59.9 (729.1)

Article XX.—MAMMALS COLLECTED IN EASTERN CUBA IN 1917. WITH DESCRIPTIONS OF TWO NEW SPECIES

By H. E. Anthony

Plates XXXV to XXXVII

Early in 1917 work was begun in the eastern end of Cuba, the Santiago region, with the intention of making collections of the living mammals and of exploring as many caves as possible in the search for extinct mammalia. I was able to get well started, with enough data gathered from various sources to insure a successful expedition, when the political rebellion that caused so much trouble in Cuba broke out. It found Mrs. Anthony, who was my able assistant on this expedition, and me at Daiquiri investigating the caves along the seacoast; and developments of this disturbance so interfered with our movements that we were compelled to remain here for several weeks after my work had been practically finished. Upon being able to get out to Santiago I learned that it was useless to attempt further work in this part of the island that spring and consequently gave up my plans and returned to New York City.

Subsequently, the entrance of the United States into the World War, when I left the Museum to enter military service, not only prevented a return to Cuba to follow up the clues I had obtained in 1917 but even kept me from a very close examination of the collection that had been made. A preliminary investigation, however, disclosed a new fossil bat, which was described.[1] Now that this material has been more fully looked over, it proves to be well worthy of putting on record.

After my return from Cuba in 1917 I was able, thanks to the courtesy of Mr. William Palmer of the United States National Museum and of Dr. G. M. Allen of the Museum of Comparative Zoology, to look over the collections made on the western end of Cuba that same spring by the National Museum and by Dr. Thomas Barbour of the Museum of Comparative Zoology. In addition to these collections I I have seen material collected on the Isle of Pines by the Messrs. Link and brought to the American Museum for identification by Mr. O. A. Peterson of the Carnegie Museum. The species taken thus in four different collections are, so far as is now known, nearly identical; that

[1]1917, Bull. Amer. Mus. Nat. Hist., XXXVII, p. 337; May 28.

is to say, a genus occurring on both ends of the island is represented by the same species at each end and there seems to be no apparent differentiation over a large range. I exclude from this statement the species of *Nesophontes* described in this paper; *Nesophontes micrus* is found at both ends of the island and further research may show a similar range for the new form.

I take pleasure in acknowledging the very material assistance rendered the expedition to Cuba by many individuals. Mr. William Fromm of Santiago, through his intimate knowledge of the region, was able to give me much valuable information and to put me in touch with many persons who could help the expedition, and to him my sincerest thanks are due. Mr. Whittaker, in charge of the Spanish American Iron Mines, placed quarters near Daiquiri at my disposal and gave me valuable assistance in many ways. Mr. Charles Ramsden, of Guantanamo, Cuba, presnted me with several specimens of rare bats from his own collection and also stood ready to help the work in the field had it not been summarily cut off. I wish also to acknowledge my appreciation of the keen interest and material aid given by Dr. W. D. Matthew of the Department of Palæontology of this Museum, one of the pioneers in the attack on the West Indian problem.

Almost all of our collecting was done in the vicinity of Daiquiri, on the eastern coast of Cuba. Commencing work at Santiago, I made a short two-day trip back into the mountains to Jarahueca, near Sabanilla, but failed to find anything in the caves there to warrant a return. A reconnaissance at Daiquiri disclosed localities well worth extended investigation and, having been joined at Santiago in the meantime by Señor Victor Rodriquez, who was kindly sent to my assistance by Dr. Carlos de la Torre of the University of Havana, I moved our base to Daiquiri where we were very courteously received by Mr. Serrano, the superintendent of the iron mines operated by the Spanish American Iron Co., who made us his guests at his own house. Working conditions at Daiquiri proved to be ideal, as we could ride to and from the caves on the railroad of the mines and the cliffs along the Daiquiri sea-front are honeycombed with caves (Plate XXXV, fig. 1). At first I was able to carry a gun and planned to collect *Capromys* and as many of the living bats as possible. With the outbreak of the rebellion I had to abandon this as all guns were confiscated and only such bats as could be netted or knocked down by branches were secured.

While a number of caves had a few bones in them, only two caves had large deposits. One of these, a small cavern high up on the side of the limestone hill that overlooks the roadstead of Daiquiri, was worked in less than a day but the other was not left until after many days work of two or more people. The earth in the small cave was very red and the bones were strongly impregnated with this pigment, probably an iron stain.

The larger cave, the one known as the "Cueva de Los Indios" (Plate XXXV, fig. 2; Plate XXXVI, fig. 2), contained earth dark brown in color, loose and light in texture, and formed partly from decomposed limestone but more largely by bat guano, long since returned to its mineral constituents. The part of the cave where we worked is a small part of what was formerly a much larger underground chamber (Plate XXXVI, fig. 1), the roof of which is today fallen in, leaving a great open center in which several large trees are growing. There are two main entrances to this central court and the one we climbed up has two mouths. The whole cave in its greatest extent is about 150 by 60 feet. In these main features it bears considerable resemblance to the "Cueva Catedral" of Porto Rico, where I found a similar rich bone deposit; and I believe that it is more than mere coincidence that bones are found in greatest abundance in the large caves where the top has fallen in, admitting light, and where there are several entrances.

Throughout most of the area covered by the former cave extension the rains have washed out the earth and it is impossible to determine what was there before the roof fell in. Great masses of limestone from the roof fill the central opening and further obstruct investigation. Small subchambers opening into the central court yielded nothing to preliminary excavations. The principal bank of earth was a low rounded mound (Plate XXXVI, fig. 2), approximately forty feet long and twenty-five feet wide, sloping uniformly from the side wall of the cave down to the cave floor. It was probably the remains of a huge guano pile with a certain admixture of earthy material from the limestone walls. The bones were found quite uniformly in a stratum of about twelve inches thickness. In this stratum there were local areas of concentration where there was little else but hundreds of small bones. Specimens were found from the top down and, although some of these at the surface were *Epimys*, *Artibeus*, and other living species, being of quite recent deposition, most of them were of an older period and were found right through to the bottom of the layer. It appeared as if some agency had removed a little of the upper surface and thus exposed these bones, since they were very dark in color and had evidently been buried beneath the soil for some time. This agency may have been the wind or rain, as, although the roof of this portion of the cave overhangs about forty feet beyond the mound, it is high enough to leave the mound exposed.

