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MAMMALS OF THE WEST INDIES.

BY GLOVER M. ALLEN.

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**Introduction.**

DURING August and September of 1910 the writer made a small collection of mammals in the island of Grenada. The study of these and of other West Indian specimens in the collection of the Museum, suggested the preparation of a list of mammals known to occur in the West Indies, with a summary of their recorded distribution and its zoögeographical bearing. Most of the conclusions reached are not new, but are of value in connection with similar studies of other groups of animals. The evident gaps in our knowledge of the distribution of many species is made evident by the summary table given. Three new island races are described. No account is taken in this paper of the aquatic mammals nor of domestic animals that have become more or less feral in some of the islands. The bibliography includes most of the important papers dealing with the mammals of the West Indies.

It is a pleasure to extend thanks to His Honor Robert S. Johnstone, now Chief Justice at Grenada, to whom I am indebted for unfailing hospitality and effective assistance while collecting in that island, as well as previously during a visit to the Bahamas.

**Zoögeographical Relations.**

Much has been written on the derivation of the West Indian land fauna, especially as to that of its molluscs, amphibians, reptiles, and birds. Hitherto but little attempt has been made to examine carefully the distribution of its mammals with a view to discovering evidence in confirmation or disproof of current theories regarding former land bridges, or other means of immigration. No doubt this is mainly due to the fact that there are comparatively few terrestrial species of mammals in the Antillean region; and the distribution of these is, in the main, so limited, or so imperfectly known, as to be of slight aid. It has been customary to ignore, more or less completely, the facts offered by the geographical distribution of bats in island faunas on the ground that they are capable of flying widely oversea, and hence

might readily populate unoccupied ground. Among certain genera it is probable that such a method of distribution may, in sporadic instances, obtain. That it is frequent and normal, however, is equally improbable. It is well known that certain species of the temperate zones retire from the higher latitudes of their summer range to winter in more equable climes. In the course of such migrations they are occasionally met with far from land. This seasonal migration for example, is probably accountable for the occurrence of *Lasionycteris noctiragans* among the Bermuda Islands. Large, strong-flying bats, such as the Old World flying-foxes, often make nightly forays of great length from their roosts to some favorite feeding-ground, and they may even conceivably visit islands within sight of their mainland haunts; but that oceanic islands are often populated in this way there is very little evidence. Indeed, the very fact that where bats are found in islands they have usually become more or less differentiated from their nearest neighbors, and this in a uniform and constant manner, is proof that such fortuitous methods of distribution as have been claimed for these animals are largely inoperative.

Dobson (in 1879) seems to have been the first to insist on the erroneousness of this assumption as to the inutility of bats in zoögeographical study. For, he says, "even if it be granted that the Chiroptera possess great powers of dispersal, it is certain that quite nine-tenths of the species avail themselves of them in a very limited degree indeed, and it is significant that the distribution of the species is limited by barriers similar to those which govern it in the case of other species of mammals." He recalls also the possible transportation of bats from place to place by vessels. The West Indies are beyond the winter range of the northern migratory bats; and, except possibly in the case of a few species to be mentioned, it is almost certain that the present chiropteran fauna of each island is quite stationary. The presence of the less strongly-flying species on the several islands may therefore confidently be assumed as evidence either that they reached these islands by following some former land bridge nearly or quite continuous, or that they are autochthonous.

In the following discussion, the evidence of the terrestrial mammals will be first considered. Of these, there are included in the present list some thirty-seven species or subspecies. Eight of these may be at once dismissed as introduced by human agency, viz.: *Oryctolagus cuniculus*, *Mus musculus*, *Epimys rattus*, *E. r. alexandrinus*, *E. norvegicus*, *Mungos birmanicus*, *Cercopithecus mona*, *C. sabaeus*. Possibly the deer occurring on Cuba should be added to this list. A compari-

son of specimens would show whether it were the same as that of Florida or Yucatan, or if it be really an insular race. Of the remainder we may distinguish, for convenience, two groups: those belonging to genera now known from the Antilles alone, and those belonging to genera that are also represented on the mainland of America. Those of the former group fall at once into two divisions, geographically. The first contains *Capromys*, *Plagiodontia*, and *Solenodon* of the Greater Antilles; the second, *Amblyrhiza* and *Megalomys* of the Lesser Antilles. A similar division may be made of the group of mammals that are insular representatives of known continental forms. Thus, in the Greater Antilles are: *Megalonyx rodens*, a fossil ground sloth known from Cuba only, and *Oryzomys antillarum*, of Jamaica, an island representative of *O. couesi*, of the neighboring Honduras peninsula. In the Lesser Antilles, from Tobago northward to and including St. Thomas, are: *Didelphys marsupialis insularis* and *Marmosa chapmani*, opossums both closely related to species of northeastern South America, and a nine-banded armadillo (*Dasybus*); all of which probably have not by natural means spread farther north than Grenada. The agouti (*Dasyprocta*), at least until very recently, occurred on practically all of the Lesser Antilles to St. Thomas. The possibility of human interference in carrying this much sought animal from island to island should, however, be kept in mind. The occurrence of *Loncheres* and *Oryzomys* in Martinique and St. Vincent respectively is of much interest. The former has been taken only once, but is known to the negroes of Martinique, so that it is possibly native. The latter, as in case of the opossums and the armadillo of the more southern islands, is closely related to a species of the neighboring mainland, and is quite different from that of Central America, whence evidently the Jamaican species was derived. There is every probability that, before the coming of the white man, *Oryzomys* was of more general distribution in the Antilles; but the introduction of the house and roof rats (*Epimys*) brought in a competitor against which the rice rat was unable to stand. Even yet, however, a careful search in the more inaccessible parts of some of the larger islands might discover a few survivors.

It is doubtful what significance may be attached to the recent discovery of a small race of raccoon in New Providence (Bahamas) and in Guadeloupe (Windward Islands). A third raccoon is known from Barbados, but its identity is still uncertain. Some have supposed that the silent dogs ("perros mudos") mentioned by the early Spanish explorers as kept by the natives of Haiti were really these

raccoons, but such a possibility seems extremely remote. Feilden and others assume with some confidence that the raccoon on Barbados might readily have drifted thither from South America with some of the wreckage of trees and flotsam that is constantly borne to the windward shores of that island by the easterly currents of air and sea. On the other hand, it might readily have been introduced during the past four hundred years by the European invaders. Patrick Browne mentions the raccoon as among the mammals occasionally brought in captivity to Jamaica, but here it is not known to have escaped and established itself.

The presence of the insectivorous genus *Solenodon* on both Cuba and San Domingo emphasizes the geographic relationship of the two islands. Evidently these primitive animals have been here for a very long period; so that not only have their congeners died out on the neighboring mainland, but they have themselves, through long isolation, become markedly differentiated on the two islands. The fact that their nearest living relative is *Centetes* of Madagascar need indicate nothing more than that both genera are surviving primitive types of this widespread order that have been preserved in their island habitats, free from the keener competition with the more numerous mainland fauna. The fact that all the known fossil Insectivora of America are found north of Mexico, and that the order is apparently represented in South America by a very recent influx of North American types into the northern part of that continent is quite in line with the fact that *Solenodon* is found in the Greater Antilles only, and is quite absent from the Lesser Antilles, which, we may suppose, it would have had to reach from the South American mainland.

The terrestrial mammals of the island of Tobago are so evidently derivatives of those in Trinidad that they are not here specially considered. Several genera occur on Tobago that are not known from the other islands to the north, but are now present on Trinidad. These are a peccary (*Tayassu*), a paca (*Agouti*), a *Zygodontomys*, and a squirrel closely akin to *Scuirus chapmani* of the latter island. In addition there are two opossums (*Didelphys*, *Marmosa*), an armadillo (*Dasypus*), an agouti (*Dasyprocta*), and, if we may trust the old French writers of two hundred and fifty years ago, a *Megalomys* was formerly found there.

Four fossil mammals have been hitherto currently recognized from the Antilles. The ground sloth (*Megalonyx*) which seems to have been common in Cuba during Pleistocene times, belongs to a genus which has not been found on the mainland south of Texas and Florida.



If its North American origin be admitted, this mammal is certain evidence of a former land connection between Cuba and Florida. Moreover, remains of a very similar species (*M. jeffersoni*) have been found in the peninsula of Florida. Probably the genus *Capromys* was contemporaneous in Cuba with this sloth. Part of the skull of an extinct species (*C. columbianus*), differing markedly, however, in the conformation of the palate from its living relatives, has been described from a cavern deposit of this island. The nearest living representative of the Cuban *Capromys* on the mainland is the much smaller *Procapromys gayi* from the mountains between La Guaira and Caracas, Venezuela. This is looked upon by Chapman as the possible mainland ancestor of the Antillean genus. At all events, these two fossil genera in Cuba point to migrations from both North and Central America (by way of Florida and Yucatan respectively).

The two other fossil species hitherto reported are Lesser Antillean. The first is a large rodent, *Amblyrhiza inuidata*, now known from cavern deposits in the islands of Anguilla and St. Martin's. This animal is likewise considered of Pleistocene age; and, though doubtless related to the South American family Lagostomidae, including the chinchillas, is currently included with the North American genus *Castoroides* in the Castoroididae. Cope supposed the genus to have reached the Antilles from South America by way of the Windward Islands; but the present evidence does not seem to exclude the chance of its having come from North America along the same route with *Megalonyx*, provided, of course, that at that time the deep cleft now separating Anguilla from the Greater Antilles did not form a barrier.

The remaining fossil mammal is an undescribed species of *Megalomys*, briefly mentioned by Major, from Barbuda. This simply serves to extend the range of this recent genus to the more northern Lesser Antilles, throughout which it probably once ranged.

Turning now to the bats, we find at present recorded from the West Indies no less than thirty-one genera. On many of the islands local forms have developed which are sufficiently marked to be entitled to rank as local races or even species, although this matter is in part one of personal opinion. Since the trinomial better expresses such evident relationships between the forms on neighboring islands, I have, in the following pages, adopted this in preference to a binomial designation in cases where specimens have been personally studied, or where previous writers have shown preference for a trinomial title. Although the bat fauna of the West Indies may be considered fairly well known, there are many islands from which few if any species are

recorded. It is noticeable that many of the better known species are cave hunters, and so are rather easily taken, once their caverns are discovered. The tree-dwelling bats, however, must usually be shot or captured as occasional chance may offer. Our knowledge of the distribution, especially of this latter class, is still therefore far from complete. For this reason the negative evidence as to the apparent absence of certain species must not be too strongly insisted upon. A singular instance is that of *Lonchorhina aurita*, originally described from a specimen without locality. Of the two additional specimens discovered in the fifty years since the first was made known, one came from Venezuela, and the second from Nassau Harbor, New Providence, Bahamas. The possible agency of a steam vessel might here be invoked, though the evidence at present points to the occurrence of the genus in the Lesser Antilles as well.

The apparent absence of certain genera is, however, very noticeable. Thus, there is no evidence that *Pipistrellus* or *Dasypterus* occurs anywhere in the West Indies. The widespread genus *Myotis* is apparently quite absent from the Greater Antilles, although in the Lesser Antilles a representative of the austral species *M. nigricans* is described from Dominica. The genus *Rhogeessa* is perhaps to be looked for in Jamaica or Cuba, as it occurs on the neighboring mainland. Of the Emballonuridae, no representatives of *Rhynchiscus*, *Saccopteryx*, *Balantiopteryx*, *Diclidurus*, and certain rarer genera are known. Of common Central American Phyllostomidae, no record appears for *Micronycteris*, *Tonatia*, *Phyllostomus*, *Anoura*, *Vampyrops*, *Chiroderma*, the subgenus *Dermanura* of *Artibeus*; the *Desmodontidae* also seem to be unrepresented, as well as the *Furipteridae* and *Thyropteridae*.

Of the thirty-one genera of bats now known from the West Indies, no less than ten are peculiar to Antillea. Of these ten, three are represented in both the Greater and the Lesser Antilles, *viz.*, *Monophyllus*, *Brachyphylla*, and *Ardops*. The remaining seven so far as known are all peculiar to the Greater Antilles (including the Bahamas). These are *Phyllonycteris*, *Reithronycteris*, *Phyllops*, *Ariteus*, *Erophylla*, *Chilonatalus*, and *Nyctiellus*. These and other genera will be severally discussed below. It is interesting to observe that no genus of bats peculiar to the Lesser Antilles has been discovered, although our knowledge of the Chiroptera of these islands is still far from complete, — so much so, indeed, that practically nothing is known of the bat fauna of most of them.

Of species whose distribution throughout the Antilles is rather

general, there are several. Of these *Noctilio leporinus*, owing to its fish-eating habits, might be expected to cross narrow stretches of sea, and so to spread from island to island. Its occurrence may therefore not be very significant from a geographical point of view. Probably the best known of the West Indian bats is *Artibeus jamaicensis*, with its races, more or less nominal. It might be thought that so large and strong a species would readily fly far over seas to populate outlying territory, but this supposition is not clearly borne out. The species is apparently absent from the Bahama archipelago, and its supposed occurrence at Key West, Florida, is unsubstantiated. Dr. K. Andersen, in his recent study of this genus, considers the Cuban form an admissible subspecies, derived probably from the Yucatan race. Typical *jamaicensis* occurs in the Honduras peninsula, St. Andrew's, Old Providence, and Jamaica, across through San Domingo and Porto Rico, and even so far east as St. Kitts, that is, slightly beyond the supposed geological boundary between the Greater and the Lesser Antilles (namely, the depression between the Virgin Islands and Anguilla. Dr. Andersen admits, however, that there "is absolutely no 'hard-and-fast' line" between *jamaicensis* and the race *palmarum*, from the latter of which he considers the race *praeceps* of the northern Lesser Antilles to be derived. The difficulty of determining the exact relationship of these bats may be gathered from the fact that *praeceps* of Dominica and Guadeloupe is indistinguishable from *acquatiorialis* of Ecuador, which itself is merely a larger edition of typical *jamaicensis*! There can be no doubt, however, that this author is correct in deriving the races *palmarum* and *praeceps* from the race of the South American mainland, while the Greater Antillean representatives came by way of Central America.

The genera *Nyctinomus* and *Molossus* are probably the swiftest flying bats, yet it is remarkable that they show a differentiation in the West Indies that indicates a long continued local habitat. The common *Nyctinomus b. musculus* of the Greater Antilles (Jamaica, Cuba, San Domingo, and Porto Rico) is a race distinct from that of the adjoining mainland of North and Central America. Among the Bahamas, a further but less marked differentiation has occurred, represented by the race *bahamensis*; while in the Lesser Antilles, from Barbados north to at least St. Kitts and St. Bartholomew is the race *antillularum*. The fact that these two or three races should have thus become separated off, while the continental *brasiliensis* is the same from Patagonia to Texas, is very significant of the practical absence of recent migration of these animals. The same is true, but



to a less degree, in the case of the West Indian race of *Molossus obscurus*, which appears to have become slightly differentiated from its prototype of South and Central America.

The case of *Natalus* is probably analogous in large measure to that of *Nyctinomus brasiliensis*. This is a genus of tropical America, and in the Antilles is known from San Domingo and Dominica. On the continent it ranges north into central Mexico. In San Domingo the slightly larger size of the representative of *N. stramineus* has caused it to be described as the race *major*. In Dominica, however, it seems quite the same as the form of the neighboring South American mainland whence it is supposedly derived. The genus is to be looked for on other of the Greater and Lesser Antilles, and from Jamaica probably rather than from Cuba, since the Yucatan land extension was perhaps slightly too far north to be available for this tropical species as a passageway to Cuba.

Of the three peculiar West Indian genera that occur in both the Greater and the Lesser Antilles, namely, *Monophyllus*, *Brachyphylla*, and *Ardops*, the first is widespread. Among the Greater Antilles it is known from Jamaica, Cuba, and Porto Rico, on each of which a local race has become differentiated. Doubtless it occurs on San Domingo as well. Among the Lesser Antilles it is represented by a local race on Santa Lucia and on Barbados; and an additional species is described, without locality, but is probably from one of the West Indies. *Brachyphylla* is recorded from Cuba, St. Vincent, and Barbados. The Cuban form is smaller, and is considered a species distinct from that of the Lesser Antilles. Possibly the genus is to be looked for on the intermediate islands. *Ardops*, with the related genera *Phyllops* and *Ariteus*, are doubtless to be considered as a unit in their geographical relationship. *Ardops* is recorded from Haiti in the Greater Antilles, and from Montserrat, Dominica, and Santa Lucia in the Lesser Antilles. In each of these islands a local form has become differentiated. The closely related *Phyllops* seems to be the representative of *Ardops* in Cuba, and in Jamaica its place is similarly taken by the kindred genus *Ariteus*. The correspondence between the distribution of the endemic genus *Monophyllus* and the *Ardops-Phyllops-Ariteus* group is therefore very striking, despite the evident gaps in our knowledge. No representative of *Brachyphylla* is yet known from Jamaica. It seems very significant, however, that this "most primitive of the *Stenodermines*" should occur with the genus *Monophyllus* on Barbados, formerly supposed to be a good example of an 'oceanic' island. The fact that the genus is yet known from

but three of the Antilles, and that it occurs here with other endemic genera, may indicate that it is a survivor in these islands of a primitive genus whose range was once more extensive. The present distribution of the five genera considered may thus indicate either that they are survivors of an ancient fauna that was endemic in Antillea (including the Greater and Lesser Antilles as a continuous land mass), or that they reached these islands by one or more land bridges from Central or South America after which their continental prototypes became extinct. In either case it is probable that *Phyllops* and *Ariteus* have become latterly differentiated from the *Ardops* stock, in Cuba and Jamaica respectively.

The bat fauna of the Greater Antilles is much better known than that of the Lesser Antilles; nevertheless, it is undoubtedly true that the number of genera is greater in the former. Of those known from the Greater Antilles (including the Bahamas), but not from the Lesser, are these fifteen: *Chilonycteris*, *Mormoops*, *Otopterus*, *Lonchorhina*, *Vampyrus*, *Phyllonycteris*, *Reithronycteris*, *Erophylla*, *Chilonatalus*, *Nyctiellus*, *Eptesicus*, *Nycticeius*, *Lasiurus*, *Mormopterus*, *Eumops*. From this list are excluded *Phyllops* and *Ariteus* as being the representatives on Cuba and Jamaica respectively of the genus *Ardops*, just considered. The genus *Lonchorhina* is known from three specimens, one from Venezuela, one from New Providence, Bahamas, and one without locality but probably the Lesser Antilles.

The genera *Peropteryx*, *Pteronotus*, and *Myotis* are as yet known in the West Indies from the Lesser Antilles only, which they have evidently reached from South America; for these island forms are closely allied to those of that mainland and Trinidad, or are identical with them. The genus *Glossophaga* is represented in the southernmost Lesser Antilles by the species *longirostris* of northern South America; while in the Greater Antilles there is in Jamaica what is probably a race of *G. soricina*. There is evidence that the latter race also occurs in the Bahamas. The South and Central American species *Artibeus planirostris* is also represented in Grenada by a local race, *grenadensis*, evidently allied to that of the neighboring mainland. It is thus evident that these bats of the Lesser Antilles are of South American origin. The genera of the Greater Antilles will be considered in further detail.

The genus *Chilonycteris* is found in Jamaica, Cuba, San Domingo, and Porto Rico, in each of which there occur together the two species *C. macleayii* and *C. parnellii*, except in San Domingo where the latter has not yet been collected. There can be little doubt of its presence

there, however. Of these two species, *C. macleayi* seems to be most nearly related to the continental *C. personata*, whose range is from Brazil north at least to Guatemala; *C. parnellii*, on the other hand, is nearer to *C. rubiginosa*, whose range is probably coextensive with that of *C. personata* on the mainland, where it is known from Brazil to Mexico. It seems strange that neither species should have yet been found in the Lesser Antilles, although *C. rubiginosa* is known from Trinidad. Among the Greater Antilles, each has developed a peculiar race on each of the larger islands. The race of *C. macleayi* found in Jamaica (*grisea*), is considered by Rehn to be the best marked of any of the subspecies; while the same seems to be true to a lesser degree of the Jamaican race of *C. parnellii*.

The case of Mormoops is somewhat similar to that of *Chilonycteris*. It is known as yet from Jamaica, Cuba, San Domingo, and Porto Rico, of the West Indies. The Jamaican species *M. blairvillii* is peculiar to that island, but in the other islands the subspecies *cinnamomea* takes its place. This differentiation is somewhat paralleled by that of its continental prototype, *M. megalophylla*, of which a northern subspecies is recognized in northern Mexico and southern Texas. Although the latter species ranges through northern South America to Trinidad, it is still unknown from the Lesser Antilles, indicating, possibly, that its extension thus far to the eastward took place mainly after the land connection with these islands had become destroyed.

