

OCCASIONAL PAPERS

THE MUSEUM

TEXAS TECH UNIVERSITY

NUMBER 108

4 JUNE 1987

THE SUPPOSED OCCURRENCE OF GLOSSOPHAGA LONGIROSTRIS MILLER ON DOMINICA AND PROBLEMS WITH THE TYPE SERIES OF GLOSSOPHAGA ROSTRATA MILLER

CHARLES O. HANDLEY, JR., AND WM. DAVID WEBSTER

In his description of *Glossophaga rostrata*, Miller (1913a) listed 14 specimens from Grenada, West Indies, and somewhat cryptically suggested that two others from Dominica might be the same taxon. The specimens in the type series had been cataloged in the U.S. National Museum of Natural History (USNM) in 1901 with Westerhall, Grenada, recorded as the collecting locality. Two juvenile skulls had been cataloged (in a different hand writing) in 1904 with Roseau, Dominica, as the locality of capture. We found it curious that all these specimens, from both localities, were cataloged and labeled with the same collector, Peter Gellineau, and date of collection, 25 August 1900, whereas the only variable data on any of the Gellineau skin labels are the collector's field numbers. Locality, date, sex, and external measurements are identical on all.

A skin of *Peropteryx macrotis* Wagner was mismatched with a skull of *Glossophaga longirostris rostrata* in the type series. In addition, juvenile skulls were mismatched with adult skins and adult skulls with juvenile skins (Table 1). Although all of the specimens, except the *Glossophaga-Peropteryx* mixup, were recorded as "male" on the original labels, size of canines suggests that the series actually is comprised of both males and females. [There is a significant difference ($P < 0.01$) in canine length in male ($\bar{X} = 2.32$ mm, $n = 14$) and female ($\bar{X} = 2.18$ mm, $n = 9$)

TABLE 1.—*Congruence of Glossophaga skins and skulls collected by P. Gellineau.*

USNM no.	Collector's no.	Current status	Age (skin/skull)	Sex ¹ (skin/skull)	Skin and skull mismatched by:		
					Age	Sex	Species
111492	1	skull only	—/juv	—/M?			X
111493	20	skin and skull	ad/ad	F/M		X	
111494	21	skin only	juv/—	M/—			
111495	22	skin and skull	ad/ad	F/M		X	
111496	23	skin and skull	juv/juv	F/F			
111497	24	skin and skull	ad/ad	F/M		X	
111498	25	skin and skull	ad/ad	M/F		X	
111499	27	skin and skull	juv/ad	F/F	X		
111500	29	skin and skull	ad/ad	M/F		X	
111501	30	skin only	ad/—	M/—			
111502	31	skin and skull	ad/ad	F/F			
111503	32	skin and skull	juv/ad	F/F	X		
111504	33	skin and skull	juv/ad	M/M	X		
111505	34 or 36	skin only	ad/—	F/—			
111506	35	skin and skull	ad/juv	M/M	X		
123473	36	skull only	—/juv	—/F			
123474	34	skull only	—/juv	—/F?			

¹See Table 2 for evidence for sex of skins; sex of skulls from canine height.

fluid-preserved *G. longirostris* from Cumaná and Isla Margarita, Venezuela.]

Furthermore, the penis can be detected on some of the skins and nipples on another (Table 2). All of the Grenadan specimens were cataloged in the USNM as skins and skulls, but three now appear in the collection as skins only, and the *Glossophaga-Peropteryx* mixup and the Dominican specimens are skulls alone. It is remarkable that when all Grenadan specimens and Dominican skulls are lumped as a single series, the number of skins (14) matches the number of skulls, the number of juvenile skins (five) matches the number of juvenile skulls, and the number of male skins (six) and female skins (eight) match the number of skulls with large canines and skulls with small canines, respectively (Table 2). With so many variables the probability of a 100 percent coincidence by chance is slim. Probably these 14 skins and skulls were components of 14 specimens, not 17 as implied by the present arrangement.

These are significant specimens. Among those from Grenada is the holotype of *Glossophaga rostrata* Miller. Those labeled as from Dominica apparently are the only specimens of *G. longirostris* ever reported from that island, or anywhere in the

TABLE 2.—Sex and age of Glossophaga skins and skulls collected by P. Gellineau.