Judging from the deposits of rat and bat remains being laid down at the present time in this cave by the Cuba Barn Owl, in some places already forming deposits of considerable extent, we have the key to the accumulation of the extinct mammalia in the mound. Another point in favor of this theory is the scarcity of complete skulls but the abundance of lower jaws and palates. The owl breaks open the skull to eat out the brains and afterward swallows the mammal entire, if it be a small one, the passage of the bones through the digesting action of the owl's stomach accounting for the very fragile nature of the bones.

On the opposite side of the cave a bone-bearing breccia was discovered. This lay in a bed varying from four to eight inches in thickness, reposing in a rather even plane which tilted decidedly toward the middle of the cave. The bed rested upon the original limestone but in many places it met the limestone only at points here and there and thus arched over, being easily broken up in consequence of this type of support. The breccia is full of the same species as were found in the mound, with the obvious exception of *Epimys*, and must have been contemporaneous in its formation with the mound. The breccia abutted against the wall at about the same height as the mound and was coated over by a thin flow of limestone evidently deposited from solution. The formation of this type of breccia is undoubtedly very rapid.

I put a man with a shovel to work at trenching through the mound, clear down to the rock floor, to learn how deep the bones went. He struck a hard formation at about two feet and extensive digging showed that the deeper layers carried no bones.

The age of the Cuban fossils must be, comparatively speaking, very recent. In my opinion, the late Pleistocene is the earliest time in which a conservative judgment can place them, while the evidence seems to favor the age of the specimens as being of the early Recent era.

As it is a labor of many days to thoroughly work over the many thousand limb bones and skeletal remains collected, a detailed report is given of the skulls only, leaving to some future paper the treatment that this mass of material deserves.

Capromys pilorides (Pallas)

I [*sodon*] *pilorides* Say, 1822, Journ. Acad. Nat. Sci. Philadelphia, II, p. 333.

Although going to Cuba with every intention of securing a large series of *Capromys*, the prohibition on the use of fire-arms prevented me from carrying out this plan and only five specimens were secured.

These five specimens are all immature animals, three of them less than half grown, the other two nearly the full dimensions, in external measurements, of a normal adult but with skulls much smaller than in adults taken at Trinidad, Cuba. A number of discrepancies noted in comparing this series with typical *pilorides* from Trinidad are attributed to age but I do not have enough material at hand to satisfy myself that such is really the case. The Daiquiri skins have the hind feet whitish on the upper side (blackish in the Trinidad series); the tail is whitish (yellow or ochraceous in the Trinidad series); and the skulls are notably wider in proportion to their length than is the case with the Trinidad specimens, one of which, moreover, seems to be comparable in age with my oldest specimen.

The only hunt that I was able to make for "Hutias" was in patches of forest near Daiquiri. This growth was not the primitive jungle but was sufficiently dense to make travel slow and difficult. I had a native guide who knew where to seek the animals and I shot two of them in the course of the morning. I was told that the Hutia climbs into the top of some tall tree and curls up for a sun bath early in the morning. The best way to hunt them is to get out when the sun is yet low and move quietly through the forest scanning closely every tall tree. Both animals that I saw were detected high up in leafy trees, where they were curled up on limbs and were not easy to distinguish from clumps of foliage.

I was told that Hutias were common about Daiquiri and the natives thought that there was more than one kind in the region but, although I offered to buy specimens, I secured only three more. The natives usually hunt this animal with a small dog which scents the Hutia in the tree above him and bays the animal; or sometimes he surprises it on the ground and chases it into a hole in the rocks.

Capromys nana G. M. Allen

Capromys nana G. M. Allen, 1917, Proc. New England Zoöl. Club, VI, p. 54.

This small *Capromys* is represented by more than three hundred mandibles, about half of which have two or more teeth, and some sixty skull fragments, only five or six of which are more than mere palates.

This material agrees well with the description and figures of *nana* given by Dr. G. M. Allen, *loc. cit.*, and Dr. Allen kindly compared for me specimens which I sent him, pronouncing them to be *nana*. It would have been not at all strange if the Eastern Cuba specimens had proved to be distinguishable from *nana* found in Central Cuba but my material is rather too incomplete to formulate a conclusive statement on this point. Certainly no characters of separation exist in the mandible and palate alone.

The discovery of *nana* as a living mammal in Central Cuba warrants the suspicion that it may be found alive in the Oriente of Cuba as well, but this fact I very much doubt. Since none of my specimens appear to be at all recent and since this mammal formed such a large part of the owl diet in times gone by, it would almost certainly appear in recent owl pellets no matter how rare the animal might be.

Geocapromys columbianus (Chapman)

Capromys columbianus CHAPMAN, 1892, Bull. Amer. Mus. Nat. Hist., IV, p. 314.

Among quite a mass of capromid material collected at Daiquiri, nearly half of the specimens are referable to *Geocapromys*. By far the greater part of the material is composed of mandibular rami of which more than two hundred and twenty-five have been examined, while the cranial fragments are mainly palates, lacking teeth, of which there are about forty that may be satisfactorily identified.

Practically all of this material is evidently from young and very young animals. None of the specimens are as large as the type specimen of *columbianus* or specimens collected by Mr. Barnum Brown near Cienfuegos. The owls doubtless did not prey upon the full-grown *columbianus* and brought only small, immature animals to the cave. Because of the small size of the remains, they are not easily separated from *Capromys nana* unless the fragments are large enough to show several characters.

Mandibles containing the premolar are at once identified by the extra internal reëntrant, nearly always well developed but occasionally approaching the condition seen in rare cases among *Capromys* where the extra reëntrant appears as little more than a slight indication of the normal angle. Also, the rather evident immaturity shown by the rami enables small *columbianus* to be distinguished from *C. nana*, while the character of the alveolar margin of the last molar, the slope of the enamel plates of this tooth, and the oblique position of the teeth in respect to a horizontal plane (more nearly at right angles in *Capromys*) are confirmatory characters.

