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## DISTRIBUTION OF MAMMALS OF THE BAHAMAS

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**Abstract.**—Excluding feral populations and failed introductions, 21 species of mammals are known from the Bahamas. Four (*Procyon lotor*, *Rattus rattus*, *R. norvegicus*, *Mus musculus*) are regarded as introduced, three (*Lonchorhina aurita*, *Glossophaga soricina*, *Lasionycteris noctivagans*) are accidental, and two (*Pteronotus parnellii*, *Mormoops blainvillii*) are known in the Bahamas only as fossils. Of the 14 indigenous and presumably breeding resident (or formerly resident) species, one (*Geocapromys ingrahami*) is a rodent and the others are bats. *G. ingrahami* and three subspecies of bats (*Natalus micropus tumidifrons*, *Eptesicus fuscus bahamensis*, *Tadarida brasiliensis bahamensis*) are endemic to the Bahamas. At least 12 of the 14 resident species probably reached the Bahamas from the Greater Antilles, and the two others probably either from the Antilles or from continental North America. Cuba appears to have contributed more breeding resident species (at least six) than has any other potential source.

In the last critical review of Bahaman land mammals, Koopman et al. (1957) reported on 13 species. Since then five additional species of bats have been recorded in the archipelago, new locality records have been reported for seven others, and more information on the Bahaman hutia (*Geocapromys ingrahami*) has become available. In the present paper, I bring up to date the distribution records of all native Bahaman land mammals and some of the introduced species. Feral populations of cats, dogs, horses, donkeys, hogs, cattle, goats, and sheep are not covered (but see Campbell 1978 and Byrne 1980) nor are the apparently aborted introductions of opossums (*Diadelphis marsupialis*) to Grand Bahama in the early 1930s (Sherman 1952) and rabbits (*Sylvilagus* ?) to the Caicos Islands in the early 1970s (T. Nicholls pers. comm.).

### METHODS

The nomenclature and systematic arrangement follow Hall (1981) with the following exceptions: *Mormoops blainvillii* is the name of the Antillean ghost-faced bat following Smith (1972); *Macrotus waterhousii compressus* is treated as a synonym of *M. w. minor* following Buden (1975a); *Erophylla sezekorni planifrons* and *E. s. mariguanensis* are Florida Field Naturalist 14: 53-63, 1986.

merged with the nominate subspecies (Buden 1976); *Lasiurus borealis* is the name of the red bat (hairy-tailed bat) in the Bahamas following Honacki et al. (1982) and others. English names are from Hall (1981) and Nowak and Paradiso (1983). Notes on habits and habitat are my own unless indicated otherwise and are based on several visits to the southern Bahamas between 1972 and 1976. Museums and collections are abbreviated as follows: ANSP = Academy of Natural Sciences of Philadelphia; AS = Albert Schwartz Collection, Miami, Florida; UPS = University of Puget Sound Museum of Natural History, Tacoma, Washington.

### THE ISLANDS

The Bahamas are hundreds of small to moderately large limestone islands distributed over an area about 950 km long and up to 600 km wide, from about 75 km off the southeastern coast of Florida to a little over 100 km off the northern coasts of Cuba and Hispaniola (Fig. 1). They include the politically separate but geographically contiguous Turks and Caicos Islands and several submerged banks all at the southeastern end of the chain. Andros, covering about 4200 km sq, is the largest island, but its central part is a mosaic of islets separated by narrow channels and tidal creeks. The maximum elevation in the Bahamas is 67 m on Cat Island.

The vegetation in the Bahamas is chiefly mesic broadleaf woodlands, pine forests, and scrublands in the north, and mainly scrublands and xeric woodlands in the south. The smallest islands or cays usually are sparsely vegetated with grasses, low bushes, cacti, and vines, and they resemble the rocky and sandy upper beach zones on the larger islands; some are covered mainly with mangroves. Mangrove swamps are common throughout, especially at the edges of tidal creeks and lagoons and on leeward shores generally.

