

6.—Straw-colored with tail ringed with dark (we nearly caught this one) (Tate).

7.—Dark reddish brown with ringed tails. This was an adult female with a young one (Tate).

8.—Juvenal, dark rufous, with long lax pelage. The young of 7 (Tate).

The foregoing observations support the hypothesis that the sexes of these animals are differentially colored, and account for use of the name *dichromatica*. Very young males may have (?) female coloration.

The animals lived among the multi-

tudinous fissures that seam the entire plateau, forming an intricate labyrinth. Tracks are often found in the open and under dry, sheltered ledges droppings occur. The food no doubt is chiefly composed of insects, and the coatis are especially likely to dig among the roots of a scroll-leaved bromelaid, *Brocchinia reducta*, which forms extensive patches on sandy bogs. They emerge from their retreats during the day only during the few irregular hours of sunshine, but doubtless roam freely at night.

Some skeletal fragments picked up at the base of the outer cliffs suggest they occur also on the upper parts of the outside slopes of the mountains.

At Mt. Roraima evidence in the form of droppings was found under overhanging sandstone ledges that suggested the presence there of coatis. The Indian porters who carried up our equipment in 1927 reported having seen an animal about the size of a small dog for an instant. On Duida, on the contrary, I obtained no direct evidence to show the presence of coatis.

PROCYON STORR[1]

Procyon STORR, 1780, Prodromus Meth. Mamm., p. 35.

GENOTYPE.—*Ursus lotor* Linnaeus.

Hollister[2] introduced *Euprocyon* Gray[3] as a subgenus with the type *Ursus cancrivorus* Cuvier to contain the South American raccoons.

The South American or "crab-eating" raccoons with their shorter palates and relatively heavier and more complex teeth are easily separated, as shown by Hollister (*loc. cit.*), from the *Procyon lotor* group, the true raccoons with longer palates and smaller teeth.

Euprocyon, which occurs over most of South America and is represented in Panama, seems to be a monotypic genus with a few weakly differentiated race. The typical race from Cayenne is represented in our collections only by an adult and juvenal from British Guiana. We have none from the Guiana highlands region. From south of the Amazon the race *P.* (*E.*) *c. nigripes* Mivart = *brazilensis* von Ihering is amply represented in our cases. Two individuals from e. Bolivia and one from Trinidad appear essentially similar to *cancrivorus cancrivorus*. From western Ecuador we have the type and two others of the *cancrivorus*-like race *aequatorialis*. If crab-eating raccoons are present in western Guiana they should conform closely to the typical form of Cayenne.

Our sets of measurements illustrate the general uniformity of the species throughout South America. The races *panamensis*, *proteus*, *gloveralleni* and *minor* though not studied are expected to conform in their cranial characters rather closely to *cancrivorus*.

Procyon (Euprocyon) cancrivorus cancrivorus (Cuvier)

Ursus cancrivorus CUVIER, 1798, Tables elementaires . . . , p. 113.

TYPE LOCALITY.—Cayenne.

MATERIAL.—British Guiana (2); Trinidad (1).

CANIDAE

DUSICYON SMITH

Dusicyon SMITH, 1839, Natural. Libr. Mamm., IX, p. 248.

On the authority of Cabrera's[4] paper and Osgood's[5] modifications of the same, the fox-like canids inhabiting the Guiana region are referable to the genus *Dusicyon*, subgenus *Cerdocyon*, species *thous*. *Thous* was indicated by Cabrera as extending from "tropical zone of northern Colombia to the mouth of the Amazon."

Careful study of the moderately extensive series listed subsequently shows that at least two fairly easily distinguishable races occur in the Guiana area. The *Cerdocyon* from the foot of the Colombian Andes, the savannas at the mouth of the Caura R., the savannas of the upper R. Cuyuni and from the province of Sucre (and doubtless the intervening llanos)

[1] On "Official List," Opinion 91, International Commission Zoological Nomenclature.

[2] Hollister, 1915, Proc. U. S. Nat. Mus., XLIX, pp. 143–150.

[3] Gray, 1864, Proc. Zool. Soc. London, p. 705.

[4] Cabrera, 1931, Journ. Mamm., XII, pp. 54–67.

[5] Osgood, 1934, Journ. Mamm., XV, pp. 45–50.

seem to be relatively homogenous. The audital bullae, though fuller, more rounded and deeper than those of the high Andean foxes *reissii*, are far less full than those of the foxes of Mt. Auyan-tepui and the Cotinga savannas north of the Rio Branco. Moreover they do not bring about proportional narrowing of the basi-occipital as occurs in the last-mentioned group. The teeth of llanos foxes though rather variable in size and proportion are definitely larger than those of Brazil. It seems probable, then, that these larger foxes cannot be referred to typical *thous*. For them the name *apollinaris* Thomas, 1918, appears to be available. *Aquilus* Bangs from the Santa Marta region has been placed by Cabrera in the synonymy of *thous*. The fox of the llanos region (middle and lower Orinoco) should be called *Dusicyon* (*Cerdocyon*) *thous apollinaris* Thomas. The specimens from the Cuyuni are slightly aberrant—perhaps transitional with Auyan-tepui specimens—in the reduction of the black dorsal hairs of their tails to a small area at the tip. The audital bullae, however, differ from those of Auyan-tepui foxes.

The foxes from the Auyan-tepui area and those of the Cotinga savannas differ markedly from Orinoco foxes in the enlargement and proportional approximation of their bullae and in the accompanying narrowness of the basi-occipital. In animals from Auyan-tepui the teeth are slightly smaller; in those from the Cotinga much smaller than in *apollinaris*. Auyan-tepui specimens, furthermore, differ from Cotinga animals in possessing small, short-haired tails with the black marking limited to the tip (as in *venezuelae* from R. Cuyuni), the Cotinga material having tails with long hairs and colored blackish dorsally from root to tip. In fact, the Cotinga material agrees perfectly with Thomas's description of *savannarum*. Considerable proportional latitude in the size of the teeth exists and *lunaris* Thomas from Moon Mountains south of the Takutu Mountains (type locality of *savannarum*) may possibly be shown to equal that form.

The exact status of *thous thous* (type locality, Surinam) remains in doubt. At the moment of writing we do not know where in Surinam savannas exist. They may be presumed to occur near the Brazilian border, however, in which case *lunaris* is probably identical to or transitional with true *thous*.

The few measurements given by Günther for *rudis* (1879) indicate a long-tailed, small-skulled animal with small teeth. *Rudis*, which was shipped to London alive from British Guiana, might equally well have come from the Cuyuni or the Rupununi savannas. Its dimensions suggest the latter and it may be synonymized with *savannarum*.

At the Mt. Duida savannas no evidence that foxes existed could be obtained. In act the Indians stated the animals did not occur there.

To sum up: A nearly homogeneous race, *thous* = *rudis* = *savannarum* = *lunaris*, is thought to inhabit the north Brazilian savannas and to extend into the Rupununi region, but to give place in the "high savannas" to a representative with similar full bullae but short-haired tails and larger skull and teeth (our material from Auyan-tepui). Auyan-tepui animals in turn are replaced in the upper Cuyuni by foxes with less inflated, more widely spaced bullae and similar tails. To the north and west (throughout the llanos) the Cuyuni foxes give place to *Cerdocyon* having well-separated bullae, moderate to large teeth, and longer tails, well-haired and black along the dorsal part. In the lower Caura and westward into Colombia individuals occur with unusually large teeth which may possibly show transition to the large Andean "wolves" currently known as *Pseudalopex reissii* Hilzheimer.

In tables of measurements for Guiana (unpublished) *Cerdocyon* specimens from the Cotinga, Auyan-tepui, Cuyuni, Caura, northern Sucre and eastern Colombia are compared with type measurements of *apollinaris*, *savannarum* and *lunaris*.

Dusicyon (Cerdocyon) thous thous Linnaeus

Canis thous LINNAEUS, 1766, Syst. Nat., 12th Ed., p. 60.

Viverra cancrivora BRONGNIART, 1792, Acta

Soc. Hist. Nat. Paris, I. p. 115. (Not seen. Ex Cabrera.)

Canis rudis GÜNTHER, 1868, Proc. Zool. Soc. London, p. 316.

Canis cancrivorus savannarum THOMAS, 1901, Ann. Mag. Nat. Hist., (7) VIII, p. 146.

Canis thous lunaris THOMAS, 1914, Ann. Mag. Nat. Hist., (8) XIII, p. 356.

TYPE LOCALITIES.—*Thous*, Surinam; *rudus*, "British Guiana"; *savannarum*, savannas at base of Kanuku Mountains; *lunaris*, Moon Mountains, south of Kanuku Mountains.

MATERIAL.—R. Cotinga savannas (4).

Dusicyon (Cerdocyon) thous apollinaris (Thomas)

Carcinocyon thous melampus J. A. ALLEN, 1911, Bull. Amer. Mus. Nat., XXX, p. 258.

Cerdocyon thous apollinaris THOMAS, 1918, Ann. Mag. Nat. Hist., (9) I, p. 371.

Cerdocyon thous thous CABRERA, 1931, Journ. Mamm., XII, p. 59 (part).

TYPE LOCALITY.—*Apollinaris*, Choachi, east Colombia (5400 feet).

MATERIAL.—Caura region (5); east slopes Colombian Andes (3); Prov. Sucre (3); upper Cuyuni savannas (3).

ICTICYON LUND

Icticyon LUND, 1845, Afh. Dansk. Vid. Selsk., II, p. 61.

GENOTYPE.—*Cynogale venaticus* Lund.

The "bush dog" *Icticyon venaticus* has been collected in British Guiana. The Museum collections contain specimens from eastern Peru and from Brazil south of the Amazon as well as an example of the race from Panama. There is every reason for supposing that this scarce animal will eventually be collected from the rain forests of the western and central Guiana region.

MUSTELIDAE

MUSTELA LINNAEUS

Mustela LINNAEUS, 1758, Syst. Nat., 10th Ed., p. 45.

GENOTYPE.—*Mustela erminea* Linnaeus.[1]

The specimens of *Mustela* from Duida and Auyan-tepui were submitted for identification to Dr. E. Raymond Hall, who for years has specialized on the genus. Dr. Hall kindly gave the problem immediate attention. I quote from his letter of October 19, 1938:

> Each of the two specimens clearly is of the species *Mustela frenata* and appears referable to the subspecies of *M. f. meridana* Hollister. The skull, obtained by Mr. Hitchcock of the Tyler Duida Expedition on Mt. Duida, provided an extension of known geographic range of more than 500 miles. Previously I knew of the species from no places nearer Mt. Duida than Caracas and Mérida. The skin which the Phelps Venezuelan Expedition saved from Mt. Auyan-tepui provides a further extension of known range to the northeastward of about 230 miles. Until receipt of these specimens I had supposed that if any weasel occurred in this area it was of the species *Mustela africana* (see my map, Carnegie Institution of Washington, Publ. No. 473, p. 101, 1936). The rostrum of the skull from Mt. Duida is a few tenths of a millimeter shorter than in any comparable specimen of *meridana* examined from farther west but this is the only variation; otherwise it agrees with topotypes of the mentioned race.

Mustela frenata Lichtenstein

Mustela frenata meridana Hollister

Mustela meridana HOLLISTER, 1914, Proc. Biol. Soc. Washington, XXVII, p. 143.

TYPE LOCALITY.—Sierra de Mérida, northern Venezuela.

MATERIAL.—One skull taken from a ledge near the summit of Mt. Duida at 7000 feet; one skin (without skull) from the lower terrace of Mt. Auyan-tepui (3500 feet).

LUTRA ERXLEBEN

Lutra ERXLEBEN, 1777, Syst. Regn. Animal, p. 448.

GENOTYPE.—*Mustela lutra* Linnaeus.

Thomas,[2] writing of the "*Lutra platensis* group," recognized seven species, which today are reduced to geographical races. Only one of these forms, *Lutra enudris*, is shown to be present in Guiana.

Much earlier Schomburgk[3] wrote of two kinds of otters in Guiana rivers—*Lutra enudris* Cuvier and *Lutra brasiliensis* Ray (= *Pteronura sandbachi*).

Pohle[4] has lately treated the entire subfamily extensively. He recognized two

[1] See Miller, 1912, Bull. U. S. Nat. Mus., LXXIX, p. 95.

[2] Thomas, 1908, Ann. Mag. Nat. Hist., (8) I, pp. 390–395.

[3] Schomburgk, 1840, Mag. Nat. Hist., V, pp. 282–288.

[4] Pohle, 1920, Archiv für Naturg. Abt. A, Heft 9, pp. 1–247.

full genera: *Lutra* (with subgenera *Lutra*, Cosmopolitan and *Lutrogale*, Oriental) and *Pteronura*. South American species allowed were *L. enudris*, *L. platensis*, *L. provocax* and *L. felina*. Only *enudris* is present in the Guiana region.

True otters entirely surround the Guiana region, though they are limited rather closely to rivers. It seems probable that the altitudinal extent of the animals is limited not so much by climatic considerations as by quantity of water. Thus otters were said by the Indians to be absent from the small Haicha River at Camarata (2000 feet) but to occur some twenty miles lower down where the Haicha and Carao united. Along the great River Caroni and its headwaters stream the Kukenam otters were reported to us as high as 3500 feet. Broadly speaking, the animals may be considered to penetrate the Guiana country wherever rivers of suitable volume occur.

Lutra enudris enudris F. Cuvier

Lutra enudris F. Cuvier, 1823, Dict. Sc. Nat., XXVII, pp. 237–250.

Lutra mitis Thomas, 1908, Ann. Mag. Nat. Hist., (8) I, pp. 387–395.

Type Localities.—*Enudris*, Guiana; *mitis*, Surinam.

Material.—R. Orinoco at foot of Mt. Duida (1); lowlands of British Guiana (several).