The distribution of the genus *Otopterus* in the West Indies seems somewhat similar, except that it is known from the Bahamas as well as from the larger islands of the Greater Antilles. It has not yet been reported from Porto Rico, where, nevertheless, it may confidently be expected. So far as known, *Otopterus* is not found south of Guatemala, whence it ranges north into southern and Lower California. Its Antillean distribution is therefore of unusual interest, since, if we assume that its range has always been north of Panama, there is no way of its having reached the Lesser Antilles through a land connection from South America. That it does not pass eastward of Porto Rico is therefore quite what would be expected, if the deep cleft between the Virgin Islands and Anguilla is considered to have been the barrier between the two chains of islands. In Jamaica, Cuba, San Domingo, and the Bahama archipelago, respectively, local races of the single species *O. waterhousii* have been developed that differ but slightly among themselves. Apparently the Jamaican form, in its smaller foot and skull is nearer the continental *O. mexicanus*

than the larger-skulled races from the other islands. That the West Indian *Otopterus* should be well distributed in the Bahamas yet wholly absent from the Florida peninsula and Gulf States directly west, is evidence that these islands have been connected recently with the Greater Antilles. If the theory of distribution through the agency of wind and chance is to obtain, here is an excellent opportunity for it to operate, since the prevailing trade wind would waft such wanderers to the east coast of Florida, where the climate and other conditions would be in part similar.

The subfamily *Phyllonycterinae*, so far as known, is peculiar to the Greater Antilles. Of its three genera, *Reithronycteris* and *Phyllonycteris* are apparently confined to Jamaica and Cuba respectively. Each is represented by a single species, and both are considered rare. These two genera are closely related, and seem to have become differentiated on the two islands from a common stock, doubtless of Central American origin. The third genus, *Erophylla*, has not yet been discovered in Jamaica, but is represented by slightly differing local races in Cuba, San Domingo, Porto Rico, and the Bahaman archipelago. Should it eventually be found in Jamaica as well, its distribution in the Antilles would correspond closely with that of *Chilonycteris*, *Otopterus*, and *Chilonatalus*. From the fact that *Erophylla* is unknown from the mainland, it may be assumed that, like the two other genera of the subfamily, it either reached these islands by land tongues from Central America, where it has since become extinct, or it has arisen as an endemic genus.

Further investigation will probably show the range of the genus *Chilonatalus* to be practically coextensive in the West Indies with that of *Otopterus*. It is now known from Old Providence Island, Jamaica, Cuba, and the Bahamas (Watling's Island and Great Abaco). Its presence is to be expected in San Domingo and probably Porto Rico. It has no known representative on the mainland, but is closest related to *Natalus*. The latter genus, though recorded at present from but two of the West Indies (Dominica and San Domingo) is likely to be found on other of the islands, particularly Jamaica and the more southern Lesser Antilles. The *Natalus* of San Domingo is larger than the continental races from which it is undoubtedly derived. That of Dominica, however, does not seem different from that of the neighboring mainland of South America. In view of the apparent absence of the genus *Natalus* from Cuba, it may be suggested that it is represented on that island by *Nyctiellus*, which in external characters is considered the least specialized of the *Natalidae*, although the skull and teeth have become considerably modified.



Although *Chilonatalus* and *Natalus* have not hitherto been found inhabiting together the same island, the fact that the former is found in Jamaica, Cuba, and the Bahamas, while the latter occurs on the intermediate island, San Domingo, and in the Lesser Antilles, is evidence that the two genera reached these islands already fully differentiated, and that *Chilonatalus* is not to be considered the representative of *Natalus* in the islands where it is now known. More likely the continental prototype of *Chilonatalus* was a Central American bat that has since died out. Moreover, the presence in Cuba of the peculiar genus *Nyctiellus*, occurring here at the same time with *Chilonatalus*, suggests that it is a derivative of *Natalus*. Undoubtedly *Chilonatalus* reached the Greater Antilles by land connection from Honduras to Jamaica, and either thence, or by way of Yucatan, to Cuba, and eastward to the Bahamas. Its presence on Old Providence Island is further evidence of the former land-bridge between the Honduras peninsula and Jamaica.

The Vespertilionidae offer several peculiarities of distribution. The absence of *Myotis* from the Greater Antilles has already been noted, and is readily to be explained from the fact that none of the North American species is known to range quite far enough south to have enabled it to spread on to the Yucatan promontory, and so to the Greater Antilles, at such time as a land connection existed. At all events it can hardly be doubted that at that period none of the North American species had extended quite far enough to the south to enable them so to cross. On the other hand, the tropical species *M. nigricans* had reached the Lesser Antilles from South America, and is now known from Dominica, where it has become slightly differentiated (*dominicensis*). Since the species ranges north into southern Mexico (Chiapas), its presence might be expected in Jamaica; but the fact that it has not yet been discovered there indicates that it may only recently have extended to Mexico.

The genus *Eptesicus* is known from Cuba and from New Providence in the Bahamas. On the former island is the large, richly colored race *cubensis*, closely related to *E. fuscus miradorensis* of Mexico and Guatemala. This fact indicates that the Cuban bat reached that island by way of the Yucatan connection, rather than from Florida. With this conclusion in mind, the occurrence of the very small *E. f. bahamensis* in New Providence, Bahamas, is somewhat of a surprise, in view of the large size of the tropical *miradorensis* and *cubensis*. May it not be possible that the Bahama brown bat is an offshoot of the small *E. propinquus*, found in Guatemala and Nicara-



gua? The status of this rare bat is still somewhat in doubt. Miller, in 1897, considered it a race of *E. fuscus*, but at the same time expressed the opinion that it might prove to be a distinct species. If the latter view be accepted, it would be possible to assume that the Bahama brown bat reached its present home by way of a land connection from Honduras to Jamaica and San Domingo. Further information as to the bat fauna of the latter island may throw light on this question.

It is remarkable that the genus *Nycticeius*, found elsewhere in America over the southeastern United States only, should also occur in Cuba. The recent discovery of a bat in East Africa, pronounced by Mr. G. S. Miller a typical *Nycticeius*, is of extraordinary interest in this connection. It is a fact probably quite in line with the presence of the molossoid genus *Mormopterus* in Cuba, Peru, and southeastern Africa, Madagascar, and Mauritius. A similar case is perhaps that of the occurrence in British East Africa of the bat genus *Laephotis*, nearly identical with the South American *Histiotus*. These and other facts point strongly to the conclusion that there was formerly a land connection between Africa and eastern South America, by means of which such an interchange of tropical genera was made possible. This view is ably supported by von Ihering from a study of marine littoral molluscs of the Tertiary and Cretaceous. Ortmann (1910) has recently reviewed his work, and writes that "the *Archhelenis-theory* of von Ihering has now received so much support from various sides that we may regard it as firmly established with regard to its general correctness. Stated in broad terms, this theory assumes a former land connection between Africa and South America, which is rather old. This connection is the last remnant of a large southern continental mass (South Atlantis, Gondwana-land), which existed since the beginning of the organic history of the earth (Cambrium), which was broken to pieces at different times, and the remnants of which are now found in Australia, India, Africa and Brazil. The separation of Brazil from Africa was the last step in the dismemberment of this old continent, an event which is placed by most writers toward the end of the Mesozoic era, although some have admitted the possible continuation of *Archhelenis* into the beginning of the Tertiary." Ortmann disagrees with von Ihering's conclusion that this land connection persisted into the Eocene.

The evident relationship of *Solenodon* to the West African *Potamo-gale* and the Madagascan *Centetes* may also point to a community of origin and a continuity of habitat in the past. But it is not necessarily

to be assumed that the genus reached the Antilles from Africa or a southern land mass by any such direct connection, for present evidence is quite as good that it came by way of the Central American land tongues to these islands.

As for the bat genus *Nycticeius*, it is possible that it was formerly more widespread in America, and is now persisting in Cuba and the southeastern United States only. Its occurrence in Cuba alone of the Antilles may indicate a former connection with Florida; the same perhaps by which the ground sloth, *Megalonyx*, apparently a North American genus, reached the island. Possible, too, *Nycticeius*, as well as *Mormopterus* and *Solenodon* reached Cuba through the Yucatan bridge, at a time when Jamaica had already become separated, thus accounting for their apparent absence on the latter island.

The genus *Lasiurus* occurs in Jamaica, Cuba, and the Bahamas (New Providence). The Cuban species is brightly colored, like the Mexican race, from which it is probably derived; but the relationships of the Bahama red bat are not satisfactorily determined. Further investigation may show that this genus is found in the other Greater Antilles.

Bats of the family Molossidae occur throughout the West Indies. The species *Nyctinomus brasiliensis* of the mainland is represented by slightly characterized races in the Greater Antilles, the Bahamas, and the Windward Islands, respectively. On both Cuba and Jamaica occurs *N. macrotis*, a species of the '*Nyctinomops*' group, which has not been elsewhere found in the West Indies. This distribution seems to be exactly matched by that of the genus *Eumops*. Thus, on Cuba is found a bat apparently indistinguishable from the *E. glaucinus* of the adjacent mainland, while on Jamaica its place is taken by the closely related species, *E. orthotis*. Doubtless the land tongues connecting Cuba and Jamaica with Yucatan and Honduras respectively, allowed these bats to reach their present homes.

The case of *Mormopterus*, known in America from Cuba and Peru, has been already discussed. It may eventually be found in Jamaica.

The genus *Molossus* is represented by three species. The first seems to be a slightly smaller race of the continental *M. obscurus*, and probably occurs throughout the West Indies, except apparently the Bahamas. A small species occurs in Cuba whose relationships are still uncertain, while in the southern Lesser Antilles is found the South American species, *M. crassicaudatus*.

*Summary.*—The foregoing survey of the known mammalian fauna of the West Indies shows but three Antillean genera that are common

to both Greater and Lesser Antilles. These are *Brachyphylla*, *Monophyllus*, and *Ardops* with its Cuban and Jamaican offshoots, *Phyllops* and *Ariteus*. The general distribution of these bats may indicate that at one time the land area of the Greater and Lesser Antilles was more or less continuous, or that the same genus reached the two groups from Central and from South America respectively, and then spread in both directions. The former supposition is the more probable, and is borne out by the facts of the distribution of reptiles (Barbour, 1910). Other species whose distribution is continuous throughout the Antilles are: *Noctilio leporinus*, *Artibeus jamaicensis*, *Nyctinomus brasiliensis*, and *Molossus obscurus*. Of these, all but the first are represented by local races, a study of which tends to show that they have reached the Antilles from both ends of the chain simultaneously.

The distinctness of the mammalian fauna of the Greater Antilles from that of the Lesser is very striking. The terrestrial species of the former seem to be entirely derived from North and Central America, while those of the Lesser Antilles are equally of South American affinity. The two faunae meet at the northeastern corner of the Antillean chain. Similarly the bats of the two groups comprise many genera or species peculiar to each. Thus *Chilonycteris*, *Mormoops*, *Otopterus*, *Erophylla*, *Chilonatalus*, *Eptesicus*, *Lasiurus*, and *Eumops* are present on two or more of the Greater, but are unknown from the Lesser Antilles. On the other hand, *Peropteryx*, *Pteronotus*, *Glossophaga longirostris*, *Artibeus planirostris grenadensis*, *Myotis dominicensis*, and *Molossus crassicaudatus* are Lesser Antillean bats that have very clearly reached those islands from South America, and are unknown in the Greater Antilles. The relations of the Lesser Antillean islands to each other are apparently much simpler than those of the Greater. Thus, the mammals of Tobago are very similar to those of Trinidad, though fewer in species; and proceeding northward, the known species are all such as would be expected to have come over a land bridge from northern South America. There is also a diminution in the number of genera represented as one proceeds northward, although, owing to our imperfect knowledge, it is still impossible to state this difference accurately. Dominica seems to be the best known of any of the Windward Islands as regards its bat fauna, but as yet only nine species are recorded.

The former land connections and faunal migrations of what are now the Greater Antilles seem to offer much more complex problems. Thus, Cuba must have received accessions largely through a Yucatan land bridge. Some also may have come from Florida by way of

another land connection. Such, for example, is probably *Megalonyx*, and perhaps the bat genus *Nycticeius*. A more intimate knowledge of the fauna of San Domingo is imperative for the determination of the extent to which migration took place between that island and Cuba. There is evidence that the connection became dissolved before that with Yucatan. This might account for the apparent isolation in Cuba of *Megalonyx*, the long-tailed species of *Capromys*, and the bats *Nycticeius*, *Nyctiellus*, *Mormopterus*. Perhaps also the apparent absence of a race of *Eptesicus fuscus* from the other islands (? except Bahamas) is explicable through the short duration of a Cuba-San Domingo connection.

Notwithstanding the number of evident similarities between the fauna of Cuba and that of Jamaica, these need not indicate any direct land connection between the two islands. Indeed, the evidence seems to point to their long isolation. Of the bat genera common to both, *Chilonycteris*, *Mormoops*, *Otopterus*, *Chilonatalus*, *Lasiurus*, *Nyctinomus* (*Nyctinomops* group), and *Eumops* are not known from the Lesser Antilles. Two species of *Chilonycteris* occur together on both Cuba and Jamaica, as well as on other of the Greater Antilles. Both have probably reached these islands through separate land connections by way of Yucatan and the Honduras peninsula respectively; and by a similar route it is probable that the other genera came to each. Evidence for this assumption is the apparent absence in Cuba and other of the Greater Antilles of the three following bats known in Jamaica: *Vampyrus spectrum*, *Hemiderma perspicillatum*, and *Sturnira lilium*. Probably the range of these tropical species never extended sufficiently far north to permit of their crossing by a land bridge to Cuba by way of Yucatan, whereas it did allow of their reaching Jamaica by way of the supposed Honduras land tongue. We may assume, further, that the connection with San Domingo had disappeared by the time they reached Jamaica.

The genus *Phyllonycteris* of Cuba may be represented in Jamaica by the endemic *Reithronycteris*, just as *Phyllops* of Cuba seems to be represented by *Ariteus* in Jamaica. The fact of these genera having been thus independently developed on the two islands from some common stock seems to indicate a long isolation.

On the other hand, there are several species which are practically identical on the two islands. Thus, *Chilonatalus micropus* of Jamaica is considered the same as that of Cuba; *Nyctinomus b. musculus* and *N. macrotis* are the same on both; and the *Eumops* of Cuba, considered the same as *E. glaucinus* of the mainland, is not greatly



different from *E. orthotis* of Jamaica. These wide-ranging bats of the family Molossidae, however, would be less expected to show local differentiation. All these five species may be assumed to have reached Cuba and Jamaica by separate land connections to each island. The fact that *Nyctinomus macrotis* and the genus *Eumops* are still unknown from the other islands may indicate that their arrival took place after both Cuba and Jamaica had lost connection with the other Antilles. Too much stress must not be laid on this negative evidence, however. The absence of *Eptesicus* from Jamaica, too, may be merely apparent. A summary of the known bat fauna of Cuba and Jamaica gives the former twenty-one and the latter nineteen species. There are six genera in Cuba that seem to have no Jamaican representative, and four Jamaican genera that are unrepresented in Cuba.

Of the connection of Cuba with Haiti and San Domingo there can be no doubt, from the many genera or even species of animals that they have in common. Of mammals, such are *Solenodon* and *Erophylla*; perhaps too the long-tailed *Capromys*. It seems equally evident, however, that it has long been separated from the other Greater Antilles. Certain facts point also to a connection by way of Jamaica, with San Domingo, and thence to Porto Rico and the Bahamas, a land bridge that may have persisted after that between San Domingo and Cuba had disappeared. Very significant here is the distribution of the short-tailed members of the genus *Capromys*. None is known from Cuba, but closely allied species are found in Swan Island, Jamaica, and the Plana Keys, Bahamas. Doubtless there was formerly a species also in San Domingo, if we may so identify the "Cori" of Oviedo. There is no very adequate evidence that any of the other animals described by Oviedo from this island were long-tailed *Capromys*. If they were, they may have been specimens brought from Cuba, or they may have been *Plagiodontia*, the significance of whose isolated habitat here it is now difficult to see. At all events, the facts point to a land bridge from Central America by way of Jamaica and San Domingo, over which the short-tailed *Capromys* reached the Bahamas. In like manner may perhaps be explained the occurrence of a bat in the Bahamas similar to *Glossophaga soricina antillarum* of Jamaica. The genus is unknown from Cuba, and indeed, for that matter, from San Domingo; but its occurrence on the latter island may be postulated. According to Andersen, a study of the genus *Artibeus* indicates that the San Domingo and Porto Rico representatives of the species *jamaicensis*



are identical and differ from the Cuban race, whose affinities are nearer the large Yucatan form. I have already suggested that the occurrence of a small *Eptesicus* in the Bahamas may be explicable by supposing that it was derived from the small Central American *E. propinquus*, by way of Jamaica and San Domingo. Further research, however, must establish its presence or absence on these intermediate islands. It may be argued that if this supposed connection allowed certain species to reach the eastern Greater Antilles, independently of a connection by way of Cuba, why did not others, such as *Solenodon*, *Plagiodontia*, *Erophylla*, reach Jamaica by the same route? It is possible that such a movement did take place; but at this date it might be out of the question to determine whether a Jamaican species had come directly from the continent to the west, or from Antillea to the east. Perhaps by this latter route came such now wholly West Indian genera as *Monophyllus*, *Ariteus*, and *Reithronycteris*. On the other hand, the main movement would naturally be from the west toward the less thickly populated lands to the east.

In conclusion, it appears that the present evidence afforded by the distribution of West Indian mammals in the main corroborates the current hypothesis that the fauna is derived in part from northern South America, and in part, by means of probably at least two land bridges, from North and Central America. A few genera are peculiar, and found throughout the chain. These may represent forms that were formerly wide ranging on the mainland and spread throughout the chain, either from both ends, or from one end provided the present island series was then a continuous land mass; on the other hand they may have developed on an Antillean continent, and since become isolated on the several islands through a depression of this continent. To the Greater Antilles, two main land bridges are indicated: one by way of the Yucatan peninsula to Cuba; a second by way of the Honduras peninsula to San Domingo and the Bahamas. Subsidiary connections probably occurred between Cuba and Florida, and Cuba and San Domingo. Between the latter and Jamaica there was doubtless a land connection, as well as between Jamaica and Central America. As shown by Alexander Agassiz in his *Three Cruises of the Blake*, published in 1888, there is at a comparatively shallow depth a bank connecting Honduras with Swan Island and other islets, Jamaica, and the southwestern arm of San Domingo. The five hundred fathom line would practically include this connection, as well as the islands of Porto Rico, Virgin Islands, and the Bahamas. Between Cuba and San Domingo, however, is a greater

depth, amounting to "not less than eight hundred and seventy-three fathoms." This cleft may well have developed to form the supposed barrier between Cuba and San Domingo. Between the Greater and the Lesser Antilles the deep valley between the Virgin Islands and Anguilla is considered the barrier that prevented the interchange of many of the South American types of the Lesser Antilles and the Central American derivatives of the Greater Antilles.

### Annotated List.

#### DIDELPHIIDAE.

##### DIDELPHIS MARSUPIALIS INSULARIS J. A. Allen.

*Didelphis marsupialis insularis* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 1902, 16, p. 259.

As stated by Dr. J. A. Allen in describing this opossum from Trinidad, "St. Vincent, Grenada, and Dominica specimens are similar, and were most likely derived from the Trinidad stock, having doubtless been introduced into these islands from Trinidad." The Museum collection contains six specimens from Trinidad and eight from Grenada, and a careful comparison of these corroborates Dr. Allen's view that they are identical. A single youngish example from St. Vincent, collected in 1903 by Mr. A. H. Clark, has the dorsal part of the supraoccipital bone considerably wider and slightly different in shape from that of the Grenada and Trinidad specimens, a condition perhaps due to youth. The skin of this specimen shows the melanistic phase, and has the long hairs of the body almost entirely black. The ears, however, are very slightly tipped with white, instead of being entirely black.