In working over the palates I have noted a very important character which I have not seen mentioned in the literature on these rodents but which I have found to be most valuable as a basis of separation between *Capromys* and *Geocapromys*. In *Capromys* the upper incisor takes its origin very near to that of the first upper premolar and the two alveoli nearly meet; there is scarcely any swelling on the maxillary to show the course of the incisor. In *Geocapromys* the course of the incisor is clearly shown on the face of the maxillary as a prominent swelling and its upper termination is high up on the wall of the anteorbital foramen, very much higher than is the case in *Capromys* where it is sunk into the zygomatic root. This character is constant among recent as well as fossil species and is especially useful when only scraps of the palate are compared, since enough of the maxillary is generally present to show this point.

None of the specimens appear to be very recent; all are very much stained; and the association shows that *G. columbianus* was contemporaneous with *C. nana* throughout the limited horizon explored.

Boromys ofella Miller

Boromys ofella MILLER, 1916, Smithson. Misc. Coll., LXVI, No. 12, p. 8; December 7.

As noted in the remarks under *B. torrei*, this species was found very sparingly. The scanty material at hand appears to agree well with the type description of *ofella* and with material collected by Dr. Barbour farther to the west. The type locality of *ofella* is Baracoa and Daiquiri is less than one hundred miles distant in the same character of country so that it would be rather surprising should the large species of *Boromys* from Daiquiri prove to be anything other than *ofella*.

Boromys torrei G. M. Allen

Boromys torrei G. M. ALLEN, 1917, Bull. Mus. Comp. Zoöl., LXI, No. 1, p. 6.

A great abundance of fragmentary material of this genus was found in caves at Daiquiri, by far the most of it coming from the Cueva de Los Indios. Some idea of the abundance of the members of this genus is shown by the fact that I have cleaned and examined over five hundred mandibular rami, while nearly as many fragments have been ignored as too badly broken up. The small *torrei* seems to have been the dominant form, as only about five per cent of this series represents the larger *B. ofella*. To go with these rami, there are eight skull fragments which, in the aggregate, show nearly all the characters of a perfect skull.

A great range of variation in dental pattern is shown by this series, which discloses about every stage of wear from the freshly erupted molar to the tooth that has the crown nearly worn to the roots. Coincident with the amount of wear, the crown pattern changes from a series of external and internal reëntrants to a series of enclosed lakes, two in each tooth, placed side by side and not in an anteroposterior line. In very early stages of wear there are two internal reëntrants in the lower molar series but the most posterior of these soon disappears, passing into a lake which has worn away by the time the two main reëntrants have worn to form the laterally placed lakes. In the lower premolar an anterior lake is present in the unworn tooth but does not persist for any great length of time. The pattern at full maturity is a figure eight with no lakes, either anterior or posterior, although individuals that should be properly included in this category may show a trace of the posterior lake, where it persists longer in m_1 and m_2. The accessory internal reëntrant does not seem to be as well developed in *torrei* as in *ofella*.

A correspondingly shifting molar pattern is to be noted in the upper dentition, where the accessory reëntrant is external and the first lake to be seen is a posterior one.

Like the Spiny Rats, the Cuban *Boromys* assumes the appearance of a mature animal while yet only about half to two-thirds grown; and, while this condition may often be detected if the material is adequate, when only fragments of skull or rami are obtained the question of determination becomes complicated. The differences between *torrei* and *ofella*, the best character of separation being size, are readily apparent and no difficulty is experienced in separating the material into two series to correspond. However, the type of *torrei* was found in the Province of Matanzas, over 400 miles from the Santiago region where my material was found, and it is not unreasonable to expect *Boromys* from the two places to differ; but a comparison of the Oriente material with specimens in the Museum of Comparative Zoology from farther west fails to disclose any noteworthy differences.

Nesophontes micrus G. M. Allen

Plate XXXVII, Figures 6, 7, 8, 9, 11, 12

?*Nesophontes micrus* G. M. Allen, 1917, Bull. Mus. Comp. Zoöl., LXI, p. 5.

This small insectivore is represented by some thirty-three skulls and one hundred and fifty mandibles, most of the former being rather fragmentary but a number of the latter being perfect, except that none of the mandibles contain a complete set of incisors.

Most of this material is stained and very dark brown, although there are a few rami that are very recent in appearance. The *Nesophontes* material is associated with the *Geocapromys* and *Boromys* and was found from almost on the surface down to about two feet, where the bone-bearing earth played out. Having before me extensive series of both the Porto Rico and the Cuba insectivores, I have made a detailed comparison of the two with the view to satisfying myself that they are congeneric. This I have been able to do and I agree with Dr. G. M. Allen that the species *micrus* is a good *Nesophontes*. For convenience in comparison I append the following table of characters by which the two forms differ.

N. edithæ	*N. micrus*
General outline of skull, viewed from above, from parietals to tip of nasals, subrectangular.	This outline often subtriangular; possibly this applies only to females.
Constriction of brain-case at occipital region moderate.	Constriction averaging greater, parietal more bulging.
Lateral face of premaxillary flat.	Premaxillary with a shallow lateral concavity, more or less pronounced.
Anteorbital border of maxillary rounded.	Maxillary with a thin shelf-like expansion on orbital border.
Lachrymal foramen small, the opening simple.	Lachrymal foramen large, actually as large as in the larger species, *edithæ*, and expanded into a trumpet-shaped opening.
Anterior upper premolars equal in size.	First anterior upper premolar noticeably larger than second.
Lower premolars of equal size, crowded in the tooth-row, obliquely overlapping each other.	Second lower premolar about half the size of the other two, premolars not crowded or overlapping.
Lower molars extending externally beyond margin of alveoli.	Lower molars not extending so far beyond margin of alveoli.

In all other characters *edithæ* and *micrus* agree and, although the differences are at once discernible and of rather a pronounced character, I believe that they are only such as should mark a good species and are not worthy of even a subgeneric split. The size difference between the two sexes is not as well shown in the Cuban series as it is in the Porto Rican *Nesophontes* but is apparent nevertheless.

Nesophontes longirostris, new species

Plate XXXVII, Figures 10, 13

Type, No. 17626, Dept. of Vertebrate Palæontology, from a cave near the beach at Daiquiri, Cuba, Feb. 1917; collector, H. E. Anthony. The type is the anterior portion of a skull, from the auditory region to the tips of the nasals being almost perfect; the dentition is complete except for the incisors on both sides. The skull is a light brown in color and was thinly encrusted with a calcareous cement.

General Characters.—Very similar to *Nesophontes micrus*, but rostrum proportionally more slender and space between upper canine and the last premolar much greater than in *micrus;* the two anterior premolars subequal in size and with distinct diastemata between the canine and the first premolar, between the two anterior premolars and between the second and third premolars of the row.

