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The Taxonomy and Status of Bats in Bermuda

BY RICHARD G. VAN GELDER AND DAVID B. WINGATE

HISTORY AND TAXONOMY

In 1884 J. Matthew Jones reported the silver-haired bat (*Lasionycteris noctivagans*) and the hoary bat (*Lasiurus cinereus*) as being found on the island of Bermuda. Of the former Jones states, "Only one specimen of this Bat is known to have occurred in the Bermudas. It was taken alive near Hamilton on the 8th of October, 1850." Under his account of the hoary bat, Jones says: ". . . only two species of Bat are known to visit the Bermudas, and that usually in the autumn and early months of winter. The present species is observed occasionally at dusk during the autumn months hawking about according to its nature in search of insects; but as it is never seen except at that particular season it is clear that it is not a resident, but merely blown across the ocean by those violent northwest gales which also usually bring numbers of birds from the American continent."

Glover M. Allen (1923, p. 61) mentioned the two preceding species as occurring on the Bermudas and added a record of the red bat (*Lasiurus borealis*) for this locality.

Recently the American Museum of Natural History received a small collection of bats from Bermuda obtained by the junior author. Present in this collection are three specimens of *Lasionycteris noctivagans*, one of *Lasiurus cinereus*, and one of *Lasiurus borealis*, and two of *Lasiurus seminolus*, the last seemingly the first record of this bat from the Bermudas.

The silver-haired bats (three skins, two skulls) were taken at the west

TABLE 1

COMPARATIVE MEASUREMENTS

Species	Locality	Sex	Length of Forearm	Greatest Length of Skull (Including Teeth)	Least Orbital Width	Breadth Across Labial Sides of M^2	Zygomatic Breadth	Length of Maxillary Tooth Row
Lasionycteris noctivagans	W. end, Devonshire Marsh, Bermuda	?	41.5	—	—	—	—	—
Lasionycteris noctivagans	W. end, Devonshire Marsh, Bermuda	?	41.0	16.0	4.1	6.6	9.9	5.9
Lasionycteris noctivagans	W. end, Devonshire Marsh, Bermuda	?	38+	16.7	4.2	6.6	9.9	5.9
Lasionycteris noctivagans	Mastic, Long Island, New York	M	41.8	16.6	4.3	6.9	—	6.1
Lasionycteris noctivagans	Valley Stream, Long Island, New York	?	—	16.3	4.1	6.7	—	5.9
Lasiurus cinereus	W. end, Devonshire Marsh, Bermuda	?	54.2	18.4	5.2	9.2	13.3	6.3
Lasiurus cinereus	Grafton, North Dakota	F	53.6	18.1	5.2	9.2	12.8	6.3
Lasiurus cinereus	Penobscot Lake, Maine	F	57.5	18.2	5.4	9.0	12.9	6.5
Lasiurus seminolus	W. end, Devonshire Marsh, Bermuda	M	39.3	—	3.9	6.2	9.8	—
Lasiurus seminolus	Ingham's Glade, Smith's Parish, Bermuda	M	39.3	14.2	3.9	6.4	9.5	4.8
Lasiurus seminolus	Homosassa Springs, Florida	M	37.8	14.2	4.1	6.2	9.9	4.6
Lasiurus seminolus	2 mi. W. of Gulf Hammock, Florida	M	37.9	13.8	3.9	6.1	9.2	4.4
Lasiurus seminolus	10 mi. SW. of Fernandia, Florida	M	39.2	13.7	4.9	6.3	9.6	4.6

end of Devonshire Marsh on October 18 and November 3, 1958. At this time of year these bats may also still be in northern United States (A.M.-N.H. No. 73630 from Woodrow, Staten Island, New York, collected November 5, 1907) and may even winter as far north as Long Island, New York (Murphy and Nichols, 1913, p. 7). In color the Bermuda silver-haired bats are indistinguishable from mainland specimens from northeastern North America and some other parts of the range. External measurements were not taken on the three specimens by the junior author, but in length of forearm they are well within the range of measurements given by G. S. Miller, Jr. (1897, p. 86), for this species and compare well with the measurements of a specimen from Long Island (table 1). In measurements of the skull, likewise the two Bermuda bats are quite similar to two specimens from Long Island, New York (all specimens are adults). The teeth of those from Bermuda show slight wear, and the animals may be young of the year.