Pteronura Gray

Pteronura Gray, 1868, Proc. Zool. Soc. London, pp. 61–66.

Genotype.—*Pteronura sandbachi* Gray = *lupina* Schinz = *brasiliensis* (Blumenbach).

In his revision of otters Pohle[1] recognized only one full species of *Pteronura: brasiliensis*, with two races. *P. sandbachi* is the Guiana flat-tailed otter and a synonym of the Amazonian *P. b. brasiliensis*.

Pteronura, like *Lutra*, is restricted in its distribution to the courses of rivers. Being a larger and heavier animal it may well require even larger volumes of water than *Lutra* does. Though its area of distribution nearly encircles our region, evidence of its presence in the extreme northeast (the lower reaches of the Orinoco) seems to be wanting. It appears to be one of those genera of Amazonian mammals exemplified by *Holochilus*, *Isothrix* and several genera of Primates which have not completed a northward encircling of the Guiana area. This break is probably maintained through the approach of savanna-type environment south from the true llanos through the Immataca region to the valley of the R. Yuruan, tributary of the Cuyuni, in close proximity to the sandstone mountains just north of Luepa.

Pohle recognized two races, *P. brasiliensis lupina* (= *P. b. brasiliensis*) of the Amazon and Orinoco region and *P. b. paranensis* of the La Plata basin.

Pteronura brasiliensis brasiliensis (Blumenbach)

Lutra brasiliensis Blumenbach, 1810, Abbild. naturhist. Gegenstände, No. 93.

Lutra lupina Schinz, 1821, Das Tierreich . . ., I, pp. 211–214, 879.

Pteronura sambachii Gray, 1837, Mag. Nat. Hist., (N. S.) I, p. 580.

Type Localities.—*Brasiliensis*, Brazil; *lupina*, Brazil; *sambachii*, British Guiana.

Material.—R. Mocha, mouth of R. Caura (2); R. Orinoco at foot of Mt. Duida (2).

Conepatus Gray

Conepatus Gray, 1837, Mag. Nat. Hist., (N. S.) I, p. 581.

Genotype.—*Conepatus humboldtii* Gray.

Although lowland skunks occur in the Province of Sucre (collectors, Carriker and myself), from the Apuré region of the Orinoco (Gumilla), and from the lower Amazon (Mauve), I find no record of the animals in the central Guiana area. The Indians of those parts visited by our several expeditions professed ignorance of the animals. So possibly *Conepatus* has not yet entered the region, or has died out.

The genus *Conepatus* is in need of revision. There has been confusion over the application of the name *mapurito* to South American material. *Mapurito* Gmelin, 1788, was designated from Pamplona, Mexico. One collateral reference to the account of Mutis, 1769, who also described a Mexican skunk was given.

[1] Pohle, 1920, Archiv für Naturg. Abt. A, Heft 9, pp. 1–247.

So in spite of Humboldt's use of it for animals from Fusagasugu, Colombia and Lojá, Ecuador, and Lichenstein's for those from Cundinamarca, the name can only be applicable to one of the Mexican forms.

Zorilla Gmelin, 1788, was founded directly or indirectly on the "zorille" of Buffon from Peru and on Gumilla's account of a skunk from the Apuré area of the Orinoco. It should be restricted.

Gumillae Lichtenstein, 1838, refers only to Gumilla's species of the Apuré. Not improbably it is the same as the large-toothed skunks of the Province of Sucre.

Amazonicus Lichtenstein, 1838, was applied to a skunk seen (or taken ?) by Mauve. That traveler apparently visited only the mouth of the Amazon (Ceará, Maranhao, Belem).

"Viverra" putorius Mutis, 1770, though possibly referring to a form of *Conepatus*, falls as a homonym to *Viverra putorius* Linnaeus, 1758, a North American skunk of the genus *Spilogale*.

If skunks are shown to inhabit Guiana they will probably be referable to *gumillae* Lichtenstein. Probably their range will be found analogous to that of *Sylvilagus orinoci*.

TAYRA OKEN

Tayra OKEN, 1816, Lehrbuch Naturg., 3ter Theil, 2te Abth., pp. xi, 1001.

GENOTYPE.—*Mustela barbara* Linnaeus.

Allen[1] in 1908 showed that the tayras, formerly placed under *Galictis*, should appear under Oken's name *Tayra*. Earlier, Thomas[2] had discussed the geographical races of *Galictis barbara*. His *G. b. typica* (which should be written *G. b. barbara*) is held to range over much of South America, including Guiana. There is little doubt that the animal occurs all along the southern margin of the Guiana region wherever there is forest. Whether it extends westward from Duida south of the Orinoco llanos to the mountains is not apparently ascertained. My opinion is that it will be found in the forests of the lower Ventuari and Caura Rivers and probably also in that wide strip of forest intervening between the llanos south of Ciudad Bolivar and the northern edge of Auyan-tepui. It will thus practically encircle the Guiana uplands. The Arecunas at Auyan-tepui seemed to recognize the description of the animal but claimed it was very rare.

Tayra barbara (Linnaeus)

(Reference under subspecies)

Tayra barbara barbara (Linnaeus)

Mustela barbara LINNAEUS, 1758, Syst. Nat., 10th Ed., p. 46.

TYPE LOCALITY.—Brazil.

MATERIAL.—Mt. Duida area (several); Mt. Roraima (1); lowlands of British Guiana (several).

GRISON OKEN

Grison OKEN, 1816, Lehrbuch Naturg., 3ter Theil, 2te Abth., p. xi and 1000.

GENOTYPE.—*Viverra vittata* Schreber.

The badger-like grisons, like the tayras, are distributed over practically the whole of the South American tropics where large forests occur. They are rare in collections, however, probably because of their alertness and shyness. Records from the region under study are limited to the Duida lowlands, R. Yuruan and British to Dutch Guiana. Though the genus extends south to Argentina the upper limit of its range in the tropics is apparently only about 3000 feet. It was unknown to the Arecuna Indians at Camarata (Mt. Auyan-tepui).

Grison vittata (Schreber)

Viverra vittata SCHREBER, 1775, Säugethiere, III, p. 447, Pl. 124.

TYPE LOCALITY.—Surinam (p. 447), Patagonia (p. 448). Unrestricted.

MATERIAL.—Mt. Duida (1); British Guiana (3); Rio Yuruan, tributary of R. Cuyuni, se. Venezuela (1).

FELIDAE

FELIS LINNAEUS[3]

Felis LINNAEUS, 1758, Syst. Nat., 10th Ed., p. 42.

GENOTYPE.—*Felis catus* Linnaeus.

For the purpose of the present paper

[1] Allen, 1908, Bull. Amer. Mus. Nat. Hist., XXIV, pp. 585–589.

[2] Thomas, 1900, Ann. Mag. Nat. Hist., (7) V, pp. 145–148.

[3] On "Official List," Opinion 91, International Commission Zoölogical Nomenclature.

nothing is gained by consideration of the generic or subgeneric status of the Guiana Felidae. All will therefore be treated under the blanket name *Felis*.

Felis concolor Linnaeus

Felis concolor LINNAEUS, 1771, Mantissa, II, p. 522.

TYPE LOCALITY.—"America" (restricted, Goldman, 1929, to São Paulo, Brazil). Goldman[1] listed *F. c. wavula* Lesson from Demarara. Later Nelson and Goldman[2] described *F. c. anthonyi* from the foot of Mt. Duida, western Guiana.

MATERIAL.—The type of *F. c. anthonyi* only.

Pumas are far too scarce in collections from the Guiana area for conclusions to be reached regarding their distribution. The specimen from Mt. Duida was shot in forest about a mile in from one of the small savannas near-by. At Auyan-tepui the Indians reported pumas as of rare occurrence. At Roraima they seemed altogether ignorant of the animals. In all probability *concolor* exists in small numbers throughout the region. Footprints seen in the dust of savanna trails may have been made either by puma or jaguar.

Felis onca Linnaeus

Felis onca LINNAEUS, 1758, Syst. Nat., 10th Ed., p. 42.

In the recent revision of the jaguars by Nelson and Goldman[3] a large number of geographical races covering most of the American tropics and subtropics were recognized. The only race whose range included the Guiana region was: *F. o. major* Fischer—"Northern S. America from Surinam west through British Guiana and extreme northern Brazil to western Venezuela."

Cabrera[4] in an excellent paper reviewed the living and extinct jaguars of South America. But his conclusions were founded chiefly upon material from the southern part of the continent.

MATERIAL.—British Guiana, Kartabo (1); Venezuela, mouth of R. Caura (1); foot of Mt. Duida (1); R. Surumu, north Brazil (1).

Felis pardalis Linnaeus

Felis pardalis LINNAEUS, 1758, Syst. Nat., 10th Ed., p. 42.

Allen's paper[5] on the lesser spotted cats of tropical America gives for *pardalis* (under generic name *Leopardus*) nine races of which *F. p. maripensis* from the Caura district and *F. p. tumatumari* from British Guiana, the latter extending across northern Brazil, alone are pertinent at present.

MATERIAL.—Villavicencio, Colombia (1); Caquetá, Colombia (1); foot of Mt. Duida (3); mouth of R. Caura (1); mouth of R. Uaupes, R. Negro, Brazil (1); Tumatumari, British Guiana (1); Kartabo, British Guiana (1); Aroa, Bolivar R.R., n. Venezuela (1).

The foregoing series of ocelots, though from widely scattered localities, affords a good basis for comparison of the animals of the Guiana region and its surroundings. The skull measurements show the much greater size attained by males than females and emphasize the great structural uniformity of these cats.

Felis tigrina Schreber

Felis tigrina SCHREBER, 1775, Säugethiere, III, Pl. 106, text p. 396 (1777).

The margay cats, also treated by Allen,[6] were shown by him to be represented by five races of which two may be present in Guiana: *F. tigrina*—"Cayenne. Probably ranges into eastern Venezuela and northern Brazil." *F. t. wiedi*—"South Brazil, west to southern Colombia."

MATERIAL.—British Guiana (Kartabo) (2); Caquetá R., Colombia (1). No specimens from Duida, Auyan-tepui or Roraima.

The adult males from Kartabo and R. Caquetá appear indistinguishable. Although the latter was referred by Allen to *wiedi*, I must consider, until evidence to

[1] Goldman, 1929, Journ. Mamm., X, pp. 345–350.
[2] Nelson and Goldman, 1931, Journ. Wash. Acad. Sci., XXI, p. 210.
[3] Nelson and Goldman, 1933, Journ. Mamm., XIV, pp. 221–240.
[4] Cabrera, 1933, Notas Preliminares del Museo de la Pata, II, pp. 9–39.
[5] Allen, 1919, Bull. Amer. Mus. Nat. Hist., XLI, pp. 341–419.
[6] *Op. cit.*, pp. 353–358.

the contrary is brought forward, the margay cats of the Guiana area as homogeneous.

Felis jaguarondi (Lacépède)

Felis jaguarondi LACÉPÈDE, 1808, in Azara's Voy. dans l'Amer. Merid., Pl. x.

Under the generic term *Herpailurus* Allen[1] treats five races of "weasel-cats." In Guiana we may expect *F. y. unicolor* Traill, "Guianas and eastern Brazil." This form extends to Sucre, northeastern Venezuela, where I have taken members of the species.

MATERIAL.—British Guiana (Kartabo) (2). Besides the above mentioned, this Museum possesses two females from the Mt. Turumiquire area of the Province of Sucre in which the tails are very much shorter than is typical for weasel-cats. We lack material from the western part of the Guiana region.

CALLITRICHIDAE

The marmosets comprise two principal types: those with normal lower canine-incisor relationships (i.e., the canine very considerably exceeding the incisors in height) and those with the lower canine very small and functioning as part of the incisive series. This latter group, *Callithrix*, includes the tufted-eared *jacchus* group, *Cebuella pygmaea*, the black-tailed *argentata* and the golden-tailed *chrysoleuca* group.

Those marmosets which have normal lower canines and their outer lower incisors as small as or smaller than the inner pair, include most of the remaining species belonging to the family. The only thoroughly distinctive generic group is *Leontocebus* (*s.s.*) easily separable from the mass of species (*Tamarin*, see beyond) by the extreme elongation of digits 3 and 4 of both manus and pes. The marmosets of the *apiculatus* group occurring along the eastern foot of the Andes from Colombia to Ecuador exhibit this character also, though in incipient form. By Elliot they were grouped with true *Leontocebus*, but both Pocock (1917)[2] and Thomas (1922)[3] have considered them distinct.

After removal of true *Leontocebus* there still remain many very distinct species which nevertheless show great structural uniformity. The bald-faced *Oedipomidas* and *Seniocebus*, distinguished from each other chiefly by the size of the ear, may be only apparently monophyletic. They exhibit wide extremes of color pattern. The northern range of the light brown species *martinsi*, common at Faro on the north side of the Amazon near Obidos, is undetermined. A second species *bicolor*, with mane and fore limbs white, whose nearest relative, in spite of its larger ears, may be *oedipus* of Colombia, was collected by the Duida expedition while at Manaos. Those two species appear to be the only bare-faced marmosets touching upon the Guiana region.

Thomas's (1922) use of *Mystax* Gray, 1870, for some of the hairy-faced marmosets is invalidated by *Mystax* Stephens, 1829 (a Trichopterous insect).[4] Similarly *Midas* Geoffroy, 1812, is invalidated by *Midas* Latreille, 1776, Près. Gen. Insects, p. 166.