De Rochefort, writing in 1658, speaks of "opossums" as one of the five species of mammals known by him to be native to Tobago. Similarly Du Tertre, in the 1667 edition of his "Histoire Générale des Antilles habitées par les Français," Vol. 2, mentions having first met with the "Manitou" on Grenada. At that time the animal seems to have been unknown in the islands to the northward; for, in the previous edition of this work, written in 1654, Du Tertre makes no mention of it in the portion dealing with the native mammals of the French islands (chiefly St. Christopher, Guadeloupe, and Marti-

nique). Apparently it was then common on Grenada; and a specimen was shown to him as a curiosity, and then thrown into the gutter, for, he says, no one eats them, not even the negroes. From this it seems very probable that its present occurrence on St. Vincent and Dominica is due to human interposition at a somewhat recent date. Mr. Austin H. Clark, who spent some months collecting among the Lesser Antilles in 1903, tells me that this opossum is found also on the larger Grenadines, (including Mustique, Bequia, Canouan, Union Island, Carriacou, and Isle Ronde). It has apparently become less common on St. Vincent and Grenada since the introduction of the mongoose. It is considered a great delicacy by the negroes of the present day, who esteem especially the hind-quarters and tail as being the sweetest meat. It is often caught by suspending a bunch of bananas over a hole dug in the ground about four feet across and the same in depth, into which the animal falls in attempting to reach the fruit.

#### MARMOSA CHAPMANI Allen.

*Marmosa chapmani* Allen, Bull. Amer. Mus. Nat. Hist., 1900, **13**, p. 197.

*Marmosa grenadae* Thomas, Ann. Mag. Nat. Hist., 1911, ser. 8, **7**, p. 514.

Two specimens from Grenada are identical in size and cranial measurements with a topotype of *M. chapmani* from Caura, Trinidad. They are, however, slightly paler cinnamon along the sides; but this is apparently not more than individual variation.

I have been able to compare with these specimens the type of *M. robinsoni* from Margarita Id., Venezuela, in the Museum collection, and find that, although the two species are quite the same in size, the latter is decidedly paler, with a smaller eye spot that does not extend so far posteriorly.

Thomas (1911) has just described as *Marmosa grenadae* the murine opossum of Grenada, from a specimen collected in 1886 and skinned out from alcohol. Owing to immersion in spirit, the color characters are unreliable, and Thomas states that the skull is as in the Trinidad species, which he here redescribes as *M. nesaea*, overlooking the name *chapmani* bestowed eleven years before on the same animal. There does not seem to be good ground for recognizing either of these names.

This little opossum seems to be not rare all over the island of

Grenada. We obtained one specimen in a trap baited with meat in the heavy forest at Grand Etang, 1800 feet; and the people in the lowlands were also well acquainted with it. Among the Grenadines, Mr. Austin H. Clark informs me that it occurs on Carriacou and Isle Ronde as well. Its local name is "manicou gros-yeux," in reference to the apparent size of the eyes due to the large black orbital spots. The possibility of its having been introduced from Trinidad is, of course, to be considered, although the likelihood of its having been carried to the small Grenadines, Carriacou and Isle Ronde, may seem rather small.

### MEGALONICHIDAE.

#### MEGALONYX RODENS (Castro).

*Megalochnus rodens* Castro, Anal. Real. Acad. Cien., Habana, 1864, 1, p. 58.

. Notwithstanding the former doubt cast on the authenticity of the Cuban fossil remains of this extinct sloth, it is now certain that they were actually found on the island. The original specimen was from the province of Cienfuegos; and additional localities are now known, viz., Cardenas and between Santo Domingo and Sagna. A discussion of these and other supposed Cuban remains of *Equus*, *Hippopotamus*, and *Mastodon* is given by Vaughan (1902). More recently Professor de la Torre (1910) has discovered additional remains of this animal, sufficient largely to reconstruct its skeleton. In his preliminary account of this find, he figures the teeth and claws, and mentions especially a locality in the Sierra de Jatibonico, where he personally excavated these bones from caverns, and found them associated with bones of a crocodile, which, he suggests, may have preyed upon the *Megalonyx*.

### DASYPODIDAE.

#### DASYPUS NOVEMCINCTUS HOPLITES, subsp. nov.

*Type*.—Adult female, skin and skeleton No. 8116, M. C. Z., from the hills back of Gouyave, island of Grenada, September 7, 1910; collected by G. M. Allen.

*General characters*.—In external characters, similar to *Dasyopus*

*novemcinctus* from Brazil, but smaller. Skull smaller, with tooth-row decidedly shorter, due in part to the usual suppression of the last molar.

*Description.*—The dermal armor in the fresh specimen is flesh color, darkening slightly in the midline. It consists of the usual frontal shield, produced posteriorly between the ears, a scapular and a pelvic shield, with nine transverse movable bands between. The dorsal surface of manus and pes are closely covered with more or less hexagonal scales. The tail has twelve complete bony rings, succeeded by an armored tip 110 mm. long. From the posterior free edges of the transverse body rings project three or four short bristles from each scale; similar but more minute hairs are present at the posterior margins of the scales on the shields of body and tail. The ventral surface of body and limbs is set with transverse rows of small round dermal scutes that average about a centimeter apart. Each of these scutes is the center of a cluster of yellowish bristles which are longest on the throat and legs. Mammae four, two pectoral, two inguinal. Claws, four on the manus, five on the pes. Ears minutely scaly.

*Skull.*—Except for its smaller size, the skull of the West Indian armadillo is very similar in form to that of the mainland animal from Brazil. The premaxillaries, however, average slightly shorter in proportion, and are nearly as long, ventrally, as the distance from their posterior points to the first tooth, instead of greatly exceeding the distance, as is more usual in mainland specimens. The most notable and interesting peculiarity of this island race, however, is the tendency to the reduction of the number and size of the teeth, which thus produces a shortening of the entire tooth-row. The number of teeth in five specimens from Brazil is:— $\frac{8-7}{8-8}$ ;  $\frac{8-8}{8-8}$ ;  $\frac{8-8}{8-8}$ ;  $\frac{8-8}{8-8}$ ;  $\frac{8-8}{8-8}$ . In the three specimens from Grenada the teeth are:—

No. 8116,  $\frac{7-7}{8-7}$ ; No. 8117,  $\frac{6-6}{7-7}$ ; No. 8118,  $\frac{7-6}{7-7}$ . It is the posterior-most tooth of the upper series that has become lost in all cases. This is clearly shown also in the single aberrant Brazilian specimen by the fact that on the left side there is a minute posterior tooth; but on the right side the corresponding position is blank, and the large seventh tooth is exactly opposite the seventh tooth of the left side. In all three Grenada specimens the small posterior tooth is permanently lost, so that the tooth row ends abruptly with the large sixth or seventh tooth. In No. 8118, it is also clearly the seventh tooth that has been lost on the right hand side, since the corresponding tooth of the left side is opposite the empty space. Moreover, this dropping out of the posterior members of the series increases the



distance between the maxillopalatal suture and the end of the tooth row, causing a marked interspace in the Grenada skulls; whereas in mainland specimens the eighth molar but is very slightly in advance of the palatal suture. The usual rule of the more rapid evolution of the upper than of the lower jaw is also well illustrated by the fact that in no case has the number of lower teeth been reduced beyond seven, and in the type the eighth lower left tooth is still retained. In the island animal, also, the teeth are noticeably smaller in absolute size than those of the smallest of the Brazilian series.

*Measurements.*—The external measurements of the three Grenada specimens, taken in the flesh, and of an alcoholic specimen from Brazil, are:—

<i>No.</i>	<i>Locality.</i>	<i>Total length.</i>	<i>Tail.</i>	<i>Hind foot.</i>	<i>Ear.</i>	<i>Sex.</i>
8116	Grenada	678	320	82	37	♀
8117	"	638	310	80	37	♂
8118	"	615	290	75	32	♂
130	Para	696	325	84	38	—

The skulls of the type, and of No. 3699 from Brazil (in parentheses) measure respectively:—greatest length 85.5 (98); basal length, 71 (82); palatal length, 55.7 (65); zygomatic width, 35 (42); inter-orbital width, 22 (23); length of premaxillaries, 9 (13); anterior tooth to premaxillary, 9 (10); length from last molar to pterygoid, 19 (20); length of upper left tooth row, 19 (24); length of lower jaw, 66.5 (80); length of lower tooth row, 20 (25).

Of the three specimens of this armadillo obtained in Grenada, the type is fully adult, and probably of nearly maximum size. The two others are apparently full grown, but the sutures of the skull are not so nearly closed. Their skulls are even smaller than those of the type. A study of the nine-banded armadillos from Brazil in the Museum collection shows that there is more or less variation in size among fully grown animals, the smallest of which are very nearly the size of the larger female from Grenada. The average size is, however, much larger, and the cranial characters sufficiently striking. It seems best, nevertheless, to regard the island animal as a subspecies, both because of the probable intergradation, and because of the expression of relationship thus made possible.

An armadillo from Caparo, Trinidad, No. <sup>7549</sup>/<sub>5942</sub>, American Museum of Natural History, is clearly the same as the typical species of Brazil. It measured:—total length, 802 mm.; tail, 360; ear, 38.5. Skull, greatest length, 93; palatal length, 63; zygomatic breadth, 38.5;

upper tooth row, 25; lower tooth row, 25; last molar to end of palate, 19.4; palatals, 17; lower mandible, extreme length, 73.3; teeth,  $\frac{8-8}{8-8}$ .

*Nomenclature.*—According to Thomas (Proc. Zool. Soc. London, 1911, p. 141) *Dasypus* should replace the generic name *Tatu*, for this armadillo. The type locality of Linné's *Dasypus novemcinctus* is "America meridionali," and is generally taken to be the eastern coast of Brazil. Linné also describes as *Dasypus septemcinctus* an armadillo which is characterized by "cingulis septenis," and lives "in Indiis." Whether this name was actually based on specimens from the Antilles or not seems impossible now to decide. Certainly, however, the Antillean armadillo normally has nine bands; and it is more reasonable to suppose an error in Linné's locality than that his specimen was abnormal. The name *septemcinctus* is doubtless best considered as referring to the small armadillo of southeastern South America, which does have seven bands. The name was so used by Schreber (in his *Säugetiere*, vol. 2) and Gray. According to Thomas the animal should be known as *Dasypus septemcinctus* Linné.

In his "Handlist of the Edentate, Thick-skinned, and Ruminant Mammals of the British Museum" (1873) Dr. J. E. Gray recognized no less than seven species of the large nine-banded armadillos from the mainland of South and Central America, five of which he there describes as new. These are: *Tatusia granadiana*, *T. leptorhynchus*, *T. brevirostris*, *T. leptoccephala*, *T. boliviensis*. He also recognizes *T. mexicana* of Peters, but ignores the latter's *T. fenestratus* of Costa Rica. His names are based mainly on minute and inconstant variations in the shape or arrangement of the head plates, and the outline of the lachrymal bone. These differences disappear on the comparison of even small series, so that it is currently considered that *Dasypus novemcinctus* of Brazil is the same as the Central American and Mexican animal. Gray's names *brevirostris* and *boliviensis* are both based on specimens from Bolivia, whence I have seen no material.

A series of ten skins and skulls from Panama, Costa Rica, and Yucatan, however, shows that the Central American animal, while essentially of the same size as the large Brazilian armadillo, is very readily distinguished by its absolutely much shorter palatal bones, which do not usually reach the level of the posterior tooth, and by the very marked inflation of the maxillary region of the skull directly in front of the lachrymal bones, as is best seen from the ventral aspect. In the Brazilian nine-banded armadillo, the palatal bones usually bow forward at least to the level of the posteriormost tooth; but in the Central American race there is commonly a space of from 1 to 3 mm. between

the last molar and the palatal. In ventral aspect, the lateral outline of the skull is nearly straight, or slightly concave from the widest portion of the zygoma to the base of the rostrum, but in the Central American skulls this margin bows suddenly out at about the level of the sixth tooth, and forms a convexity that ends at the level of the second or third tooth. Peters (Monatsb. k. preuss. Akad. Wiss. Berlin, 1864, p. 180) described the nine-banded armadillo from Costa Rica under the name of *Dasypus fenestratus*, and pointed out the fact of its shorter palate, as well as other less important cranial differences, as contrasted with the typical species. In the same paper he also described *D. mexicanus* from Mexico. These two names, however, appear to be synonymous, for the Mexican animal is essentially similar to that of Costa Rica. Since the latter is first described, it will therefore be proper to speak of the nine-banded armadillo of Mexico and Middle America as *Dasypus novemcinctus fenestratus* Peters. In this connection, it is interesting to note that four specimens from Mexico in the Museum collection have but eight thoracic rings instead of the nine usually found.

As nearly as can be judged from Gray's figure of *T. granadiana* (Hand-list of Edentata, 1873, pl. 2, p. 2) this name is probably synonymous with *D. novemcinctus*, as the New Grenada specimen seems to show a less swollen malar region than does his figure of *mexicana*. The greater length of the palate in the Central American race is evident from the following measurements:—

No.	Locality.	Greatest skull length.	Greatest length of palatals.
130	Para	89	19.5
998	Brazil, Sta. Rita	98	19.8
1030	" "	93.5	22.3
1003	" "	96	18.5
3699	Brazil	100.5	20
Average		95.4	20
2835	Panama	99.5	17.5
12330	Costa Rica	101	17.5
12325	"	97.5	15.4
12329	"	98	16.5
12326	"	98	16.2
Average		98.8	16.6

*Antillean Distribution.*—There is no evidence to show that the Antillean armadillo ever occurred naturally to the northward of Grenada. De Rochefort, writing in 1658, on the natural history of the Antilles, gives the "Tatou" as a native of Tobago, and notes that, while some armadillos are as large as foxes, "ceus qui sont à Tabago sont beaucoup plus petis" (1658, p. 123). Evidently, then, the Tobago armadillo was small, as is the Grenada animal. Again, Du Tertre, writing in 1654, of the natural history of the French Islands, St. Christopher, Guadeloupe, and Martinique, does not mention its occurrence; but in the 1667 edition of this work, written after he had visited Grenada, he includes it, with the remark that he had never seen it until he visited that island, where it was then common. Its flesh was highly esteemed, and the animal was much hunted with dogs. He adds, in substance, that Grenada is the only one of the islands inhabited by the French where this little animal can live, and that many people have endeavored to transport it alive to Martinique, but without success. For if they even take it as far as St. Vincent, its strength fails it, and most of them die on the voyage. If even the strongest live until they reach Martinique, they die as soon as they touch the ground. This statement, however, was doubtless a more or less fanciful explanation of the absence of the "tatou" from the other islands; for Labat, in 1742, disproves it by asserting that he himself saw one in 1704, alive and well, that had been brought from Grenada to Martinique at Fort St. Pierre. He had never tasted its flesh on Martinique; but in Grenada in 1700 he had several times eaten it, and speaks of it as white, fat, and delicate (Labat, 1742, 3, p. 19).

On Grenada it is now confined to the rough country, covered with primeval forest, on the hills of the region about Grand Etang, and thence to the hills back of Gouyave, on the west coast. Its flesh is much esteemed by the negroes, who capture it by means of a deadfall constructed over the armadillo's runway among the thick undergrowth. This consists of a small palisade of stakes for about a yard on each side of the trail, above which a number of heavy stones are suspended on a couple of logs placed lengthwise with the runway, and held by an ingenious series of levers and notched sticks, on the "figure 4" principle. This deadfall is sprung by the animal tripping a slender trigger in passing between the palisades of stakes. The traps are usually visited every other day, and one man may catch one or two tatous in this time from his six or eight traps. It is also sometimes hunted with dogs at the present day; and Mr. John Branch, of

Grenada, tells me that he has in this way captured five in a single night in the forest back of Victoria.

Mr. Austin H. Clark tells me that several years previous to 1904 the armadillo was introduced from Grenada into Carriacou, but has not been met with there since. He suggests that this island may be too dry for its existence.

## CERVIDAE.

### ODOCOILEUS.

Gundlach (1866-7, p. 40) says that the deer is not native, but has been introduced into Cuba. It is not mentioned by Ramon de la Sagra (1840) in his work on Cuban mammals.

## LEPORIDAE.

### ORYCTOLAGUS CUNICULUS (Linné).

*Lepus cuniculus* Linné, Syst. Nat., 1758, ed. 10, 1, p. 58.

The common hare has been introduced into Barbados, and into Balliceaux in the Grenadines. Mr. Austin H. Clark writes (in 1903) that on Barbados it is becoming rare, as the mongoose preys on the young; but it is still very common on Balliceaux. What is presumably the same animal was introduced long ago into Guadeloupe from Europe. Du Tertre says of it, in 1654, that it had then become very abundant, and made burrows to the depth of two or three feet, where the hard volcanic "tuf" was encountered through which it was unable to dig. He observes that the rats eat the young, and often kill the old ones as well, from which he predicts their eventual extermination.

Feilden (1890) states that, according to Dr. Sinclair Browne, they were first brought to Barbados from England in 1842 by Thomas Trotman; and were bred in an enclosure on the Bulkeley estate, St. George's Parish. A heavy rainfall finally demolished part of the enclosure and allowed the hares to escape. They increased rapidly; and Dr. Browne recalled a man in St. Phillip's Parish who, about 1870, annually shot two or three hundred. By 1890, their numbers were much reduced, due, according to Feilden, in part to the possession of firearms by the negroes, but chiefly to the mongoose.

The European rabbit (*Lepus europaeus*) is said to have been in-



roduced into Barbados; but, although they increase rapidly at first, the mange soon attacks the old ones, and the rats kill the young before they are large enough to leave their burrows.

## AGOUTIDAE.

### DASYPROCTA ALBIDA Gray.

*Dasyprocta albida* Gray, Ann. Nat. Hist., 1842, 10, p. 264.

*Dasyprocta cristata* Auct.

Since 1876 the agoutis of the Lesser Antilles have been tacitly referred to *Dasyprocta cristata* (Desmarest), following Alston, who, in his paper on the genus (Proc. Zool. Soc. London, 1876, p. 347-352) wrote that West Indian specimens seemed identical with others which Waterhouse had identified with Desmarest's species. Desmarest's name dates from 1816, when he published the description, without locality, in the *Nouvelle Dictionnaire*, 1, p. 213. Later, however, in his *Mammalogie* (1820) he states that the species was known from two specimens only that came from Surinam, and were living in captivity at the Paris Museum. Desmarest knew the West Indian species, which he considered the same as his *D. acuti*, found in Brazil, and Guiana. The name *cristata* is therefore referable to some one of the continental species of *Dasyprocta*. I have been able to examine skins and skulls of but five Antillean agoutis,—two from Sta. Lucia, and one from St. Vincent, in the collection of the Museum of Comparative Zoölogy, and a single one each from the islands of Montserrat and St. Kitts, kindly lent by the U. S. National Museum. I have also studied material from Trinidad in the collections of these Museums and of the American Museum of Natural History. From this small series it is difficult to draw very certain conclusions, but it seems evident that the St. Vincent and Sta. Lucia specimens at least are readily distinguishable from those of Trinidad. These latter may be assumed as representing more or less closely the mainland animal, probably the same as that which Thomas has named *D. rubatra*. The final disposition of the name *cristata* remains still to be worked out.

In 1842, J. E. Gray described and named as new an agouti from the island of St. Vincent. This was apparently an albinistic individual, as shown by the brief diagnosis: "whitish gray, nearly uniform, the hair of the back elongated, white at the base.... Size of a guinea-pig, *Cavia cobaya*." Later writers have ignored this name,

or considered it synonymous with *D. cristata*. Apparently, however, the St. Vincent agouti is a valid race of the Trinidad species, and to it therefore Gray's name will apply. The specimen in the collection of the Museum of Comparative Zoölogy is an adult female, procured in February, 1904, by Mr. Austin H. Clark. It seems to represent a smaller animal than that of Trinidad, with a hind foot of about 95 mm. instead of 109 or 110 as in the latter. The skull is markedly smaller, with a shorter and more sharply tapering rostrum, shorter nasals, and a shorter median frontal suture. The maxillary pit at the inner side of the antorbital foramen is smaller, and circular, instead of large and oval, as in the Trinidad animal. The lachrymal canal opens on the upper side of this pit. The skull measures as follows (in parentheses are measurements of a Trinidad skull):—greatest length, 94 (104); basal length, 69 (76); palatal length, 34 (42); median length of nasals, 31.4 (36.5); median length of frontal suture, 38 (44); zygomatic width, 48 (48); upper diastema, 24.5 (29); upper cheek teeth (alveoli), 15.5 (17). The skin accompanying the St. Vincent skull seems redder than usual, but can be practically matched with Trinidad skins.

#### DASYPROCTA ANTILLENSIS Selater.

*Dasyprocta antillensis* Selater, Proc. Zool. Soc. London, 1874, p. 666, pl. 82.