Detailed Description.—Skull narrow and elongate, presenting all of the characters of *micrus*, but the rostrum very long and slender; interorbital region parallel-sided, with frontals rounded and somewhat inflated; nasals very narrow; premaxillæ with slight concavities along the nasal suture and meeting the nasals at almost ninety degrees, instead of a gradual rounded transition into the nasal region as in *Nesophontes edithæ;* anteorbital border of maxillary expanded into a thin shelf that is continued about the lachrymal foramen to form a large trumpet-shaped opening; palate long and narrow, interior margins of tooth-rows nearly parallel; pterygoids long and inflated to tube-like proportions.

Dentition.—Dentition essentially that of typical *Nesophontes*, the canine tall and sharp, two-rooted; first two premolars simple and nearly equal in size, scarcely half as tall as the third premolar which is submolariform in shape with a very high piercing cusp and a notch-like shoulder on the anterior cingulum; first two molars of equal size with well-developed protocone and metacone, the paracone being almost vestigial in comparison and smaller in the second molar than in the first; third molar about half the size of the first two and lacking a high metacone; between the canine and the first premolar there is a distinct separation, with separations of equal extent between the first and second and the second and third premolars, resulting in the distance from the canine to the third premolar being much longer than in *micrus*.

It will be seen from the measurements that *longirostris* is a longer and slenderer form in its proportions than *micrus*. Because of the fragmentary nature of the material, some unusual measurements had to be taken but they serve to show that the new form varies consistently from *micrus*. Although as long or longer than males of *micrus* in most proportions, in breadths *longirostris* is as narrow as the females, while in the character of the separation of the canine and last premolar it is unapproached by any of the series of *micrus* and quite exceeds a large male of *edithæ*. It is impossible to be sure whether the type represents a male or a female, although it might be argued from its slender structure that when more of the skulls with separated premolars are found there will be individuals conspicuously heavier in structure than the type. If so, these individuals will doubtless be noticeably larger than *micrus*, judging from the apparent sexual variation in the series of *micrus* and *edithæ*.

The spacing of the premolars in *longirostris* would appear to be rather an important character, in view of the fact that (1) there is so little variation in the dentition shown by the very large series of *N. edithæ* and the fairly large series of *N. micrus*, and (2) the differences between the two species are remarkably constant when everything is considered. A search among the one hundred and fifty mandibular rami of Cuban *Nesophontes* fails to reveal one with a corresponding spacing of the lower premolars.

MEASUREMENTS

	micrus	*longirostris*	*edithæ*
Length from glenoid fossa to alveolus of first incisor.	No. 17627—18.8 ♀ 17628—19.7? ♂ 17629—19.0? ♂ 17630—.... ♂ 17631—20.8 ♂ 17632—19.3 ♀	No. 17626—21.3 (Type)	No. 17095—29.2 ♂ 14174—27.0 ♀ (Type)
Length of palate, postpalatal notch to alveolus of first incisor.	17627—13.2 ♀ 17628—14.1? ♂ 17629—14.2? ♂ 17630—14.5? ♂ 17631—15.3 ♂ 17632—13.7 ♀	14.7	20.5 ♂ 19.2 ♀
Breadth across maxillary zygomatic roots.	17627— 9.9 ♀ 17628—11.5 ♂ 17629—10.7 ♂ 17630—10.9 ♂ 17631—11.8 ♂ 17632—10.8 ♀	10.6	16.5 ♂ 14.6 ♀
Breadth of rostrum at canines.	17627— 4.1 ♀ 17628— 5.0 ♂ 17629— 4.2 ♂ 17630— 4.5 ♂ 17631— 5.1 ♂ 17632— 4.0 ♀	4.4	7.5 ♂ 6.4 ♀
Breadth of palate across m^1.	No. 17627— 7.8 ♀ 17628— 8.5 ♂ 17629— 8.2 ♂ 17630— 8.1 ♂ 17631— 8.4 ♂ 17632— 7.5 ♀	7.8	12.1 ♂ 10.4 ♀
Depth of rostrum, vertical distance at m^1.	17627— 6.3 ♀ 17628— 7.6 ♂ 17629— 7.4 ♂ 17630— 6.5 ♂ 17631— 7.7 ♂ 17632— 6.2 ♀	6.5	10.0 ♂ 9.2 ♀

	micrus	*longirostris*	*edithæ*
Distance from glenoid fossa to maxillary zygomatic root.	17627— 6.1 ♀ 17628— 7.1 ♂ 17629— 7.0 ♂ 17630— ... 17631— 7.6 ♂ 17632— 6.3 ♀	No. 17626— 7.6 (Type)	No. 17095—11.7 ♂ 14174—10.5 ♀ (Type)
Length of maxillary tooth-row, canine to m³.	17627—10.6? ♀ 17628—12.0? ♂ 17629—11.6? ♂ 17630—11.8 ♂ 17631—11.7? ♂ 17632—11.1 ♀	12.0	16.2 ♂ 14.9 ♀
Distance from canine to last premolar, posterior border of canine to anterior border of premolar.	17627— 2 ♀ 17628— 2 ♂ 17629— 2.6 ♂ 17630— 2.6 ♂ 17631— 2.2 ♂ 17632— 2.2 ♀	3.2	2.8 ♂ 2.7 ♀

Noctilio leporinus mastivus (Dahl)

Vespertilio mastivus DAHL, 1797, Skrivter. af Naturhist.-Selskabe Kjöbenhavn, IV, p. 132.

A fragment of a right mandible, containing the last two molars, proves upcn comparison with the mandible of a female from Porto Rico to be unquestionably of this species. This is the only record for *Noctilio* that I secured and it was found in a cave at the top of a low hill looking out over the sea. The mandible is stained a deep red and was in the formation with *Nesophontes* and *Boromys*.

Chilonycteris parnellii boothi (Gundlach)

Chilonycteris boothi GUNDLACH, 1861, Monatsber. k. preuss. Akad. Wissensch., Berlin, p. 154.

This bat was not secured in the flesh nor was it noted alive in any cave, but a skull was picked up on the floor of a small cave at Daiquiri. The skull is white and not discolored in any way, from which fact I should expect to find this species inhabiting some of the many caves of this region.