"*Tamarin* Gray" was listed by Elliot in the synonymy of *Leontocebus*[5] and furnished an excuse for certain remarks by Pocock (*op. cit.* p. 257). It was proposed originally in subgeneric form. Gray used (1870, p. 68) *Tamarin* to distinguish *Midas ursulus*. His classification ran as follows:

Midas:
- Lower lip white—*Mystax*
  - *Midas mystax*
  - *Midas labiatus*
  - *Midas rufiventer*
- Nose black; whiskers white, broad
  - *Midas leucogenus*
- Nose black; face brownish, with some gray hairs
  - *Midas flavifrons*
- Nose and lips black—*Tamarin*
  - Var. 1. Hand black
  - Var. 2. Hand yellow or orange (*midas* and *rufimanus*)

[1] *Op. cit.*, pp. 380–384.
[2] 1917, Ann. Mag. Nat. Hist., (8) XX, pp. 247–258.
[3] 1922, Ann. Mag. Nat. Hist., (9) IX, pp. 196–199.
[4] Stephens, 1829, in Syst. Cat. Brit. Insects, p. 320 cited "*Mystax* ? (Latreille ?)," listing under it *nigra* and *azurea*, both properly constituted by Linnaeus, 1767, Syst. Nat., 13th Ed., reformed, p. 909. The citation above suffices to reduce *Mystax* Gray to a homonym.
[5] 1913, A Review of the Primates, I p. 194

Tamarin Gray thus had equal rank with *Mystax* Gray as a subdivision of *Midas* Gray. Since *Midas* can no longer be used, it seems suitable to elevate *Tamarin*, which includes the tautonymic specific name *midas*, to generic rank. Its type by designation (Palmer) is *Midas ursulus* Geoffroy. No earlier name than *Tamarin*[1] appears available.

Lesson,[2] under *Leontopithecus*, included *L. marikina*, *fuscus* and *ater*. He held *mystax* to be a young specimen of his "varieté B." of *ater*. So *Leontopithecus* was in general equivalent to *Tamarin*.

Into his "*Mystax*" Thomas threw the great mass of species which by Elliot were included in *Leontocebus*. He recognized also *Mico* (type *argentatus*), which Pocock two years earlier disallowed. But the characters used were dermal and related only to hair tufts and color. The species of "*Mico*" are all referable to the genus *Callithrix* which does not occur at all in Guiana.

If the skulls of all the foregoing marmosets are compared it becomes at once clear that only two main types occur: skulls in which the canines contrast markedly in form and size with the incisors, the mandibular rami meet to form a V rather than a U, the condylo-coronoid ramus is relatively high, and protocones and metaconids are well developed; and the reverse of all the foregoing. In the former group must be included *Leontocebus*, *Oedipomidas*, *Seniocebus* and *Leontopithecus* (= *mystax* Thomas and Pocock); in the latter *Callithrix* (= *Hapale* Thomas and Pocock), *Mico* and *Cebuella*.

Apparently the only species of marmosets occurring in the eastern Guiana area are *midas*, *ursulus* and *rufimanus*, placed by Elliot in "*Cercopithecus*." They are here considered *Tamarin*. The dull-colored, bare-faced species *martinsi* is plentiful near Faro. In the area indicated by the junction of the R. Uaupes with the Negro an almost wholly black representative of the *apiculatus* group of marmosets is found, but seems not to extend northward to the foot of the Guiana uplands.

[1] *Tamarinus* Trouessart, with type *Simia midas* Linnaeus, becomes thus a synonym of *Tamarin* Gray, for no one will deny that *ursula* and *midas* are congeneric.

[2] Lesson, 1840, Spec. Mamm., p. 200.

TAMARIN GRAY

Tamarin GRAY, 1870, Cat. Monkeys, Lemurs and Fruit-eating Bats, p. 68 (originally a subgenus of *Midas* Gray).

GENOTYPE.—*Midas ursulus* Geoffroy.

Tamarin (Tamarin) midas (Linnaeus)

(References under subspecies)

Tamarin (Tamarin) midas midas (Linnaeus)

Simia midas LINNAEUS, 1758, Syst. Nat., 10th Ed., p. 28.

TYPE LOCALITY.—"America."

MATERIAL.—British Guiana (1).

Tamarin (Tamarin) midas egens (Thomas)

Leontocebus midas egens THOMAS.

TYPE LOCALITY.—Obidos, north bank of R. Amazon.

MATERIAL.—None.

Tamarin (Oedipomidas) Reichenbach

Oedipomidas REICHENBACH, 1862, Vollständ, Naturg. Affen., p. 5. Type, *Simia oedipus* Linnaeus.

Seniocebus GRAY, 1870, Cat. Monkeys, Lemurs and Fruit-eating Bats, p. 68. Type, *Midas bicolor* Spix.

It is questionable whether *Oedipomidas* and *Seniocebus* should be completely synonymized or allowed separate subgeneric standing. Elliot at first (1913) placed his *Leontocebus* between them but subsequently (1914) united them. The only character of reasonable stability distinguishing them is the size of the pinna of the ear, while the striking general similarity in color pattern between *S. bicolor* and *O. oedipus* suggests their near relationship. Species nearly related to *oedipus* are *geoffroyi* and *salaquiensis;* to *bicolor*, *meticulosus*.

Tamarin (Oedipomidas) bicolor (Spix)

Midas bicolor SPIX, 1823, Sim. et Vesp. Brasil, p. 30.

TYPE LOCALITY.—"Rio Negro."

MATERIAL.—One specimen (A.M. 78965) from near Manaos.

Tamarin (Oedipomidas) martinsi (Thomas)

Leontocebus martinsi THOMAS, 1912, Ann. Mag. Nat. Hist., (8) XI, p. 84.

TYPE LOCALITY.—Faro, lower Jamunda River, north bank of R. Amazon.

MATERIAL.—Series of eight from the type locality.

LEONTOCEBUS WAGNER

Leontocebus WAGNER, 1839, Schreber's Säugethiere, Suppl., I, pp. ix, 248.

TYPE.—*Midas chrysomelas* Kuhl (restricted by Thomas).[1]

Other species: *Simia rosalia* Linnaeus and *S. Leoninus* Humboldt. We have only *rosalia,* which is extralimital. Distinguished by extreme length of digits 3 and 4, large size of skull; well-developed rostrum, large teeth.

CEBIDAE

CEBUS ERXLEBEN[2]

Cebus ERXLEBEN, 1777, Syst. Regn. Anim., Mamm., pp. 44–54.

GENOTYPE.—*Simia capucinus* Erxleben.

Since Elliot's work on *Cebus* (1913) in his "Review of the Primates," the only outstanding contribution toward the solution of the problems presented by the genus appears to be that by Cabrera,[3] 1917.

Like his predecessors, Cabrera again placed reliance almost wholly upon color differences and development of head crests. He assumed, as did authors writing before him, that no characters of taxonomic value could be distinguished by studying the skulls and teeth.

In my view the external differences between crested monkeys such as *cirrhifer* and uncrested monkeys like *apiculatus* were so striking that it appeared probably additional characters of taxonomic value could be discovered in the crania of those animals. A number of such characters are listed below. The skulls of *Cebus* nevertheless show a high degree of uniformity, the differences to be pointed out being relatively small. Furthermore sexual dimorphism is present, particularly in the case of the crested Cebi, in consequence of which characters which hold for one sex are sometimes invalid for the other.

In the Guiana region, crested *Cebus* monkeys (with blackish hands, feet and tail) occur only along its southern margin. We have good series from the Cassiquiare Canal and Rio Negro; also from Faro on the north bank of the Amazon near Obidos. A single skull (A.M. 77793) from French Guiana probably belongs in the crested group. Monkeys of that class extend along the foot of the Andes northward into Colombia (*fatuellus*) and throughout the region south of the Amazon from Ecuador and Bolivia eastward through Matto Grosso, the Tapajoz area, Paraguay to southeastern Brazil.

Uncrested *Cebus* monkeys occur in Central America (*hypoleucus* and allies), south to western Ecuador (*aequatorialis*) and east of the Andes through northern Venezuela to Trinidad; also through the entire forested Guiana region below 4000 feet; and south along the Andes to Bolivia (*flavus*). Southeast from Colombia, they reach the middle Amazon (*unicolor*), but it is uncertain whether they penetrate to Matto Grosso and southeast Brazil. *Variegatus* and *frontatus*, it is true, were placed by Elliot in his section "without tufts," but the degree of development of hair crests varies to a considerable degree in specimens from southeast Brazil. On the other hand, the cranial features of all our monkeys (as well as the dark color of their hands, feet and tails) from that region combine to ally them with the tufted forms.

The following set of characters will serve to distinguish the skulls of crested monkeys from those of uncrested species:

[1] Wagner's conception of *Leontocebus* included also *Seniocebus* and *Oedipomidas* (*op. cit.*, p. ix).

[2] On "Official List," Opinion 91, International Commission Zoological Nomenclature.

[3] Cabrera, 1917, Rev. Real. Acad. Ciencias, Madrid, XVI, pp. 221–244.

TABLE VII

	Crested	Uncrested
Ratio of depth of mandible below articular surface to length[a] c–m_3	More than 100%	Less than 100%
Sagittal crest	Developed in old males. The temporal ridges unite a short distance (10 mm.) behind supra-orbital ridges	Undeveloped in old males
External narial opening	Narrower than high (about 12 × 14 mm.)	Approximately as wide as high
Relation of maxillomalar suture to lower margin of orbit	Suture reaches orbit well exterior to center of inferior orbital margin	Suture reaches orbit at approximately the center of inferior orbital margin
Relation of width of pterygoid fossa to width of palata between m^{2-2}	Narrow: $\frac{12.5}{18}$, or 70%	Wide: $\frac{15}{18}$, or 80%
Molar tooth series	Relatively compressed antero-posteriorly: $\frac{\text{width of } p^2}{\text{length } p^{2-4}} = \frac{6.7^b}{10.3}$ or 65%	Relatively uncompressed antero-posteriorly: $\frac{\text{width of } p^2}{\text{length } p^{2-4}} = \frac{6.2^b}{11.7}$ or 53%

The comparisons drawn in the above table must be taken broadly. The scope of this paper does not permit a complete revision of the genus *Cebus*, and consequently the distinctions offered must be treated as provisional and based chiefly upon our Guiana material plus specimens from other regions taken more or less at random.

The relationship of the crested *Cebus* monkeys to the Guiana region has been indicated. The material from the Cassiquiare area appears referable to *macrocephalus* (which is not improbably the same as *crassiceps*). At present I have no means of determining how far north through the French-Dutch-British Guiana coastal strip the crested division may extend.

Capucinus Linnaeus, 1758, 10th edition of the "Systema Naturae," though alone inadequate to serve as identification for any species, was reprinted in abbreviated form from the full description with plate (1754) of a living monkey. That description (and the plate) fits the appearance of the Central American monkey, the white-face or "cara blanca" very closely. Linnaeus wrote of *capucinus* (1754): "body size of cat, black, with long lax hair; face and greater part of head, except black hairs, pale yellow extending onto the breast and to the bend of the elbows . . . . tail longer than body, hairy, rather woolly, incurved. . . ." He further mentioned that his animal was slow-moving and climbed with difficulty and made a great deal of noise ("horrendo clamore"). The slow movements were due probably to sickness or cage trouble of some sort. The noisiness of the animal conforms to behavior in Panamanian *Cebus* (see F. M. Chapman, 1929[1], 1938[2]; R. K. Enders, 1935[3]).

Elliot (1913) reached the conclusion that *capucinus* Linnaeus, 1758, was the "cara blanca." He designated the species type of the genus *Cebus* Erxleben, 1777. That designation was supported later by the International Commission on Nomenclature, which in Opinion 91 placed the names on the "Official List."

Erxleben's concept of *Cebus* (1777) included a number of other Platyrhine monkeys in addition to "*capucinus*" and "*apella.*" His *capucinus* was based in part upon the Linnaean references and in part upon descriptions of monkeys by many other authors. His own description of "*capucinus*" diverged somewhat from that of Linnaeus. Though it still contained "fur and limbs black," it mentioned extensive color variations, etc., the effect

[a] In adult males of many crested species the depth of the ramus from the articular surface exceeds the vertical height from the glenoid to the crown of the skull.

[b] In males. In females the absolute dimensions are usually less.

[1] "My Tropical Air Castle," pp. 282–326.

[2] "Life in An Air Castle," pp. 161–172.

[3] Bull. Mus. Comp. Zoöl., Cambridge, LXXVIII, No. 4, pp. 385–502.

of combining descriptions by other authors. *Capucinus* Erxleben was therefore composite. The fact that *capucinus* Erxleben was not the equivalent of *capucinus* Linnaeus made it a possible homonym.

Turning now to the name *apella* (accompanied by plate) which had precisely the same early history as *capucinus*, we read in Linnaeus (1754): "tail prehensile .... color fuscous or blackish gray .... feet and tail black. Head black above, the blackish reaching the angle of the frons.... It climbs easily .... makes noise like Meleagris" (American wild turkey). The plate resembled the uncrested brownish-gray *Cebus* of Guiana.

Elliot (1913) concluded that *apella* Linnaeus was the animal "known generally to authors as *Cebus capucinus*." Cabrera (1917) concluded that it was one of the crested monkeys ". . . . tendiendo en los muy adultos a formar dos crestas laterales." Cabrera had the colors "dark brown-red, generally; darker on shoulders, brighter and more yellowish on chest. Forearms, legs .... and tail black. Whole upper part of head also black. . . ."

Although I am unable to affirm Elliot's identification of *apella* Linnaeus with the vague "*capucinus* of Authors," I must deny identity between Dr. Cabrera's description (pp. 225–226) and the large woodcut that appears in Linnaeus, 1754. That plate, if we consider the peripheral facial shadings slightly exaggerated, agrees with the common brownish-gray *Cebus* of the Guianas whose hands, feet and tail are only a little darker than the body. Either *apella* Linnaeus may be regarded as unidentifiable, or Erxleben may be considered "first reviser" (1777). Plate XXVIII of *apella* in Schreber, "Die Säugethiere," is a reproduction of that of Linnaeus (1754). But the artist has taken extraordinary liberties in the matter of color. Instead of "fuscous" the body is brown; besides "feet and tail black" the entire hind legs and hind quarters are so colored. In fact the coloration of the plate leads one to believe that Schreber's illustrator may have used one of the crested monkeys as a model. Even in his description he speaks of "a circle of black hair .... that makes a short beard under the chin and a toupee over the brow. . . ."