The one specimen of *Lasiurus cinereus* is indistinguishable in color from some specimens of this species from the mainland. The measurements of its skull are almost identical with those of an individual from Grafton, North Dakota, except that the zygomatic arches are more widely spread. The specimen was obtained November 4, 1958, at the same locality as the silver-haired bats. On the mainland these bats have been found as far north as Long Island, New York, as late as December 2 (Kimball and Nichols, 1940, p. 214).

The single specimen of *Lasiurus borealis* was collected at East Side, St. George's Island, Bermuda, on October 18, 1958. Unfortunately the skull of this specimen was not preserved, and no external measurements were recorded for it. It is an adult and in color does not differ from specimens from the mainland. The forearm measures 39.5 mm.

The first shipment of bats from the junior author included a single specimen of *Lasiurus seminolus*. Later, when the uniqueness of this specimen had been called to his attention, he sent a second one, which is badly shot, consisting mainly of wings and a few bits of fur, but with a complete skull. Both specimens are adult males, one taken at the west end of Devonshire Marsh, Devonshire Parish, on August 26, 1957, and the other at Ingham's Glade, Smith's Parish, on August 21, 1956. The testes of the August 26 specimen measured 5 mm. Compared with alcoholic specimens of *L. pfeifferi* from Trinidad, Cuba, the Seminole bats from Bermuda differ in having a shorter forearm, narrower orbital constriction, and a slightly longer maxillary tooth row. The shorter forearm and the presence of slight frosting on the upper parts of the Bermuda specimens rule out the possibility of their being *L. degelidus* Miller, 1931, from Jamaica, and

the narrower orbital constriction and longer maxillary tooth row of the Bermuda animals should distinguish them from *L. minor* Miller, 1931, from Haiti.

Compared with *L. seminolus* from the mainland, the Bermuda specimens are indistinguishable in color from some specimens from Florida. The rich chestnut color characteristic of *seminolus* is clearly evident. In

FIG. 1. The Bermuda cedar forest (*Juniperus bermudiana*) before destruction by scale disease. Photograph taken in 1945.

length of forearm the Bermuda animals fall within the measurements for mainland specimens; the external measurements were not recorded.

In cranial measurements the specimens of *L. seminolus* from Bermuda are within the range of most measurements of specimens from Florida. However, both of the Bermuda animals have very narrow orbital constrictions, equaled only by two of the 18 Florida specimens examined, and a longer tooth row (table 1).

In view of the fact that the Seminole bat is sympatric with the red bat and that there is no evidence of interbreeding or dichromatism, we tend to follow those who regard *L. seminolus* as a distinct species.

STATUS

It is noteworthy that only the migratory and non-hibernating species of bats from eastern North America have been recorded in Bermuda. The observation and collection records show a marked seasonal distribution following very closely the pattern of bird migration through Bermuda.

FIG. 2. Another view of the Bermuda cedar forest that is shown in figure 1. Photograph taken in 1945.

The junior author has consistently noted a correlation between the arrival of waves of bats and waves of birds in Bermuda during migration, the largest influxes of both occurring between September and late November. This would seem to indicate that the bats recorded from Bermuda are stragglers blown or "drifted" off the American coast during migration and carried to the Bermuda area under the same meteorological influences that bring hosts of migrant land birds to Bermuda from that coast. As with the drifted land birds, these bats depart again (presumably in a re-orientation attempt) after a recovery period of about two weeks on the island. Some remain longer, particularly those arriving after mid-

October. A few bats occasionally remain over the winter, and there are scattered midsummer records which suggest that individuals may also remain over the summer on occasion. When a fairly complete series of observations and counts of bats since 1955 is reviewed, it seems that in a normal year a minimum of 100 bats is likely to occur in Bermuda during fall migration and perhaps half that number during the spring migration.