Two skulls of the agouti from Sta. Lucia seem to show that it is distinct from that of St. Vincent, or of Trinidad, although the skins do not appear to differ.

In 1874, Selater described two living agoutis received from Sta. Lucia by the Zoological Society of London. These he compares with *D. punctata* of Central America; and notes a specimen from St. Vincent in the British Museum, which he considers the same as his Sta. Lucia animals. He proposes to call the West Indian animal *D. antillensis*, and gives a plate of it. Since his description was evidently based on Sta. Lucia specimens, the name *antillensis* may stand for the agouti of this island. It is nearly the same in size as the Trinidad agouti, but with notably shorter nasals, which tend to be narrower, and to taper slightly at the distal end. The rostrum is noticeably shorter; and the incisive foramina are prolonged posteriorly to reach the maxillo-intermaxillary suture, instead of ending some 3 or 4 mm. anterior to it. The pit in the maxillary bone at the inner side of the antorbital fossa is smaller and more nearly circular.

Among the material in the collection of the U. S. National Museum is a single skull (No. 14010) of an agouti from the island of Montserrat, collected by Fred Driver, and received May 20, 1902. It is that of a female, and the condition of the basi-occipital suture shows that it is not fully adult, though probably mature. This specimen is slightly smaller than the skull of *D. albida* of St. Vincent, and differs remarkably in the narrowness of the zygomata and brain-case, narrow palate, and contracted opening of the posterior nares. The conformation of the palate is especially striking, for the posterior prolongations of the maxillaries are so reduced as to be almost absent along the posterior half of the alveolar border, instead of broadly tapering to the inner angle of the last molar, as in all the other specimens examined. The palatal bone therefore practically occupies the full width of the posterior half of the palate. The antorbital foramen is much reduced in vertical extent as compared with specimens from other islands; and the maxillary pit is elliptical in outline, and smaller than in Trinidad skulls. The incisive foramina are long, and reach the maxillo-premaxillary suture.

This skull measures as follows:—greatest length, 90; basal length, 67; palatal length, 33; length of nasals, 30.5; median length of frontal suture, 37; zygomatic breadth, 42; mastoid breadth, 32; diastema, 22; upper molar row (alveoli), 18; lower molar row (alveoli), 19; anterior width of palate between inner borders of alveoli, 7.6.

The structure of the palate in this single specimen is so different from that of any other agouti I have examined that it may be merely an abnormality; so that, in view of this possibility, and the fact of its being not fully adult, it seems best to await additional specimens before naming it.

A skull from the island of St. Kitts, also in the U. S. National Museum, has very broad short nasals, but is evidently immature, and somewhat abnormal owing to a fracture of the premaxillary, and the loss of the upper right incisor. Probably a series of agoutis from the various islands of the Lesser Antilles would show that they had become slightly differentiated on all or most of them.

*Antillean Distribution of Dasypsecta.*—The agouti must formerly have been rather generally distributed throughout most of the Lesser Antilles. De Rochefort, in 1658, included it among the five species of mammals listed as native to Tobago, and gives a crude picture of one sitting on its haunches, and eating leaves which it holds in its forepaws. It is still found on Grenada, where, however, it is confined to the small area of primeval forest yet remaining among the hills

of the interior. Here it has become excessively scarce of late years, due, as some think, to the mongoose killing the young. None of the native hunters with whom I spoke in Grenada seemed to think it possible to procure specimens. Mr. Austin H. Clark tells me that the agouti has been introduced into the southeastern end of Bequia, where, however, it has not thriven, possibly for lack of sufficient water. It is not found on the other Grenadines. On St. Vincent it still occurs, among the wooded highlands; and Mr. Clark obtained a specimen here in 1904, and writes that, although largely nocturnal, it may sometimes be seen in the daytime tearing to pieces rotten stumps and fallen trees, apparently for the insect larvae inhabiting them. Farther north, it is well known to occur on Sta. Lucia, whence the Museum possesses specimens taken some thirty years ago by Mr. John Semper. Probably it once lived in most or all of the larger islands to the northward; for Du Tertre, in 1654, includes it as a well known species among the French isles. He mentions no particular island as its habitat; but since his title is a "*Histoire Générale des Isles de S. Christophe, de la Guadeloupe, de la Martinique,*" etc., it may be assumed that it was found on them. The eruptions of Martinique may have contributed to exterminate it there. At all events I have not found it definitely recorded from that island. Labat, writing in 1742 (3, p. 23) of the Antilles, voices his belief that it is found in all the islands. He acknowledges that he did not find it on Martinique, for which perhaps the snakes may have been responsible, but he knew it to be common on Guadeloupe, Dominica, and St. Kitts. Chapman (1897, p. 29) records a specimen taken in Dominica, where it was said to be still common in the interior of the island. There is a specimen in the collection of the U. S. National Museum from the island of Montserrat, received in 1902. In the catalogue of the Museum of Comparative Zoölogy are recorded two skins of the agouti from St. Kitts (or St. Christopher) received in 1881 from F. Lagois, but they are not now to be found. A specimen from this island was lent to me, however, by the U. S. National Museum. The British Museum has specimens also from St. Thomas (Alston, P. Z. S., 1876, p. 348). The possibility of its having been introduced into these more northern islands is of course not to be overlooked, but there is no evidence of it. Du Tertre (1654) states that among the French Isles they are much hunted for their flesh, with dogs trained to run them. They usually seek shelter in a hollow tree, whence the hunters smoke them out. He says further that the female brings forth two young at a birth, in a nest made on the ground under a bush. The

Caribbean Indians used the sharp incisor teeth of the agouti in their ceremonies, for cutting the skin all over their bodies to draw the blood.

## CASTOROIDIDAE.

### AMBLYRHIZA INUNDATA Cope.

*Amblyrhiza inundata* Cope, Proc. Amer. Phil. Soc., 1868, p. 313.

*Loxomylus latidens* et *quadrans* Cope, *Ibid.*, 1870, p. 608; 1871, p. 102.

In 1868 there was deposited at Philadelphia a cargo of cave earth, limestone fragments, and bone breccia, brought for commercial purposes from the island of Anguilla. A number of bone fragments were discovered by Cope in this shipment, and among them the remains of a large extinct rodent, which he named *Amblyrhiza inundata*. At the instance of Professor Cope, the colonial physician at St. Martin's made further investigation of the Anguilla caves and sent back a quantity of fragments, including the femur of an Iguana, portions of the leg bone of a rodent the size of an agouti, and perhaps related to it, a fragment of an artiodactyle, "apparently a member of the Bovidae," as well as more portions of *Amblyrhiza*, including teeth, on which Cope promptly founded two species of a new genus — *Loxomylus quadrans* and *L. latidens* — but these are now considered synonymous with *Amblyrhiza inundata*.

Very recently, J. W. Spencer (1910) has announced the discovery of *Amblyrhiza* remains in a cavern on the island of St. Martin's, and notes the further discovery in Cuba by Professor de la Torre, of "a large Pleistocene fauna of rodents, edentates and other vertebrates, as also excellent specimens of Jurassic fossils."

NOTE.—*Coendu pallidus* Waterhouse.—The prehensile-tailed porcupine is attributed to the "West Indies" by Waterhouse (Mammalia, 1848, 2, p. 435), on the basis of a skin so labeled in the British Museum. Probably this specimen came from Trinidad.



## OCTODONTIDAE.

## CAPROMYS PILORIDES (Pallas).

*Mus pilorides* Pallas, Nov. Spec. Quad. Glir. Ord., 1778, p. 91.

Mr. F. M. Chapman in his revision of the genus notes specimens of this Cuban species from El Guama and San Diego de los Baños in western Cuba, and from Trinidad in central southern Cuba. The Museum of Comparative Zoölogy has specimens from Matanzas in northwestern Cuba, and one from Puerto Principe in east central Cuba. It appears to be commoner than *C. prehensilis*, and is known locally as 'Hutia congo.'

Although the teeth of this species are said to be similar to those of *C. prehensilis*, this is rather understating the case; for in *pilorides* the outer enamel folds are much deeper than in the long-tailed species, a point that has apparently not hitherto been emphasized.

Concerning *Capromys elegans*, described in 1901 by Latorre, there seems considerable likelihood that it is merely a partially albinistic and very brightly colored example of *C. pilorides*. It is based on a mounted skin in the Madrid Museum (labeled as from Cuba), and is briefly diagnosed as follows: "*C. rufo-flavus*, capite, cauda, pedibusque castaneo-fuscis, macula faciali minima, flava; macula alia dorsali magna, lanceata, fusca, albo-limbata; pilis frontalibus erectis." The tail is described as partly naked, due apparently to abrasion of the hairs. The general dimensions of the skin are nearer those of a small *C. pilorides*, rather than of *C. prehensilis* or even *melanurus*, to which latter it is said to approximate in the shape of the head! The measurements given are: head and body, 485; tail, 200; hind foot without claw, 75. Until further evidence is forthcoming, it appears better not to recognize this as a distinct species.

## CAPROMYS PILORIDES RELICTUS, subsp. nov.

*Type*.—Adult male, skin and skull, No. 10,996, M. C. Z., from Casas Mountains, Nueva Gerona, Isle of Pines, Cuba; collected 10 March 1902, by Walter R. Zappey.

*General characters*.—Externally similar to *C. pilorides* of Cuba, but smaller. Skull and teeth markedly smaller and more lightly built throughout; postpalatal fossa differently shaped; premaxillaries extending back slightly beyond the nasals.

*Description.*—General color a grizzled yellowish brown, paler on the belly and tail, where the yellowish prevails. Short hairs about the muzzle whitish, shading into pale russet between the nose and eyes. Crown, nape, and entire dorsal surface and sides of body, and the throat, a coarsely grizzled pale ochraceous and black, or Prout's brown. The black is most prominent on the shoulders, and gives place to Prout's brown on the sides and throat. The separate hairs are hair-brown at the base, then black for one half or more of their length, with a subterminal ring of ochraceous, succeeded usually by a very small black tip. On the sides of the body the hair-brown is much more extensive, nearly to the exclusion of the black. Numerous entirely black hairs occur among the particolored hairs of the back. Upper surfaces of the forearms and feet nearly clear Prout's brown. Ears scantily clothed with short buffy hairs. Long hairs about the base of the tail nearly clear ochraceous buff, giving place to the shorter buffy hairs of the terminal three fourths. Ventral surfaces of the body and limbs nearly clear buffy, darkened by the hair-brown bases which everywhere show through. The vibrissae are numerous and long, the more dorsal ones black, the more ventral clear white.

A second specimen, also from the Casas Mountains of Nueva Gerona, is quite similar in coloration, except that the hairs lack the ochraceous tint, and are instead buff in their paler portions, producing thus a much grayer effect. Neither specimen shows the rufous tint that is so prominent in some specimens from Cuba, nor are there traces of incipient albinism, such as are usually found in Cuban examples. These characters, however, are subject to such variation in the typical race that it would be unsafe to assume that the Isle of Pines *Capromys* may not occasionally be rufescent or albinistic.

*Skull.*—The skull of *C. pilorides relictus* differs more widely, it would seem, from that of *C. pilorides pilorides*, than does that of *C. prehensilis gundlachi*, of the Isle of Pines, from the Cuban prototype. It is about one sixth smaller, and proportionately lighter, with smaller and more slender teeth. The form of the postpalatal fossa is remarkably different. In the Cuban *pilorides*, its anterior outline is that of a broadly rounded arch, reaching about to the level of the middle of the posterior molar. In *relictus* this fossa is at first narrow and parallel-sided, then becomes V-shaped, with the point at about the level of the anterior end of the last molar. In typical *pilorides*, the posterior border of the nasals reaches or exceeds that of the premaxillaries; whereas, in the two specimens of *relicta*, the nasals are slightly ex-

ceeded by the posterior prolongations of these bones. In all the skulls of the Cuban *pilorides* examined, the posterior dorsal border of the parietal has a conspicuous medial emargination; whereas that of *relictus* is nearly straight across. Apparently, also, the slight postorbital processes of the frontal seen in the Cuban skulls are much less developed in the Isle of Pines race; so that the supraorbital margin is much more nearly straight. Other slight differences, such as the greater curvature of the ventral outline of the ramus, are less tangible, or due, perhaps, to individual variation.

*Measurements.*—No external measurements of the Isle of Pines specimens were taken. The dry skins, which are carefully made, show the following dimensions in millimeters:—

No.	Total length.	Tail.	Hind foot.	Ear.
10,996 Type	773	238	92	25
10,997	690	230	89	25

The skull of the type lacks the condylar region. Its dimensions follow; and for comparison the corresponding measurements of a Cuban *C. pilorides*, No. 7231, are added in parentheses:—greatest length, 94.5 (111); palatal length, 42 (53); diastema, 25 (32); zygomatic breadth, 49 (52); interorbital constriction, 27 (29); nasals (median length), 25 (36.5); upper cheek teeth (alveoli), 20 (23); lower cheek teeth (alveoli), 20.5 (23); ramus from condyle to tip of incisors, 63.5 (76).

#### CAPROMYS PREHENSILIS Poeppig.

*Capromys prehensilis* Poeppig, Journ. Acad. Nat. Sci. Philadelphia, 1824, ser. 1, 4, p. 11.

Poeppig considered this species to be rarer than *C. pilorides*. He had specimens from the mountains of southern Cuba—Partido de las Piedras, Macurizes, Masmariges. Mr. Chapman records specimens from western Cuba, at San Diego de los Baños and Cabañas. No doubt this and the short-tailed hutia were once generally distributed throughout the island. Its local names are “Hutia caraballi” or “Hutia mono.”

#### CAPROMYS PREHENSILIS GUNDLACHI Chapman.

*Capromys prehensilis gundlachi* Chapman, Bull. Amer. Mus. Nat. Hist., 1901, 14, p. 317, pl. 39, 2 figs., text-fig. 2.

This race is confined to the Isle of Pines, where it represents *C. prehensilis*. The fact that both the common species of *Capromys* (*C. pilorides* and *C. prehensilis*) have representatives on the Isle of Pines, off the southwest coast of Cuba, is evidence of their former general distribution throughout at least the Cuban portion of Antillea. The fact of the differentiation of these Isle of Pines animals in numerous striking cranial characteristics further indicates a long period of isolation. Mr. Chapman's account of the variations exhibited by his series of six *gundlachi* and seven *prehensilis* may point to a less tendency to albinism in the Isle of Pines animals, as seemed also to be true of the new race of *pilorides* described above from that island.

#### CAPROMYS MELANURUS Poey.

*Capromys melanurus* Poey, Monatsb. k. preuss. Akad. Wiss. Berlin, 1864, p. 384.

The type of this species came from Manzanillo in the southeast of Cuba, where it was locally called "Andaraz". Dobson (1884) in his account of its anatomy, states that his two specimens were from the mountains (Sierra Maestra) at the southern extremity of the island, eight miles north-northeast of Portillo. It is supposed to be at present confined to this eastern portion of Cuba, but no specimens seem to have been taken for many years. A comparison with skins of *prehensilis*, to which it seems closely related, is much to be desired. Dobson's figure, drawn from an alcoholic specimen, indicates a rather bushy-tailed animal. Mr. Chapman considers that *Capromys poeyi* of Guérin (1834) is a synonym of *C. prehensilis* Poeppig (1824), but it may well be that Guérin was describing the animal now known as *C. melanurus* of Poey (1864). Guérin specially notes the tail as entirely covered with long rusty hairs and lacking the naked space below. Poey also indicates a supposed smaller species, with yellow unringed hair, and in a footnote the name *C. pallidus* is applied to it by Peters (Monatsb. k. preuss. Akad. Wiss. Berlin, 1864, p. 384 and footnote).

#### CAPROMYS (GEOCAPROMYS) THORACATUS True.

*Capromys thoracatus* True, Proc. U. S. Nat. Mus., 1888, 11, p. 469.

This was described from two specimens obtained on Little Swan Island, where the animal is said still to occur, and is called "Hutia". The discovery of the genus on this small island is of extraordinary

interest as tending to confirm the theory of a former land connection from the peninsula of Honduras to Jamaica.

CAPROMYS (GEOCAPROMYS) BROWNII Fischer.

*Capromys brownii* Fischer, Synopsis Mamm., Addenda, 1830, p. 389 (=589).

This dark-colored short-tailed *Capromys* is probably still to be found in the wooded parts of Jamaica. In addition to a mounted specimen, the Museum has a skin and skull collected in Jamaica in July, 1905, by Capt. Wirt Robinson.

CAPROMYS (GEOCAPROMYS) INGRAHAMII Allen.

*Capromys ingrahami* Allen, Bull. Amer. Mus. Nat. Hist., 1891, 3, p. 329, fig. 1-10.

The discovery of this animal on one of the Plana Keys, situated between Acklin's and Maraguana Islands, of the Bahama group, was made only twenty years since. As noted by Allen (1891) it was common and easily obtained on this small islet of only four or five miles in length and about half a mile wide. No trace of *Capromys* was found on the neighboring islands; and there is no evidence that it has been on them within historic times. Columbus, in his journal, distinctly states that no wild quadrupeds were met with in the Bahama Islands among which he first landed (*viz.*, Watling's Island, Rum Cay, Long Island, and Exuma). Not until he reached Cuba did Columbus find the hutia. Catesby's reference to the Bahama Coney in his Natural History of Carolina, Florida and the Bahama Islands, (1743) throws no light on the subject. His figure seems to represent the common *C. pilorides* of Cuba. Of early references to these mammals, those of Oviedo have been very often quoted, but always with much uncertainty as to what animals were really meant. A valuable transcription, with commentary, has been given by MacLeay (1829), who was familiar with *Capromys* in Cuba. Gonzalo Hernandez de Oviedo y Valdes published in 1535 his "Historia general de las Indias," and a second edition appeared in 1547. Oviedo seems to have lived in the present island of San Domingo and Haiti, and his notes on mammals appertain to that island. He admits, however, that he had his information concerning them at second hand. He mentions the following four native species, as well as a kind of dog. The *Hutia*



was of a gray mixed color, somewhat less than a rabbit, with rat-like ears and tail. It was considered excellent food, and already was becoming scarce but fifty years after the discovery by Columbus. This animal is supposed to have been one of the long-tailed *Capromys*. Possibly it was *Plagiodontia*, described and figured nearly three hundred years later by F. Cuvier, though MacLeay thought it might be similar to the Cuban *C. prehensilis*. The *Quemi* was likewise found in San Domingo; but Oviedo considered it even then extinct. According to many persons who had seen it, it was as large as a small hound or beagle, gray like the hutia, and of the same form and proportions. MacLeay considers this some form of *Capromys* related to the Cuban *C. pilorides*. A third form, called *Cori*, appears to have had a very short tail; and is unhesitatingly referred to the Guinea-pig by MacLeay. It is more likely, however, that this was one of the short-tailed *Capromys*, standing thus midway between that of Jamaica and that of the Plana Keys, Bahamas. The fourth animal is the *Mohuy*, the size of a hutia, but clearer gray, and with stiffer hair. Possibly this may have been the *Plagiodontia*, although at this late date, it seems impossible to determine its identity with any assurance.

#### CAPROMYS COLUMBIANUS Chapman.

*Capromys columbianus* Chapman, Bull. Amer. Mus. Nat. Hist., 1892, 4, p 314, text-figs. 3, 4.

The fragment on which this species is based was found in a sub-fossil condition in a cave near Trinidad, Cuba. Imbedded in the walls of the cave were found molluscan shells said to be identical with those of existing species, a fact that indicates a recent age for this animal. The portion of the skull discovered shows a palate so strongly contracted at its anterior end that the alveoli of opposite sides are brought nearly into contact. So striking is this difference in the width of the palate that it seems doubtful if the animal described should be considered congeneric with *Capromys*.

#### PLAGIODONTIA AEDIUM F. Cuvier.

*Plagiodontia aedium* F. Cuvier, Ann. Sci. Nat., Zool., 1836, ser. 2, 6, p. 347, pl. 17.

Of this interesting animal, nothing further seems to have been discovered since it was first described nearly seventy-five years ago, from San Domingo.

## LONCHERES ARMATUS (I. Geoffroy).

*Nelomys armatus* I. Geoffroy, Ann. Sci. Nat., Zool., 1838, ser. 2, 10, p. 125.