USNM no.	Adults				Juveniles				
	Skins		Skulls		Skins		Skulls		
	Evidence	FA ¹	USNM no.	Canine height ²	Evidence	FA ¹	USNM no.	Canine height ²	
111498	penis	37.5	111493	2.46	penis	38.3	111506	—	
111500	penis	38.0	111495	2.52	penis	38.0	111492	—	
111501	penis	38.3	111497	2.40					
111506	penis	37.0	111504	2.52					
			Assumed to be Males						
111497	nipples	38.5	111498	2.22	no penis	37.7	123474	—	
111493	no penis	38.1	111499	2.22	no penis	37.8	111496	2.28	
111495	no penis	40.2	111500	2.16	no penis	34.9	123473	2.16	
111502	no penis	36.5	111502	2.28					
111505	no penis	38.8	111503	2.22					
			Assumed to be Females						
			111496	2.22	no penis	37.7	123474	—	
			111499	2.22	no penis	37.8	111496	2.28	
			111503	2.16	no penis	34.9	123473	2.16	
			111502	2.28					
			111503	2.22					

¹FA: length of forearm in mm.

²Height of upper canine in mm measured with an ocular micrometer from anterior base of crown to tip; — = not fully erupted.

³EP gap: average width in mm of epiphysal gap between metacarpal and first phalanx of right and left third finger, measured with an ocular micrometer. Relative age (1, youngest) of juvenile skins based on width of gap.

⁴Relative age of juvenile skulls (1, youngest) based on presence of milk teeth, eruption of M², and closure of nasal sutures.

West Indies north of St. Vincent (Jones and Phillips, 1970). Miller's (1913a, 1913b) remark that the two skulls labeled Dominica are not certainly identifiable was misinterpreted by Hall and Kelson (1959:115) and Hall (1981:122) to mean that they were unidentifiable. Actually Miller recognized them as *Glossophaga longirostris*, but because of their youth and poor condition he was not sure that they were the same as the nearby Grenadan race, *G. l. rostrata*. Our examination of these specimens confirms Miller's position. They definitely are *G. longirostris*, but if they actually had been taken on Dominica we, too, would hesitate to identify them to subspecies.

We believe that in these series both specimens and data have been scrambled so that they cannot be used as labeled. Consequently, we searched the old correspondence files in the Smithsonian Archives and studied specimen labels for clues to the provenience of the specimens, and we have carefully examined the specimens themselves for clues to age and sex.

RESOLUTION

The Smithsonian Archives contain what appears to be a complete set of correspondence pertaining to the bats collected by Peter Gellineau for the USNM. Both sides of each exchange of letters are accounted for, as also are pertinent requisitions and invoices.

The correspondence was initiated on 26 February 1900 by G. S. Miller, Jr., Assistant Curator, Division of Mammals, USNM. He solicited Peter Gellineau, "Professor and Naturalist," and a resident of Westerhall Estate, Grenada, to supply specimens of Grenadan bats to the USNM.

In the summer of 1900, Gellineau sent two lots of bats to Miller on approval. Miller found them to be not "wholly satisfactory." Apparently the first sample had skulls inside the skins and only one label for the lot. In the second shipment, labels became detached from skulls in transit so that skulls could not be matched with skins. Miller (14 August 1900) sent Gellineau more detailed instructions for specimen preparation and said he would return the sample specimens.

However, on 25 August 1900, before he had received Miller's new instructions, Gellineau shipped three dozen *Artibeus jamaicensis*, three dozen *Glossophaga longirostris*, and two *Peropteryx macrotis*, all skins and skulls. Miller (14 September 1900) found some improvement in specimen makeup and

labeling, but many of the skulls in this shipment had been “so injured in preparation” as to be useless. Consequently, he picked out 34 of the better specimens and returned the remainder to Gellineau, together with the two sample lots that had been submitted earlier in the summer. Only 33 of these specimens (one *Peropteryx*, 14 *Glossophaga*, and 18 *Artibeus*) can be accounted for in subsequent records. The following year (16 May 1901) Gellineau sent an additional two dozen specimens of *Peropteryx macrotis*, all of which Miller accepted.