Erxleben, writing of "*apella*" (p. 50), offered merely citations from Linnaeus, 1754, 1758, 1766 and from Schreber. His remaining citations are from authors who used only non-technical names. He questioned whether "*apella*" was separable from *capucinus*.

Both Schreber and Erxleben set up classifications of the primates. But since *Cebus* had not been proposed when Schreber wrote he cannot be said to have revised it. Erxleben's concept of *Cebus* included South American monkeys of the genera *Alouatta*, *Ateles*, *Saimiri*, and in addition four species of *Cebus* (*s.s.*): *capucinus*, *apella*, *trepidus* and *fatuellus*. That concept was narrowed by the successive separation of the above-named genera.

As Cabrera has pointed out (p. 227) the forms *apiculatus* (R. Caura), *brunneus* (coast ranges of Caribbean) and *olivaceus* (Mt. Roraima) are conspecific. In none of the three are the tail, hands and feet truly black, though they become rather darker than the general body color. To the above names may be added *griseus* Desmarest; and not improbably *malitiosus* (Santa Marta) belongs with this group. All of these monkeys are without head tufts, have yellowish or straw-color on the upper arm and the tail slightly to moderately darker than the body color. They would fall under the name *griseus* if *apella* were not applicable to them.

Possibly their names should be written:

C. apella apella	
C. a. olivaceus	Mt. Roraima
C. a. apiculatus	R. Caura
C. a. brunneus	Northern Venezuela
C. a. malitiosus	Santa Marta
C. aequatorialis	Western Ecuador

A second group of uncrested *Cebus* monkeys, which border upon the southern edge of the Guiana region, includes *albifrons*, *gracilis*, *leucocephalus*, *versicolor*, *unicolor*, *flavus*, *castaneus*, *variegatus* ?, *xanthosternos*, *robustus*, *cuscinus*. All have the body color some shade of rather clear brown, the limbs and underparts becoming orange-brown, the crown darkening to Bone Brown or Warm Sepia.

They are essentially Amazonian in distribution.

The third uncrested group is the Central American division, which includes *nigripectus* and *chrysopus* of Colombia.

The last group of *Cebus* monkeys represented in the Guiana area is the crested group, which like the light brown uncrested group seems to reach only the southern edge of the region.

To this group belong:

nigrivittatus Wagner	Upper R. Branco
fatuellus Linnaeus	?
peruanus Thomas	Marcapata, Mambari, Peru
macrocephalus Spix	Lake Cactua, R. Solimoes
crassiceps Pucheran	?
The black-crested *Cebus* of French Guiana	
A number of forms from south of the Amazon	

All are probably best treated as subspecies of *fatuellus* Linnaeus, whose type locality has never been restricted.

If the characters of the dentitions are compared for the groups *capucinus*, *olivaceus* and *albifrons*, the black-backed, brownish-gray-backed and clear-brown-backed *Cebus* monkeys, respectively, of Central America, the Guiana area and the Amazonian region, the following points can be observed:

1.—The toothrows c–m^3 in the first two range from 27 to 30 mm.; but in *albifrons* are 27 mm. or less.

2.—The antero-posterior length of the premolars in *olivaceus* in relation to the molars is proportionally greater than in *capucinus* and *albifrons*.

3.—The width of m^3 in *capucinus* (±4.9 mm.) exceeds the corresponding dimensions in *olivaceus* and *albifrons* (3.7–4.5 mm.).

There is little doubt that a detailed and careful analysis of the teeth and skulls of *Cebus* would go far toward clearing up the present confused state of the classification, which hitherto seems based entirely upon the head tufts and color patterns.

In juvenal specimens the milk teeth are much smaller than the permanent teeth and p^4 is molariform. The change to permanent premolars is completed at about the time of eruption of m^1.

Cebus fatuellus (Linnaeus)

Simia fatuellus LINNAEUS, 1766, Syst. Nat., 12th Ed., p. 42.

The Linnaean description of this crested *Cebus* is founded wholly upon Brisson's[1] "Sapajou cornu," which, as indicated by the paired asterisks, Brisson described from an actual specimen. If, as seems possible, the black-crowned Cebi, with or without crests, are really conspecific, all of the named forms will come under the species *fatuellus* either as races or as synonyms.

The place of origin of *fatuellus* is unknown. But it has become customary for authors to assign the geographical area of the upper Magdalena valley with Tolima as the region of distribution for *fatuellus*, and in default of evidence to the contrary, restriction of the type locality to the forests of that region "from 5000 to 7000 feet" (Elliot) should apply.

The races of crested *Cebus* adjoining or in Guiana are few. The name *trepidus* may be applied to the form from French and Dutch Guiana. Elliot (II, p. 67) claimed it unidentifiable. But in point of fact it is well founded. *Trepidus* Linnaeus, 1766, Syst. Nat., 12th Ed., p. 39, was based upon "The Bush-tailed Monkeys" of George Edwards, 1764, Gleanings of Natural History, Part III, p. 222, Plate 312. Edwards' animal is unmistakably a black-crowned brown-bodied *Cebus*. Edwards stated it was captured from an enemy ship in the West Indies and was reported to come from Surinam. It was a juvenal male ("size of a half-grown cat"). Linnaeus, not Edwards, mentioned its head crests.

Trepidus Linnaeus then may be applied by restriction of type locality to Surinam to the black-crowned monkeys of eastern Guianas. We have a skull without skin from Cayenne whose structure is that of a crested *Cebus*.

It seems probable that *macrocephalus* Spix, 1823, and *crassiceps* Pucheran apply to the same race. The descriptions are similar. *Macrocephalus* from Lake Cactua, near R. Solimoes, extends north to the Rio

[1] Brisson, 1756, Le Regne Animal, Paris, No. 3, p. 195.

Negro and westward into Ecuador. We have two young specimens from near San Fernando de Atabapo, R. Orinoco. Our series from Faro, near Obidos on the north side of the Amazon, may perhaps be referred to *trepidus*. But it is open to question whether the Surinam race is separable from *macrocephalus*. In case of identity, the whole of the *fatuellus* monkeys reaching from Dutch and French Guiana along the south side of the Guiana highlands to the R. Negro basin and thence northward would bear the name *trepidus*.

An abundance of names is available for the black-crowned forms from south of the Amazon: *azarae, libidinosus, versuta, cirrhifer, cristatus*, etc.

Cebus fatuellus trepidus (Linnaeus)

Simia trepida LINNAEUS, 1766, Syst. Nat., 12th Ed., p. 39.

TYPE LOCALITY (restricted).—Surinam.

MATERIAL.—French Guiana, one adult skull without skin; Faro, R. Jamunda, north bank of R. Amazon, a series.

Cebus fatuellus macrocephalus Spix

Cebus macrocephalus SPIX, 1823, Simiarum Vesp., pp. 3–4, Pl. 1.

Cebus crassiceps PUCHERAN, 1857, Revue Zool., p. 343.

TYPE LOCALITIES.—(*Macrocephalus*) Lake Cactua, R. Solimoes; (*crassiceps*), unknown to describer, but Elliot writes "Rio Negro."

MATERIAL.—From Guiana area, a small series from Rio Negro and two juvenals from near San Fernando de Atabapo, R. Orinoco. Also ample material from eastern Ecuador.

Cebus apella (Linnaeus)

(References to literature under subspecies)

Probably the best way to consider *apella* of British Guiana and its nearest allies (listed earlier) is as slightly variant races of a single species. Their general uniformity of structure and color is unquestionable. *Apella, olivaceus* and *apiculatus* with their representative from Mt. Duida are almost inseparable. *Brunneus* from the forest west of Caracas is chiefly distinguished by its longer pelage. *Malitiosus* of Santa Marta is probably at best another subspecies closely allied to *brunneus*. The coastal species *aequatorialis* may be annectent between *apella* and the *albifrons* groups from west and south of the Amazon.

Cebus apella apella (Linnaeus)

Simia apella LINNAEUS, 1758, Syst. Nat., 10th Ed., p. 28.

Cebus griseus DESMAREST, 1820, Mamm., p. 81.

TYPE LOCALITY.—Unknown. But if *apella* is admitted as the common gray-brown, uncrested *Cebus* of the British Guiana, the type locality may be so restricted.

MATERIAL.—Ample series, chiefly collected by Dr. W. Beebe at Kartabo.

Cebus apella olivaceus Schomburgk

Cebus olivaceus SCHOMBURGK, 1848, Reisen in Britisch Guiana, III, p. 767.

TYPE LOCALITY.—Mt. Roraima.

MATERIAL.—A young topotype.

Cebus apella apiculatus Elliot

Cebus apiculatus ELLIOT, 1907, Ann. Mag. Nat. Hist., (6) XX, p. 292.

TYPE LOCALITY.—La Union, R. Caura, R. Orinoco.

MATERIAL.—Ample series of specimens collected by Klages and by Carriker near the mouth of the Caura; a large number of specimens from the Mt. Duida region taken by the Tyler Duida expedition; a small series from Mt. Auyan-tepui, middle R. Caroni.

Cebus albifrons (Humboldt)

Simia albifrons HUMBOLDT (1811), 1812, Receuil d'Observations . . . . , pp. 323–325, 356.

Cebus flavus E. GEOFFROY, 1812, Annales du Museum d'Hist. Nat. Paris, XIX, p. 112.

TYPE LOCALITIES.—Maipures and Atures Rapid, R. Orinoco (*albifrons*); "le Brèsil" (*flavus*).

MATERIAL.—From Guiana area: a series from Cassiquiare and R. Negro.

It seems that to the foregoing pale brown *Cebus* monkeys we may add a host of names, probably conspecific, though representing in some cases geographical races: *unicolor* Spix and *gracilis* Spix, both from

Teffé; *castaneus* I. Geoffroy, 1851, from Cayenne; *xanthosternos* Kuhl and *robustus* Kuhl, 1820; *barbatus*, *variegatus* and *albus*, all of Geoffroy, 1812; *versicolor* Pucheran; *leucocephalus* Blainville; and finally *cuscinus* Thomas from southern Peru.

Flavia Schreber, 1775 (Pl. XXXI B), is not certainly identifiable as *Cebus*.

Apparently this pale-brown group has its headquarters in the region of the upper Amazon and Rio Negro, whence it reaches north to Maipures (*albifrons*) east to Cayenne (*castaneus*) and southwest to Peru and Bolivia.

LAGOTHRIX E. GEOFFROY ST. HILAIRE

Lagothrix E. GEOFFROY ST. HILAIRE, 1812, Ann. Mus. d' Hist. Nat. Paris, XIX, p. 107.

GENOTYPE.—*Lagothrix cana* E. Geoffroy St. Hilaire.

It is with some doubt that I include *Lagothrix* in a paper on the Guiana region. But the Guaviare R. is so near the western part of our area that there is considerable likelihood *L. lagotricha* may be discovered in Guiana.

The skulls of the woolly monkeys are very similar to one another. The most easily recognized is that of the recently described *hendeei* of Peru. In it the maxillary root of zygoma is approximately twice as deep as the squamosal root (6:3 mm.), and a well-developed descending process is present, as in the brown *infumata*. Zygomatic arches widely flaring and temporal fossa short and wide; a strongly developed foramen behind m^3 at root of pterygoid; bullae very low, flat and descending but little below the basi-occipital.

Infumata (the brown *Lagothrix*) has the skull with the roots of the zygoma subequal in depth (5:4 mm.). The descending process is only incipient. The flare of the arches is nearly as great as in *hendeei*. The posterior palatal foramina lie between m^{3-3} or m^{2-2}. The bullae are rather well developed and 14 to 15 mm. broad. The braincase is much wider than that of *hendeei* (60:54 mm.). In both *infumata* and *hendeei* the crowns of m^3 and m^2 are subequal. *Infumata* is apparently nearly related to *ubericola*, *thomasi* and *caroarensis*. The skull of *L. lugens* of Tolima, Huila, and the northern parts of the east slopes of the Colombian eastern Andes (near Villavicencio) has relatively delicate zygomata (depth, 3 to 4 mm.) which are much less expanded than those of *infumata;* middle incisors large (width of crowns, 5 mm.); m^3 considerably smaller than m^2; skins dark, grizzled gray with head and underparts darker.

Lagothricha, present from the Caquetá to the Uaupes, has the zygoma, particularly its middle, as heavy or heavier than that of *infumata*. M^3 is proportionally smaller than m^2, as in *lugens*. The skin is readily recognized from the fact that the head is not darker than the body (Elliot calls the head black, p. 57) and that from neck to mid-back the color is very pale, near Light Drab.

The woolly monkeys, *cana*, typical for the genus, from the Madeira and Villa Bella de Imperatriz (we have none from farther east), have the zygoma deep (6 to 6.5 mm.) and only moderately arched; and the bulla extending slightly (3 to 4 mm.) below the quite broad basi-occipital. They resemble the *infumata* group in having the crown of m^3 equal in area to that of m^2. The skins are a rather clear gray, with the head and underparts fuscous. Some trace of a brownish base appears in the gray-tipped hairs of the thighs and at the base of the tail.

Lagothrix lagotricha (Humboldt)

Simia lagotricha HUMBOLDT, 1812, Receuil Observ. Zool., pp. 322, 354.

TYPE LOCALITY.—Guaviare R., tributary of the Orinoco R., Colombia.