Macrotus waterhousii minor (Gundlach)

Macrotus minor GUNDLACH, 1864, Monatsber. k. preuss. Akad. Wissensch., Berlin, p. 382.

In the deposits at Daiquiri I found five skulls and ten mandibles of this species as fossils. Additional material was found in fresh owl pellets but the fossil material is all old and dark brown in color. In no way do these specimens differ from the bat now living there.

Forty-three specimens of the living *Macrotus* were collected as follows: Daiquiri, 11 skins, 10 alcoholics; Jarahueca, 15 alcoholics; Siboney, 2 skins, 5 alcoholics.

This series presents the two color phases described by Rehn in his revision of the genus[1] but these two types of coloration in their relation to sex are difficult to determine; although the brightest colored specimens are males, some of the females are ferruginous in color. None of the ferruginous phase have the "hair unicolor" as given by Rehn. Four females taken March 2 had large embryos; three taken March 7 had small embryos.

Macrotus is a very common bat in eastern Cuba and was noted in most of the caves where the chambers were well darkened.

Monophyllus cubanus Miller

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

Only one specimen of this species was collected and this constitutes the sole positive record I secured. This specimen was taken at Jarahueca near Sabanilla, in a cave among the hills. In several of the larger caves about Daiquiri I saw small bats that may have been *Monophyllus* but the caves were too high to collect with a net and without a gun I could not verify my observations. It seems very probable that this species is not generally distributed on the eastern end of the island or more would have been taken.

Brachyphylla nana Miller

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

Although *Brachyphylla* was not found living in any of the caves visited, a good series of fossil skulls was secured. Every one of the crania is discolored by age but a few of the mandibles are white and quite fresh, showing that this bat is occasionally to be found frequenting

[1]A Revision of the Mammalian Genus *Macrotus*, 1904, Proc. Acad. Nat. Sci. Philadelphia, p. 463.

this region. The material comprises sixty-six skulls, only three of which are at all complete and these are without teeth, and sixty mandibular rami, of which twelve are perfect but lacking teeth in most cases.

Upon looking up the specimens of Cuban *Brachyphylla* in the American Museum, I discovered that a series collected at Santiago in April 1902 and labeled as *cavernarum* are in reality *nana*. This series contains twenty alcoholic specimens and six of the skulls have been removed and cleaned for study. This material affords an excellent basis for comparison with the fossil series, which agrees well with the animal now living on the island. Not one specimen among the entire series seems to be referable to *cavernarum*, from which *nana* is readily distinguished by size alone. In addition to the characters pointed out by Miller[1] as separating these two species, namely the difference in size and the extent of the postpalatal notch, it is to be noted that there is a slight difference in the development of the last upper molar. In *cavernarum* this tooth has an anteroposterior breadth nearly equal to the lateral breadth, but in *nana* the tooth is relatively narrower in the line of the tooth-row, in most of the skulls.

Compared with a large series of fossil *cavernarum* from Porto Rico the size difference is sufficient to separate the Cuban series without difficulty, although there is a tendency in the Porto Rican specimens for the skull to be a trifle smaller than in the bat now living there. The character of the differences separating these two species is such that I believe *nana* will stand eventually as a subspecies of *cavernarum*, when more material has been secured and the range of the genus is better understood.

Artibeus jamaicensis Leach

Plate XXXVII, Figures 1, 2

Artibeus jamaicensis Leach, 1821, Trans. Linn. Soc. London, XIII, p. 75.

Among the lot of *Artibeus* material taken fossil are several skulls and a mandible of a race or perhaps species quite noticeably larger than *jamaicensis parvipes*. The skulls are fragmentary, being the anterior portions, some of which contain several molars, and have been encrusted with lime. This lime may or may not signify a greater antiquity, since all of the other skulls of *Artibeus* were in a loose earthy formation and had not become cemented. Because of the fragmentary nature of this material, taken in conjunction with the closely intergrading characters

[1]1902, Proc. Acad. Nat. Sci Philadelphia, p. 409; September 12.

of the *jamaicensis* group, I have been unable to allocate satisfactorily these specimens. It is certain that they do not represent *parvipes* since they are conspicuously larger and more massive, with heavier teeth, in all these characters closely approaching typical *jamaicensis* (Plate XXXVII, figs. 1–5). On the other hand, these characters apply as well to *j. yucatanicus* and the possibilities of distribution serve for the one as well as the other. It would not be unreasonable to suppose that these specimens represent the earlier ancestral form of *parvipes,* but for the fact that the number of fossil skulls of *Artibeus* from Daiquiri indicates that the intergradation between the large specimens and the smaller, normal *parvipes* is rather abrupt. The not inconsiderable amount of variation in the *parvipes* series does not produce a skull truly comparable to this large form, the principal measurements of which are as follows.

Breadth of palate across alveoli of m^2, 12.7 mm. (*parvipes,* 11.6 mm.); interorbital breadth, 7.4 and 7.3 mm. (*parvipes,* 6.7 mm.); greatest breadth of m^2, 3.8 mm. (*parvipes,* 3.6 mm.); greatest length of mandible, 19.6 mm. (*parvipes,* 18.8 mm.).

Judging from the conclusions reached by Dr. Knud Andersen in his monograph on *Artibeus,*[1] it would be decidedly unwise to attempt to base far-reaching conclusions upon such scanty material and the best treatment seems to be to consider this large form as *jamaicensis* in the broad sense.

Artibeus jamaicensis parvipes (Rehn)

Plate XXXVII, Figures 3 to 5

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

Upwards of ninety skulls and one hundred and fifty mandibles of this bat were found fossilized in the caves about Daiquiri. Practically all of this material is discolored and fully as ancient as the specimens of *Nesophontes* and *Boromys* with which it was found associated.

The individual variation disclosed by this series and by a few skulls picked up from nearest bone deposits, mainly from owl pellets, is very apparent. One of the principal characters of variation is the size and shape of the rostrum, correlated with a less noticeable variation in the size of the entire skull.

This species is a common bat, living in the caves throughout the eastern end of the island. It was seen in the caves visited near Sabanilla and was found in a number of caves from Aguadores to Daiquiri.

[1]1908, Proc. Zool. Soc. London, pp. 204-319; September.