Worldwide changes in sea level and climate associated with the glacial-interglacial cycles at the higher latitudes largely have shaped current biogeographic patterns in the Bahamas (see Olson 1982 and Pregill and Olson 1981). During glacial periods, when sea level was much lower than now, the Bahama banks (Fig. 1) were large "superislands," whereas during the interglacials sea level and island configurations more closely approximated those now. Although authorities disagree as to the extent of high sea level stands during the later interglacials, most agree that the last major low-stand (c. 100-130m below present sea level) was about 17,000 years ago (e.g. Masters and Flemming 1983). The kinds of fossil vertebrates found on the Great Bank indicate that the fauna was much more diverse then, that climate in the northern islands was much drier than now, and that prairie-type habitats were much more extensive (see Olson 1982). Also, the "superislands" were closer to and provided larger targets for potential colonists on the adjacent mainland and in the Greater Antilles—the close proximity of the southwestern edge of the Great Bank to Cuba is especially noteworthy.

The southern Bahamas lie on several small, precipitous banks that are separated from each other and from adjacent areas by deep water passages that apparently never were bridged by land during even the lowest sea levels of the Pleistocene. They probably were less affected physiographically by sea level fluctuations than were the northern islands, but during the low sea-level stands the presently submerged banks off the southeastern end of the chain doubtless served as stepping-stones that facilitated dispersal between the Bahamas and the Antilles.

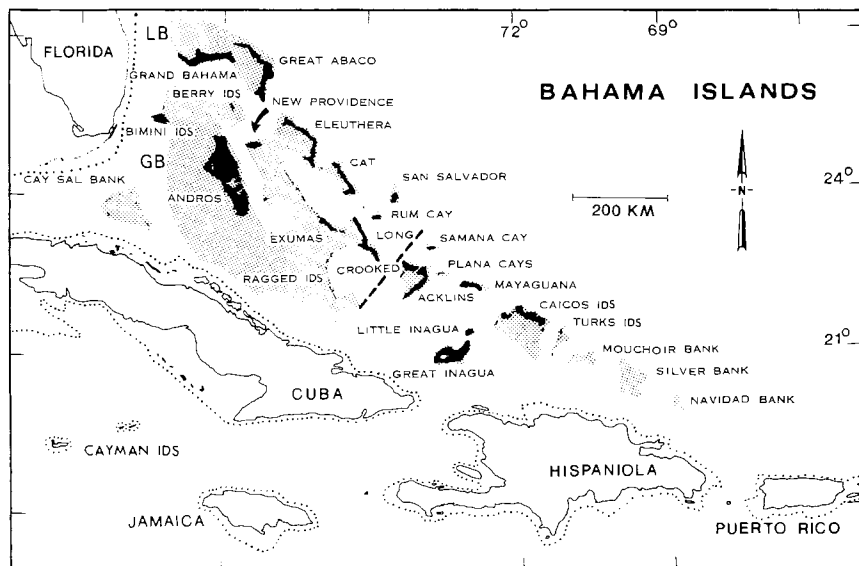


Figure 1. Map of the Bahamas Islands. Stippling denotes Bahama banks and, along with dotted lines, the areas within the 100 fathom contour; LB = Little Bahama Bank, GB = Great Bahama Bank; broken line passes through the Crooked Island Passage and denotes boundary between the northern and southern Bahamas.

### SPECIES ACCOUNTS

*Noctilio leporinus*.—The greater bulldog bat has been recorded only one time in the Bahamas; five specimens (AS 5772-76, skins and skulls), including a gravid female, were collected on Great Inagua, by Richard Thomas, 9 and 10 February 1967. *N. leporinus* is widespread in the Greater and Lesser Antilles and in tropical America generally.

*Pteronotus parnellii*.—The Parnell's moustached bat is known in the Bahamas only from fossil material collected on New Providence (Olson and Pregill 1982), but it is widespread in the Greater Antilles (several different subspecies) and occurs in southern and western Mexico southward to South America.

*Mormoops blainvillii*.—The Antillean ghost-faced bat is known in the Bahamas only as fossils from New Providence and Little Exuma (Olson and Pregill 1982). Extant populations are confined to the Greater Antilles.