Although we observed no specimen of these monkeys in the Duida region the Guaviare is so near that it seems probable that *lagotricha* will ultimately be discovered in our area.

ATELES E. GEOFFROY[1]

Ateles E. GEOFFROY, 1806, Ann. Mus. Hist. Nat. Paris, VII, pp. 262–269.

Ateleus ELLIOT, 1913, Review of the Primates II, emendation.

GENOTYPE.—*Simia paniscus* Linnaeus.

The spider monkeys are referable to some half dozen groups, distinguishable from

[1] On "Official List," Opinion 91, International Commission Zoological Nomenclature.

one another by various minor anatomical characters independent of the color of the skins. In the typical group *paniscus* Linnaeus (*pentadactylus* Geoffroy) the thumb in reduced condition is retained. Elliot believed that the presence or absence of the thumb was not of taxonomic significance but I find supporting characters in the skulls and teeth.

All three of our specimens from R. Jamunda (north bank of the R. Amazon, near Obidos) possess thumbs. Not a single individual of our large series of black spider monkeys from eastern Peru (representing *S. chamak*) retains the thumb. None of the remaining species possesses any trace of thumb. The skull of *paniscus* (♀)[1] has a full braincase (width 58 to 61 mm.); moderate outer width across orbits (62 to 68 mm.); malar foramen 3 to 3.7 mm.; small, triangular pterygoids without pointed tips; small post-glenoid process, ligulate to triangular in shape (5 mm. deep by 5 mm. wide at base); zygoma unexpanded, of nearly uniform depth (6.7 mm.); teeth relatively narrow (p^2, length 4 mm., width 4.8 mm.); m^3 oval in outline (length 3 mm., width 5 mm.).

Other black spider monkeys are *dariensis* of Panama; *robustus* and *fusciceps* of southeast Colombia and of Ecuador, respectively; *chamek* of eastern Peru; the white-browed *marginatus* of the Tapajoz; and *longimembris* from Baron Malgaço, Central Brazil.

Robustus and *fusciceps* are large monkeys with braincases 59 to 62 mm. wide; orbits 61 to 67 mm. across the outer width; pterygoids pointed to slightly falcate; and zygomata well expanded. The teeth are considerably larger than those of *paniscus:* p^2, 3.8 × 5.4; m^3, 4.2 × 5.8.

Dariensis agrees with *robustus* in the arching of the zygomata and the characters of the pterygoids. In it p^2 is narrower (4.8 mm.).

The skull of the black species from Peru, *chamek* Humboldt, resembles that of *paniscus* more closely than it does the forms from west and north of the Andes. It is distinguishable by its wider premolars (p^2, 5 mm.) and narrower m^3 (4.2); also its zygoma is relatively weak (depth, 4 to 4.5 mm.).

Allen's species *longimembris* is a black spider monkey that differs in a number of respects from any of the foregoing. The frons is very prominent. The squamosal and mastoid widths of the skull are reduced. The malar foramen is enlarged to 6 mm. diameter, and the teeth are very large in proportion to those of other species (p^2, 4.6 × 5.8; m^3, 3.4 × 4.8; m^1, 5.6 × 6.9). The species is aberrant.

The remaining black species, *marginatus*, is very distinct. In it the malar foramen is much reduced, the frons is high and rounded, and the teeth about as large as those of *robustus* (p^2, 4.3 × 5.3; m^3, 3.3 × 5.2). The zygomatic process of the squamosal has a distinct ascending process. This feature is also somewhat developed in the Peruvian *chamek*.

The remaining species of spider monkeys are *belzebuth* Geoffroy of which *variegatus* Wagner can at best be considered only a race. *Belzebuth* has black upperparts and yellowish or straw-colored underparts, the limbs straw-colored with strong admixture of blackish hairs. The skull can be recognized by the near-obsolescence of the malar foramen, the small, ligulate post-glenoid process (6.5 mm. deep × 3.7 mm. wide at base), and by the shallowness of the zygomatic process of the squamosal. The teeth are larger than those of *paniscus*, except m^3, which is rounder and narrower (3.7 × 4.5 mm.).

The Mexican division of *Ateles*, which has the color of the lower back more or less straw-colored (*pan, tricolor*), is easily recognized also by the proportional narrowness of the braincase (56 mm.), the increase of the external orbital width and the combination of widely flaring zygomata (with distinct upward arch, seen from the side) and short temporal fossa. The teeth of *pan* are slightly smaller than those of *robustus*.

From Honduras and Nicaragua, the locality for the brown-backed *geoffroyi* monkey, which according to Elliot "varies greatly," skulls apparently representing

[1] Because of lack of males of the type species of *Ateles*, comparisons throughout the ensuing discussion have been based upon female individuals.

more than one species occur in our collections. Most have flaring zygomata like *pan*, but A.M. 28495 from Matagalpa (and probably others) has unexpanded zygomata and small, ligulate processes similar to those of the black *paniscus*. This group needs careful analysis.

The status of *rufiventris*, *grisescens* and *cucullatus* must remain undiscussed for purposes of this paper. The description of *hybridus*, if the assumed locality be ignored (Plée collected it), appears substantially that of a faded *marginatus*.

From the analysis of the genus *Ateles* just completed it is seen that two full species or three, depending upon whether *ater* and *paniscus* are really distinct, occur in the Guiana region. The third species is *belzebuth* with *variegatus* either a synonym or a subspecies. The black forms occur east and southeast, as far south as the north bank of the lower Amazon, those with straw-colored underparts inhabit the Caura-Duida portion of Guiana and extend westward to the foothills of the Andes of southern Colombia, Ecuador and northern Peru. No spider monkeys were seen at Auyan-tepui, nor did the Arecuna Indians seem to know what they were.

Ateles paniscus (Linnaeus)

Simia paniscus LINNAEUS, 1758, Syst. Nat., 10th Ed., p. 26.

Ateles pentadactylus E. GEOFFROY, 1806, Ann. Mus. d'Hist. Nat. Paris, VII, p. 269.

TYPE LOCALITY.—"Brasilia" (*paniscus*).

MATERIAL.—R. Jamunda, north bank of R. Amazon (3 females).

Ateles ater F. Cuvier

Ateles ater F. CUVIER, 1823, Hist. Nat. Mamm., I, livr. XXXIV.

TYPE LOCALITY.—Cayenne, French Guiana.

MATERIAL.—None. Dr. W. Beebe informs me that once he observed a small troup of black spider monkeys on the eastern side of the Essequibo River, British Guiana.

Elliot credits "*ater*" with an enormous geographical range: "Panama [*dariensis*]; French Guiana; Rio Sina Cereté, Bolivar, Colombia; and eastern Peru [*chamek*]. I doubt the subspecific identity of the Panamanian, Peruvian and Cayenne black, thumbless spider monkeys. Hence my restriction of the name *ater* to those of British and French Guiana.

Ateles belzebuth E. Geoffroy

Ateles belzebuth E. GEOFFROY, 1806, Ann. Mus. d'Hist. Nat. Paris, VII, p. 272.

Ateles variegatus WAGNER, 1840, Schreber's Säugethiere, Suppl., I, p. 313; 1855, Schreber's Säugethiere, Suppl., V, p. 78.

Ateles vellerosus GRAY, 1865, Proc. Zool. Soc. London, p. 733.

TYPE LOCALITIES.—Banks of the Orinoco (*belzebuth*); "aus den nordwestlichen Theilen" of Natterer's voyages (*variegatus*); "Brazil ?" (*vellerosus*).

The geographical range of this spider monkey with buffy underparts fills the relatively enormous area reaching from the foothills of the Andes of south Colombia, Ecuador and north Peru, across to Mt. Duida, down the right bank of the Orinoco to Caura Valley, and down the Amazon at least to Punto Indiana. The natives about Mt. Auyan-tepui seemed to recognize the name "marimonda" but claimed it did not occur there.

The species exhibits great uniformity of color and structure throughout its area of distribution.

ALOUATTA LACÉPÈDE

Alouatta LACÉPÈDE, 1799, Tabl. Div., Sousdiv., Ordres et Genres des Mamm., p. 4.

GENOTYPE.—*Simia beelzebul* Linnaeus.

A study of the skulls of the monkeys of this genus reveals certain small though perfectly definite characters in the bones and teeth that allow of segregation of the "species" into several distinct groups. A synopsis of those groups with their characteristics follows.

ALOUATTA GROUPS

1.—CENTRAL AMERICAN GRAY HOWLERS: Small species with wide zygomata (80 per cent of condylo-basal length); large, wing-like pterygoids; malar foramen minute (2.5 mm.); lacrymal foramen large (2.8 mm.); post-glenoid processes small and triangular; descending portion of maxillary process of zygoma pronounced; sphenoidal fissure (between orbit and ectopterygoid region) elongate (10 mm.) and well opened; incisors but little spaced out

(outer width i^{2-2}, 16 mm.); p^4 decidedly wider than p^2 (7.3 or more: 6.8 or less); m^3 but little smaller than m^1 (4.9 or more × 7.8 or more: 7.6 or less × 8.7 or less). Color of skin grayish to blackish.

2.—SOUTH AMERICAN RED HOWLERS:

Medium-sized species with unwidened zygomata (70 per cent of condylo-basal length); pterygoids large and wing-like as in *palliata* group; malar foramen large (7 to 8 mm.); lacrymal foramen as in *palliata;* post-glenoid process moderately large, ligulate; descending part of zygoma accentuated; sphenoidal fissures obsolete; incisors moderately spaced (outer width, i^{2-2}, 17.5 mm.); p^4 little wider than p^2 (6.8 to 7.6:5.8 to 6.8 mm.); m^3 distinctly smaller than m^1 (5.5 or more × 7.7 or more:7.6 or less × 8.5 or less). Color of hair orange-yellow to rufous.

3.—LARGE BLACK HOWLERS FROM SOUTH OF AMAZONIA:

Large species with unwidened zygomata (68 per cent of condylo-basal length); pterygoids large and wing-like; malar foramen moderate (5 mm.); lacrymal foramen small (2 to 2.5 mm.); post-glenoid process medium, moderately developed, in size and shape between those of *palliata* and *senicula* groups; descending part of zygoma (below orbit) undeveloped, zygoma shallow in comparison with *palliata* and *senicula* (9 mm. : 12.5, 14 mm.); sphenoidal fissure obsolescent, though not quite closed; incisors widely spaced in pmx (outer width i^{2-2}, 17 to 18 mm.); p^4 much wider than p^2 (8.0:7.0); m^3 distinctly smaller than m^1 (5.5 or more × 7.1 or more : 8.0 or less × 9.2 or less). Color of skin all black.

4.—BLACK HOWLERS WITH RUFOUS (NEAR CLARET BROWN) FEET, SIDES AND RUMP (Tapajoz River and eastward):

Medium-sized species with strongly widened zygomata (78 per cent of condylo-basal length); pterygoids small, subtriangular; malar foramen medium (4 mm.); post-glenoid process small, subtriangular; descending part of zygoma undeveloped; zygoma shallow (10 mm.); sphenoidal fissure nearly obsolete; incisors unspaced, closely pinched together (i^{2-2}, 14 mm.); p^4 much wider than p^2 (6.8 to 7.2:5.8 to 6.1); m^3 distinctly smaller than m^1 (4.8 or more × 7.1 or more:7.6 or less × 8.2 or less). Color of skin black, with rufous as stated above.

The four major categories just outlined may not include all branches of the genus *Alouatta.* From Paraguay and east Brazil there exist (*fide* Elliot) the sexually dichromatic species *caraya* and *ululata.* But further discussion of the genus is really beyond the scope of the present paper.

In the Guiana region only the red group seems to be represented. That group which extends from the Caura River and Santa Marta east and southeast to Trinidad, the Guianas, the north banks of the Amazon, and south along the foot of the Andes to Peru and Bolivia includes many named forms. There is also a group of reddish howlers in Espiritu Santo and Paraná (see Elliot, p. 275).

In South America, north of the Amazonian latitudes, a large number of names have been applied to red howling monkeys. In Colombia west of the Andes (and in the inter-Andean valleys) the following names have been proposed:

seniculus	from	"Cartagena"
rubecunda	"	Santa Marta (Bonda)
bogotensis	"	Cundinamarca (Subia)
caucensis	"	Upper Cauca Valley (Charingo)

In addition, *laniger* Gray from "Colombia" and *chrysurus* I. Geoffroy from "Spanish Guiana or Colombia" were disposed of by Elliot by placing both in the synonymy of *seniculus,* where perhaps they ought to remain.

For red howler monkeys from west of the Colombian Andes some five names are available, namely:

caquetensis	from	Caquetá (La Murelia)
stramineus	"	"Gran Para"
macconnelli	"	The coast of Demarara
ursina	"	Sucre (Mountains of Cocollar)
insulanus	"	Trinidad

On the basis of the exceptional broadening of the zygoma and the maximum enlargement of the malar foramen, the red howlers of the Cumaná region (*ursina*) appear closely related, if not identical to some from Bonda, Santa Marta, Colombia (*rubicunda*). On the other hand, the skulls of red howlers from Auyan-tepui, Duida (*stramineus ?*), the Caquetá region (*caquetensis*), and even *caucensis* and *bogotensis* from west of the eastern Colombian Andes agree with one another in possessing zygomata vertically reduced and small malar foramina. Specimens of *macconnelli* (Guiana coastal strip) have the vertically widened zygoma of *ursina* and the reduced malar foramen of *caquetensis,* etc.

Southward, *caquetensis* is successively represented by *flavicauda* of Jaen, Peru, *sara* of eastern Bolivia and several red howlers distinguished by technical names in various parts of "Brazil."

Our Guiana highlands monkeys must be referred apparently to a single form (*caque-*

tensis-stramineus) which extends eastward through the forests north of the highlands to the Mazaruni River, and possibly also along their southern side to the Branco. In the lowlands of British Guiana, southeast and south to the Amazon the doubtfully separable *macconnelli* occurs.

