

Notes on Bats from the
Luquillo Mountains of Puerto Rico

Michael R. Willig¹
Department of Biological Sciences
Loyola University
New Orleans, LA 70118

and

Arlene Bauman²
Department of Biology
Taylor University
Upland, IN 46989

Present Address: ¹Department of Biological Sciences and The Museum, Texas Tech University, Lubbock, TX 79409. ²Department of Fisheries and Wildlife, Michigan State University, East Lansing, MI 48824.

Introduction

Bats compose the major portion of the Puerto Rican mammal fauna in terms of species richness and densities. Sixteen species compose the modern bat fauna, although two of those taxa (Marcrotus waterhousii, Phyllonycteris major) have become extinct on the island since the late Pleistocene (Baker and Genoways, 1978). The only other extant mammals on Puerto Rico are Mus musculus (House Mouse), Rattus norvegicus, Rattus rattus (Roof Rat) and Herpestes auropunctatus (Indian Mongoose), all introduced species. Nonetheless, in comparison with the other large islands of the West Indies (Cuba, Hispaniola, and Jamaica), the Puerto Rican chiropteran fauna is quite depauperate; for the most part, this can be attributed to Puerto Rico's small size and remote position with respect to the mainland (Baker and Genoways, 1978).

Anthony's (1918, 1925) pioneering work on the bat fauna of Puerto Rico was somewhat limited since he primarily obtained specimens from caves or buildings. More recently, Tamsitt and Valdivieso (1970) presented data concerning the chiropteran community at the El Verde field station in the Luquillo Experimental Forest. This report is a continuation of that research in that a more extensive survey of the chiropteran fauna of the forest was undertaken.

Materials and Methods

Various numbers of standard Japanese mist nets were utilized to capture bats in the Luquillo Experimental Forest. Netting areas included locales on the grounds of the El Verde Field Station (350 m), positions along the entrance road to the station, and various sites within the forest to the south of the Quebrada Sonadora. In addition, bats were captured within the

El Yunque Quadrangle at the base of the El Toro trail (750 m). Nets were opened at dusk and closed no earlier than 2300 hours. [See appendix I for a complete summary of netting records.] Sacrificed specimens were identified, aged, sexed and measured (Total length, Tail length, Hindfoot length, Ear length and Tragus length) according to standard museum procedure (DeBlase and Martin, 1981). In addition, dissections were performed on the specimens to ascertain reproductive condition and determine stomach contents. Specimens were preserved in a buffered 10% formalin solution and housed at the Carnegie Museum of Natural History, Pittsburgh, Pennsylvania.

Results and Discussion

As expected, the bat fauna of the Luquillo Forest was depauperate in comparison with continental tropical rain forests and other comparable sites on islands of the Greater Antilles in terms of species richness and species densities. One hundred fifty-three specimens were captured during 23 nights of netting; 66 specimens were released after capture while 87 specimens were sacrificed for further analysis (see Table 1). Two new species of bats (Brachyphylla cavernarum and Eptesicus fuscus) for the Luquillo Forest were captured, while Pteronotus parnellii was recorded for the first time from the Caribbean National Forest at El Yunque. Unidentified aerial insectivores frequently foraged above the forest canopy; however, numerous attempts to capture specimens with mist nets proved unsuccessful.

Digestive tracts from approximately 20% (17 individuals) of the sacrificed specimens contained food (Table 1). Fruits of Cecropia peltata appeared to be the main dietary constituent for both of the common frugivores (Artibeus jamaicensis and Stenoderma rufum). Two specimens of A. jamaicensis contained Piper seeds also.

Both A. jamaicensis and S. rufum exhibited high levels of reproductive activity during June and July. Sixty-eight percent of the adult female A. jamaicensis were pregnant and/or lactating while 100% of the adult female S. rufum were pregnant and/or lactating during the course of the study. This indicates that like other tropical bats (Wilson, 1979; Willig, 1982), these species give birth at the beginning of the rainy season, thereby maximizing the quantities of food available during periods of high physiological stress (lactation).

Acknowledgements

We would like to thank Drs. R. Garrison, D. Reagan, and R. Waide for their cooperation, advice, and enthusiasm throughout the study; C. Zucca and A. Estrada Pinto graciously identified botanical material. We would also like to acknowledge C. Gros and J. Roach for typing the manuscript. Research was generously supported by funds from the U. S. Department of Energy, administered by Oak Ridge Associated Universities. In addition, some research materials were provided by H. H. Genoways, Carnegie Museum of Natural History.