*Macrotus waterhousii*.—The Waterhouse's big-eared bat is widespread and common on the Great Bahama Bank and in the southern

Bahamas, but is unknown on the Little Bahama Bank. It has been recorded on Andros, New Providence, Eleuthera, Cat Island, the Exumas (Great Exuma, Darby Island), Long Island, San Salvador, Crooked Island, Acklins Island, East Plana Cay, Great Inagua, and the Caicos Islands (Providenciales, North Caicos, East Caicos). Allen (1905) reported a colony of about 75 in "one of the underground dungeons cut in the limestone rock at Ft. Charlotte," New Providence. I saw only singletons or small groups of several to approximately a dozen individuals in caves in the southern Bahamas. An abandoned house at Jacksonville, East Caicos was used as a night-time feeding roost by at least two *M. waterhousii* during 29 February-2 March 1976; the bats were observed hanging from the roof and feeding on insects (mainly large moths) several times during 1930-2100 hrs and one time each at midnight and at 0130 hrs. I consider Bahaman populations north of the Crooked Island Passage to be *M. w. minor* and those in the southern Bahamas *M. w. waterhousii* (see Buden 1975a) although some authorities (e. g. Hall 1981) treat the northern populations as an endemic Bahaman subspecies, *M. w. compressus*.

*Lonchorhina aurita*.—The Tomes' sword-nosed bat is known in the Bahamas only from an adult male (ANSP 1770) said to have been taken in Nassau Harbor (Miller 1905). *L. aurita* occurs elsewhere in southern Mexico southward to northern South America and Trinidad.

*Glossophaga soricina*.—The Pallas' long-tongued bat is known in the Bahamas only from a skull (ANSP collection) said to have been collected on an unspecified island in the archipelago (Rhen 1902). *G. soricina* occurs elsewhere in western and southern Mexico southward to South America, and in the Antilles only on Jamaica.

*Monophyllus redmani*.—The Leach's long-tongued bat is uncommon in the southern Bahamas, where it has been recorded from Crooked Island, Acklins Island, and the Caicos Islands (Providenciales [skull only], North Caicos, Middle Caicos), usually occurring as singletons or in small groups of 15-20 individuals. There are no records north of Crooked Island. *M. redmani* occurs elsewhere only in the Greater Antilles, where it is fairly common Bahaman populations are included under *M. r. clinedaphus*, which occurs also in Cuba and Hispaniola, but examples from the Caicos Islands have narrower skulls and differ slightly also in other measurements (Buden 1975b).

*Artibeus jamaicensis*.—The Jamaican fruit-eating bat is uncommon to locally common in the southern Bahamas where it has been recorded from Mayaguana, Great Inagua, Little Inagua (the only species of bat taken there) and the Caicos Islands (Providenciales), but it is unknown from the Great and Little Bahama banks. Bahaman populations are included under *A. j. parvipes*, although many specimens approach the

nominate subspecies in their larger size (Buden 1985). *A. jamaicensis* is widespread and common in the Greater Antilles (*parvipes* on Cuba and the Isle of Pines, *jamaicensis* elsewhere), and several different subspecies occur in the Lesser Antilles and in Mexico southward to South America. It has also been recorded from the Florida Keys (Lazell and Koopman 1985).

*Brachyphylla cavernarum*.—The Antillean fruit-eating bat has been recorded live in the Bahamas only from one cave on Middle Caicos, where no more than 30-40 individuals were seen at one time (Buden 1977), but fossil material from New Providence (see Olson and Pregill 1982) suggests it was more widespread formerly. Endemic to the West Indies, it occurs also in the Greater and Lesser Antilles, where it is common. I include the Caicos population under *B. c. pumila*, which occurs also in Hispaniola (Buden 1977), although Swanepoel and Genoways (1978, 1983) are of the opinion that Antillean populations from Cuba eastward to Hispaniola, together with the Caicos population, comprise a monotypic species, *B. nana*.