Specimens were taken as follows: Daiquiri, 14 skins, 4 alcoholics; Jarahueca, 13 alcoholics.

The series presents few features worthy of comment. The coloration is rather uniform throughout the series but there are two individuals somewhat lighter than the others.

Each of eleven females collected March 7 contained a single large embryo, some of them nearly ready for birth.

Phyllops falcatus (Gray)

Arctibeus falcatus GRAY, 1839, Ann. Nat. Hist., IV, p. 1.

This rare species is represented by seven fragmentary skulls and four mandibular rami collected at Daiquiri. The animal was not found alive. In addition to this small series, I have an almost perfect skull taken from an owl pellet collected by Mr. Barnum Brown, of the Department of Vertebrate Palæontology of this museum, at the "Cueva de Los Machos" near Cienfuegos.

Compared with a skull taken from an alcoholic specimen (No. 123187, U. S. N. M.) collected at Santiago and kindly loaned me by Mr. Gerrit S. Miller, Jr. of the National Museum, this series of subfossil skulls shows considerable differences. None of them are as large as the Santiago specimen and there are minor variations in the breadth, extent, and shape of the postpalatal notch. None of the series, however, intergrade with *P. vetus*, from which they may be readily distinguished by their larger size, the more V-shaped postpalatal notch, and by the absence of the deep basioccipital pits, this latter character alone sharply separating the two series.

The material of *falcatus* is, for the most part, fresh in appearance and not deeply discolored, some of it very recent in fact.

Phyllops vetus Anthony

Phyllops vetus ANTHONY, 1917, Bull. Amer. Mus. Nat. Hist., XXXVII, p. 337.

I have very little to add to my original description of this species, *loc. cit.*, except that, having gone over the entire collection of cave material more thoroughly than I had done at that time, I am able to confirm the impression that *vetus* is an older form than *falcatus*. The finding of specimens of *falcatus* in the cave material has drawn attention to the fact that the specimens of *vetus* are all more ancient in appearance, more deeply stained and discolored. The totality of bat species brought in by the owls is so much greater than the number of species I observed personally that I have come to regard the owl as an exceedingly efficient collector. Consequently, if recent remains of a form are not found in the deposits made by the owls, the odds are greatly against that form being found alive in that particular region.

Phyllonycteris poeyi Gundlach

Ph[yllonycteris] poeyi GUNDLACH, 1861, Monatsber. k. preuss. Akad. Wissensch., Berlin (1860), p. 817.

This species is represented by twenty-three skulls, five of which are only slightly broken, and five mandibles, all of which were found in the deeper layers of bones and are all brown and ancient-looking. Compared with skulls of *poeyi* taken at Guanajay, no differences worthy of note can be detected.

This bat was not found living in any of the caves.

Erophylla sezekorni (Gundlach)

Phyllonycteris sezekorni GUNDLACH, 1861, Monatsber. k. preuss. Akad. Wissensch., Berlin (1860), p. 818.

A large series of forty-one skins and eight alcoholics of this rare bat was taken in a cave near Siboney. Formerly a very rare species, its recent rediscovery has shown that it is common locally and I found that to be the case about Siboney.

About two miles from Siboney on the railroad to Santiago, a faint trail takes off to the right through the low brush and leads up to a small opening in the mass of limestone that forms the low ridge parallel to the sea-front. This entrance is the opening to a large and fairly high chamber with a number of smaller side chambers, so low that often one can not stand erect in them. This cave is the home of many hundreds of *Erophylla* and they seem to have the cave entirely to themselves. Being unable to use the shot-gun, I was forced to have recourse to primitive collecting methods. The bats were congregated in large numbers in the small subchambers and I entered these, going through the small openings on my hands and knees. Once inside, I would lay wildly about me with a handful of switches, trusting to be able to knock down some bats because of their number in such close quarters. In this I was successful and, by following them from chamber to chamber and repeating the process, I was able in two visits to the cave to obtain this large series. It would be hard to find a more exhausting way to collect bats; the violent exertion in the close air of the cave brought forth the perspiration in torrents and left me completely used up at the end of half an hour. At my second visit to the cave, the number of bats to be seen was very noticeably less and it may be that this species leaves a cave completely when too closely harassed.

The series is about evenly divided between the two sexes, and small embryos were found in eleven of the females, taken February 26 and 28. The coloration of the entire series is remarkably uniform.

Compared with a series of *Erophylla bombifrons* from Porto Rico, there are no apparent differences in color between selected individuals but the average coloration of *bombifrons* is darker. The forearm of the Porto Rican bat is a trifle longer, about three millimeters, the ear is shorter and broader, with a more deeply notched tragus, the tragus of *sezekorni* being much longer.

An examination of the skulls of this series reveals the rudimentary condition of the zygomatic arch. Never more than a mere thread of bone at a mid-point, in two specimens the arch is incomplete and the uniform appearance of the gap, the same on both sides, shows that it is not an accidental break.

Natalus primus, new species

Type, No. 41009, Dept. of Mammalogy, Amer. Mus. Nat. Hist., Daiquiri, Cuba, February 1917; collector, H. E. Anthony. The type is the right mandibular ramus with the last two premolars and all of the molars in position; a topotype mandible contains the last premolar and the first molar.

Characters.—A very large *Natalus*, with long slender mandible and heavy teeth.

Measurements.—Greatest length, 14.4 mm.,[1] 14.6, (13.6)[2]; depth of mandible at m_1, 1.5, 1.4, (1.4); transverse breadth of m_1, 1.1, 1.1, (.9).

From *Chilonatalus* and *Nyctiellus*, the only ones of the *Natalidæ* hitherto known from Cuba, *Natalus primus* is easily separated by the great difference in size. From *Natalus major*, the largest of the group, it may be known by its even greater length of mandible and noticeably heavier teeth. The first lower molar is especially "plump" in contour and the tooth extends externally considerably beyond the alveolar border.

These mandibles were found associated with *Nesophontes* and *Boromys* in the Cueva de los Indios at Daiquiri, buried but a short distance under the surface. The bone is stained a very dark brown and

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[1]First measurement given is that of type, second of topotype.

[2]Measurements of type mandible of *Natalus major* Miller, kindly loaned me for comparison by Mr. Gerrit S. Miller, Jr. of the United States National Museum.

probably represents an extinct form. This is a northward extension of the genus in the West Indies and doubtless is the Cuban representative of the same ancestral stock from which the Santo Domingan *major* developed.

