
Sexual Dimorphism in *Artibeus jamaicensis*

Melissa Hopkins

Dominica Study Abroad 2014

Texas A&M University

Dr. Thomas Lacher, Jr. and Dr. Jim Woolley

Abstract

Fifty specimens of *Artibeus jamaicensis* were analyzed for sex, weight, forearm length, and sexual condition. The measurements of forearm length between the sexes were then run through a statistical program and a t-value and p-value were calculated. The purpose of the study was to reveal possible sexual dimorphism in *Artibeus jamaicensis* in relation to forearm length. After analysis, there is strong evidence for sexual dimorphism in this species, possibly related to the wing loading demands of females when pregnant. In addition two calls were obtained from free-flying males and the structure and dominant frequencies presented.

Introduction

The Commonwealth of Dominica lies in the center of the Lesser Antilles and, for its size in comparison to other islands in the area, the diversity of its fauna is quite expansive (Honeychurch 1998). In particular, out of its eighteen species of land mammals, Dominica is inhabited by twelve native species of bats spanning six families. Of these twelve species four are frugivorous, all four of which belong to the family Phyllostomatidae (Evans and James 1997). The purpose of this study was to identify possible sexual dimorphism in one frugivorous species, *Artibeus jamaicensis*, focusing on differences in forearm length between the sexes. A few sample echolocation calls, obtained via out-of-hand flight, were also recorded during the process of this study.

Artibeus jamaicensis, more commonly known as the Jamaican or Mexican Fruit Bat, has a fairly widespread distribution, occurring from Sinaloa and Tamaulipas, Mexico, southward toward Ecuador, Venezuela, Trinidad, Tobago, the Greater and Lesser Antilles, the Florida Keys, and Amazonian Brazil to northwestern Argentina. As aforementioned, it belongs to the family Phyllostomatidae, which also includes nectarivores, insectivores, and even sanguinivores. This frugivorous species is relatively large and thickset, with no noticeable tail, a small uropatagium, and a well-developed nose leaf. The fur of *Artibeus jamaicensis* is dark brown, grayish, or black on the upperparts, and the individual hairs have white bases, giving a slightly silvery tinge. The face usually bears four pale stripes, both above and below the eyes, although these may sometimes be faint (Ortega 2001).

Materials & Methods

All bats used in this study were netted at Check Hall River, Archbold Tropical Research and Education Centre, Springfield, Dominica, using a six meter polyester mist net set up between two metal poles. Netting occurred over a range of nights, from May 25, 2014 to June 3, 2014, at times approximately between 6:30 PM to 9:30 PM, and a total of 15 bats were captured. Once a bat was captured it was immediately detangled from the net and placed inside a tube sock, which was then latched with a clothespin. At the end of the night, when netting was completed, all captured bats were sexed and, if female, checked for signs of pregnancy, their forearms measured, weighed, and then flown out-of-hand while both the Pettersson Ultrasound Detector D 240x and the H2 Zoom Recorder were activated. Any recorded calls were analyzed using the SonoBat 2. 9. 6 software.

Results

A total of 50 specimens of *Artibeus jamaicensis* were analyzed for this study, thirty-one of which were female and nineteen of which were male. Measurements were drawn from both bats captured during the span of my stay at the Archbold Tropical Research & Education Centre and from a previous project conducted by Laura Duffie in 2010.

In order to increase sample size in this study the data collected from a previous project conducted by Laura Duffie were also included. A total of 35 specimens of *Artibeus jamaicensis*, ranging in weight from 38 to 64 g and in forearm length from 58 to 65 mm, were collected in this 2010 report. Of these thirty-five, twenty-two were female

and thirteen were male (Duffie 2010). A total of 15 specimens of *Artibeus jamaicensis*, ranging in weight from 34 to 67 g and in forearm length from 58 to 67 mm, were captured during my stay. Of these fifteen, nine were female and six were male (Table 1).

Table 1. Measurements for both the 2010 and the 2014 *Artibeus jamaicensis* that were captured.

2014 DATA				2010 DATA			
Sex	Weight (g)	Forarm Length (mm)	Sexual Condition	Sex	Weight (g)	Forarm Length (mm)	Sexual Condition
Female		60	Not Pregnant	Female	57	58	Pregnant
Female	43	61	Not Pregnant	Female	45	60	Not Pregnant
Female	60	61	Pregnant	Female	60	61	Pregnant
Female	52	62	Pregnant	Female	54	61	Not Pregnant
Female	57	62	Not Pregnant	Female	42	61	Not Pregnant
Female	54	63	Not Pregnant	Female	54	61	Not Pregnant
Female	65	63	Pregnant	Female	42	61	Not Pregnant
Female	51	64	Not Pregnant	Female	49	61	Not Pregnant
Female	67	67	Pregnant	Female	60	62	Pregnant
Male	44	58		Female	59	62	Pregnant
Male	34	58		Female	55	62	Not Pregnant
Male	48	59		Female	50	63	Not Pregnant
Male	40	60		Female	55	63	Pregnant
Male	41	60		Female	44	63	Not Pregnant
Male	47	61		Female	58	63	Pregnant
				Female	50	63	Not Pregnant
				Female	38	63	Not Pregnant
				Female	42	64	Not Pregnant
				Female	56	64	Pregnant
				Female	49	64	Not Pregnant
				Female	64	65	Pregnant
				Female	58	65	Pregnant
				Male	38	58	
				Male	45	58	
				Male	47	59	
				Male	39	59	
				Male	42	60	
				Male	40	60	
				Male	50	61	
				Male	41	62	
				Male	49	62	
				Male	42	62	
				Male	47	64	
				Male	42	64	
				Male	59	65	