All of the Gellineau bats of both purchases (1900 and 1901) were accessioned together on 28 May 1901 (accession no. 38038) and were cataloged as a single lot on 29 June 1901 (USNM 111468-524). In 1904 (9 April), two more Gellineau *Glossophaga* (juvenile skulls only) were cataloged and labeled “Roseau, Dominica.” Seventeen USNM numbers pertain to the *Glossophaga*—USNM 111492-506 for the Grenadan specimens and USNM 123473-74 for those labeled Dominica.

No accession number was noted for the Dominican specimens, and we found no correspondence related to them—peculiar, because information on the Grenadan specimens is so complete. Nor was there mention of Dominica in the Miller-Gellineau correspondence file. We think USNM 123473-74 were mislabeled in processing and did not come from Dominica. They must be part of the Grenadan series, which is missing two skulls. It is easy to see how this error could have occurred.

When Miller was dealing with Peter Gellineau, he also was buying bats from H. Selwyn Branch (Guadalupe and Dominica, 1901) and Charles E. Ashcraft, Jr. (Dominica, 1902). Both Branch and Ashcraft collected at Roseau, Dominica, and in 1902 Miller named *Tadarida antillarum*, the holotype of which was a Branch specimen from Roseau. By 1904, whoever cataloged USNM 123473-74 must not have had Ashcraft, Branch, Gellineau, Dominica, and Grenada sorted out clearly.

Another factor in the mixup could have been the skull cleaning process. At the turn of the century USNM skulls were being cleaned by private contractors (for example, on 21 November 1900 Miller contracted the services of W. H. Wilson of Forest Glen, Maryland, to clean 1000 skulls for \$150.00). Evidently there were some problems, for on 25 April 1901 Marcus Ward Lyon, Jr., Division of Mammals aide, inscribed the following note on the flyleaf of the *Skull cleaning record book*: “In the summer of 1900 all skulls, cleaned and uncleaned, were brought up to the

Museum from the *Cleaners* Skulls are now sent down in small lots”

The Gellineau Grenadan *Glossophaga* were received at the USNM in September 1900, but they were not cataloged until the following June. We suspect that the skulls were sent off for cleaning before the collection was cataloged. If they were caught up in the confusion implied in Lyon's note, that could account for scrambled labels and the separation of two skulls from the rest.

Evidently the scrambling of labels occurred at the USNM sometime during processing rather than by the hand of the collector on Grenada. The latter possibility occurred to us when we read of Miller's difficulty in getting acceptable specimens from Gellineau. However, Miller selected for the USNM 14 specimens among the 36 *Glossophaga* that Gellineau had sent to him. The exact coincidence among the 14 specimens now at the USNM of numbers of adult and juvenile skins and skulls, and female and male skins and skulls indicates that the confusion must have occurred after Miller's selection had been made. Oddly, the scrambling seems to have involved only the labels and whole skulls, for all of the crania and mandibles appear to be properly matched. So, labels must have been separated from skulls and reassociated with the wrong skulls after Miller made his selection in September 1900 but before the skulls had been cleaned.

Gellineau labeled the series of each species that he secured with collector's numbers beginning with number one. Thus, there were *Glossophaga longirostris* 1-36, *Artibeus jamaicensis* 1-36, and *Peropteryx macrotis* 1-2 (1900) and 1-24 (1901). USNM numbers must have been copied from the museum catalog onto the skull labels one at a time whenever a skull dribbled back from cleaning. We infer this from the saga of *Glossophaga* no. 23. The number "111490" was transcribed onto the original skull label of *Glossophaga* no. 23. However, this is the catalog number of *Peropteryx* no. 23. Later, someone else (in different hand writing) scratched out 111490 and wrote the correct number, 111496, the catalog number of *Glossophaga* no. 23, on the label. The skulls of *Glossophaga* and *Peropteryx* are so different that it is unlikely that such an error would have been made if the skulls as a group had been matched up with the skins for numbering at the time of cataloging. The error in labeling *Glossophaga* no. 23 supports our belief that skulls were sent off to be cleaned before the

collection was cataloged, and were numbered and labeled individually, one or a few at a time, at later dates.