The occurrence of a spiny rat in the island of Martinique seems first to have been made known by Dr. F. W. True, who, in 1885, published a note on a specimen procured there by F. A. Ober, and received in 1878, with other collections, by the U. S. National Museum. Apparently no direct comparisons with other species were made; but from the published descriptions, Dr. True was "inclined to believe that the specimen should be classed with *L. armatus*." Dr. True at that time believed the species to have been recently introduced into the island, and considered it not unlikely that many small rodents were from time to time brought over by sailing vessels from the South American continent to these islands.

On the other hand, Mr. Austin H. Clark, who collected for some weeks on Martinique in 1904, states that the natives of the island assured him that a spiny rat was to be found there, though he obtained none. This bit of evidence may indicate that the species is really indigenous, and still survives in this one of the Lesser Antillean Islands.

## MURIDAE.

## ORYZOMYS ANTILLARUM Thomas.

*Oryzomys antillarum* Thomas, Ann. Mag. Nat. Hist., 1898, ser. 7, 1, p. 177.

This Jamaican species is based on a single specimen in the British Museum, collected by P. H. Gosse some time prior to 1850. Two skins in the collection of the U. S. National Museum are also noted by Thomas as mentioned by Coues (Coues and Allen, Monographs of North American Rodentia, 1877, p. 116, footnote). These two were collected about 1877, five years after the introduction of the mongoose. Since this date no specimens seem to have been taken, and it is perhaps nearly, if not quite, extinct. No trace of this genus has ever been found on the other Greater Antilles, although Dobson (Proc. Zool. Soc. London, 1884, p. 234, footnote) gives "*Hesperomys palustris*" as a species of Cuba, or of Jamaica, or both, believing it to have been introduced from the United States. Probably this

reference really applies to the native Jamaican rice-field mouse. Undoubtedly, the introduction of the Old World rats and mice must have contributed in great measure to reduce the numbers of any indigenous species in these islands, and the addition of the mongoose would seem to leave little hope of their escape from utter annihilation.

According to Thomas, the Jamaican *Oryzomys* is closely related to *Oryzomys couesi* of Central America, whose range extends northward to Honduras, Guatemala, and Chiapas in southern Mexico.

#### ORYZOMYS VICTUS Thomas.

*Oryzomys victus* Thomas, Ann. Mag. Nat. Hist., 1898, ser. 7, 1, p. 178.

St. Vincent is the only island of the Lesser Antilles from which this genus is now known. The single specimen on which the species is based was collected for the British Museum about 1892, by H. H. Smith, who marked it "forest rat." Its relationship is evidently with South American rather than Central American species, and it is compared with the continental *O. longicaudatus*. It is probably approaching extinction, if it is not already extinct. A thorough search on the other Lesser Antilles might reveal the presence of the genus; but Chapman, in several days' trapping in Dominica, failed to find it, nor did we get it in the Grenada forests. The introduced rats, which are everywhere common on the islands, would hardly fail to drive it out, wherever the two come into competition.

#### MEGALOMYS DESMARESTII (Fischer).

*Mus desmarestii* Fischer, Synopsis Mammalium, 1829, p. 316.

The so called "Muskrat of the Antilles" probably once occurred throughout all or most of the Windward Islands. De Rochefort, in 1658, includes it as one of the five native mammals of Tobago. On Santa Lucia it was also found, and on Martinique. Du Tertre, however, writing in 1654, mentions it from Martinique only, of the French islands. Here they were commonly eaten by the people, who, after singeing the hair, exposed them to the air over night, and then boiled them, throwing off the first water in order to get rid of the strong musky odor. In the Paris Museum are said to be six specimens of this genus, including the type of the present species, collected by D.

Plée in Martinique. Major (1901) notes that a specimen from the same place, collected also by Plée, is in the Leyden Museum. No recent examples appear to have been collected, and it is not unlikely that it has been entirely exterminated by the rats and human enemies.

#### MEGALOMYS LUCIAE (Major).

*Oryzomys luciae* Major, Ann. Mag. Nat. Hist., 1901, ser. 7, 7, p. 206. The Santa Lucia muskrat has been recently described as a peculiar island form. It differs conspicuously from that of Martinique in having the belly wholly brown instead of white. The type is a specimen in the British Museum, taken some sixty years ago.

#### MEGALOMYS "MAJORI" Trouessart.

*Megalomys majori* Trouessart, Catalogus Mammalium, fasc. 2, Rodentia, 1904, p. 415 (*nomen nudum*).

In his description of the Santa Lucia muskrat, Forsyth Major (1901, p. 206) briefly refers to a fragment of this rat, consisting of the lower teeth, found in a fossil state in a small ossiferous breccia in the island of Barbuda. This he considers to represent an extinct species but does not discuss it further. Trouessart, in the last issue of his 'Catalogus Mammalium,' proposes the name *majori* for this animal, but gives no description, and erroneously quotes the locality as Barbados. The name is therefore a *nomen nudum*, and the characters of the supposed species are still unknown.

#### MUS MUSCULUS Linné.

*Mus musculus* Linné, Syst. Nat., ed. 10, 1758, 1, p. 62.

The house mouse, although generally distributed among the Antilles, appears to be less abundant than the rats. Chapman did not obtain it among the mammals trapped on Dominica. Du Tertre (writing in 1654) notes its introduction into the French islands, but says that it was not very common, and it apparently increased far less rapidly than the black rat. The Museum has specimens from Grenada, St. Kitts, and Haiti. Feilden (1890) testifies to its abundance on Barbados, and notices that the specimens taken there seem redder than usual.

## EPIMYS RATTUS (Linné).

*Mus rattus* Linné, Syst. Nat., ed. 10, 1758, 1, p. 61.

## EPIMYS RATTUS ALEXANDRINUS (Geoffroy).

*Mus alexandrinus* Geoffroy, Descript. de l'Egypte, Mamm., 1818, p. 733.

These rats were very early introduced into the West India islands, and have become generally distributed among them. Apparently they increased enormously at first, and became a serious menace to the growing of certain crops, as the sugar cane. It was with the hope of exterminating them that the mongoose was first brought to Jamaica. Already, in 1654, Du Tertre makes mention of the great abundance and voracity of the rats among the French islands. He says that they destroy all sorts of fruits and green plants, especially sugar-cane. Hughes (1750) says that in Barbados they "are so very numerous, and so very destructive to Sugar-canes, that the yearly Loss to the Inhabitants of the Parishes of *St. Joseph's* and *St. Andrew's* alone, is computed to be no less than Two or Three Thousand Pounds."

At the present time, although still abundant on the islands, they appear, on some at least, to have reached a sort of adjustment as one of the faunal elements, and are not so noticeably destructive. This, at all events, appears to be the case in Grenada, where they are everywhere found, even in the primeval forest about Grand Etang, in the interior of the island. No reports of damage from rats were brought to notice, and no signs of destruction to the cocoa or fruits were seen. It may well be that the mongoose serves to check their increase, though it can hardly exterminate them. In Grenada we once started a rat from a heap of dried leaves in a cocoa orchard, It at once ran up a tree, and passing from limb to limb, quickly evaded our pursuit.

A few specimens of *M. alexandrinus* were taken in San Domingo by A. H. Verrill in 1906. In Cuba, Gundlach (1866-7, p. 55) thought it less common than the black rat, and speaks of its making round nests in trees. Browne, in his History of Jamaica (1789, p. 484) speaks of the "cane rat" as so destructive in the sugar fields that it often destroys one fourth or more of the crop. He adds, "There are great numbers of them in every plantation, though they take great pains to get rid of them; for the watchmen have seldom anything else to do



but set traps for them, which they do with infinite art and ease. Numbers of the negroes roast these animals in the stoke-holes, and eat them; and I have been informed by men of character, who have tasted of them, that they are very delicate meat."

#### EPIMYS NORVEGICUS (Erxleben).

*Mus norvegicus* Erxleben, Syst. Regni Anim., 1777, 1, p. 381.

The brown rat seems to be less common in some at least of the islands than the black and the roof rats. Chapman (1897, p. 30) records the capture of two specimens in Dominica.

Gundlach (1866-7, p. 55) a half century ago considered this more abundant and destructive than the black or the roof rat in Cuba. He writes that it lives more in holes in the ground; and not only kills the domestic fowls, but gnaws the sugar canes to such an extent as to effect serious damage.

Fielden (1890) says this is an abundant species in Barbados, where he had found no other.

### VIVERRIDAE.

#### MUNGOS BIRMANICUS (Thomas).

*Herpestes auropunctatus birmanicus* Thomas, Ann. Mag. Nat. Hist., 1886, ser. 5, 17, p. 84.

In 1872, W. Bancroft Espeut imported four pairs of mongoose from Calcutta to Jamaica, for the purpose of destroying the rats that caused so great a destruction of sugar-cane. These four pairs increased so rapidly, and attacked the rats with such ardor, that ten years later it was estimated that they effected an annual saving to the colony of 100,000 pounds sterling. Shortly after, however, they had so reduced the rats that they fell upon the native ground animals, and nearly annihilated certain toads, lizards, birds, and mammals. Even young pigs, lambs, kittens, and newly dropped calves were said to have been killed by them; and their diet included also various fruits and even sugar-cane. In consequence of the destruction of the toads and lizards, it is said (Howard, Science, new ser., 1897, 6, p. 384), the ticks became so abundant and so infested the mongoose that its numbers soon lessened greatly. Duerden, however (Journ.

Jamaica Inst., 1897, 2, p. 471), doubts the supposed destruction by ticks, and probably with reason. The diminution was more likely due to other causes, by which a gradual adjustment of the newly added faunal element was taking place.

Three specimens of mongoose, taken on the island of Grenada in 1910, are all in worn pelage. One appears to be in process of molting, and has shed the long hairs along the middorsal line of the rump and base of the tail. A comparison of these specimens with a series of Indian *M. griseus*, to which the mongooses of the West Indies have hitherto been tacitly referred, shows at once that they are smaller, and differently colored. On further study, they prove to be unquestionably *M. birmanicus* of eastern India (Burmah, Assam), and exactly agree in external appearance with a skin of that species from "East India" in the collection of the Museum. The long hairs of the back are usually five-banded; the basal ring is dark, the succeeding one whitish, the next black, then one of buff-yellow, with finally a black tip. These hairs cover the entire dorsal surfaces, giving a general yellowish brown grizzled appearance. Ventrally, the hairs are without the black tips, and the buff-yellow ring is so prominent as to impart its color to the throat, anal region, and ventral part of the base and sides of the tail proximally. The tarsus is naked along a line that narrows to the heel. The skull is decidedly smaller than that of *M. griseus*. The external measurements of two adults from Grenada are as follows, the first dimension in each case being that of a male, the second that of a female: total length, 666 mm., 561; tail, 265, 255; hind-foot, 60, 60; ear from meatus, 21, 23. The skulls of the same individuals measure respectively: greatest length, 68, 64; basal length, 65, 60; palatal length, 38, 35; zygomatic breadth, 35, 32; postorbital constriction, 11, 11; length of upper cheek teeth, anterior base of canine to back of molar<sup>2</sup>, 25.5, 24; length of premolar<sup>4</sup> from posterior end to tip of inner lobe, 8, 7; transverse width of upper molar<sup>2</sup>, 3.6, 3.5; lower cheek teeth, 28.8, 27.5; lower mandible from condyle to tip of incisors, 41, 42.6.

In addition to the specimens from Grenada, the Museum has a skin and skull of the same species taken in April, 1909, by Dr. Thomas Barbour at Port Antonio, Jamaica. Browne, in his History of Jamaica, speaks of what seem to have been at least two species of mongoose that had been brought captive to Jamaica from Africa, but these were apparently never loosed.

In the seventies, mongooses were brought from Jamaica to Grenada, as I am told by Mr. Septimus Wells of that island, who remembers

seeing the first crate of them brought to St. George's. On Grenada they are now common, not only about the houses and plantations, but even in the forests on the hill-tops of the interior. Mr. John Branch tells me that they seem now to be less common than they were a few years ago, so that on his estate at Point Saline, at the south end of the island, the ground lizards (*Ameiva*) that were nearly exterminated by the mongoose are now reappearing in small numbers. Possibly some sort of adjustment is going on, so that the mongoose is finding its place as part of the fauna in relation to the other animals. Nevertheless in Grenada the mongoose has evidently much reduced the ground lizards, but the damage done to the native birds is less evident. Apparently the mountain ground dove (*Geotrygon*) has suffered somewhat; and of the pea dove (*Engyptila wellsi*) I could find no trace during my stay in 1910. The agouti also seems to be nearly extinct in Grenada, due, it is supposed, to the killing of the young by this rapacious beast. Neither Mr. Clark nor I learned of the mongoose being in the Grenadines.

Mr. Austin H. Clark, who has kindly supplied some notes made by him during a stay in the Windward Islands in 1903, says that the mongoose is abundant on Barbados and St. Vincent, and is present also on Sta. Lucia. It is not uncommon to see as many as six in a morning's walk on Barbados or St. Vincent.

On Barbados it is a great menace to the raising of domestic fowls, turkeys, and ducks; for the young birds fall an easy prey. The decrease in the number of feral hares is attributed to the destruction of their young by this animal, as is also the diminution of the ground dove. According to Feilden (1890), the mongoose was introduced in Barbados a few years prior to 1890, to stop the damage done by rats. It seems effectively to have decreased these pests, so that it was uncommon to see much harm to the cane fields.

On St. Vincent, the mountain ground dove (*Geotrygon*) has disappeared, and the common ground dove (*Columbigallina*) and the ani (*Crotophaga*) have been reduced in numbers, supposedly by the ravages of this animal. Because of the destruction of the ground lizards on St. Vincent, the mole crickets are said to have increased to such an extent as to be a pest to the agriculturist.

Among the Greater Antilles, the mongoose is now in Jamaica, Cuba, San Domingo, and Porto Rico. From San Domingo I have examined a skin with part of the skull, taken April 26, 1895, at San Domingo City, and kindly loaned me for examination by the Field Museum of Natural History. This is the specimen previously recorded by Dr.

Elliot as the large Indian mongoose (*Mungos mungo*); but its skull and external measurements are identical with those of *M. birmanicus*, although the coloration is a somewhat lighter gray. I have little hesitation in considering it an unusually pallid specimen of the latter species.

The only Porto Rican specimen I have seen is one taken in 1899 by A. B. Baker, and now in the collection of the U. S. National Museum. This specimen had rightly been identified as *M. birmanicus*. According to Palmer (1899, p. 95) the mongoose was introduced at San Juan, Porto Rico, about 1877-79, and is now generally distributed in that island. It is said to have acted very effectively in reducing the number of rats there. Palmer further states that the mongoose is present in the small island of Vieques, just east of Porto Rico, and is abundant on St. Thomas. "Numbers" had also been sent to Cuba and St. Croix. Apparently they have not yet spread throughout Cuba, but are now common in certain parts of the western end of the island. Mr. Walter R. Zappey tells me that when he visited Cuba in 1906 the mongoose was so common about the Toledo plantation, near Havana, that it was nearly impossible to raise poultry.

It has been suggested that more than one species may have been introduced into the West Indies, but all that I have seen are the Burmese mongoose. It is common now in at least four of the southern Lesser Antilles, and in the seven islands above named, in the northern part of the West Indian group.

## PROCYONIDAE.

### PROCYON MAYNARDI Bangs.

*Procyon maynardi* Bangs, Proc. Biol. Soc. Washington, 1898, 12, p. 92.

This raccoon, so far as known, is confined to the island of New Providence, Bahamas. In his list of mammals of the Bahamas, Mr. G. S. Miller Jr. (1905) has given excellent illustrations of the skull of this small species. According to its describer, no tradition of its having been introduced from elsewhere was discovered; but Miller notes that J. H. Riley, who collected at New Providence in 1903, heard unsatisfactory reports of its having long ago been brought thither.

## PROCYON MINOR Miller.

*Procyon minor* Miller, Proc. Biol. Soc. Washington, 1911, 24, p. 4.

This newly described raccoon is known from a single young male which was received by the U. S. National Museum from the l'Hermier Museum. It was collected at Pointe-à-Pitre, Guadeloupe Island. It seems to be a small, or dwarfed, species somewhat resembling the Bahama raccoon.

It can be at present a matter of conjecture only whether or not this animal reached Guadeloupe by natural means. Possibly it was introduced by the French in the early days.

## PROCYON ? CANCRIVORUS (G. Cuvier).

For many years a raccoon has existed on the island of Barbados, but there is no record of specimens being compared with the mainland forms. Hughes, writing in 1750, speaks of a bounty being offered for their destruction; and Schomburgk, in 1848, considered them at that time 'scarce.' Feilden (1890) believed this animal to be *P. cancrivorus*, and stated that it was still to be found in considerable numbers in the rocky parts of the island. He thought its presence probably accidental, and indeed it is not impossible that it may have been introduced by man, or even have found its way on floating tree-trunks to the windward shores of the island.

## SOLENODONTIDAE.

## SOLENODON PARADOXUS Brandt.

*Solenodon paradoxus* Brandt, Mém. Acad. Imp. Sci. St. Pétersbourg, 1833, ser. 6, 2, p. 459, pls. 1, 2.

Since the publication of my paper on this species in 1910, additional specimens have been received from San Domingo by the American Museum of Natural History and the United States National Museum. These were part of a shipment of five living animals sent to the zoölogical gardens at New York and Washington.



## SOLENOTODON CUBANUS Peters.

*Solenodon cubanus* Peters, Monatsb. k. preuss. Akad. Wiss. Berlin, (1861), 1862, p. 169.

Practically nothing has been added to our knowledge of this species since the account published by Peters in 1861, and the subsequent description of its anatomy by Dobson.

Gundlach records it from the Sierra Maestra and Bayamo (south-eastern Cuba), and the country between Cienfuegos and Trinidad (south-central Cuba).

Poey (1851) goes at some length into the accounts of the early historians of Cuba to show that this animal, which he names the 'Almiqui' was unknown to the discoverers. Gundlach (1866-7, p. 44) believes, however, that Pichardo ('Diccionario de voces Cubanos') is probably correct in identifying the *Ayre* of Oviedo with the *Solenodon*.

## EMBALLONURIDAE.

## PEROPTERYX CANINA PHAEA, subsp. nov.

*Type*.—Adult female, skin and skull, No. 8101, M. C. Z.; collected at Point Saline, Grenada, 29 Aug. 1910, by G. M. Allen.

*General characters*.—Intermediate in external dimensions between *P. trinitatis* and *P. canina*; skull as large as in the latter; fur in the brown phase lacks the reddish cast seen in *canina*.

*Description*.—The type resembles specimens of *P. canina* in its general appearance, except that the fur above and below is nearly unicolor, of a dark Prout's brown, quite without the reddish cast characteristic of the continental species. The color difference is practically the same as that between *P. kappleri* and the brighter *P. canina*. The fur is long and light with an erect bang on the forehead. The membranes are blackish.

*Measurements*.—The dimensions of the type in the flesh are: length, 63 mm.; tail, 17; foot, 8.5; ear, 14; tibia, 18; forearm, 42. The skull measures: greatest length, 14.3; basal length, 10.5; palatal length, 4; interorbital constriction, 2.5; zygomatic breadth, 8; mastoid breadth, 7.1; mandible, 9; maxillary tooth row (exclusive of incisors), 5.4; mandibular tooth row (exclusive of incisors), 5.9.

*Remarks*.—The *Peropteryx* from Grenada is very closely related to those of Trinidad and the mainland adjacent. Mr. G. S. Miller Jr.

(Bull. Amer. Mus. Nat. Hist., 1899, **12**, p. 178) has characterized the former as *P. trinitatis*, a smaller animal than *P. canina*, with a forearm averaging 40 mm. (39–41) instead of 45, as in *P. canina*. Robinson and Lyon give forearm measurements of *P. canina* from La Guaira, Venezuela, ranging from 41 to 45 mm.; average of eleven specimens, 42. These Venezuela specimens are therefore rather smaller than typical specimens from eastern Brazil, the forearm of which is given by Gervais as 45 mm. The sixteen adults obtained by us in Grenada show extremes of 41–44.5 mm. in forearm measurements, with an average of 42.5. They are therefore to be distinguished from those of northern South America by the color alone, a character which is, however, rather striking. From the *Peropteryx* of Trinidad they are differentiated by the forearm measurement, but the color of this species is unknown except from alcoholic specimens. Although the Grenada *Peropteryx* differs but slightly from its nearest representatives to the south, it seems nevertheless advisable to emphasize these differences by giving a subspecific name, since a somewhat similar trend of variation is found in the races of *Artibeus planirostris* inhabiting the same areas.