Bibliography

- Anthony, H.E. 1918. The indigenous land mammals of Porto Rico, living and extinct. Mem. Amer. Mus. Natur. Hist. 2:331-435.
- _____ 1925. Mammals of Porto Rico, living and extinct, Chiroptera and Insectivora In: Scientific Survey of Porto Rico and the Virgin Islands, Vol. 9, Part 1, pp. 1-96.
- Baker, R.J. and H.H. Genoways. 1978. Zoogeography of Antillean bats In: Zoogeography in the Caribbean, Acad. Natur. Sci. Phila., Spec. Publ. 13, pp 53-97.
- DeBlase, A.F. and R.E. Martin. 1981. A Manual of Mammalogy. Wm. C. Brown Co. Publ.; Dubuque, Iowa.
- Tamsitt, J.R. and D. Valdivieso. 1970. Observations on bats and their ectoparasites In: A Tropical Rain Forest, (H. T. Odum and R.F. Pigeon, eds.), pp. 123-128. U.S. Atomic Energy Commission; Oak Ridge, TN.
- Willig, M.R. 1982. A comparative ecological study of Caatingas and Cerrado Chiropteran communities: composition, structure, morphometrics, and reproduction. Ph.D. Dissertation, Univ. Pittsburgh. 324 pp.
- Wilson, D.E. 1979. Reproductive patterns In: Biology of Bats of the New World Family Phyllostomatidae. Part III. Special Publ., The Museum, Texas Tech. Univ., 16:317-378.

Table 1. Relative abundance of bats (based upon netting samples) and stomach contents of sacrificed individuals. Values in parenthesis indicate the number of preserved specimens retained for stomach analysis.

SPECIES	FEEDING GUILD	NUMBER OF CAPTURED INDIVIDUALS	STOMACH CONTENTS
<u>Artibeus jamaicensis</u>	Frugivore	90 (44)	<u>Piper treleaseanum</u> <u>Cecropia peltata</u>
<u>Stenoderma rufum</u>	Frugivore	50 (35)	<u>Cecropia peltata</u>
<u>Monophyllus redmani</u>	Nectarivore	8 (5)	
<u>Brachyphylla cavernarum</u>	Frugivore	1 (1)	
<u>Eptesicus fuscus</u>	Insectivore	1 (1)	
<u>Pteronotus parnelii</u>	Insectivore	1 (1)	
TOTAL		153 87	

Appendix I. Catalogue of specimens captured from the El Verde Field Station, operated by the Center for Energy and Environment Research for the U. S. Department of Energy, University of Puerto Rico; Municipality of Rio Grande (350 m, Km 19 on Route 186); Puerto Rico.

Catalogue Number	Age	Sex ^B	Species	Measurements ^C	Reproductive Condition ^D
5401	SA	— F	*** * 3 June 1982 <u>Artibeus jamaicensis</u>	66 0 14 19 = 32.0	
5402	A	— M	*** * 4 June 1982 <u>Artibeus jamaicensis</u>	74 0 13 20 = 44.0	5.0 x 3.0
5403	A	— F	<u>Artibeus jamaicensis</u>	81 0 12 22 = 52.0	PL
5404	A	— F	<u>Stenoderma rufum</u>	59 0 12 20 = 27.0	P, L
5405	A	— M	*** * 5 June 1982 <u>Artibeus jamaicensis</u>	78 0 13 21 = 49.0	7.9 x 5.3
5406	SA	— F	<u>Artibeus jamaicensis</u>	74 0 13 21 = 40.0	
5407	A	— M	<u>Monophyllus redmani</u>	61 8 8 14 = 11.0	

5425	A	—	F	<u>Stenoderma rufum</u>	10 June 1982	*** * *	*** * *	61	0	12	18	≡	27.5	P, L
5426	A	—	M	<u>Stenoderma rufum</u>				58	0	11	17	≡	21.0	8.1 x 4.2
5427	SA	—	F	<u>Stenoderma rufum</u>				63	0	12	19	≡	28.0	
					11 June 1982	*** * *	*** * *							
5428	A	—	F	<u>Eptesicus fuscus</u>				116	51	9	18	≡	18.0	L
5429	A	—	M	<u>Stenoderma rufum</u>				54	0	10	19	≡	22.5	6.8 x 4.7
5430	SA	—	F	<u>Stenoderma rufum</u>				52	0	13	17	≡	22.5	
					12 June 1982	*** * *	*** * *							
5431	SA	—	F	<u>Stenoderma rufum</u>				54	0	10	18	≡	22.0	
5432	A	—	F	<u>Stenoderma rufum</u>				55	0	13	18	≡	22.5	L
5433	A	—	F	<u>Stenoderma rufum</u>				60	0	12	19	≡	30.0	P, L
5434	A	—	M	<u>Stenoderma rufum</u>				55	0	12	18	≡	23.0	5.9 x 4.4
5435	A	—	F	<u>Artibeus jamaicensis</u>				73	0	14	21	≡	43.0	
5436	A	—	M	<u>Artibeus jamaicensis</u>				72	0	13	21	≡	38.0	6.5 x 4.9
5437	A	—	M	<u>Artibeus jamaicensis</u>				71	0	13	21	≡	39.0	8.4 x 3.6
					14 June 1982	*** * *	*** * *							
5438	SA	—	F	<u>Artibeus jamaicensis</u>				72	0	13	19	≡	33.0	
					15 June 1982	*** * *	*** * *							
5439	A	—	F	<u>Artibeus jamaicensis</u>				80	0	15	21	≡	49.0	PL