The format of Gellineau's original skull labels provides an important clue in the Dominican mixup. Unfortunately, only two of the original labels remain with the skulls of *Glossophaga* (USNM 111496, original no. PG 23, and USNM 111499, original no. PG 27), but they show how USNM 123473 and USNM 123474 could have come to be mislabeled. Data on the skull labels are unusually complete, including date (25 August 1900 on all) in addition to sex (male on all), collector's initials (PG), and collector's number.

Thus, if two of the skulls had become separated from the rest in cleaning, they would have turned up later with only these data on their original labels (date, collector, sex, and field number, but no locality or USNM number) to aid a technician in processing them. Some sort of lapsus then led to the confusion of an Ashcraft or Branch locality with the Gellineau skulls. The skulls, already cataloged as part of the skin and skull combinations in 1901, but not so indicated on the labels, thus were recataloged as "skulls only" in 1904 (leaving two Grenada skins without skulls), and were labeled "Roseau, Dominica, Aug. 25, 1900, Peter Gellineau."

Further compounding the confusion was an error of transcription in cataloging that we cannot unravel. From among the 36 specimens of *Glossophaga* that Gellineau submitted, Miller picked out 14 specimens to be kept for the USNM. Each of the 14 skins presently in the USNM has an original label attached. Thus, 14 collector's numbers can be positively accounted for—20-25, 27, 29-35. On the other hand, because of missing original skull labels, only two collector's numbers (PG 23 and 27) can be positively accounted for on the skulls. The collector's numbers presently on the 14 skulls, all of them transcriptions except for nos. 23 and 27, are not entirely congruent with the numbers on the skins—1 (properly a *Peropteryx* number), 20, 22-25, 27, 29, 31-36. Numbers 34 and 36 are the transcriptions in the USNM catalog and on the specimen labels inscribed "Roseau, Dominica." Both numbers also are associated with USNM 111505 from Grenada, the skull of which now is missing. The collector's number on the original skin tag of USNM 111505 is 34, but in the USNM catalog the number for USNM 111505 is 36, which does not appear on any skin label! A careless glance at the

number 34 on the skin label might have translated it into a 36. On the other hand, is it possible that the no. 36 on the skull label of USNM 123473 is a transcription error for no. 30, which now lacks a skull? Or could Miller have erred and picked a skin and skull pair with collector's numbers that did not match, nos. 30 and 36 for example? In the absence of their original skull labels these questions can never be answered, but the confusion surrounding nos. 30, 34, and 36 may well have contributed to the eventual cataloging of the two stray skulls as USNM 123473 and 123474 with less than accurate data.

SYLLOGISM

To make a long story short, all available evidence supports the hypothesis that all specimens that Peter Gellineau sold to the USNM were part of a single series from Grenada. Cataloging and labeling two juvenile skulls "Dominica" seems to have been a curatorial lapsus in the USNM. Probably through ignorance of collecting procedures the collector recorded specious sex, measurement data, and collection date on the original specimen labels. Poor curatorial procedures in the USNM led to mismatching skins and skulls and further confusion of label data.

These blunders in the field and in the museum involving the Grenada collection have had several repercussions.

1) Skins and skulls have been scrambled. Most if not all are now mismatched. There is no way that individual skins and skulls can be more than approximately correlated (juvenile skulls as a group with juvenile skins, male skulls as a group with male skins, and female skulls as a group with female skins). These data are summarized in Table 2.

However, now that the sex of individual skins and skulls has been determined by the discovery of penis or nipples and by the size of the canines, it is safe to use the skins and skulls independently in taxonomic comparisons (Table 3).

2) The holotype of *G. rostrata* Miller is a composite, a male skin with a female skull. Because the characters most used in taxonomic studies of *Glossophaga* are cranial, we restrict the holotype designation to the female skull. The male skin thus becomes a paratype.

3) The juvenile skulls, USNM 123473 and USNM 123474, have been the sole basis of the supposed occurrence of *G. longirostris* on Dominica. With their locality data corrected to Grenada, the

TABLE 3.—Cranial measurements of adult Grenadan *Glossophaga longirostris* taken with dial calipers as described by Handley (1959:98).