Molossus tropidorhynchus Gray

Molossus tropidorhynchus Gray, 1839, Ann. Nat. Hist. IV, p. 6.

A mandible with a molar and two premolars is the only fossil record of this species found. A skull found in one of the caves came from the uppermost layer and is doubtless not very ancient to judge from its appearance. No variation from the living form can be detected in the fossil.

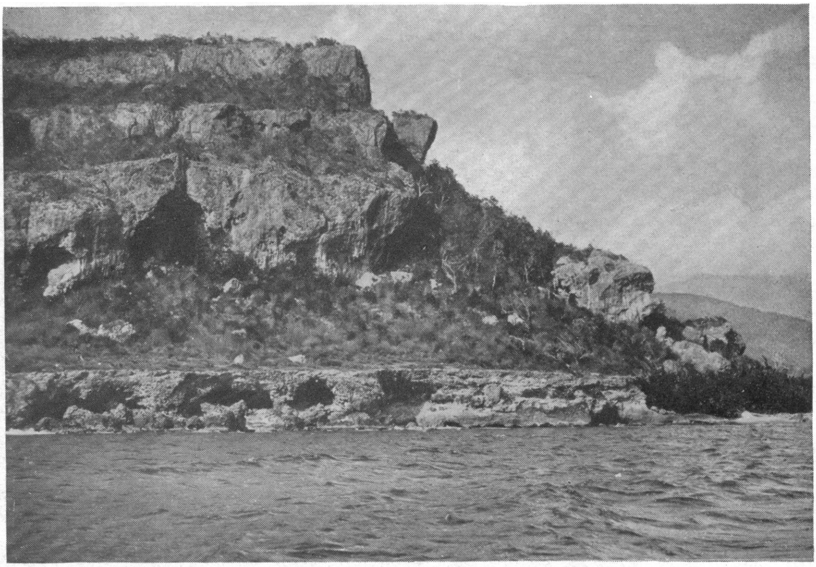
A small colony of *Molossus* was found in a small fissure that opened out on the exposed face of the sea-wall. Their presence was detected by droppings at the foot of the wall and when a shot was fired into the crevice several of the bats flew out but only one was secured. A later attempt to climb up to the crevice proved fruitless since the animals had departed, probably driven away by my previous disturbance. A small, free-tailed bat was seen nightly, flying about the hillsides near the superintendent's quarters, but as I did not dare shoot for fear of having my gun confiscated I could not be certain as to its identity. As I did not take *Nyctinomus* at Daiquiri these bats were very probably *Molossus tropidorhynchus*.

Plate XXXV

Daiquiri, Cuba

Fig. 1. Sea-wall showing typical limestone formation in which caves were found.

Fig. 2. Inner entrance to the Cueva de los Indios. The trees are growing in the area exposed by the fallen-in ceiling.



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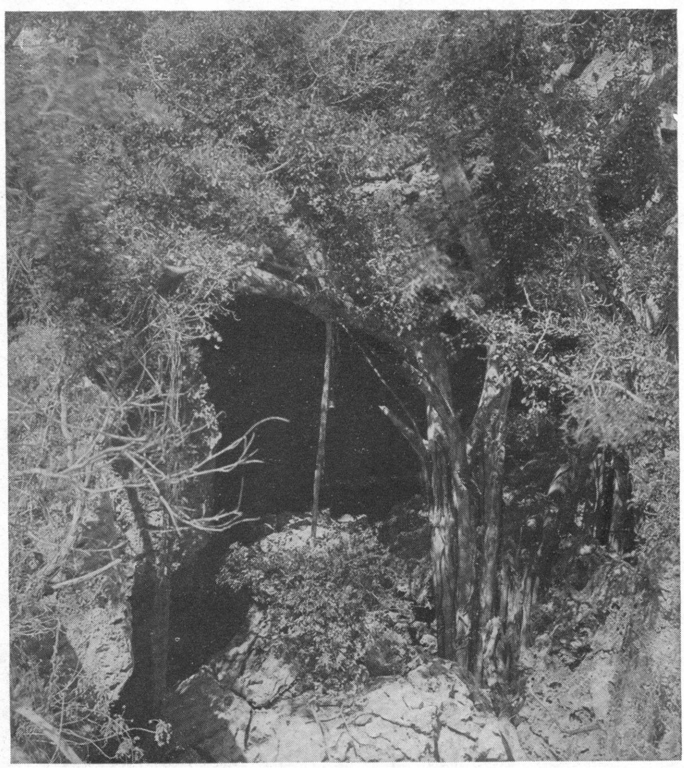

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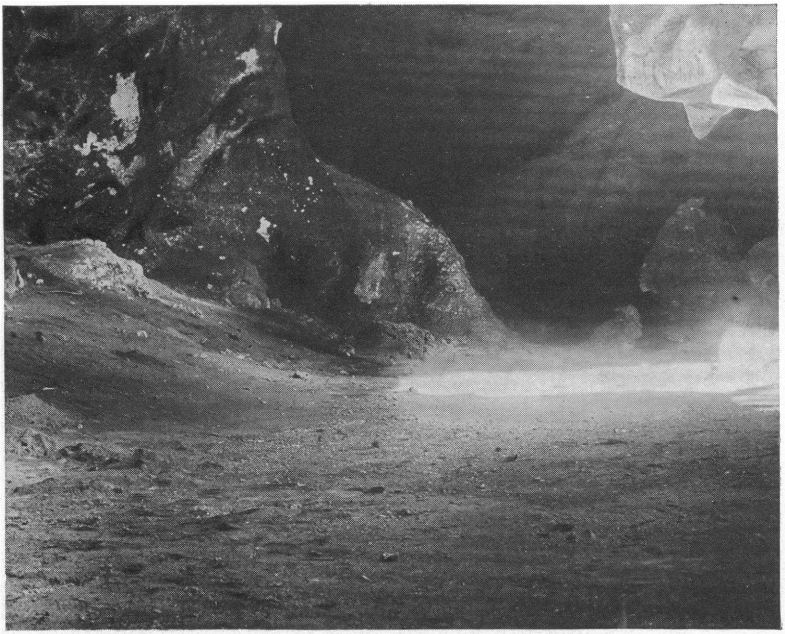
PLATE XXXVI

Daiquiri, Cuba

Fig. 1. Main chamber of the Cueva de los Indios showing fossil-bearing mound to the left.