*Erophylla sezekorni*.—The buffy flower bat is one of the most widespread and common bats in the Bahamas, being recorded from Great Abaco, Andros, New Providence, Eleuthera, Cat Island, Great Exuma, Little Exuma, Long Island, San Salvador, Crooked Island, Acklins Island, Mayaguana, Great Inagua, and the Caicos Islands (Providenciales, North Caicos, Middle Caicos, East Caicos). Allen (1905) found "hundreds" deep in a cave at Hurricane Hole, Great Abaco—the northernmost record. Benedict (in Miller 1905) reported that the "Albatross" Expedition collected approximately 100 in a cave near Nassau during the winter of 1884/85, and that "many hundreds must have remained, as no perceptible diminution in number could be observed." Koopman et al. (1957) reported "great numbers" in caves in the Exumas. Those I saw in the southern Bahamas usually were in scattered groups of 4-50 individuals each, totalling up to several hundred in the largest caves. I include all Bahaman populations under *E. s. sezekorni* together with those from Cuba, the Isle of Pines, Jamaica, and the Cayman Islands (Buden 1976), although several different subspecies have been recognized in this group, including *E. s. planifrons* in the northern Bahamas and *E. s. mariguanensis* in the southern Bahamas (see Hall 1981).

*Natalus micropus*.—The Cuban funnel-eared bat has been recorded on Great Abaco, Great Exuma (fossil only), and San Salvador. Its current status in the archipelago is uncertain and the literature on Bahaman populations is scanty. Miller (1905) reported that J. H. Riley observed approximately a dozen in a cave on San Salvador in 1903, and Allen (1905) estimated 300 in a cave at Israel's Point, Great Abaco, 7 July 1904,

although none was seen there about two weeks later. *N. micropus* occurs elsewhere on Providencia, a small island in the southwestern part of the Caribbean, and on Cuba, Jamaica, and Hispaniola. I follow Hall (1981) and others in treating Bahaman populations as an endemic subspecies, *N. m. tumidifrons*. Ottenwalder and Genoways (1982) are among those who consider them to be an endemic species.

*Natalus lepidus*.—The Gervais' funnel-eared bat has been recorded on Eleuthera, Cat Island, Great Exuma (fossil only), Little Exuma, and Long Island, all on the Great Bahama Bank. It probably is common locally, but its present status is unknown and the literature on Bahaman populations is scanty. It occurs elsewhere only on Cuba and the Isle of Pines. *N. lepidus* was reported in the Bahamas first by Allen and Sanborn (1937) who examined 118 specimens from Long Island and 26 from Cat Island.

*Lasionycteris noctivagans*.—The silver-haired bat is accidental in the Bahamas. A female (UPS 13472, skin and skull) taken on Providenciales, Caicos Islands, 15 October 1970, by Bill Biven, is the only record for the West Indies. It was found semitorpid behind a window shutter on the outside of a house. *L. noctivagans* is common throughout most of the United States and southern Canada and it usually overwinters in the southern parts of its range; the Caicos specimen is the southernmost record.

*Eptesicus fuscus*.—The big brown bat is uncommon to locally common in the Bahamas where it has been recorded from the Great Bahama Bank, on Andros, New Providence, Great Exuma, and Little Exuma (living and fossil), from the southern Bahamas on Crooked and Acklins Islands, and from San Salvador. Miller (1905) reported that C. J. Maynard saw several hundred "occupying a space about the size of a bushel basket" in the dungeons of old Fort Charlotte, New Providence, 22 March 1893, but other Bahaman records usually refer to much smaller groups. Populations on New Providence and San Salvador are included under *E. f. bahamensis*, and those elsewhere in the Bahamas are considered to be *E. f. dutertrei*, which occurs also in Cuba (Buden 1985).

*Lasiurus borealis*.—The red bat is scarce but widespread in the Bahamas, being known from Andros, New Providence, Cat Island, Long Island, Mayaguana, Great Inagua, and the Caicos Islands (Providenciales and one or more unspecified islands). I follow Honacki et al. (1982) and others in considering populations in the Bahamas, Hispaniola, and Puerto Rico as *L. b. minor*, which has been regarded as a full species (*L. minor*) by some authorities (e. g. Hall 1981, Nowak and Paradiso 1983).

*Tadarida brasiliensis*.—The Brazilian free-tailed bat has been recorded in the Bahamas from Great Abaco, Little Abaco, Eleuthera, Long Island, Great Exuma, Little Exuma, Crooked Island, Acklins Island, and Fortune Island. Bahaman populations are an endemic subspecies, *T. b. bahamensis*.

*Rattus rattus*.—The black rat is introduced, widespread, and common in the Bahamas. It is most numerous in areas of human habitation but occurs also on some remote, scrub-covered cays devoid of permanent settlements. However, little is known of the status of this and the two other introduced rodents, Norway rat (*Rattus norvegicus*) and house mouse (*Mus musculus*) on different islands in the Bahamas.