An interesting point, apparently not yet recorded for the continental *Peropteryx*, is the occurrence of a dark color phase in the Grenada race. Thus among the adults taken, are a few colored entirely of a sooty brown, somewhat darker than Ridgway's clove-brown.

We found these bats in but one spot, a rather open cave on the sea-cliffs at Point Saline, the extreme southern end of the island. They clung by both hind feet to the rough surfaces of the rock, usually in well-shaded, overhanging places; but, on being disturbed, would flit farther into the darker recesses of the cave. Others, however, flew about under a tree near the mouth of the cave, but eventually took shelter in adjoining fissures. Their characteristic sprawling position when they first alight, with forearms spread out holding the body against the wall, is noted by Robinson and Lyon. When alarmed, they make a sharp, twittering noise, not very loud.

## NOCTILIONIDAE.

### NOCTILIO LEPORINUS (Linné).

*Vespertilio leporinus* Linné, Syst. Nat., ed. 10, 1758, **1**, p. 32.

*Vespertilio mastivus* Dahl, Skrift. Naturhist. Selsk. Kjöbenhavn, 1797, **4**, pt. 1, p. 132, pl. 7.

The fish-eating bat seems to be generally distributed among the Antilles. Indeed, its habit of feeding on small fish would naturally lead it over the water, so that its occurrence on most of the islands would not be remarkable. Dobson records specimens from Jamaica (Mt. Edgecombe), St. Thomas, and Grenada; Tomes mentions one example from Long Hill, Jamaica; Elliot has noted it from Mona and Dr. J. A. Allen (1890) from Antigua. Dahl in 1797, described it from St. Croix as *V. mastivus*, but the status of this supposed form is still in doubt. Gundlach (1866-7, p. 51) considers it a rare species in Cuba, where it is sometimes seen flying about over the lagoons. He says it is also found in Guadeloupe. The Museum has specimens from Grenada, Sta. Lucia, and St. Vincent, the last collected by Mr. Austin H. Clark in 1903. Mr. Clark tells me that this bat usually resorts by day, to deep narrow clefts in the rocks, rather than to more open caves, and that its presence in such places may often be detected by its peculiar musky odor.

P. H. Gosse (1847) has given an account of the habits of this bat in Jamaica, where he found a colony spending the daytime in the interior of a large hollow tree.

## PHYLLOSTOMIDAE.

### CHILONYCTERIS MACLEAYII Gray.

*Chilonycteris macleayii* Gray, Ann. Nat. Hist., 1839, 4, p. 5.

Mr. Rehn, in his review of this genus (1904), notes that this bat seems to be found throughout Cuba. It rests hanging in clusters in caves, and often frequents houses as well.

In a series of over fifty Cuban skins, collected by Mr. W. Palmer, Mr. Miller has noted a very interesting dimorphism. Apparently a larger and a smaller form occur together, independent of age or sex.

### CHILONYCTERIS MACLEAYII FULIGINOSA Gray.

*Chilonycteris fuliginosa* Gray, Proc. Zool. Soc. London, 1843, p. 20.

This subspecies is confined to the island of San Domingo, and, according to Rehn, is the smallest of the genus.

### CHILONYCTERIS MACLEAYII INFLATA Rehn.

*Chilonycteris macleayii inflata* Rehn, Proc. Acad. Nat. Sci. Philadelphia, 1904, p. 190.

On the island of Porto Rico, to which this species is confined, "the phyla represented by *M. fuliginosa* and *M. inflata* reaches its extreme type in the latter race, the most apparent diagnostic character of which is the inflated rostrum." There is apparently no appreciable difference in size.

CHILONYCTERIS MACLEAYII GRISEA Gosse.

*Chilonycteris grisca* Gosse, Naturalist's Sojourn in Jamaica, 1851, p. 326, pl. 6, fig. 1.

In addition to its larger size, the Jamaican representative of the *macleayi* group differs so markedly in other slight peculiarities that, according to Rehn, no general comparison with the other races is needed. He notes specimens from Phoenix Park (the type locality), Oxford Cave, Kingston, and Lucea.

CHILONYCTERIS PARNELLII (Gray).

*Phyllodia parnellii* Gray, Proc. Zool. Soc. London, 1843, p. 50.

According to Rehn, the only definite records for this Jamaican bat are:—Sportsman's Hall, Oxford Cave, and Lucea. Osburn (1865, p. 68) gives an account of its habits in captivity.

CHILONYCTERIS PARNELLII BOOTHII Gundlach.

*Chilonycteris boothii* Gundlach, Monatsb. k. preuss. Akad. Wiss. Berlin, 1861, p. 154.

This is the Cuban representative of the Jamaican *C. parnellii* but differs "in the disposition of the lower premolars, the more depressed rostrum, and the more robust form" (Rehn, 1904, p. 197).

The lower second premolar is not so crowded as in *parnellii*, and is visible from either labial or lingual aspect of the jaw.

Miller (1904) records specimens obtained from a cave near Baracoa, Cuba.

CHILONYCTERIS PARNELLII PORTORICENSIS Miller.

*Chilonycteris portoricensis* Miller, Proc. Acad. Nat. Sci. Philadelphia, 1902, p. 400.

The Porto Rico *Chilonycteris* differs from that of Cuba, chiefly in its smaller ears. As shown by Miller, the second lower premolar is

separated from the first and the third by a distinct space, whereas in the Jamaican species the first and third lower premolars are in contact, and the second is forced quite out of the tooth row. The type locality is near Pueblo Viejo, Bayamon district, Porto Rico.

PTERONOTUS DAVYI Gray.

*Pteronotus davyi* Gray, Mag. Zool. Bot., 1838, 2, p. 500.

So far as present knowledge goes, this species, though common in Brazil, Venezuela, and Trinidad, is unknown in the West Indies except in the island of Dominica, whence it has been recorded by several writers (Thomas, Ann. Mag. Nat. Hist., 1892, ser. 6, 10, p. 410; Miller, Proc. Biol. Soc. Washington, 1902, 15, p. 155; Rehn, Proc. Acad. Nat. Sci. Phila., 1904, p. 254). There is also a specimen in the Museum of Comparative Zoölogy from Dominica, taken in 1906, by Mr. A. H. Verrill.

MORMOOPS BLAINVILLII Leach.

*Mormoops blainvillii* Leach, Trans. Linn. Soc. London, 1820, 13, p. 77, pl. 7.

The type locality of this bat is Jamaica, to which it seems confined. Mr. Rehn (1902a), in his review of the genus, mentions specimens from Moneague, St. Ann, and Kingston. Tomes (1861, p. 65) records it from Freeman's Hall and Sportsman's Cave.

On the continent, this genus is represented throughout Mexico and Central America by a single, somewhat larger, and quite different species (*M. megalophylla*). If the insular races are to be derived from continental stock by way of Yucatan and Central America, it is evident that much differentiation has taken place since the continuity of the land areas. On the island Curaçao, off the coast of northern South America, is a form so slightly differentiated from *M. megalophylla* that it is considered by Rehn to be merely a subspecies. The Antillean representatives, however, more nearly resemble each other than they do their continental relatives, indicating perhaps that these islands have been connected at a period later than their separation from the mainland.

MORMOOPS BLAINVILLII CINNAMOMEA (Gundlach).

*L[obostoma] cinnamomeum* Gundlach, Arch. f. Naturg., 1840, 6, pt. 1, p. 357.



The relationships of this bat are evidently with the Jamaican Mormoops, of which Rehn considers it a subspecies. Miller, however, (1904, p. 343) "can see no necessity . . . for applying to this well marked form a trinomial name"; but I have here followed Rehn in order to emphasize this relationship. The chief point of distinction is that the first upper premolar of *cinnamomea* attains its greatest thickness posteriorly, giving the tooth a subconoid, instead of a rhomboid, outline. The type locality is Casetal St. Antonio el Fundador, Cuba; but specimens apparently indistinguishable are recorded by Rehn from San Domingo (Aquacate), and Mona Island, between San Domingo and Porto Rico.

#### OTOPTERUS WATERHOUSII (Gray).

*Macrotus waterhousii* Gray, Proc. Zool. Soc. London, 1843, p. 21.

The typical subspecies is confined to the island of San Domingo and Haiti. The type was from the latter country; and additional specimens are recorded from San Domingo City by Elliot (1896, p. 82) and from Caña Honda by J. A. Allen (1908a, p. 581).

#### OTOPTERUS WATERHOUSII JAMAICENSIS (Rehn).

*Macrotus waterhousii jamaicensis* Rehn, Proc. Acad. Nat. Sci. Philadelphia, 1904, p. 433.

The Jamaican *Otopterus* has been separated from those of the neighboring islands on the basis of smaller size combined with slight cranial differences. It is said to be one of the commonest of the bats on the island. Specimens are recorded from Spanishtown and Kingston; the Museum contains two specimens from Port Antonio, collected in 1909 by Dr. Thomas Barbour.

#### OTOPTERUS WATERHOUSII MINOR (Gundlach).

*Macrotus minor* Gundlach, Monatsb. k. preuss. Akad. Wiss. Berlin, 1864, p. 382.

This Cuban representative of *waterhousii* is said to be readily characterized by its small size and deeper coloration, though it closely approaches the Jamaican race. The type came from western Cuba.

Rehn (1904a) in his revision of the genus, has likewise referred to the Cuban subspecies three specimens in the National Museum collection from the mountainside near Nueva Gerona, Isle of Pines. Miller (1904) records specimens taken in Cuba by William Palmer at Guanajay and El Cobre, in the first instance from a cave, in the second from a copper mine. The predilection of this bat for underground caverns is well known. Gundlach believed that those in the eastern part of Cuba were larger than those from the western portion of the island.

OTOPTERUS WATERHOUSII COMPRESSUS (Rehn).

*Macrotus waterhousii compressus* Rehn, Proc. Acad. Nat. Sci. Philadelphia, 1904, p. 434.

The form of *Otopterus* occurring in the Bahama Islands has been recognized as a subspecies on the ground of its narrow rostrum and elongate-elliptical first lower premolar. The type specimen is from Eleuthera Island, whence the National Museum possesses six examples as well as one from Long Island, to the south. Mr. Rehn has also examined a specimen from Andros Island, which is probably one of three recorded by Dr. J. A. Allen (1890, p. 170) as taken there by Dr. J. I. Northrop. At Nassau, New Providence, a considerable colony inhabited the dungeon of old Fort Charlotte, but hitherto the species has not been noted from the northern islands of the group (Abacos and Great Bahama).

LONCHORHINA AURITA Tomes.

*Lonchorhina aurita* Tomes, Proc. Zool. Soc. London, 1863, p. 83.

The specimen on which Tomes based this species was found by him in a jar containing several species of West Indian bats, including *Mormoops blainvillii* and *Pteronotus davyi*, but unfortunately without indication of locality. Seventeen years later a second example was reported from 'New Grenada,' in the collection of the British Museum (Dobson, Rept. Brit. Assoc., 1880, p. 196; p. 28 of separate). A third specimen was recently found by Mr. G. S. Miller, Jr., in the collection of the Academy of Natural Sciences of Philadelphia (No. 1770). This is an adult male, and was captured in Nassau Harbor, New Providence, Bahamas (Miller, 1905, p. 382), and thus confirms, in part, the supposed West Indian habitat of the species. No further specimens are known.

*VAMPIRUS SPECTRUM* (Linné).

*Vespertilio spectrum* Linné, Syst. Nat., ed. 10, 1758, 1, p. 31.

Dobson (1878, p. 471) records a skin and skull of this large species from Jamaica. They were obtained there by J. S. Redman, and are preserved in the British Museum. I am not aware of other records.

This bat, like *Sturnira* and *Hemiderma*, probably reached Jamaica by a former land connection with Honduras, but did not range far enough to the north to reach Cuba by way of Yucatan.

*GLOSSOPHAGA LONGIROSTRIS* Miller.

*Glossophaga longirostris* Miller, Proc. Acad. Nat. Sci. Philadelphia, 1898, p. 330.

At St. George's, Grenada, we obtained eight specimens of both sexes, from holes, in the old fort on Richmond Hill. One of these was immature, though nearly full grown; the rest were adults. Five more adults were taken at Grand Etang (1800 feet), Grenada. These five were found hanging to the ridge pole in a room of a disused stable, whence they obtained egress by means of a partially opened window. These bats were extremely alert throughout the day, and on the slightest alarm would dart through the window and flit off into the forest close by. It was only through great caution in approaching the window and closing it quickly that we were able to capture them, after several unsuccessful attempts.

The specimens represent both the dark (nearly Broccoli brown) and the brighter (Mars brown to russet) phases, irrespective of sex.

The type of this species, which is in the collection of the Museum of Comparative Zoölogy, is from the Santa Marta Mountains, Colombia, where also a large series was obtained for the American Museum of Natural History, from Bonda and Taguaga, in "a cave on the seashore" (J. A. Allen, Bull. Amer. Mus. Nat. Hist., 1900, 13, p. 89). Lieutenant Wirt Robinson likewise found it abundant at La Guaira, Macuto, San Julian, and Pena de Mora, all in Venezuela. Our specimens extend its known range into the Lesser Antilles; and the Museum also possesses a large series from Carriacou, among the Grenadines, collected a few years ago by Mr. Austin H. Clark.

The occurrence of *G. soricina* on Trinidad has been recorded by Allen and Chapman (1897, p. 15) and by Rehn (1902, p. 38); but I have found no reference to its occurrence in the Windward Islands

other than that of Dobson (1878, p. 501), who notes specimens in the British Museum from Grenada and "? Isle of St. Vincent." As this was before *longirostris* was discriminated, it seems likely that these references are to that species. On the Venezuelan coast, Robinson found *longirostris* the commoner of the two species of *Glossophaga*, in the proportion of 12 to 1.

In the type specimen of *G. longirostris*, the lower incisors are entirely wanting, although their alveoli are distinctly visible. Among a series of thirty-four specimens, also from the Santa Marta Mountains, Colombia, in the collection of the American Museum of Natural History, "the incisors are all present in both jaws" in nearly one half of the individuals; "in about one-third of the series they are entirely absent in both jaws; in the remainder some of the incisors are present and the alveoli of those lacking are clearly indicated. Apparently they are absent, as a rule, only in old specimens" (J. A. Allen, Bull. Amer. Mus. Nat. Hist., 1900, 13, p. 90). All the incisors are present in our series of eleven adults from Grenada, but only five of the thirteen specimens from Carriacou have the entire number. Of the eight in which the number of incisors is incomplete, three have lost one or other of the first lower incisors; one has lost the lower right and the upper left incisors; one, the lower right first and second, and left upper second incisors; one has lost all the lower incisors but the second on the left side; and one has lost the left upper second incisor only. As might be expected, therefore, it is the first lower incisor that is commonly the first to go. As originally suggested by Mr. G. S. Miller Jr., this species is doubtless in process of losing the lower incisors, and is thus approaching the condition found in the related genera, *Lichonycteris*, *Choeronycteris*, and *Hylonycteris*, which have quite lost these teeth.

#### GLOSSOPHAGA SORICINA ANTILLARUM Rehn.

*Glossophaga soricina antillarum* Rehn, Proc. Acad. Nat. Sci. Philadelphia, 1902, p. 37.

The type and two other specimens of this subspecies came from Port Antonio, Jamaica, where they were collected in December, 1890. In a letter to the writer, Mr. Rehn suggests that this race is perhaps nearer to *longirostris* than to *soricina*; but on geographical grounds this seems doubtful although no careful comparison of the two has yet been made. The forearm measurement is given as 38 mm.; extreme length of skull, 22.5, as against 35 and 20 or 21 for the corre-

sponding measurements of *soricina*. A skull collected in the Bahamas and referred to this same subspecies, is stated to be in the collection of the Academy of Natural Sciences of Philadelphia.

#### MONOPHYLLUS REDMANI Leach.

*Monophyllus redmani* Leach, Trans. Linn. Soc. London, 1822, 13, p. 76.

This species, so far as known, is confined to Jamaica. The genus is of peculiar interest in that it is apparently confined to the West Indies, with island races in both Greater and Lesser Antilles.

#### MONOPHYLLUS CUBANUS Miller.

*Monophyllus cubanus* Miller, Proc. Acad. Nat. Sci. Philadelphia, 1902, p. 410.

Gundlach (1866-7, p. 48) records this bat from Cuba under the name *Monophyllus redmani*. He had found it in but two caves, one at Rangel, in the western part of the island, and a second at Guisa, in the eastern extremity. This Cuban representative is later described by Miller as nearest the Jamaican *M. redmani*, but slightly smaller, with a more slender skull. "In the general form of both skull and teeth it is, however, more closely related to the large Jamaican species than to the smaller members of the genus." The type and a number of other specimens came from a cave at Baracoa, Cuba.

#### MONOPHYLLUS PORTORICENSIS Miller.

*Monophyllus portoricensis* Miller, Proc. Washington Acad. Sci., 1900, 2, p. 34.

The Porto Rico *Monophyllus* is the smallest of the four species hitherto made known. The type and five other specimens were collected in a cave at Bayamon, Porto Rico.

#### MONOPHYLLUS CLINEDAPHUS Miller.

*Monophyllus clinedaphus* Miller, Proc. Washington Acad. Sci., 1900, 2, p. 36.



In view of the fact that, so far as known, no member of this genus has been taken on the mainland of America, it is probable that this species, described from a single specimen without locality, is likewise Antillean. In size and other characters it approaches nearest to *M. redmani* of Jamaica. Possibly its home may be looked for in San Domingo.

MONOPHYLLUS LUCIAE Miller.

*Monophyllus luciae* Miller, Proc. Acad. Nat. Sci. Philadelphia, 1902, p. 411.

The Santa Lucia *Monophyllus* is, as might be expected, "nearly related to that of Barbados. Its larger size and less crowded teeth readily distinguish it."

MONOPHYLLUS PLETHODON Miller.

*Monophyllus plethodon* Miller, Proc. Washington Acad. Sci., 1900, 2, p. 35.

The type was collected in St. Michael's Parish, Barbados. It is a strongly characterized species, and, strangely enough, appears to have escaped observation in this thickly populated island until 1899.

HEMIDERMA PERSPICILLATUM (Linné).

*Vespertilio perspicillatus* Linné, Syst. Nat., ed. 10, 1758, 1, p. 31.

Dobson's (1878, p. 494) statement that this bat occurs "throughout the West Indian islands" is probably based on the fact that he had specimens from the eastern and western extremes of the group,—namely, one each from Grenada and Jamaica. These constitute the only specific records I have found for it in the West Indies. The species is common on the tropical mainland of South and Central America north to southern Mexico. It occurs in Trinidad, whence it may have reached Grenada at times when a connection existed. Its presence in Jamaica may equally be explained by assuming a former connection with the Honduras peninsula. Its case is somewhat paralleled by that of *Sturnira lilium*, whose range on the mainland probably did not extend sufficiently far to the north to enable it to reach Cuba by a Yucatan connection.

No critical comparison appears to have been made between specimens from Jamaica and the mainland.

## STURNIRA LILIUM (E. Geoffroy).

*Phyllostoma lilium* E. Geoffroy, Ann. Mus. Hist. Nat. Paris, 1810, 15, p. 181.

The occurrence of this bat in Jamaica is of considerable interest. I have found but two records, namely, those given by Dobson (1878, p. 540) of two skins in the British Museum obtained in Jamaica by P. H. Gosse and J. Gould. On the mainland, this bat is common in northern South America, and in Central America as far north as Honduras and the southernmost states of Mexico. It may therefore have reached Jamaica when there was still a land connection with the Honduras peninsula. In Yucatan it is apparently almost unknown. There is said to be a specimen in the British Museum from northern Yucatan; but otherwise Colima, in southwestern Mexico, seems to be its most northerly record (J. A. Allen, Bull. Amer. Mus. Nat. Hist., 1890, 3, p. 181). It is probably so rare to the north of latitude 20° that it did not reach Cuba by way of the Yucatan connection, thus accounting for its apparent absence on the other Greater Antilles.

I have found no record of this bat for the Lesser Antilles, and it is therefore of special interest to note its discovery in the island of Dominica by A. H. Verrill. The specimens referred to were among a small collection of bats, now in the Yale University Museum, made by Mr. Verrill in Dominica in 1906. In addition to the present species, there were a number of *Pteronotus daryi*, which is well known to occur in this island. Through the kindness of Professor A. E. Verrill, I was enabled to study the collection, and to obtain one of the specimens of *Sturnira* for the Museum of Comparative Zoölogy. The presence of this genus in Dominica is in line with the known occurrence in the same island of representatives of the South American *Pteronotus daryi* and *Myotis nigricans*, both of which are present in Trinidad, but have not yet been recorded from the intermediate islands.