Fig. 2. Mound from which many thousand bones were collected.



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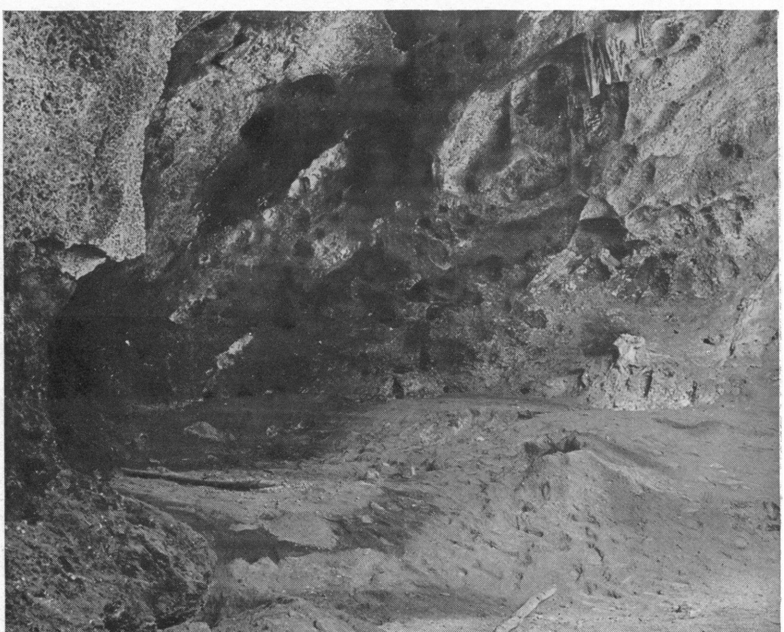

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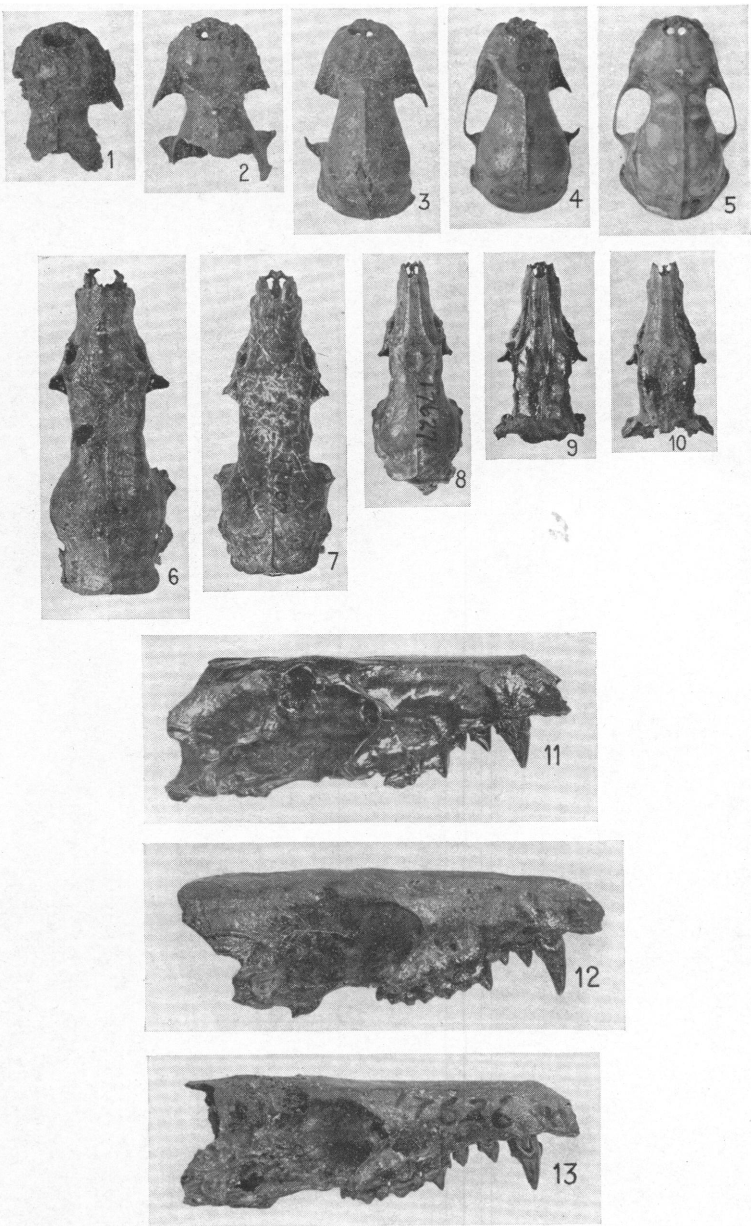
Plate XXXVII

Skulls of West Indian Mammals. All figures natural size except Figs. 11–13, which are about twice natural size.

Fig. 1. *Artibeus jamaicensis,* No. 41010, Daiquiri, Cuba.
Fig. 2. *Artibeus jamaicensis,* No. 41011, Daiquiri, Cuba.
Fig. 3. *Artibeus jamaicensis parvipes,* No. 41012, Daiquiri, Cuba.
Fig. 4. *Artibeus jamaicensis parvipes,* No. 41013, Daiquiri, Cuba.
Fig. 5. *Artibeus jamaicensis parvipes,* No. 41113, Daiquiri, Cuba.
Fig. 6. *Nesophontes edithæ,* No. 17114, ♂, Porto Rico.
Fig. 7. *Nesophontes edithæ,* No. 17107, ♀, Porto Rico.
Fig. 8. *Nesophontes micrus,* No. 17627, ♀ Daiquiri, Cuba.
Fig. 9. *Nesophontes, micrus,* No. 17631, ♂, Daiquiri, Cuba.
Fig. 10. *Nesophontes longirostris,* No. 17626, sex. indet., Daiquiri, Cuba.
Fig. 11. *Nesophontes micrus,* No. 17631, ♂, Daiquiri, Cuba.
Fig. 12. *Nesophontes micrus,* No. 17633, ♂?, Daiquiri, Cuba.
Fig. 13. *Nesophontes longirostris,* No. 17626, sex indet., Daiquiri, Cuba.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