Alouatta senicula (Linnaeus)

Alouatta senicula stramineus (Geoffroy)

Stentor stramineus E. Geoffroy, 1812, Ann. Mus. d'Hist. Nat. Paris, XIX, p. 108.

Alouatta seniculus caquetensis J. A. Allen, 1914, Bull. Amer. Mus. Nat Hist., XXXIII, p. 650.

Type Localities.—Gran Para, middle Orinoco R. (*stramineus*); La Murelia, Caquetá district, eastern foot of Colombian Andes (*caquetensis*).

Material.—Mt. Duida area (9); Rio Caura area (2); Caquetá (2); Auyantepui area (5).

Alouatta senicula macconnelli Elliot

Alouatta macconnelli Elliot, 1910, Ann. Mag. Nat. Hist., (8) V, p. 80.

Type Locality.—"Coast of Demarara."

Material.—A considerable series, chiefly collected by W. Beebe in the neighborhood of Kartabo.

Elliot compared *macconnelli* with "*seniculus*," which in his monograph he gave a range of "Colombia, and forest between the Rio Negro and Solimoes. . . . Rio Madeira . . . . Brazil." In my view *seniculus* should be restricted in application to those red howlers occurring in Colombia north of the Andes, whose skulls are recognizably distinct from those of the Caquetá-Guiana area.

Saimiri Voigt

Saimiri Voigt, 1831, Cuvier's Thierreich, I, p. 95.

Genotype.—*Simia sciurea* Linnaeus.

Two obvious types of skin coloration occur in the genus *Saimiri:* squirrel monkeys with the crown of the head colored black, and squirrel monkeys with the crown of the head approximately like the back. In the former group are included *oerstedi* (Chiriqui), *citrinellus* (Costa Rica), *nigripes* (Peru) and *boliviensis* (Bolivia); in the latter, all other species.

Like those of *Aotus* the skulls in *Saimiri* present a very great degree of uniformity over its range which extends from Nicaragua to Bolivia and Paraguay.

Oerstedi, with *citrinellus*, is distinguishable by the position of the malar foramen, which is much nearer the outer flange of the orbital ring than it is to the maxillo-malar suture; development of a relatively large posterior palatal flange; shortened and broadened zygomatic arch and temporal fossa (in adults); moderately deep zygoma (2.6 mm.); and narrow molar teeth (width m^1, 3.7 mm.).

The skulls of the black-capped *boliviensis* and *nigripes* can be recognized by the greater degree of inflation of the braincase; narrowed inter-orbital region (less than 2.5 mm.); wide first upper incisors (crown i^1, 3.1 mm.); and wide molars (width m^1, 4 mm.).

In *sciureus* and allies the skull can be distinguished from that of the *oerstedi* group by the simpler construction of the posterior palate: the normal position of the malar foramen; the weaker zygomata which even in adults are far less expanded at the squamosal process. The molars, too, are of moderate width (width m^1, 3.7); the incisors small (width of first upper incisors 2.6 mm.).

To the *sciureus* group, which alone occurs in Guiana, must be referred *cassiquiarensis* (Cassiquiare Canal), *macrodon* (eastern Ecuador), *madeirae* (R. Madeira) and *ustus* (Peru).

It appears necessary to restrict the type locality of *sciureus* from the distributional range given by Elliot (1913, Review of the Primates, I, p. 310). If not previously restricted, I propose that the type locality of *sciureus* be limited to Kartabo, British Guiana. With this restriction accomplished it is possible to discuss the two named forms in Guiana, *sciureus* and *cassiquiarensis*.

Elliot distinguishes *cassiquiarensis* from *sciureus* by a "black curved line in front of ears." This feature appears to be merely a slight downward extension of the lateral crown coloration. A black streak occurs on either side of the olive-colored crown, extending from the upper part of the sides of

the neck forward above the ears and ends in a slight downward branch in front of the ears. I have found this character in specimens from British Guiana, Cassiquiare, Tapajoz and Madeira. In all of the nine specimens showing it the sex was female. I suggest, therefore, that the character is sex-linked and worthless for taxonomic purposes.

The skulls of Cassiquiare specimens have rather heavier zygomata, less inflated braincase, and less prominent post palatal spine than in *sciureus*.

Saimiri sciureus (Linnaeus)

(Reference under subspecies)

Saimiri sciureus sciureus (Linnaeus)

Simia sciureus LINNAEUS, 1758, Syst. Nat., 10th Ed., p. 19.

TYPE LOCALITY.—"India," an obvious error. The range indicated by Elliot is here restricted to limit the type locality to British Guiana.

MATERIAL.—Several specimens from Kartabo, British Guiana.

Saimiri sciureus cassiquiarensis (Humboldt)

Chrysothrix sciureus cassiquiarensis HUMBOLDT, 1812, Receuil Observ. Zool., p 334.

TYPE LOCALITY.—Cassiquiare Canal.

MATERIAL.—A good series of topotypes.

CALLICEBUS THOMAS

Callicebus THOMAS, 1903, Ann. Mag. Nat. Hist., (7) XII, pp. 456–457.

GENOTYPE.—*Callithrix personatus* Geoffroy.

The monkeys of this genus, which before 1903 merely formed part of the polymorphic "*Callithrix*," have become highly diversified as regards color, while maintaining a high degree of uniformity in the form of the skull and teeth. Certain major divisions, which I think represent species, can be segregated on the basis of cranial characters and on certain definite types of color pattern, rather than color shade.

1.—Malar foramen large (1.5 mm.); maxilla providing a large (50 per cent) proportion of the descending process of the zygoma; the ascending portion of the squamosal root of zygoma nearly obsolete; outer half of audital bulla very deep, much compressed laterally, and developed into a crest-like process behind. Basioccipital between bullae relatively wide (5 mm.).

The color pattern of the skins in monkeys of this group is distinguishable by the buffy-white of the hands and the white pectoral patch. The dorsal color in the northwest of the range (*lugens* of upper Orinoco) is black, tail black or reddish black, without pale tip. The representative in north Peru is reddish black, and specimens from Teffe appear dull dark reddish. *Torquatus* Hoffmansegg, from "o Certao, inner Para," was an ally of *lugens*, but with a chestnut suffusion over the upper parts and proximal portion of limbs and tail. The underparts were colored russet.

Lugens was placed by Elliot in the synonymy of *torquatus* Hoffmannsegg. It is better recognized as a geographical race of the latter.

Other named forms referable to this group are *duida* (Mt. Duida), *amictus* (Solimoes), *lucifer* (Loreto, E. Peru), *ignitus* (Tonantins), *purinus* (Purus), *regulus* (Upper Solimoes).

2.—Malar foramen usually minute (exceptionally, as large as in *lugens* group); maxilla providing only a small (one-third or less) anterior part of the descending process of the zygoma; ascending portion of squamosal root of zygoma forming an obvious eminence upon the deep (3–4.5 mm.) zygoma, located above the squamosal-malar suture; bulla only moderately deepened along outer margin, cresting only incipient, the portion of bulla beneath eustachian canal somewhat enlarged; basioccipial between the bullae narrower (4–4.5 mm.).

Pattern in this group is distinct from that of the former in that the hands and forearms are never contrasting buffy and black. In *ornatus* from Colombia the hands are indeed whitish but the arms are rufous. In most members of the group there is considerable rufous on the limbs and underparts, while the body is gray or reddish gray, and the tails ashy with the subterminal band of each hair darker. From the Urubamba region these widow-monkeys

are much darker, having blackish hands, head, feet and tail, though the tip of the tail is yet ashy. At the northern limit of the group, the Colombian *ornatus* has a white band across the brow.

Other members of this group are *cupreus* (Ucayali), which is one of the red forms, *caligatus* (Madeira), *ustofuscus* (Brazil).

3.—From eastern and southern Brazil and across to Bolivia a third division appears separable. There is some shortening of the anterior part of the palate and of the rostrum, indicated by the infra-orbital foramen lying above p^2 instead of above p^3; the bullae are still less deepened and without crests, though the infra-eustachian portion is still enlarged; the teeth are smaller and the toothrow considerably shorter.

A skull of a female (No. M-9) collected by Mr. Gilmore in Minas Geraes, Brazil, has similarly shortened rostrum, but the bullae a little deeper and the infra-orbital foramen represented by several small pores.

Skins from Bolivia and Paraguay have whitish-gray forearms and hands, gray or brownish-gray backs, light rusty red or yellowish underparts and dark or light gray tails; those from southeastern Brazil have long gray body pelage, black hands, feet and face, and brownish-gray tail.

Of the three groups tentatively indicated, only the *lugens* group reached Guiana, and at that only the western part.

We now have an extensive series of true *lugens* from the Cassiquiare, whose range Humboldt gave as the Cassiquiare and Guaviare, as well as a number of specimens of *duida* from Duida. The color of hands, feet and throat patch, and the dorsal brownish clouding appear to be variables of insufficient value for the differentiation of *duida* as a race. I have no evidence of the occurrence of *lugens* in the Caura valley or east of the Parima Mountains.

Callicebus torquatus (Hoffmannsegg)

Callithrix torquata Hoffmannsegg, 1807, Gessellsch. Naturf. Freunde, Berlin, I, pp. 86–92 (Extra limital).

Callicebus torquatus lugens (Humboldt)

Simia (*Callithrix*) *lugens* Humboldt, 1812, Receuil Observ. Zool., p. 357.

Callicebus lugens duida Allen, 1914, Bull. Amer. Mus. Nat. Hist., XXXIII, p. 647.

Type Localities.—Guaviare, Cassiquiare and upper Orinoco (*lugens*); base of Duida (*duida*).

Material.—Ample series of topotypes from Duida and Cassiquiare Canal.

The *torquatus* group, the only division of *Callicebus* that shows any relationship with the Guiana area, reaches that region merely along its western and southwestern margin. The "viudita" was unknown to the Indians at Mt. Auyan-tepui.

Pithecia Desmarest[1]

Pithecia Desmarest, 1804, Nouv. Dict. d' Hist. Nat., XXIV, Tabl. Meth. Mamm., p. 8.
Genotype.—*Simia pithecia* Linnaeus.

There seem to be but four thoroughly distinct saki monkeys, namely, *pithecia*, *monacha*, *satanas* and *chiropotes*. The two former are distinguished by the relatively great lateral expansion of the nasals in relation to the distance apart of the canines, the massive character of the zygoma, the considerable degree of inflation of the bullae, and the narrowing of the anterior end of the mesopterygoid fossa. The latter species exhibit the converse of these characters. The two former have the hair whorl on the neck; the latter on top of the head. Indeed, the total differences may be considered by some of subgeneric value.

Of the remaining names recognized by Elliot, *capillimentosa* and *albicans* seem to be forms of *monacha*, *chrysocephala* to be a form of *pithecia*, and *albinasa* a form of *satanas*.

Since the appearance of Elliot's monograph, *milleri* J. A. Allen, *lotichiusi* Mertens and *napensis* Lönnberg have been described. All three are related closely to *monacha*.

The division of *Pithecia* with the broadened nasals appears to be the more specialized, if the type of rostrum prevalent among other Cebidae is considered.

The degree of similarity between the skulls of the south Amazonian *albinasa* and the north Amazonian *chiropotes* is remarkable, when the marked color differences are

[1] On "Official List," Opinion 122, International Commission Zoological Nomenclature.

considered. The skulls can, however, be separated by the relatively greater interorbital width in the former (6 mm.) and lesser in the latter (4.5 mm.). Both have full braincases (about 52 mm. in breadth) and tend to develop a sagittal crest.

The skulls of *monacha* and *pithecia* can be distinguished by the fact that the latter is larger, with large teeth (p^2–m^3, 18.4: 17.5); and that the ascending branch of its premaxilla is much broader (4 mm.: 2 mm.) and has a broader articulation with the nasal.

The species *pithecia*, *monacha* and *chiropotes* are present in or border upon the Guiana region.

Pithecia pithecia (Linnaeus)

(Reference under subspecies)

Pithecia pithecia pithecia (Linnaeus)

Simia pithecia LINNAEUS, 1766, Syst. Nat., 12th Ed., p. 40.

TYPE LOCALITY.—Guiana.

MATERIAL.—Kartabo, British Guiana (ample series).

Linnaeus founded *pithecia* solely upon "Le Sapajou à queue de Renard" Brisson, 1756, marked with the twin asterisks that denoted description from an actual specimen. This "fox-tailed" or white-headed saki appears to be a species characteristic of the Guiana region. Elliot gives a range representing the whole Guiana region east and south of the highlands.

Pithecia pithecia chrysocephala I. Geoffroy

Pithecia chrysocephala I. GEOFFROY, 1850, Comptes Rendus, p. 876.

TYPE LOCALITY.—"Banks of the Amazon."

MATERIAL.—A small series from Rio Negro.

The yellow-headed form of *Pithecia pithecia* appears to be only a local variant of the widely distributed species.

Pitheca monacha E. Geoffroy

(Reference under subspecies)

Pithecia monacha monacha E. Geoffroy

Pithecia monacha E. GEOFFROY, 1812, Ann. Mus. d'Hist. Nat., XIX, p. 116.

The distribution of this species covers practically the whole of the Amazonian basin. Several local forms have been named: *capillimentosa* (Cayenne), *milleri* (Caqueta), *albicans* (Teffe), *lotichiusi* (Middle Amazon), *napensis* (eastern Ecuador). The Guiana animals have the hands gray or blackish gray; those from south of the Amazon (e.g., R. Tapajoz) have white hands. *Milleri* is very close to the Guiana form, though somewhat darker.