## BRACHYPHYLLA CAVERNARUM Gray.

*Brachyphylla cavernarum* Gray, Proc. Zool. Soc. London, 1834, p. 123.

This genus is at present known from two species only, *cavernarum*, of St. Vincent, and *nana*, of Cuba. The exact significance of this distribution it is perhaps unsafe to conjecture until further research shall have shown more convincingly that the genus does not occur

on the other Antillean islands. According to Miller it is the least specialized of the stenodermatous bats. Hence, it may once have been more widespread, and the colonies now existing in Cuba and St. Vincent may represent the last remnant of a disappearing race.

In St. Vincent this bat was apparently to be found in only one large cave near Barrouallie. Mr. Austin H. Clark, who visited this place in 1903, writes that it is a rather large chamber with two entrances, one at about the high-water mark, and rather low; the other about ten feet in height, through which a boat may be rowed. He saw but two bats, both of which were secured, and proved to be of this species. A few years before, a collector who visited the spot, obtained a large number; and the bats appear subsequently to have left.

In his list of mammals of Barbados, Col. Feilden (1890) has included this species, which, he says, is locally known as the "Night Raven"; and adds that the British Museum has specimens of the genus from Cuba, St. Vincent, and other parts of the West Indies. If this identification be correct, it is of very great interest; and it is to be hoped that the other localities may be verified and published.

#### BRACHYPHYLLA NANA Miller.

*Brachyphylla nana* Miller, Proc. Acad. Nat. Sci. Philadelphia, 1902, p. 409.

So far as known, this bat is confined to the island of Cuba, whence it was described in 1902, from a single skull found at El Guama in the pellet of a Cuban barn owl. It is a smaller animal than the *B. cavernarum*. In a subsequent paper Mr. Miller (1902c, p. 249) has given external measurements and a description of the skin, on the basis of specimens from the southern part of Santiago province.

Dobson, in his Catalogue of the Chiroptera of the British Museum, had recorded this genus from Cuba, but considered the species the same as that of St. Vincent, as did also Gundlach. The latter author (1866-7, p. 50) found it abundant in caves at San Cristobal, and mentions occasional specimens from the vicinity of Matanzas and Cárdenas, Cuba.

#### ARTIBEUS JAMAICENSIS Leach.

*Artibeus jamaicensis* Leach, Trans. Linn. Soc. London, 1821, **13**, p. 75. Jamaica.

*Madatacus lewisii* Leach, Trans. Linn. Soc. London, 1821, **13**, p. 81. Jamaica.

*Artibeus carpolegus* Gosse, Naturalist's Sojourn in Jamaica, 1851, p. 271, pl. 6, fig. 5. Jamaica.

*Dermanura cra* Cope, Amer. Nat., 1889, **23**, p. 130. St. Martin's.

*Artibeus coryi* Allen, Bull. Amer. Mus. Nat. Hist., 1890, **3**, p. 173. St. Andrew's.

*Artibeus insularis* Allen, Bull. Amer. Mus. Nat. Hist., 1904, **20**, p. 231. St. Kitt's.

Dr. Knud Andersen (1908), in the preparation of his recent monograph of this genus, has examined a very large series of this species from various points in Central America and the West Indies, and is unable to find recognizable differences between those from the mainland and those from many of the Antillean Islands. Specimens indistinguishable from typical *jamaicensis* are found in Panama, Nicaragua, Guatemala, Campeche, and southern Mexico. In the synonymy of this race, Andersen puts several nominal species described from the different islands. He has examined specimens from St. Andrew's, Old Providence Island, Jamaica, San Domingo, Porto Rico, St. Martin's, St. Kitt's. To this race should also probably be referred the specimens recorded by Dr. J. A. Allen (1890, p. 170) from the small islands Anegada, Virgin Gorda, Anguilla, and Antigua; and, according to Andersen, those from San Domingo referred to *A. j. parvipes* by the same writer (Allen, 1908, p. 581). It is interesting that no specimens are known from the Bahamas, where the genus seems absent.

#### ARTIBEUS JAMAICENSIS PARVIPES Rehn.

*Artibeus parvipes* Rehn, Proc. Acad. Nat. Sci. Philadelphia, 1902, p. 639.

This is the Cuban representative of *A. jamaicensis*, and the smallest of the group. It is, however, only very slightly smaller than the Jamaican bat. Its supposed occurrence at Key West rests on no satisfactory basis, and should be disregarded until better evidence is forthcoming. According to the studies of Dr. Knud Andersen, the Cuban bat is rather more similar in cranial characters to *A. j. yucatanicus* of the neighboring peninsula of Yucatan than to typical *A. j. jamaicensis*, although externally all three are similar. This fact, however, is considered to indicate that *parvipes* reached Cuba by way of the land tongue now represented by the Yucatan peninsula, a conclusion no doubt well justified.

Palmer found this a common species in eastern Cuba, and obtained it in the Isle of Pines as well.

Mr. Miller (1902, p. 410) has recorded the finding of remains of this species in the pellets of the Cuban barn owl, which shows that it is occasionally captured by that bird.

ARTIBEUS JAMAICENSIS PALMARUM Allen and Chapman.

*Artibeus palmarum* Allen and Chapman, Bull. Amer. Mus. Nat. Hist., 1897, 9, p. 16.

This race, described from the island of Trinidad, is recorded by Andersen (1908, p. 279) from St. Vincent only, of the West Indies. Its occurrence should be expected probably on the intermediate islands, and on Tobago as indicated by this author.

ARTIBEUS JAMAICENSIS PRAECEPTUS Andersen.

*Artibeus jamaicensis praeceptus* Andersen, Ann. Mag. Nat. Hist., 1906, ser. 7, 18, p. 421.

Andersen has named this race on the basis of three specimens from Dominica and Guadeloupe. The type is from the latter island, and represents a form a very little smaller than *A. j. palmarum*, of which it is considered a northern offshoot. Its similarity to *A. j. aquatorialis* of Ecuador and southern Colombia is so great that the two are indistinguishable, a fact which Andersen believes is due to parallelism in development.

ARTIBEUS PLANIROSTRIS GRENADENSIS Andersen.

*Artibeus planirostris grenadensis* Andersen, Ann. Mag. Nat. Hist., 1906, ser. 7, 18, p. 420.

A series of forty specimens was obtained in 1910 at St. George's, Grenada, from the recesses of an old fort on Richmond Hill. Here was evidently a breeding colony; and as usual among bats of this genus, the adults were mainly of one sex, for, of the thirty adults, all but four were females. The breeding season was apparently over, for all but one of the young obtained were well grown. The single exception was still suckling, and of about half the bulk of its mother.

Dr. Knud Andersen (1908, p. 204-319) has shown that the bats of the *planirostris* group have spread from the mainland of South America to the southernmost of the Lesser Antilles, and in Trinidad and Tobago



have become slightly differentiated (*A. p. trinitatis*), as well as in Grenada (*A. p. grenadensis*).

ARDOPS HAITIENSIS Allen.

*Ardops haitiensis* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 1908, **24**, p. 581.

A single specimen from Caña Honda, San Domingo, is the type of this newly discovered species. The three other known members of the genus are Lesser Antillean.

The closely allied genera, *Phyllops* and *Ariteus*, seem to represent *Ardops* on the islands of Cuba and Jamaica respectively. The case seems nearly paralleled by that of the *Phyllonycteris* bats, represented in Jamaica by *Reithronycteris*, in Cuba by *Phyllonycteris*,—each monotypic,—and in other of the Greater Antillean islands (Bahamas, Porto Rico) by *Erophylla*. In this instance, however, there is also a Cuban species of *Erophylla*.

ARDOPS MONTSERRATENSIS (Thomas).

*Stenoderma montserratense* Thomas, Proc. Zool. Soc. London, 1894, p. 133.

In the island of Montserrat is found this large species, where, according to its describer, it is said to do considerable damage among the cocoa plantations (probably in eating the young fruit). During the day it is found hanging under the branches of trees. The forearm measurement is given in the type as 51.5 mm.

ARDOPS NICHOLLSI (Thomas).

*Stenoderma nicholsi* Thomas, Ann. Mag. Nat. Hist., 1891, ser. 6, **7**, p. 529.

This bat is known from Dominica only, to which it is supposed to be peculiar. Its forearm measurement is 46 mm.

ARDOPS LUCIAE (Miller).

*Stenoderma luciae* Miller, Proc. Acad. Nat. Sci. Philadelphia, 1902, p. 407.

The Santa Lucia *Ardops* differs from that of Dominica (*A. nicholsi*), according to Miller, in its larger size and more deeply bifid inner

upper incisor. It is smaller than *A. montserratensis*, and with a distinct white shoulder spot.

PHYLLOPS FALCATUS (Gray).

*Artibeus falcatus* Gray, Ann. Nat. Hist., 1839, 4, p. 1.

*Stenoderma albomaculatum* Gundlach, Monatsb. k. preuss. Akad. Wiss. Berlin, 1867, p. 155.

This genus is closely related to *Ardops* of the Lesser Antilles and Haiti. The single known species is confined to Cuba, where it appears to be very rare. According to Gundlach, it has been noted at Matanzas and Cárdenas, and occasionally enters houses.

ARITEUS ACHRADOPHILUS (Gosse).

*Artibeus achradophilus* Gosse, Naturalist's Sojourn in Jamaica, 1851, p. 271, pl. 6, fig. 4.

*Ariteus flarescens* Gray, Mag. Zool. Bot., 1837, 2, p. 491.

The type species is the only form of this genus known. It is apparently confined to Jamaica, although Dobson (1878, p. 528) recorded a specimen from Cuba, but probably in error for *Phyllops*, as Miller (1907) does not credit it. It appears to be nearly akin to *Ardops*, but lacks the last molar, while the first lower molar retains the metaconid. It seems probable, therefore, that it represents *Ardops* in Jamaica, as *Phyllops* represents it in Cuba.

The related genus *Stenoderma*, known from a single specimen without locality, may eventually be rediscovered in the West Indies.

NOTE.—*Centurio senex* Gray.—A specimen supposed to have come from Cuba, was mentioned by Lichtenstein and Peters in 1854, but Peters later wrote that this locality was erroneous (Peters, Monatsb. k. preuss. Akad. Wiss. Berlin, 1864, p. 382).

PHYLLONYCTERIS POEYI Gundlach.

*Phyllonycteris poeyi* Gundlach, Monatsb. k. preuss. Akad. Wiss. Berlin, 1860, p. 817.

This bat is certainly known from Cuba only, where it is locally abundant. Miller (1904, p. 344) has recently redescribed and figured

this species on the basis of a magnificent series collected by Palmer at Guanajay, El Guama, and Baracoa, Cuba. Great numbers were taken in a large cave at the first-named locality. Gundlach records it from San Cristobal and Matanzas. The absence of calcar, and the reduced condition of the interfemoral membrane and of the molar cusps have led to the separation of the species from the bats formerly classed with it, as the representative of a monotypic genus confined to Cuba.

Miller (1902, p. 410) notes that the Cuban barn owl occasionally preys on this bat, as shown by the presence of skulls in owl pellets; and Palmer (Miller, 1904, p. 345) was assured by the natives that the Cuban boa at times captures them as they emerge in numbers from their cave.

#### REITHRONYCTERIS APHYLLA Miller.

*Reithronycteris aphylla* Miller, Proc. Acad. Nat. Sci. Philadelphia, 1898, p. 334.

This remarkable species is still known from the type specimen only, an adult male taken in Jamaica and preserved in the museum of the Institute of Jamaica. The muzzle terminates in a "disc-shaped rudimentary nose leaf like that of *Brachyphylla cavernarum*." The teeth are said to resemble closely those of *Phyllonycteris poeyi* of Cuba, now considered the sole member of its genus; this species has likewise a rudimentary nose leaf, "the erect portion represented by a mere bluntly angular projection" (Miller, 1907, p. 173). The close relationship of the three genera *Phyllonycteris*, *Reithronycteris*, and *Erophylla* is evident; and they are united by Miller in a distinct subfamily, *Phyllonycterinae*, confined, so far as known, to the Greater Antilles.

#### EROPHYLLA SEZEKORNI (Gundlach).

*Phyllonycteris sezekorni* Gundlach, Monatsb. k. preuss. Akad. Wiss. Berlin, (1860) 1861, p. 818.

So far as known, this species seems confined to Cuba, whence it was described by Gundlach. Peters, however, included Jamaica in its range (Monatsb. k. preuss. Akad. Wiss. Berlin, 1868, p. 364).

#### EROPHYLLA SANTA-CRISTOBALENSIS (Elliot).

*Phyllonycteris santa-cristobalensis* Elliot, Proc. Biol. Soc. Washington, 1905, 18, p. 236.

The bat of this genus occurring in San Domingo has been recently separated on the basis of material from San Cristobal. Probably the relationships of this and the other described forms would be best expressed by a trinomial designation.

*EROPHYLLA BOMBIFRONS* (Miller).

*Phyllonycteris bombifrons* Miller, Proc. Biol. Soc. Washington, 1899, **13**, p. 36.

This island species is confined so far as known to Porto Rico. The type and thirteen other specimens were taken in a limestone cave near Bayamon, Province of San Juan.

*EROPHYLLA PLANIFRONS* (Miller).

*Phyllonycteris planifrons* Miller, Proc. Biol. Soc. Washington, 1899, **13**, p. 34.

This is a common species among the Bahamas. It was first described from specimens collected in the limestone caves at Nassau, New Providence. On Great Abaco it was found abundantly in the sea caves at Hurricane Hole, in 1904; and a few were found at Marsh Harbor (G. M. Allen, 1905, p. 70). Miller (1905, p. 382) further records it from New Providence, Eleuthera, and Long Island, where it was collected by J. H. Riley.

NATALIDAE.

*NATALUS STRAMINEUS* Gray.

*Natalus stramineus* Gray, Mag. Zool. Bot., 1838, **2**, p. 496.

No type locality is assigned to this species, but it is probably the mainland of South America. Miller (1902, p. 399) records a series of eighteen specimens from Dominica, and contrasts these with the race found in San Domingo. Its occurrence in some of the intermediate islands is to be expected.

*NATALUS STRAMINEUS MAJOR* Miller.

*Natalus major* Miller, Proc. Acad. Nat. Sci. Philadelphia, 1902, p. 399.

This bat was described from a specimen taken near Savaneta, San Domingo. It is slightly larger than specimens from Dominica, and is by Elliot considered a subspecies of *N. stramineus*.

#### CHILONATALUS BREVIMANUS (Miller).

*Natalus (Chilonatalus) brevimanus* Miller, Proc. Acad. Nat. Sci. Philadelphia, 1898, p. 328.

The slight differences in measurements of this Old Providence Island bat have led to its separation from the Jamaican species *C. micropus*, to which it is closely related. It was first recorded from the island in 1890 by Dr. J. A. Allen, and Mr. G. S. Miller (1898) has since tabulated the measurements of twenty specimens from the same place.

In characterizing the subgenus *Chilonatalus*, Miller states that "the form of the glandular elevation above the nostrils and the apparently double lower lip, taken in connection with the other characters pointed out by Harrison Allen in which the *Natalinae* resemble *Chilonycteris* and *Mormoops*, may indicate a closer relationship between the two groups than has heretofore been suspected."

#### CHILONATALUS MICROPUS (Dobson).

*Natalus micropus* Dobson, Proc. Zool. Soc. London, 1880, p. 443.

Dobson founded this species on Jamaican specimens, obtained near Kingston. Miller (1904) records a specimen collected at Baracoa, Cuba, by W. Palmer, which he was unable to distinguish from the Jamaican animal. The measurements given (forearm, 32) seem very slightly smaller than those of the latter (forearm 32, 34, 34), but at present there appears to be no reason for separating the Cuban from the Jamaican bat.

#### CHILONATALUS TUMIDIFRONS Miller.

*Chilonatalus tumidifrons* Miller, Proc. Biol. Soc. Washington, 1893, 16, p. 119.

Among the Bahamas occurs a *Chilonatalus* closely allied to *C. micropus* and *C. brevimanus*. The type and three other specimens were collected in 1903 at Watling's Island. The following year a



large colony was found on Great Abaco, some two hundred miles to the northwest, in a limestone cave (G. M. Allen, 1905, p. 68).

NYCTIELLUS LEPIDUS (Gervais).

*Vespertilio lepidus* Gervais, in La Sagra's Hist. Fis. Pol. y Nat. de la Isla de Cuba, 1838, part 2, 3, p. 32.

Miller (1904, 1907) has pointed out the characters separating this as the type and only known species of a genus distinct from *Natalus*, though closely allied. He states that it is externally the least specialized member of the Natalidae, though "in the peculiar form of the skull, and in the reduced size of the anterior canine and premolar it represents a more advanced stage than any of the related genera."

It was originally recorded from Cuba, and was obtained in 1900 by W. Palmer in the Isle of Pines, at Nueva Gerona. Its flight is said to be very low, about bushes, and close to buildings. Gundlach (1866-7, p. 52) speaks of it as common in certain parts of the island of Cuba, as at Matanzas, Guines, and Cabo Cruz.

Tomes (1861) referred to this species certain Jamaican specimens which seem later to have been described by Dobson as *Natalus micropus*.

VESPERTILIONIDAE.

MYOTIS DOMINICENSIS Miller.

*Myotis dominicensis* Miller, Proc. Biol. Soc. Washington, 1902, 15, p. 243.

This *Myotis*, recently described from the island of Dominica, is nearest related to *M. nigricans* of South America, from which it differs in its slightly smaller size, and in having the face-line of the skull more abruptly elevated above the level of the rostrum. Its presence in Dominica raises the presumption that the genus will eventually be found on some at least of the islands to the south as well.

Elliot (Field Columb. Mus. Publ., Zool. Ser., 1904, 4, p. 580) includes "West Indies" in the range of *Myotis lucifugus*, but on what grounds is not evident, for the genus seems to be as yet unknown from any other of the Antilles.

EPTESICUS FUSCUS CUBENSIS (Gray).

*Scotophilus cubensis* Gray, Ann. Nat. Hist., 1839, 4, p. 7.

In his report on Cuban bats collected by W. Palmer, Mr. Miller

(1904) states that in color the Cuban brown bat is practically identical with the large Mexican *miradorensis*, to which he considers it most closely related. Specimens of *E. f. osceola*, from southern Florida, also approach it very closely in the rich dark brown of the fur.

EPTESICUS FUSCUS BAHAMENSIS (Miller).

*Vespertilio fuscus bahamensis* Miller, N. Amer. Fauna, 1897, no. 13, p. 101, fig. 26, b.

The differences between the brown bat of the Bahamas and its larger relative of the mainland were pointed out in 1890 by Dr. J. A. Allen, but were not recognized by name until seven years later. In color it seems practically indistinguishable from typical *E. fuscus*, but in measurements it is nearly as small as *propinquus* of Central America. The possibility of this bat being a derivative of *propinquus*, and having reached the Bahamas from Central America by way of a Jamaica-San Domingo connection has been previously suggested. I can find no records for this species except from New Providence, Bahamas, where it haunts the dungeon of old Fort Charlotte.

NYCTICEIUS HUMERALIS CUBANUS (Gundlach).

*Vesperus cubanus* Gundlach, Monatsb. k. preuss. Akad. Wiss. Berlin, 1861, p. 150.

The Cuban *Nycticeius* has been shown by Miller (1904, p. 338) to be merely a small insular race of the species inhabiting the southeastern United States. As in the case of *Eptesicus*, it has no known representatives in the other Greater Antilles or the Windward Islands. Gundlach records it from Havana and Cárdenas.

LASIURUS [vel NYCTERIS] PFEIFFERI (Gundlach).

*Atalapha pfeifferi* Gundlach, Monatsb. k. preuss. Akad. Wiss. Berlin, 1861, p. 152.

The Cuban red bat is apparently an uncommon species, as indeed Gundlach remarks. It was not obtained by Palmer in 1900 and 1902. In color it is said to be brighter than *borealis* of the continent, and slightly larger, which suggests that its relationships may be with Central American rather than with southern Florida stock.

Gundlach (see Peters, 1862, p. 153) notes a female with three embryos at the beginning of May, and states that he obtained specimens at Cárdenas and in the Cienega de Zapata.

The applicability of the generic name *Nycteris* in place of *Lasiurus* seems not fully established.

LASIURUS [vel NYCTERIS] BOREALIS ? SEMINOLUS (Rhoads).