Museum no. ¹	Greatest length	Zygomatic breadth	Postorbital breadth	Braincase breadth	Length of			
					maxillary toothrow	Postpalatal length	Maxillary breadth	Canine breadth
Supposed Females								
USNM111498	22.6	9.4	4.7	8.8	7.7	7.5	5.7	4.0
USNM111499	22.7	9.9	4.8	8.7	7.7	7.0	5.9	4.0
USNM111500 ²	22.6	9.8	4.8	8.8	8.0	6.9	5.7	4.1
USNM111502	22.7	10.0	4.8	8.7	8.0	7.1	6.0	4.2
USNM111503	22.9	9.9	4.7	8.7	7.9	7.3	5.7	4.1
Average	22.7	9.8	4.8	8.7	7.9	7.2	5.8	4.1
Supposed Males								
USNM111493	22.4	9.7	4.5	8.6	7.8	6.9	6.0	4.3
USNM111495	22.2	10.1	4.8	8.8	7.9	6.9	6.0	4.2
USNM111497	22.2	10.0	4.6	8.8	7.8	7.1	5.9	4.0
USNM111504	22.5	9.7	4.6	8.4	7.6	6.8	5.7	4.2
Average	22.3	9.9	4.6	8.7	7.8	6.9	5.9	4.2
Known Females								
MCZ 8110	22.9	9.9	4.7	8.8	7.9	6.9	5.9	4.0
MCZ 8108	23.0	9.3	4.5	8.8	7.9	—	5.8	4.0
MCZ 8107	22.8	9.6	4.6	8.9	8.1	7.1	6.0	4.0
MCZ 8104	23.1	9.6	4.7	8.9	—	7.0	—	3.7
BM 96.11.8.5	23.0	10.2	4.8	8.9	8.0	7.1	—	4.1
AMNH 176617	23.6	9.9	—	—	8.2	6.5	5.9	4.3
AMNH 175906	22.9	9.9	4.8	9.1	8.0	7.0	5.7	3.9
AMNH 175909	22.7	9.5	4.8	9.1	7.8	6.8	5.5	3.8
Average	23.0	9.7	4.7	8.9	8.0	6.9	5.8	4.0
Known Males								
AMNH 176612	—	—	—	8.5	7.7	6.8	5.6	3.8
AMNH 176615	22.7	10.0	4.5	8.6	7.7	—	5.7	4.1
MCZ 8109	22.4	9.8	4.5	8.8	7.8	6.9	—	4.1
Average	22.6	9.9	4.5	8.6	7.7	6.9	5.7	4.0

¹USNM, National Museum of Natural History; MCZ, Museum of Comparative Zoology; BM, British Museum (Natural History); AMNH, American Museum of Natural History.²Holotype of *G. rostrata* Miller.

reported geographic distribution of *G. l. rostrata* shrinks to St. Vincent, the Grenadines, Grenada, and Tobago (see Webster and Handley, 1986).

4) The date of collection on the specimen labels (25 August 1900) is actually the date on which specimens were mailed to Washington, not the date of capture.

EPILOGUE

If we had set out to contrive a story of mishandling a collection of specimens, we might not have thought of all the things that went wrong when Gerritt Miller purchased Grenadan bats from Peter Gellineau. Nor would we have been able to reconstruct the true story if the archival material pertaining to it had not been so completely preserved and had not the perpetrators inadvertently left so many useful clues. The bottom line of our story is not that a parade of carelessness led to compromising the usefulness of a valuable series of specimens. It is a reminder of the need of reverence for curatorial traditions and rigorous adherence to strict rules for management of specimens and data.

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Address of authors: C. O. HANDLEY, JR., *Division of Mammals, Smithsonian Institution, Washington, D.C. 20560*; W. D. WEBSTER, *Department of Biological Sciences and The Museum, Texas Tech University, Lubbock, Texas 79409*. Present address of Webster, *Department of Biological Sciences, University of North Carolina at Wilmington, Wilmington, North Carolina 28406*. Received 21 November 1986, accepted 24 November 1986.

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ISSN 0149-175X



Texas Tech University Press
Lubbock, Texas 79409