There is no word in Geoffroy's description of *monacha* to indicate the color of the hands, which nevertheless Elliot describes as "yellowish white"—the color "roux-doré" is probably the result of discoloration of the original gray-white hair tips. In view of the uncertainty of the type locality, "le Bresil ?" it is desirable that it should be restricted. I propose its restriction to the Tapajoz River, where the *monacha* have white hands, keeping *capillimentosa* for the dark-handed *monacha* of the Guianas and northeast of the Amazon.

There appears to be distinct sexual dichromatism in *monacha:* Males are contrastingly gray or blackish and white, while females exhibit a rather dull grayish hue.

Pithecia monacha capillimentosa (Spix)

Pithecia capillimentosa SPIX, 1823, Sim. et Vesp., Brasil, p. 16, Pl. XI.

TYPE LOCALITY.—Cayenne.

MATERIAL.—British Guiana (series); R. Jamunda, north Bank of Amazon (1).

This is the northeastern race of *monacha* with dark gray hands. Its nearest ally seems to be *milleri*, of the Caquetá area of Colombia, which, however, has the hands much whiter.

Pithecia chiropotes (Humboldt)

Simia (Pithecia) chiropotes HUMBOLDT, 1812, Observ. Zool., pp. 311, 358.

TYPE LOCALITY.—Upper Orinoco, south of the cataracts.

MATERIAL.—Mt. Duida region (2); R. Jamunda, near Obidos (a good series).

The range of this species indicated by Elliot extends south to Peru and east (between the northern side of the Amazon and the Guiana highlands) to British Guiana.

AOTUS HUMBOLDT

Aotus HUMBOLDT, 1812, Receuil Observ. Zool. et Anat. Comp., I, pp. 306–311, Pl. XXVIII.

GENOTYPE.—*Simia trivirgata* Humboldt.

In spite of the numerous "species" attributed to this genus great anatomical uniformity prevails throughout. It is doubtful whether more than two or three valid species exist. In the Colombian highlands a type of pelage with very long lax fur occurs, which is in quite marked contrast to the pelage of *trivirgatus* from the Orinoco lowlands. But animals with rather similar long pelage reappear in Paraguay and south Brazil.

The skulls of Colombian mountain form *aversus* are contrasted in Table VIII with those of the species *trivirgatus* of the upper Orinoco River.

To the *aversus* division may be referred *lanius* (Central Andes), *griseimembra* (Santa Marta), *pervigilis* (Colombia), *zonalis* (Panama), *bipunctatus* (Panama) and *lemurinus* (Sta. Fé de Bogotá). The last mentioned is the oldest name.

The *trivirgatus* division includes *infulatus* (Pará), *nigripes* (Peru), *senex* (Peru), *vociferans* (Marañon), *oseryi* (Peru), *gularis* (Napo), *spixi* ("South America"), *miconax* (Peru) and *nigriceps* (Peru).

The relationships of the forms from the higher levels of the Andes in Peru may well be with the *lanius* group. We have no material to settle the point.

Microdon Dollman seems to be distinct. It may, however, be juvenal, with milk dentition.

The animals from Paraguay and southern Brazil may well constitute a distinct species. As mentioned above they have long pelage-like *lanius* of Colombia. There is some indication of enlargement of the interorbital area. In one specimen (A.M. 36978) the frontal sinus region is considerably inflated. The structure of palate and zygoma appear intermediate between those of *lanius* and *trivirgatus*. A certain degree of excision of the outer margin of the orbit appears at the point of entry of the maxillo-frontal suture.

The material from the Guiana region seems all to be referable to true *trivirgatus*.

Aotus trivirgatus (Humboldt)

Simia (*Aotus*) *trivirgatus* HUMBOLDT, 1812, Receuil Observ. Zool., p. 28.

TYPE LOCALITY.—Banks of R. Cassiquiare.

MATERIAL.—Several topotypes; also specimens from R. Negro and Duida Region; adequate series from British Guiana.

TAPIRIDAE

TAPIRUS BRISSON

Tapirus BRISSON, 1762, Regnum Animale, p. 81.

GENOTYPE.—*Tapirus tapirus* Brisson = *Hippopotamus terrestris* LINNAEUS (Palmer, 1904).

Type fixed by Merriam, 1895, Science, (N. S.) I. p. 376. But Brisson's specific names are disallowed, so Merriam's designation was valueless.

Tapirus terrestris (Linnaeus)

Tapirus terrestris LINNAEUS, 1758, Syst. Nat., 10th Ed., p. 74.

TYPE LOCALITY.—Brazil.

Based upon Marcgrave and Ray, "Animal dubium," "H. pedibus posticis trisulcis."

MATERIAL.—Mt. Duida (9 skulls); several specimens from British Guiana.

This morphologically stable species is rather common throughout the forested parts of the Guiana region. At night it emerges from the woods into the savannas where it makes characteristic tracks that

TABLE VIII

	aversus	*trivirgatus*
Back of palate	Sides combining with post-palatal spine to form an angular M-shaped pattern	Sides and post-palatal spine-forming a rounded M-pattern
Zygoma	weak and shallow (2.5 mm.)	strongly built and deep (3.5 mm.)
Pterygoid fossae	small (2 to 2.5 mm.)	Large (2.8 to 3.0 mm.)
Toothrow	slightly arched	nearly straight
m^1	small (3.3 × 3.7 mm.)	large (3.2 × 4.0 mm.)

in the course of years become deeply rutted and are frequently used by traveling Indians. At Mt. Auyan-tepui tapir tracks were abundant as high as 3500 feet. Probably they go higher when the terrain is suitable, for on the eastern slopes of the Andes near the Pastaza River I found tracks of tapir above 7000 feet.

TAGASSUIDAE

TAGASSU FRISCH

Tagassu FRISCH, 1775, Natur.-syst. vierfüss. Thiere, im Tabellen, III, Tab. gen.

GENOTYPE.—"Das amerikanische einzige Schwein-Geschlechte,"[1] or *Sus tajacu* Linnaeus, 1758.

Tayassu FISCHER, 1814, Zoognosia, III, pp. 284–289.

GENOTYPE.—Designed by Miller and Rehn[2] as "*Tayassu pecari* Fischer = *Sus albirostris* Illiger, 1815" and partly affirmed in Opinion 90 of the International Commission on Zoological Nomenclature. Fischer's description of *pecari* reads "T. corpore nigro, maxilla inferior alba" (White lipped).

Dicotyles Cuvier, 1816, Régne Animal, I, p. 237.

GENOTYPE.[3]—Species were *torquatus* (collared) and *labiatus* (White lipped). Designation of genotype apparently not made, except in application, see Opinion 90.

Olidosus MERRIAM, 1901, Proc. Biol. Soc. Wash., XIV, p. 120.

GENOTYPE.—"*Dicotyles albirostris* Illiger."

So long as one can regard the collared and white-lipped peccaries as congeneric, no trouble is caused by similarity of the names *Tagassu* and *Tayassu*. But if they are treated as genera or subgenera the slightly absurd condition becomes evident. Nor can *Tayassu* be disposed of by means of any rules on homonyms. The collared peccaries are *Tagassu* and the white-lipped peccaries *Tayassu*.

Tagassu tajacu (Linnaeus)

Sus tajacu LINNAEUS, 1758, Syst. Nat., 10th Ed., p. 50.

TYPE LOCALITY.—"Mexico, Panama, Brazil."

MATERIAL.—Mt. Duida area (3); Mt. Auyan-tepui (1).

Unlike the case in *T. pecari*, the large alisphenoid and postmaxillary swelling in the lower, anterior portion of the orbit apparently develops only in females. In males the cells are either undeveloped or limited to a small, ridged eminence along the surface of the alisphenoid bone. Being thus a secondary sexual character alisphenoid cells have no taxonomic value.

As regards possible races of the collared peccary in South America, I have been unable to separate skulls (of the same sex) taken in west Colombia, north Peru, the Tapajoz and Xingu Rivers, Matto Grosso from our specimens of Duida, Auyan-tepui, British Guiana (*macrocephalus*), Sucre and Trinidad. Even the Central American forms and the Mexican *angulatum* appear to me separable only with difficulty from the South American pigs. When misleading structures such as milk dentition and the above-mentioned alisphenoid cells are eliminated, little remains upon which to base the diagnoses of "species." Both *pecari* and *tajacu*, the white-lipped and collared peccaries, whether treated as genera, subgenera or only species must now be considered old, stable organisms of vast geographical range.

Tagassu pecari (Fischer)

Tayassu pecari FISCHER, 1814, Zoognosia, III, pp. 285–287.

TYPE LOCALITY.—"Austral America."

MATERIAL.—Mt. Auyan-tepui (7); British Guiana (the series of 10 or more representing *T. p. beebi* Anthony); mouth of Rio Uaupes (2). Also studied: material from Surinam, Colombia, Peru and Brazil.

The skulls of the type and several individuals of *beebi* differ from our material from Mt. Auyan-tepui in possessing considerably wider molars and larger premolars. But others from the same locality have teeth essentially similar. The material from south of the Amazon, and from the R. Uaupes has large teeth, while that from Colombia possesses teeth with characters essentially similar to our Auyantepui series.

The type locality ("South America") of

[1] Palmer, 1904, Index Generum Mammalium, p. 955, points out that this must have been *Sus tajacu* Linnaeus, 1758, Syst. Nat., 10th Ed., p. 50, with "fascia flava circum humores" and therefore a collared peccary. No white-lipped peccary had been described when Frisch wrote.

[2] Miller and Rehn, 1901, Proc. Boston Soc. Nat. Hist., XXX, pp. 12–13.

[3] Suspension of the "Rules," requested in favor of *Dicotyles*, was declined in Opinion 90 of the International Commission on Zoological Nomenclature.

Tagassu pecari (Fischer) has, so far as I can discover, not been restricted. Restriction to British Guiana, Surinam, Cayenne or eastern Brazil might easily put *beebi* in synonymy. Meanwhile for purposes of this paper we can state only that the white-lipped peccaries of the east and south of the Guiana region are chiefly large-toothed; those of the west and north (including Auyan-tepui) are essentially small-toothed.

CERVIDAE

In spite of many papers written on the subject of the deer of South America the status of some of these has remained confused. Part of this confusion lies in the lack of clear definition, apart from differences in the horns, to show the characters of *Odocoileus* and *Mazama*. Hornless members of these genera in the South American lowlands have been confused repeatedly. Thus, a "new subspecies," based upon a female, has even been placed in the wrong genus: the skull of *tumatumari* (♀, type) is not that of a *Mazama* but of *Odocoileus;* the skin carrying the same number, on the other hand, is a *Mazama* skin. The specimens were collected by Leo Miller. It is possible that the skull (of *Odocoileus*) and the skin (of *Mazama*) were mismatched before reaching Dr. J. A. Allen's[1] hands, but it is strange that, after distinguishing *Mazama* from *Odocoileus*, he should have included the skull of *tumatumari* with its inflated audital bullae and large teeth in the former genus. Specimens, other than the type, from the same locality are, in fact, referable to *Mazama*.

Allen distinguished small females of *Odocoileus* from females of large species of *Mazama* by (1) the form of the superior border of the orbits and (2) the form of the audital bullae. Besides those characters the following others, somewhat variable, may be cited: the proportionally large size of the facial pits which reduce the length of the lacrimo-frontal suture; the forward extension of the facial part of the malar bone between lacrymal and maxilla, which reduces the length of the maxillo-lacrimal suture (some *Mazama* show this character exceptionally, e.g., *trinitatis*); the relatively large size of the teeth of *Odocoileus* (smallest from Panama with m^{1-3}, 39.5), and small size in *Mazama* (largest from Trinidad with m^{1-3}, 40.0); the proportionally high condyle of the lower jaw and low coronoid process, $\frac{\text{angle to condyle}}{\text{angle to coronoid}}$ in *Odocoileus*, approximately 70 per cent, in *Mazama*, approximately 63 per cent; the proportionately widened lower second incisors of *Odocoileus*. The maximum toothrow measured in *Odocoileus* was m^{1-3}, 43.7; the minimum for *Mazama*, $m.^{1-3}$, 27.0. Thus overlap in the two sets of measurements occurs rarely.

In studying both *Odocoileus* and *Mazama* care must be taken to distinguish milk from permanent premolars. In upper milk premolars the crowns decrease in length from front to back; in the permanent teeth the reverse is the case, although p^3 and p^4 are sometimes about equal in length. This forms a useful basis for distinguishing the ages of specimens. The second upper milk premolar is usually shed last. The mp^3 is, like mp^2, narrower than long; mp^4, on the other hand, is more strongly molariform than p^4.

In *Odocoileus* there appear to be several fairly distinct divisions which may be typified as follows:

1.—*virginianus*	group	large forms
2.—*hemionus*	"	" "
3.—*peruvianus*	"	" "
4.—*gymnotis*	"	lesser forms
5.—*rothschildi*	"	small forms

In *gymnotis* (*sensu lato*) the strong supra-orbital development to be seen in *virginianus* and *peruvianus* is less developed, the full inflation of the bulla (and the form of the antlers in males) leaves no doubt of its generic position. *Gymnotis* with *rothschildi* should be regarded as less specialized, and *virginianus* and the high Andean deer *peruvianus* as more specialized types.

In the Guiana region none but the less specialized *gymnotis* and its allies occur. *Gymnotis, savannarum, tumatumari* (skull), *lasiotis* and *margaritae* are the named forms of deer which show geographical relationship to the area.