*Atalapha borealis seminola* Rhoads, Proc. Acad. Nat. Sci. Philadelphia, 1895, p. 32.

In a previous paper (1905, p. 67) I referred to this race, not without some hesitation, a single specimen of a red bat, taken at Nassau, New Providence, Bahamas. A second careful comparison with the red bat of southern Florida fails to disclose any very striking differences. The Bahaman specimen is apparently fully grown, but not quite adult; and though its measurements otherwise agree very well, that of the tibia seems slightly less than in Florida specimens. The color is less reddish underneath, but this may be due in part to other causes. Miller (N. Amer. Fauna, 1897, no. 13, p. 110) records a skull only, from Nassau. These two specimens indicate that the red bat is of regular occurrence at least in New Providence. The possibility of its introduction by vessels is perhaps not wholly out of the question. On the other hand, further specimens may show that the slight differences pointed out are constant, and sufficient to characterize a Bahaman race. Its affinities seem to be nearer *seminolus* than to *pfeifferi*.

Miller (1897) has also recorded a skin of the red bat from Spanish-town, Jamaica, but it was in such condition as to be unidentifiable with certainty. It suffices however, to establish the occurrence of the genus in Jamaica.

## MOLOSSIDAE.

NYCTINOMUS BRASILIENSIS MUSCULUS Gundlach.

*Nyctinomus musculus* Gundlach, Monatsb. k. preuss. Akad. Wiss. Berlin, 1861, p. 149.

The type locality of the common *Nyctinomus* of the *brasiliensis* group, occurring in the Greater Antilles, is Cuba, whence it was described by Gundlach. Mr. G. S. Miller (1902b, p. 248) has pointed out that it is "readily distinguishable from all of the known continental members of the *Nyctinomus brasiliensis* group by its smaller size, shorter ear, and rudimentary, peg-like anterior upper premolar."

To this race I have referred a specimen in the Museum collection from Jeremie, Haiti; and in his recent paper on bats from San Domingo, Dr. J. A. Allen (1908, p. 581) has similarly identified three specimens from that island. Three others, collected in Jamaica by Dr. Thomas Barbour, and by him presented to the Museum of Comparative Zoölogy, seem, after careful comparison, to be essentially identical; and Mr. Miller has included Porto Rico, as well, in its range.

NYCTINOMUS BRASILIENSIS BAHAMENSIS Rehn.

*Nyctinomus bahamensis* Rehn, Proc. Acad. Nat. Sci. Philadelphia, 1902, p. 641.

This is a slightly larger and more grayish representative of the Cuban *N. b. musculus*. The type locality is Governor's Harbor, Eleuthera, Bahamas. Other specimens are recorded by the describer from Little Abaco, where, as well as on Great Abaco, it was found by the writer in 1904. Miller (1905, p. 380) also mentions it from Long Island, Bahamas, on the basis of specimens collected by J. H. Riley for the U. S. National Museum.

NYCTINOMUS BRASILIENSIS ANTILLULARUM Miller.

*Nyctinomus antillularum* Miller, Proc. Acad. Nat. Sci. Philadelphia, 1902, p. 398.

This is a slightly smaller form of the *Nyctinomus* of Cuba and Porto Rico, with a forearm of from 36.5 to 38.5 mm. It probably occurs throughout the Lesser Antilles. Miller records specimens from Tobago, St. Lucia, Dominica, Montserrat, and St. Kitts.

In the collection of the Museum of Comparative Zoölogy are three specimens from St. Kitts, and three from St. Bartholomew's Island, which appear to be referable to this species. The type locality is Roseau, Dominica. There can be little doubt that the relationship of this bat is best expressed by the use of a trinomial.

NYCTINOMUS MACROTIS Gray.

*Nyctinomus macrotis* Gray, Ann. Nat. Hist., 1839, 4, p. 5.

This bat falls in the group of American *Nyctinomi* characterized by the presence of 2-2 lower incisors, and the slender, nearly parallel

upper incisors. It was originally described from a specimen sent to W. S. MacLeay from the interior of Cuba, where it was found in a hollow tree. Palmer and Riley failed to obtain it, however, in the course of their recent work in that island. It is represented in Jamaica as well as in Cuba, and specimens from the two islands are considered identical. The skull of a Jamaican example is figured by Miller (1907, p. 253, fig. 43). Dobson (Report Brit. Assoc. Adv. Sci., 1880, p. 195) also notes specimens from Jamaica in the Kingston Museum.

#### MORMOPTERUS MINUTUS (Miller).

*Nyctinomus minutus* Miller, Bull. Amer. Mus. Nat. Hist., 1899, 12, p. 173.

The discovery of this bat at Trinidad, Cuba, where it was collected in 1892 by Mr. Frank M. Chapman, is of very great interest. The genus is elsewhere known in America from Central Peru only, where it is represented by a slightly larger species, *M. kalinowskii* Thomas. In South Africa, Madagascar, and Mauritius, occur several forms; and one, *M. whitleyi* Scharff, has recently been described from West Africa (Benin). According to Mr. G. S. Miller, Jr., the two American species agree in having but 2-2 instead of 3-3 lower incisors.

#### EUMOPS GLAUCINUS (Wagner).

*Dysopes glaucinus* Wagner, Arch. f. Naturg., 1843, pt. 1, p. 368.

*Molossus ferox* Gundlach, Monatsb. k. preuss. Akad. Wiss. Berlin, 1861, p. 149 (not of Tschudi).

*Promops glaucinus* Miller, Proc. U. S. Nat. Mus., 1904, 27, p. 339.

Although, as shown by Miller (1904, p. 339), this bat was described from Cuba fifty years ago, it seems not to have been again noted until 1900, when a specimen was collected for the National Museum at Pina del Rio, Cuba, by W. Palmer and J. H. Riley. Mr. Miller was unable to distinguish the single example from the continental form; and, as shown by the measurements, the two are certainly almost identical.

#### EUMOPS ORTHOTIS (H. Allen).

*Molossus glaucinus* Dobson, Proc. Zool. Soc. London, 1876, p. 714.

*Nyctinomus orthotis* H. Allen, Proc. Amer. Phil. Soc., 1889, 26, p. 561.



*Nyctinomus orthotis* H. Allen, Proc. U. S. Nat. Mus., 1890, **12**, p. 638.

*Nyctinomops orthotis* Miller, Proc. Acad. Nat. Sci. Philadelphia, 1902, p. 393 (by *lapsus*).

*Promops orthotis* Miller, Proc. Biol. Soc. Washington, 1902, **15**, p. 250.

*Eumops orthotis* Miller, Bull. 57, U. S. Nat. Mus., 1907, p. 258.

This is the Jamaican representative of *Eumops glaucinus* of Central America and Cuba, with which, indeed, it was considered by Dobson identical. It is apparently a trifle smaller, but no careful comparison of the two forms has yet been published. The above synonymy is sufficient to show the vicissitudes of nomenclature through which this species has passed to its final place in the genus *Eumops*.

#### MOLOSSUS OBSCURUS VERRILLI Allen.

*Molossus obscurus* Auct.

*Molossus fuliginosus* Gray, Mag. Zool. Bot., 1838, **2**, p. 501, (not of Cooper, 1837).

*Molossus fuliginosus* Gray, Dobson, Cat. Chiropt. Brit. Mus., 1878, p. 413.

*Mollossus* [sic] *verrilli* Allen, Bull. Amer. Mus. Nat. Hist., 1908, **24**, p. 581.

Under the name *Molossus obscurus* are still currently confused at least two species, whose ranges and habits appear to be much alike. These are a smaller, glossy black animal, which, in a previous paper (1908, p. 59) I have shown to be *M. crassicaudatus*, with forearm measuring usually 36 or 37 mm.; second, a larger, browner bat, the true *M. obscurus*, with forearm 40 to 43 mm. The extremes of these two species may often approach each other very closely in many of their external measurements; but the bulk of the larger bat is very conspicuously, probably nearly a third, greater. The skulls are markedly different in size, that of *M. crassicaudatus* measuring in extreme median length 16 or 17 mm., that of *M. obscurus* from north-eastern Brazil, 19 mm., with a more prominent, knife-like sagittal crest. The color differences between the two species are not so readily apparent in alcoholic specimens, a fact which has no doubt largely aided in their confusion, although in *M. obscurus* the more extensive pale bases to the hairs, especially of the shoulders and chest, will usually aid in distinguishing it. A further point of difference between

the two species, and one that has not apparently been noticed hitherto, is that in *obscurus* there are on the posterior border of the femora, more particularly at the distal ends, some half dozen long hairs that project stiffly out nearly a centimeter beyond the short close fur. These hairs, though present in *crassicaudatus*, are much shorter, and less stiff, so that when wet in alcohol they lie flat with the fur of the body instead of projecting boldly.

Various authors have recorded *Molossus obscurus* from the West Indies; but in the absence of specimens on which these records are based, it is difficult to determine which of the two species is meant. This difficulty is increased by the fact that the West Indian representative of *M. obscurus* is slightly but constantly smaller than typical specimens from the mainland (the type locality is probably Surinam or Cayenne). This fact I pointed out previously (1908, p. 58), but at that time had only four specimens from the Lesser Antilles. Since then Dr. Thomas Barbour has presented to the Museum five alcoholic Molossi from Jamaica, collected by him at Mandeville in 1909. A comparison of these nine Antillean bats with a series of *M. obscurus* in the Museum collection from northeastern Brazil shows that the latter are larger and heavier-bodied, with larger skulls, teeth, and forearms. The specimens from Jamaica seem identical in every way with alcoholics from Dominica and Sta. Lucia. If this slight amount of difference be considered a sufficient basis for separating the Antillean Dusky Bat, the name *Molossus fuliginosus* of Gray, 1838, shown by Dobson (1878, p. 413) to be based on Jamaican specimens, would be available for it, except that this name is unfortunately preoccupied by *Molossus fuliginosus* of Cooper, 1837, for *Nyctinomus cynocephalus* of South Carolina. Recently, however, Dr. J. A. Allen has described as *Molossus verrilli* a skin and skull from Samana, San Domingo, which he compares with the much smaller *M. tropidorhynchus* of Cuba, than which it is said to be much larger and "general coloration darker." The measurements given are: forearm, 40 mm.; third metacarpal, 41; skull, total length, 17; width of brain case, 9.

The measurements of a specimen of *Molossus* (M. C. Z., No. 7382) from Mandeville, Jamaica, are given below, and in parentheses after each the corresponding dimensions of *M. obscurus* from Brazil (M. C. Z., No. 3063):—total length, 94 mm. (104 mm.); tail, 36 (40); hind foot, 8 (9); ear from meatus, 10 (15); tibia, 12 (14); forearm, 38.5 (43). Skull, greatest length, 17 (19); basal length, 12.4 (15); palatal length, 5.7 (7); zygomatic breadth, 10.8 (11.2); interorbital constriction, 4 (4); upper tooth row, excluding incisors, 6.4 (6.7); lower

tooth row, excluding incisors, 7 (7.5). The actual difference indicated by these measurements does not seem great, and still less is this the case when they are compared with those of *M. crassicaudatus*. They are, however, sufficient to produce a difference in the relative bulk that is very striking to the eye; so that where the two species (*obscurus* and *crassicaudatus*) occur together, as in Dominica, they may readily be differentiated by this means alone. No doubt skins would show specific color differences, but I have had none from the West Indies.

I am unable to detect any important characters separating the Jamaican and Lesser Antillean representatives of *Molossus obscurus* from *M. verrilli* of San Domingo, and therefore use the latter name in a subspecific sense to include them all provisionally at least. In addition to the series from Jamaica, the Museum of Comparative Zoölogy has specimens from Sta. Lucia and Dominica. It doubtless occurs also on the other Lesser Antilles and Porto Rico; but I have examined no specimens, and the published records seem uncertain. Dobson (1878), however, records *obscurus* from St. Thomas, and Feilden (1890) notes it from Barbados. The statement of the latter, that there is a great difference in the size of individuals as seen on the wing, probably indicates that both *crassicaudatus* and the present form occur there.

#### MOLOSSUS CRASSICAUDATUS E. Geoffroy.

*Molossus crassicaudatus* E. Geoffroy, Ann. Mus. Hist. Nat. Paris, 1805, 6, p. 156.

This small, dark-colored *Molossus* is common in Grenada, and lives in colonies underneath the roofs of houses. Buildings covered with galvanized iron sheeting are especially favored by it since the small holes left open where the convexities of the sheeting meet the rafters afford ready ingress to the spaces between ceiling and roofing. A large colony inhabited the roof of a cottage at St. George's, and here a small series was easily obtained by placing a dipnet over one of the openings. The owner of the house told us that the bats were active all night, constantly coming and going. Their strong odor and sharp chattering notes render their presence rather obnoxious. They commence flying while it is still light, even before the sun has quite disappeared. Their flight is high and rapid, and on several occasions towards evening we saw them in some numbers hawking over a hill at the same time

with a few Swifts (*Chaetura*). The flight of the two was very similar, and seemingly of about the same velocity, without much doubling or dodging, so that at a distance it was sometimes difficult at first glance to distinguish bird from mammal. The distinct bend of the wing at the carpus in the bat, however, was quite diagnostic in the failing light.

We kept some ten or more of these bats in a net during an entire night and day, and noticed that during the night they made no effort to escape, but all hung in a solid cluster, apparently at rest, though at times one would utter a sharp trill or chirrup. During the succeeding day they maintained their position, but appeared to be sleeping, and felt decidedly cool to the touch.

One of the specimens (No. 7448) is of special interest, in that it has a second lower incisor on the left side, a mere spicule, yet of the same vertical height as the central bilobed incisor. This extra incisor is thus, no doubt, a reversion to the condition shown by the closely related genera *Eumops* and *Promops*, in which there are normally two lower incisors on each side, both, however, bilobed.

As pointed out by the writer in a previous paper (1908, p. 59) *Molossus crassicaudatus* is a wide-ranging species whose characters are very constant. It inhabits the continent of South America from Argentine to Panama, and north among the Lesser Antilles, whence the Museum has specimens from Sta. Lucia, Dominica, and St. Vincent in addition to the series from Grenada. Dr. J. A. Allen (1890, p. 169) has recorded from Virgin Gorda (just east of Porto Rico) a small black *Molossus*, with forearm 37 mm., third finger 72, which may be none other than this species, here probably near its northern limit. The diminutive *M. tropidorhynchus* of Cuba is even smaller (forearm 33).

What was probably this same bat was noted occasionally at Bathsheba and Hastings, Barbados, by Mr. Austin H. Clark; but none was secured. It may have been a bat of this early-flying species that Ligon saw captured by a hawk at Barbados. This interesting occurrence he relates as follows (Ligon, Hist. Barbadoes, 1673, p. 58): "And for Hawkes, I never saw but two, and those the merriest stirrers that ever I saw fly; and one of them was in an evening just at Sun setting, which is the time the Bats rise, and soare to a good height; and at a downcome, this *Barbary* Faulcon took one of them and carried it away."

## MOLOSSUS TROPIDORHYNCHUS Gray.

*Molossus tropidorhynchus* Gray, Ann. Nat. Hist., 1839, 4, p. 6.

This very small *Molossus* (forearm 33) is known from Cuba only. It may there represent the little black *M. crassicaudatus* of the Lesser Antilles. It was found abundantly by Palmer under a tiled roof at Pinar del Rio in the western end of the island, as also at El Cobre.

## CERCOPITHECIDAE.

## CERCOPITHECUS MONA (Schreber).

*Simia mona* Schreber, Säugethiere, 1774, 1, p. 97, pl. 15.

In the island of Grenada this monkey is found in small numbers and has evidently been introduced from the Cameroons or some adjacent part of West Africa. It has apparently been established here for a considerable period for all the persons of whom I made inquiries agreed that it had been there as long as they could remember. Possibly it was brought by the slave traders early in the last century. From inquiries and observations it appears that these monkeys are confined to the heavy primeval forest, a small area of which now remains on the hills in the interior of the island. During our week's stay at Grand Etang in the midst of this forest we noted two bands of these monkeys in the neighboring woods. The one was usually to be found among the lofty trees on the westerly shore of the lake — the Grand Etang. The other frequented the valley across the divide nearby to the south. Apparently there was also a third band in the forest east of the lake. I could learn nothing corroborative of various vague reports of the damage done by these animals to cocoa plantations and vegetable gardens near the woods. During the time of our stay, at all events, they were feeding on the nut-like fruits of certain large forest trees, of which they seem very fond. Notwithstanding the length of time that these monkeys must have been in the island, they seem not to have multiplied very greatly. They are usually rather shy and alert, although at times, prompted perhaps by curiosity, a few may steal quietly into the trees near the Grand Etang rest-house, but at once retreat to the forest if alarmed. Each of the bands observed appeared to have its own feeding ground over which it ranged. With caution it is often possible to approach close



to them as they feed busily in the treetops; but they are exceedingly watchful and usually the first intimation of their presence is the sounding of an alarm by one of their number, a series of loud coughing barks — “*wok, wok, wok*” — about twenty times repeated. This seems to be given by one of the old males for the tone is much hoarser and more resonant than that of the single answering calls of the others. They scamper off through the treetops running along the branches and leaping or swinging from one tree to another, faster than a man on the ground can readily follow. On one occasion the series of alarm notes was heard an hour or more after darkness had fallen over the forest.

CERCOPITHECUS SABAEUS (Linné).

*Simia sabaea* Linné, Syst. Nat., ed. 12, 1766, 1, p. 38.

For many years this monkey has lived in a feral state in Barbados and St. Kitts, where it has been introduced from West Africa. The time of its introduction is uncertain, but Ligon writing of Barbados in 1673, did not mention it among the mammals of the island. It probably came sometime during the next seventy-five years, for Hughes, in 1750, speaks of it in his work on the natural history of the island.

Mr. Austin H. Clark, who visited Barbados in 1903, writes me that owing to the almost complete deforestation of that place, it is found at only a few points. “In a patch of woodland on the Foster Hall estate, near Bathsheba, St. Joseph’s, it is very frequently met with, especially in the early mornings after a rainy night. At such times the monkeys will often sit on the larger and more exposed branches of the trees and sun themselves. I once saw as many as half a dozen on a single large branch in this wood. At other times they are shy and secretive, but if a gun be fired anywhere in the vicinity it is almost certain to bring a response in the shape of a bulldog-like growl from one or more of these animals. Monkeys are also common in the woods along the upper reaches of Joe’s River. This species is very destructive to fruit grown in the vicinity of the woods inhabited by it and will also raid vegetable gardens and sweet potato patches.”

Apparently these monkeys have never been able to increase very greatly in Barbados. Hughes (1750) says that they “are not very numerous in this Island; They chiefly reside in inaccessible Gullies; especially where there are many Fruit trees. The greatest Mischief they do to the neighboring Planters is digging out of the Earth their

Yams and Potatoes, and sometimes breaking and carrying off a great many ripe Sugar-canes. As a Law of this Island provides a *Praemium* for destroying these, as well as Racoons, they yearly rather decrease than multiply." Schomburgk, in his History of Barbados written in 1848, states that this monkey was then nearly extinct, but this belief may have been due to his misapprehension that it was a native species of *Cebus*.

There seems to be no record of the introduction of this monkey into St. Kitts, though it is said to have become common there.

I have followed Pocock in using the specific name *sabaeus* in place of *callitrichus*, hitherto current for the green guenon.



[illegible]

*Distribution—Continued.*

[illegible]



[illegible]

*Distribution—Continued.*

	St. Andrew's	Old Providence	Swan Ids.	Jamaica	Cuba	Isle of Pines	Haiti & S. Domingo	Mona	Porto Rico	Plana Keys	Waling's Id.	Long Id.	Andros	New Providence	Eleuthera	The Abacos	St. Thomas	Virgin Ids.	St. Croix	Aneгада	Anguilla	St. Martin's	St. Bartholomew	St. Kitts	Barbuda	Antigua	Montserrat	Guadeloupe	Dominica	Martinique	Sta. Lucia	St. Vincent	Grenadines	Grenada	Barbados	
Nyctinomus brasiliensis musculus				+					+																											
Nyctinomus b. bahamensis																																				
Nyctinomus b. antillarum																																				
Nyctinomus macrotis																																				
Mormopterus minutus																																				
Eumops glaucinus																																				
Eumops orthotis																																				
Molossus obscurus verrilli				+																																
Molossus crassicaudatus																																				
Molossus tropidorhynchus																																				
Cercopithecus mona																																				
Cercopithecus sabaeus																																				

\* Fossil Species.

— Authentic Records.

+ Specimens in Coll. M. C. Z.

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