*Rattus norvegicus*.—The Norway rat is introduced and widespread in the Bahamas. It is less common there than is the black rat, and usually is found in urban areas or settlements.

*Mus musculus*.—The house mouse is introduced, widespread, and common in the Bahamas, being most numerous in or near settlements.

*Geocapromys ingrahami*.—The Bahaman hutia is endemic to the Bahamas. An estimated 12,000 on East Plana Cay (Clough 1972) comprise the only known natural, extant population, but five females and six males were released on a small cay in the Exumas National Sea and Land Park, 14 January 1973 (Clough 1974). Fossils or subfossils of *G. ingrahami* have been reported from Great Abaco, Eleuthera, Great Exuma, Little Exuma, Long Island, San Salvador, and Crooked Island (Olson and Pregill 1982), and fossils of *Geocapromys* unidentified as to species are known from Andros, New Providence, and Cat islands (Morgan 1977). *Geocapromys* was reported living on Samana Cay to as recently as 1931 (Barbour and Shreve 1935), and it may have been extant on New Providence during the late 1700s. Schoepf, as translated by Morrison (1911), wrote "the American marmot (*Arctomys Monax Schreb.*) has been found from the first on the larger of the Bahama islands. They call it Rabbet here, a coney, but in North America the woodjack. It lives in holes in the cliffs. and hardly grows to the size of a coney, at least those I saw on [New] Providence [during April-June 1784] were much smaller. Whoever has occasion to compare these carefully with the North American will find the two something different, in color as well as in size."

*Procyon lotor*.—A pair of raccoons was introduced to Grand Bahama from Florida during the early 1930s, and by the 1950s *P. lotor* had become an agricultural pest there (Sherman 1952). Raccoons are known elsewhere in the Bahamas only on New Providence where first recorded in 1784 by J. P. Schoepf who regarded them as introduced (McKinley 1959). J. H. Riley (in Miller 1905) indicated they may have been brought

to New Providence from Florida "by one of the large plantation owners many, many years ago." Bangs (1898) proposed the name *P. maynardi* for the population on New Providence, and Koopman et al. (1957) regarded raccoons as native there but treated *maynardi* as a subspecies of *P. lotor*, as have other authorities subsequently (e.g. Hall 1981). Olson and Pregill (1982) suggested that in view of the absence of *Procyon* from the rich fossil deposits on New Providence, and, as it is known on the Great Bank only on New Providence, the most populous island, it should be regarded as introduced to the Bahamas until there is evidence to the contrary.

### DISCUSSION

The Bahamas show no evidence of ever having had previous extra-archipelago land connections; presumably they were colonized over water largely, if not entirely, from the Greater Antilles and from eastern continental North America. In comparison with the Greater Antilles, the Bahamas are smaller, less diverse in habitat, and have a relatively depauperate fauna. Dispersal to the Bahamas was doubtless facilitated during glacial episodes when the sea level was much lower than now, and the islands were much larger and closer to adjacent land areas. With the exception of bats, mammals are poor at dispersal over water and generally are not well represented on islands; 16 of the 17 nonintroduced mammal species in the Bahamas are bats.

Of the 21 species of nondomesticated mammals recorded in the Bahamas, at least three (*Rattus rattus*, *R. norvegicus*, *Mus musculus*) were introduced, and *Procyon lotor* probably falls into this category. *Lonchorhina aurita*, *Glossophaga soricina*, and *Lasionycteris noctivagans* are known only as accidentals.

The 14 remaining species breed or probably breed in the archipelago, or are known there as fossils. Of these, *Geocapromys ingrahami* is the only species confined to the Bahamas and the only one that is not a bat. Its nearest living relative is *G. brownii*, endemic to Jamaica, but *G. columbianus* is known from fossils collected in Cuba. At least 11 of the 13 other species probably also reached the Bahamas from the Greater Antilles. Ten occur in the Antilles but not in adjacent continental North America. The remaining species (*Eptesicus fuscus*) occurs in North America, although Bahamian examples more closely resemble those from Cuba. *Lasiurus borealis* and *Tadarida brasiliensis* occur in continental North America as well as in the Antilles, and the direction from which they colonized the Bahamas is not clear.