The skulls of the five animals above

[1] Allen, 1915, Bull. Amer. Mus. Nat. Hist., XXXIV, p. 531.

listed match one another perfectly in dentition, in the fact that the premaxilla does not reach the nasals, in the sutural relationships adjoining the lacrimal bone, and all other characters. The skins are all fawn-colored—not rufous. It seems probable that *gymnotis* should be applied to the *Odocoileus* of the entire llanos region, southward through the highland savannas of Guiana (I saw, but failed to secure, a fully antlered buck at Mt. Auyan-tepui, 3000 feet), to the Rio Branco savannas of northern Brazil, and Rupununi, and Kanuku savannas of British Guiana. If *savannarum* is a valid race, it will apply probably to the deer inhabiting the last-mentioned three areas. Thus the *Odocoileus* skull misnamed *Mazama a. tumatumari* ought to be referable to *savannarum* of the Rupununi (but in point of fact I cannot distinguish it from females from the lower Caura).

Margaritae, because of its rather smaller teeth, may represent an eastward extension, analogous to what has occurred in numerous other genera, of the Central American group that comprises *rothschildi*, *chiriquensis* and *costaricensis*. Incidentally, the type of *chiriquensis* yet retains all of its milk premolars, and m^{3-3} are but half erupted. Osgood's photographs of *margaritae* show adult premolars.

Tropicalis, from western Colombia, which Cabrera described as a race of *gymnotis*, is possibly rather related to the *rothschildi* group. The elimination of *margaritae* and *occidentalis* as close relatives of *gymnotis* leaves only *savannarum* and the type skull of *tumatumari*.

In regard to the latter, the village Tumatumari lies in dense rain forest on the south bank of the Potaro River. I spent one night there in 1928. Dr. F. E. Lutz who earlier passed several days there heard accounts of "large open areas" to the south, which may represent extensions of the Rupununi savanna country where deer of the genus *Odocoileus* undoubtedly occur. Such a savanna area might account for the specimens of *Odocoileus* collected there by Miller.

In the matter of the mismatched skull and skin of *tumatumari* (and I have no doubt they *are* mismatched) it seems desirable to restrict the name to the skull (*Odocoileus*) and to leave the skin (*Mazama*) for reidentification.[1]

It is interesting to note that the collector of *Odocoileus*, A.M. 77791, in which no permanent premolars are yet in place, states the specimen was "♀, adult, in milk."

MAZAMA RAFINESQUE

Mazama RAFINESQUE, 1817, Amer. Monthly Mag., p. 363.

GENOTYPE.—*Mazama rufa* Illiger, 1815 = *Cervus pita* Rafinesque, 1817 = Gouazou-pita Azara.[2]

After pointing out the high degree of variability of the several species of *Mazama*, Allen segregated them into two species-groups, the red group and the brown group. He discovered no additional character.

In the Guiana region he listed the following:

Red group:	*M. americana americana*	Cayenne
	M. americana tumatumari	Tumatumari, Potaro R., British Guiana
	M. americana juruana	R. Juruan, e. Venezuela
Brown group:	*M. nemorivaga*	Cayenne

I find no type locality west of these until the high Andes are reached, so that the brockets of the lowlands of western Guiana are presumably referable to one of the above races.

Schomburgk[3] writes of "rufus" (= *americana*) in the forested mountains and the neighborhood of Pirara and of "*simplicornis*" (= *nemorivaga*) in the coast forests of British Guiana.

To gain adequate understanding of the systematics of this genus it has been necessary to examine all of the types in the American Museum and to read all descrip-

[1] I take this occasion to correct some additional errors, incidentally noted, in Allen's work on *Mazama*: m^{1-3} in type of *M. gualea* 32.7 mm., not 27
" " " " *M. zamora* (♀) 38 mm., not 30
" " " " *M. murelia* 31.5 mm., not 24
" " " " *M. trinitatis* (♀) 37 mm., not 28
" " " " *M. juruana* (♀) 35.5 mm., not 27
" " " " *M. fuscata* (♂) 38.2 mm., not 29
" " " " *M. c. sanctaemartae* (♂) 34.1 mm., not 26

[2] Allen, J. A., 1915, Bull. Amer. Mus. Nat. Hist., XXXIV, p. 531.

[3] Schomburgk, 1848, Reisen in Britisch Guiana, III, pp. 784–786.

tions of extra-mural material in the light of what those types reveal.

Disregarding for the moment the many names which have been applied to members of this genus, and using as nearly as possible none but the skulls of males with antlers as the basis of study, there appear to be two principal divisions within the genus.

Division A (Large brockets)	Division B (Small brockets)
Pedicel of antlers relatively elongate and narrow, projecting far (20 mm.) behind fronto-parietal suture	Pedicel relatively short and thick, extending little or not at all behind fronto-parietal suture
Teeth large: molar toothrow 58 mm., or more; m^{1-3}, 33–40 mm.; width of p^2, 8–10 mm.	Teeth small: molar toothrow 55 mm. or less; m^{1-3}, 28–32 mm.; width of p^2, 6.3–8 mm.
Distribution: South America to eastern Panama	Distribution: South and Central America to Mexico

Division "A," the large brockets, includes *americana* (Cayenne), *juruana* (s.e. Venezuela), *trinitatis* (Trinidad), *citus* (Maracaibo), *sanctaemartae* (Santa Marta), *zetta* (Medellin), *gualea* = *fuscata* (western Ecuador), *zamora* (eastern Ecuador), *rufa* (Paraguay), *jucunda* (Rio Grande do Sul), *rosii* (R. Bermejo), etc.

Division "B" comprises the Central American brockets *tema* (= *sartorii* ?), *pandora*, *cerasina*, *reperticia*; *bricenii* and *rufina* (respectively, from the high Andes of Venezuela and Ecuador), *sheila* (north Venezuela), *murelia* (Caquetá), *nemorivaga* (Cayenne), *simplicicornis* (Paraguay), *argentina* (Bermejo), *nanus* (?).

Besides the foregoing there are a number of named brockets from south of the Amazon which I have not attempted to allocate, namely, *whitelyi*, *tschudii*, *rondoni*, *sarae*, *nambi*, *superciliaris*, *mexianus*.

Division "A," which may be designated the *americana* group, appears to be relatively homogeneous structurally. Most of its members are "red" brockets. Its northwestern members *fuscata*, *gualea*, *zamora*, *cita*, *zetta*, are easily distinguished by the relatively enormous size of the premolars, and especially by the widening of p^2 and p^3 so as nearly to equal the width of p^4. The type *juruana*, a fine male from Villavicencio, eastern Colombia, *trinitatis*, *americana* (we have only one, A.M. 36349A, from Tumatumari in our collection), and material from the Tapajoz and Tocantins rivers, and the Matto Grosso, which presumably represents *rufa*, are separable from those previously enumerated by their narrower p^2 and p^3.

Division "B," the *simplicicornis* group, includes both "brown" (which should be thought of as grayish brown) and "red" brockets. There appear to be three sections of this division—possibly four: the Central American *tema* (= *sartorii* ?), described, respectively, by Rafinesque and de Saussure as "fallow brown above, white beneath" and "brun fauve, blanchâtre en dessous," has teeth not quite as small as those of our adult male *rufinus* (A.M. 66742) from just east of Quito. In *tema* (A.M. 100193) the molar toothrow = 51.5; in *rufina*, 49.7. Merriam's *pandora* has the toothrow 50 mm. The skull of *tema* is broader, more heavily built, and has the basi-occipital very broad and flat in comparison with that of *rufina*. So probably *tema* and *pandora* represent a group not very closely related to *rufina* and *bricenii*.

The next section includes *cerasina* (rufous, with toothrow about 54 mm.), *sheila* (rufous, with toothrow 55 mm.), and slightly removed *murelia* (gray-brown, with toothrow 54 mm.) and *nemorivagus* (Cayenne, with toothrow, based upon Guiana material, 51–53 mm.).

In each of the foregoing sections the horns are short, straight structures, with or without lateral flanges. The deer corresponding to this group from south of the Amazon—typical members of the *simplicicornis* section—are characterized in age by far greater elongation of the horns than in northern forms. They are also somewhat larger and heavier (toothrows, 55–56 mm.). A single individual from the Tocantins (A.M. 96171) agrees closely with Guiana material.

This discussion of the forms of *Mazama* has been necessary in order to settle the relationships of the representatives of the genus in the Guiana region. Those are: *Mazama americana* (= *M. juruana*, = also the skin of "*Mazama a. tumatumari*, the skull being *Odocoileus*); *M. nemorivaga*,

of which *M. murelia* can be regarded as insufficiently differentiated to be regarded as a good race. Our Duida material appears to be identical to *murelia*; whereas the specimen from Auyan-tepui has exceptionally small teeth and may be more nearly allied to the eastern form.

Mazama americana (Erxleben)

Moschus americanus ERXLEBEN, 1777, Syst. Regn. Animal., p. 324.

Mazama americana tumatumari J. A. ALLEN, 1915, Bull. Amer. Mus. Nat. Hist., XXXIV, p. 536. The skin only (the skull of type is *Odocoileus*).

Mazama americana juruana J. A. ALLEN, 1915, *op. cit.*, p. 537.

TYPE LOCALITIES.—*Americana*, Cayenne; *tumatumari*, Tumatumari, River Potaro, British Guiana; *juruana*, R. Juruan (tributary of Rio Cuyuni), s.e. Venezuela.

MATERIAL.—Only a few red brockets from British Guiana; the types of *juruana* and *tumatumari*, A.M. 94170, 94157, from Faro, north bank of Amazon; A.M. 76900 from Mt. Duida.

The nearest relatives of *americana* occur in Trinidad and southward to and across the Amazon. The deer of the northwestern quarter of South America are easily distinguished by their large premolars.

Mazama nemorivaga (F. Cuvier)

Cervus nemorivaga F. CUVIER, 1817, Dict. Sc. Nat., VII, p. 485.

Mazama murelia J. A. ALLEN, 1915, Bull. Amer. Mus. Nat. Hist., XXXIV, p. 547.

Mazama nemorivaga J. A. ALLEN, 1915, *op. cit.*, p. 548.

TYPE LOCALITIES.—*Nemorivaga*, Cayenne; *murelia*, L. Murelia, R. Caquetá, Colombia.

MATERIAL.—Thirteen specimens from British Guiana; Mt. Auyan-tepui (1) (small teeth); Mt. Duida (3); the type of *murelia* from Caquetá.

The affinities of these gray brockets are primarily South American. *Nemorivaga* and *murelia*, if distinguishable at all, are at least very intimately related. Next to one another they are linked to *simplicicornis* and its allies south of the Amazon. It is possible that *pandora* of Yucatan, which I have not studied, may exhibit some characters connecting it with them.

ODOCOILEUS RAFINESQUE

Odocoileus RAFINESQUE, 1832, Atlantic Journ., I, p. 109.

GENOTYPE.—*Odocoileus spelaeus* Rafinesque = *Cervus virginianus* Boddaert (Palmer, 1904).

In his treatment of *Odocoileus* Cabrera[1] concludes that two forms of *O. gymnotis* occur in the region now under treatment: *O. g. gymnotis* from the "llanos of northern Venezuela" and *O. g. tropicalis* Cabrera from "eastern Colombia, tropical zone." There is also to be considered *O. savannarum* Cabanis.

Goeldi[2] in his review of S. American deer publishes a distribution map on which he shows *gymnotis savannarum* as the *Odocoileus* inhabiting Guiana and *gymnotis gymnotis* as the form found in the llanos. He marks too the southern limit of *O. gymnotis* as the Amazon River, beyond which *Blastocerus* takes its place.

Odocoileus gymnotis (Wiegmann)

Cervus gymnotis WIEGMANN, 1833, Isis, p. 963.

Cervus spinosus GAY AND GERVAIS, 1846, Ann. Sci. Nat., (3), Zool. V., pp. 93–94.

Cervus savannarum CABANIS, 1848, Reisen in Britisch Guiana, III, p. 785.

Cervus wiegmanni FITZINGER, 1879, Sitz.-ber. K. Ak. Berlin, LXXVIII, p. 344.

TYPE LOCALITY.—"Unser exemplar. . . . stammt aus Colombien. Sein früherer Besitzer empfing es über S. Thomas aus der Gegend des Orenoco" (see also below).

MATERIAL.—Males: Mt. Duida, 300 feet, 1 juv. (A.M. 76900), with m^{1-3} through, p^{3-4} permanent, right mp^2 still in place (permanent p^{2-2} both visible); R. Caura, juv. (A.M. 16928), m^1 alone erupted, mp^{2-4} still retained. Females: R. Caura, adult (A.M. 17553); Caicara, y. ad. (mp^{2-4} still unreplaced); also ad. from R. Caura (A.M. 21311) with permanent dentition complete, unworn; Tumatumari, British Guiana, adult (A.M. 36350, the type specimen of *tumatumari*), permanent premolars fully developed but unworn.

[1] 1918, Bol. Real. Soc. Española Hist. Nat., XVIII, pp. 300–307.

[2] Goeldi, 1913, Mitt. Naturf. Ges. Bern. aus den Jahre 1912, pp. 284–300.

Wiegmann describes *gymnotis* as "most like the Mexican deer. . . .short horns. . . . bare ears. . . .short hair as though shorn, closely appressed. . . .body color like the winter pelage of Virginia deer. . . ." There follows much detailed description of pelage and horns, ending with a set of measurements.

From the above one readily gets the picture of an *Odocoileus* of the lowlands as suggested by Cabrera. And his restriction of type locality to the Orinoco Valley is entirely reasonable.

Comparison of two possible races of *gymnotis* in Guiana region:

gymnotis	*savannarum*
"die Spitze des Kinnes ist weiss; dann folgt ein tief dunkelbrauner Winkelstreif, der bis an die Mitte der Unterlippe reicht, und nach hinten von einem lebhaft rostgelben Streife begränzt wird, welcher, zum Mundwinkel aufsteigend. . . . . ." (Wiegmann).	". . . an der Unterlippe nur an jeder Seite ein dunkelbrauner Fleck ist und dass diese Flecke nach unten nicht zusammenstossen" (Cabanis).

I cannot feel that these descriptions refer to different races.

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