FIG. 3. The Bermuda cedar forest after destruction by the scale *Carulaspis minima*, between 1946 and 1951. Photograph taken in 1960.

Although seemingly a high figure, considering Bermuda's position (580–800 miles from the North American coast), this estimate is greatly exceeded by the numbers of diminutive land birds regularly reaching Bermuda.

Of the few species of bats now known to occur in Bermuda, the red bat and the hoary bat are regular on both migrations. The red or Seminole bat is the most common, and there are sight records of one or both of these species for every month of the year. The hoary bat has been recorded over the winter, but not as yet during the midsummer months. The silver-haired bat is probably regular on both migrations but varies

in numbers from year to year. The status of the Seminole bat is not yet clear, but the only two records were made in August, suggesting that it might be an early fall visitor.

Prior to the destruction of the Bermuda cedar forest, *Juniperus bermudiana*, by a scale disease (1946 to 1951), Bermuda appeared to offer an ideal environment for the support of a resident population of both cave

FIG. 4. Another view of the Bermuda cedar forest that is shown in figure 3. Photograph taken in 1960.

and forest bats (figs. 1–4). Earlier workers have also commented on this fact, but none has supplied any evidence that such a resident population existed. The junior author has made careful examinations of innumerable caves on the island without finding any evidence of cave-inhabiting bats, ancient bone deposits, or fossil remains. Such lack of evidence indicates that cave-inhabiting species never were resident. A resident population of forest bats might more easily escape detection, but J. L. Hurdis (1897), after a residence of 15 years in Bermuda, from 1840 to 1855, concluded that bats were not resident there but were strictly visitors, occurring most commonly in fall and never remaining over the entire winter. He

further described bats as by no means common and mentioned having met several natives who had never seen one. J. M. Jones (1884) came to the same conclusions. At the time of which Hurdis and Jones wrote, the island was, however, relatively denuded of forest compared with the condition in the early twentieth century. This situation, revealed by the examination of old photographs, was apparently the result of heavy timbering for an active shipbuilding industry between 1700 and 1810. If it be assumed that a thick forest would be necessary to provide food and cover during the severe winter season, it might be suggested that a resident population of bats could not have survived at that time.

At any rate, therefore, there was very little evidence to support a conclusion that bats were resident at that period, and there is no evidence of a resident population at the present time. However, there seems to have been a period just prior to the epidemic destruction of the cedar forest when bats were generally considered common and were reputedly present at all seasons of the year. This interim period is correlated with a period of heavy natural re-afforestation between the end of the shipbuilding era and the outbreak of the cedar scale disease. The junior author shares the opinion of many Bermudians that bats seemed to become much less common after the cedar forest died. Most likely this "decline" is only apparent, produced in the following way: At present, bats remain for only a short period of time owing to lack of food and cover, whereas formerly the cedar forest provided abundant food, and bats arriving on the island probably remained longer and accumulated during the migration until the available habitat was filled to capacity. Since the cedar forest disappeared, there are only two records of bats successfully wintering, possibly because the present lack of shelter from the severe windstorms common in Bermuda at that season causes a reduction in aerial insect activity. Evidence that the margin for survival for wintering bats is very slim is supplied by a record of *L. cinereus* found dying of starvation and unable to fly on February 15, 1959, in the locality it had been known to frequent during the preceding months.

It is remotely possible that *L. seminolus* had become established as a resident prior to the destruction of the cedar forest, particularly as its occurrence as a migrant in two successive years in August seems out of context with its generally southern range on the continent. This concept of a resident population would certainly explain the alleged year-round occurrence of bats just prior to the loss of the cedars. However, further collecting and observations will be required to settle this question and to validate the slight differences, if significant, now evident in these bats before taxonomic recognition can be accorded them.

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The senior author is responsible for the taxonomic conclusions and the junior author for the material on the status of these bats.

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