On geographic grounds, Cuba and Hispaniola are the most probable Antillean sources of Bahaman mammals, and all species of bats known to breed in the Bahamas occur also on one or both of these islands. Cuba shares more taxa of mammals with the Bahamas than does any other potential source. *Natalus lepidus* is known only from Cuba (including Isle of Pines) and the Bahamas, and four subspecies of bats (*Macrotus waterhousii minor*, *Artibeus jamaicensis parvipes*, *Erophylla sezekorni sezekorni*, *Eptesicus fuscus dutertrei*) occur in Cuba and the Bahamas, but not in Hispaniola. *Geocapromys ingrahami* probably also is of Cuban ancestry (see above). *Noctilio leporinus* and *Monophyllus redmani* may have reached the Bahamas from Cuba, but the same subspecies occurs also in Hispaniola in the case of *M. r. clinedaphus*, and virtually throughout the Antilles in the case of *N. l. mastivus*.

No species of mammal is shared exclusively by Hispaniola and the Bahamas, but *Brachyphylla cavernarum pumila* is known only from Hispaniola and the Caicos Bank, and *Macrotus waterhousii waterhousii* occurs in the southern Bahamas and Hispaniola (also Jamaica and as fossil on Puerto Rico), but not in Cuba. Whether the fossil *Brachyphylla* on the Great Bank also are "Hispaniolan" or represent an invasion from Cuba that has since died out is unknown. That *M. waterhousii* presumably colonized the southern Bahamas from Hispaniola and the northern Bahamas from Cuba is noteworthy. In view of the close proximity of the southern islands to Hispaniola and of their isolation from the Great Bank islands, which were part of a land mass close to northern Cuba, such bipartite Cuban/Hispaniolan avenues of dispersal into the Bahamas are not surprising. However, such routes can not always be distinguished in cases of wide ranging species that show little differentiation among the islands.

Among the 12 indigenous species of mammals that probably breed in the Bahamas, one species (*Geocapromys ingrahami*) and three subspecies (*Natalus micropus tumidifrons*, *Eptesicus fuscus bahamensis*, *Tadarida brasiliensis bahamensis*) are endemic. The absence of other endemic species or of any endemic genera probably is due largely to the recent emergence of these islands from the sea (compared with the Antilles) and to the short time populations have been isolated from each other. However, *Pteronotus parnellii*, and *Mormoops blainvillii* are Antillean species known in the Bahamas only as fossils from the Great Bank, and the only evidence of *Brachyphylla cavernarum* and *Natalus micropus* on the Great Bank also is fossil, thus suggesting a more diverse bat fauna formerly, at least among the northern islands.