		*** * 2 July 1982		*** * *				*** * *			
5454	A	—	F	<u>Artibeus jamaicensis</u>	81	0	14	22	≡	58.5	L
5455	A	—	F	<u>Artibeus jamaicensis</u>	79	0	13	21	≡	46.5	
5456	A	—	F	<u>Artibeus jamaicensis</u>	75	0	12	20	≡	42.0	
5457	A	—	F	<u>Artibeus jamaicensis</u>	78	0	13	21	≡	43.0	
5458	A	—	F	<u>Artibeus jamaicensis</u>	77	0	13	20	≡	43.0	
5459	SA	—	M	<u>Artibeus jamaicensis</u>	79	0	13	21	≡	43.0	4.3 x 2.1
*** * * 6 July 1982											
5460 ^A	A	—	M	<u>Pteronotus parnellii</u>	84	15	9	19	≡	12.5	
5461 ^A	A	—	F	<u>Monophyllus redmani</u>	61	6	9	14	≡	10.0	
5462 ^A	A	—	F	<u>Stenoderma rufum</u>	56	0	13	19	≡	29.0	P
5463 ^A	A	—	M	<u>Stenoderma rufum</u>	50	0	12	20	≡	25.5	6.5 x 2.9
5464 ^A	A	—	F	<u>Artibeus jamaicensis</u>	72	0	14	22	≡	55.0	L
5465 ^A	A	—	F	<u>Artibeus jamaicensis</u>	75	0	15	21	≡	50.5	PL
5466 ^A	A	—	F	<u>Artibeus jamaicensis</u>	71	0	13	21	≡	53.5	L
5467 ^A	A	—	F	<u>Artibeus jamaicensis</u>	76	0	13	21	≡	50.0	
5468 ^A	A	—	F	<u>Artibeus jamaicensis</u>	78	0	13	22	≡	47.5	
5469 ^A	A	—	F	<u>Artibeus jamaicensis</u>	70	0	13	21	≡	48.0	
5470 ^A	SA	—	F	<u>Artibeus jamaicensis</u>	72	0	12	21	≡	43.0	

5471 ^A	A	—	M	<u>Artibeus jamaicensis</u>	79	0	14	21	≡	48.5	7.6 x 5.2
5472 ^A	A	—	M	<u>Artibeus jamaicensis</u>	71	0	13	22	≡	50.0	8.0 x 6.2
5473 ^A	A	—	M	<u>Artibeus jamaicensis</u>	73	0	13	20	≡	50.5	10.7 x 8.1
5474 ^A	A	—	M	<u>Artibeus jamaicensis</u>	74	0	13	22	≡	53.0	8.1 x 6.8
5475 ^A	A	—	M	<u>Artibeus jamaicensis</u>	72	0	14	21	≡	49.0	8.6 x 4.9
5476 ^A	SA	—	M	<u>Artibeus jamaicensis</u>	69	0	13	21	≡	42.5	5.4 x 3.8
				*** 7 July 1982	***						
5477	A	—	M	<u>Stenoderma rufum</u>	51	0	12	19	≡	24.0	6.7 x 3.1
5478	A	—	M	<u>Stenoderma rufum</u>	51	0	11	19	≡	23.5	6.0 x 3.4
5479	A	—	M	<u>Stenoderma rufum</u>	53	0	12	18	≡	23.0	5.1 x 3.5
5480	A	—	F	<u>Stenoderma rufum</u>	52	0	12	19	≡	21.0	L
				*** 8 July 1982	***						
5481	A	—	F	<u>Stenoderma rufum</u>	58	0	13	20	≡	28.5	L
5482	A	—	F	<u>Stenoderma rufum</u>	58	0	12	18	≡	26.5	L
5483	SA	—	M	<u>Stenoderma rufum</u>	54	0	12	18	≡	22.5	5.0 x 3.0
				*** 9 July 1982	***						
5484	SA	—	F	<u>Stenoderma rufum</u>	53	0	13	20	≡	21.0	
				*** 13 July 1982	***						
5485	J	—	M	<u>Artibeus jamaicensis</u>	58	0	14	15	≡	10.0	

5486	A — M	*****	18 July 1982	*****	74	0	14	18	≡	42.0
			<u>Artibeus jamaicensis</u>							
5487	SA — M	*****	21 July 1982	*****	52	0	12	17	≡	16.5
			<u>Stenoderma rufum</u>							

A Specimens captured at the base of El Toro Trail in the Caribbean National Forest (Km 13.5 on Route 191, 750 m); Municipality of Naguabo (El Yunque Quadrangle); Puerto Rico [18°17'59" N, 65°47'35" W].

B Adult = A, Sub Adult = SA, Juvenile = J; Male = M, Female = F.

C Standard museum measurements (mm or grams): Total length - Tail length - Hindfoot length - Ear length ≡ Weight.

D For females: Pregnant = P, Lactating = L, Post-lactating = PL.

For males: Testis length x testis width given in mm.