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## LITERATURE CITED

- ALLEN, G. M. 1905. Notes on Bahama bats. Proc. Biol. Soc. Wash. 18: 65-72.
- ALLEN, G. M., AND C. C. SANBORN. 1937. Notes on bats from the Bahamas. J. Mamm. 18: 226-228.
- BANGS, O. 1898. A new raccoon from Nassau Island, Bahamas. Proc. Biol. Soc. Wash. 12: 91-92.
- BARBOUR, T., AND B. SHREVE. 1935. Concerning some Bahamian reptiles, with notes on the fauna. Proc. Boston Soc. Nat. Hist. 40: 347-366.
- BUDEN, D. W. 1975a. A taxonomic and zoogeographic appraisal of the Big-eared Bat (*Macrotus waterhousii* Gray) in the West Indies. J. Mamm. 56: 758-769.
- BUDEN, D. W. 1975b. *Monophyllus redmani* Leach (Chiroptera) from the Bahamas, with notes on variation in the species. J. Mamm. 56: 369-377.
- BUDEN, D. W. 1976. A review of the bats of the endemic West Indian genus *Erophylla*. Proc. Biol. Soc. Wash. 89: 1-16.
- BUDEN, D. W. 1977. First records of bats of the genus *Brachyphylla* from the Caicos Islands, with notes on geographic variation. J. Mamm. 58: 221-225.
- BUDEN, D. W. 1985. Additional records of bats from the Bahama Islands. Carib. J. Sci. 21: 19-25.
- BYRNE, R. 1980. Man and the variable vulnerability of island life. Atoll Res. Bull. 240: 1-200.
- CAMPBELL, D. G. 1978. The ephemeral islands: a natural history of the Bahamas. London: Macmillan.
- CLOUGH, G. C. 1972. Biology of the Bahaman hutia, *Geocapromys ingrahami*. J. Mamm. 53: 807-823.
- CLOUGH, G. C. 1974. Additional notes on the biology of the Bahamian hutia, *Geocapromys ingrahami*. J. Mamm. 55: 670-672.
- HALL, E. R. 1981. The Mammals of North America. Vols. 1 and 2, 2nd edition. New York: John Wiley and Sons.
- HONACKI, J. H., K. E. KINMAN, AND J. W. KOEPL (Eds.). 1982. Mammal species of the world. Lawrence, Kansas: Allen Press and the Assoc. Sys. Coll.
- KOOPMAN, K. F., M. K. HECHT, AND E. LEDECKY-JANECEK. 1957. Notes on the mammals of the Bahamas with special reference to the bats. J. Mamm. 38: 164-174.
- LAZELL, J. D., JR., AND K. F. KOOPMAN. 1985. Notes on bats of Florida's Lower Keys. Fla. Sci. 48: 37-41.
- MASTERS, P. M., AND N. C. FLEMMING (Eds.). 1983. Quaternary coastlines and marine archaeology. London: Academic Press.
- McKINLEY, D. 1959. Historical notes on the Bahama raccoon. J. Mamm. 40: 248-249.
- MILLER, G. S. JR. 1905. Mammals of the Bahamas. Pp. 373-384. in G. B. Shattuck (Ed). The Bahama Islands. Baltimore, Maryland: Geogr. Soc. Baltimore and Johns Hopkins Press.
- MORGAN, G. S. 1977. Late Pleistocene fossil vertebrates from the Cayman Islands, British West Indies. Unpubl. M. S. thesis. Gainesville, Florida: Univ. Florida.

- MORRISON, A. J. 1911. Travels in the confederation. Vol. 2. Philadelphia: William J. Campbell Co. [A translation of J. D. Schöpf. 1788. Reise durch einige der mittlern und Südliehen vereinigten nordamerikanischen Staaten nach Ost-Florida und den Bahama-Inseln unternommen in der Jahren 1783 und 1784.]
- NOWAK, R. M., AND J. L. PARADISO. 1983. Walker's mammals of the world. Vols. 1 and 2. 4th edition Baltimore and London: Johns Hopkins Univ. Press.
- OLSON, S. L. (Ed.). 1982. Fossil vertebrates from the Bahamas. Smith. Contr. Paleob., No. 48.
- OLSON, S. L., AND G. K. PREGILL. 1982. Introduction to the paleontology of Bahaman vertebrates. Pp. 1-7. in S. L. Olson (Ed.). Fossil vertebrates from the Bahamas. Smith. Contr. Paleob., No. 48.
- OTTENWALDER, J. A. AND H. H. GENOWAYS. 1982 Systematic review of the Antillean bats of the *Natalus micropus* complex (Chiroptera: Natalidae). Ann Carnegie Mus. 51: 17-38.
- PREGILL, G. K., AND S. L. OLSON. 1981. Zoogeography of West Indian vertebrates in relation to Pleistocene climatic cycles. Ann. Rev. Ecol. Syst. 12: 75-98.
- REHN, J. A. G. 1902. A new bat of the genus *Glossophaga*. Proc. Acad. Nat. Sci. Philadelphia 54: 37-38.
- SHERMAN, H. B. 1952. Raccoons of the Bahama Islands. J. Mamm. 35: 126.
- SMITH, J. D. 1972. Systematics of the chiropteran family Mormoopidae. Univ. Kansas Mus. Nat. Hist. Misc. Publ. 56: 1-132.
- SWANEPOEL, P. AND H. H. GENOWAYS. 1978. Revision of the Antillean bats of the genus *Brachyphylla* (Mammalia: Phyllostomatidae). Bull. Carnegie Mus. Nat. Hist. 12: 1-53.
- SWANEPOEL, P. AND H. H. GENOWAYS. 1983. *Brachyphylla nana*. Mammalian Species 206: 1-3.



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