Average forearm length for male specimens was found to be $60.53 \text{ mm} \pm 2.2 \text{ mm}$, while average forearm length for female specimens was found to be $62.35 \text{ mm} \pm 1.8 \text{ mm}$ (Table 2).

Table 2. Comparison of Mean and Standard Deviation values for forearm length between males and females.

Sex	N	Mean	Std. Deviation
<i>Male</i>	19	60.53	2.17
<i>Female</i>	31	62.35	1.78

A T-test for significance (equal variances assumed) revealed a t-value of 3.242 for forearm length between the sexes, with degrees of freedom equaling 48 and a p-value equaling 0.002.

In addition to the above data, two echolocation calls were recorded from free-flying males of the species. Both calls were indicative of *Artibeus jamaicensis*, as they possessed the species' characteristic triple harmonic.

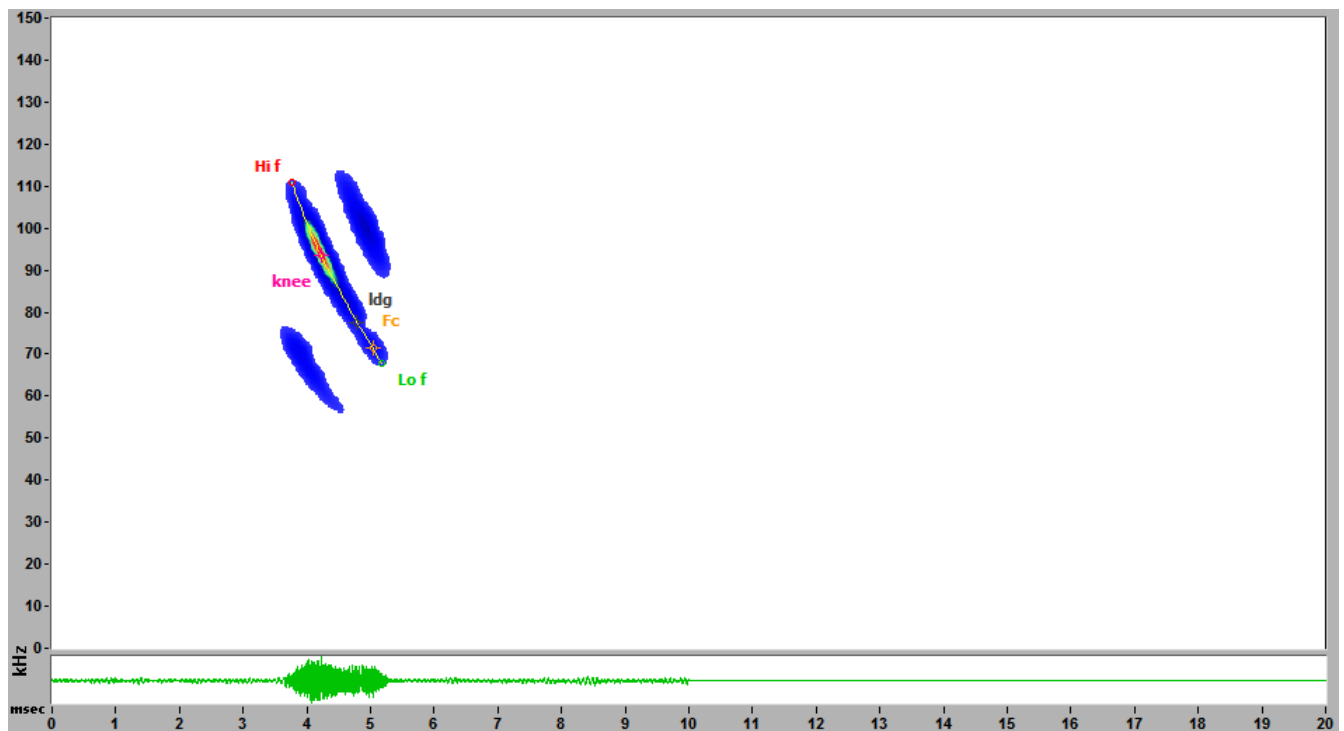


Figure 1. First call structure for *Artibeus jamaicensis*.

The first call recorded possessed an average frequency of 71.7 khz, with a low frequency of 67.8 khz and a high frequency of 110 khz (Figure 1).

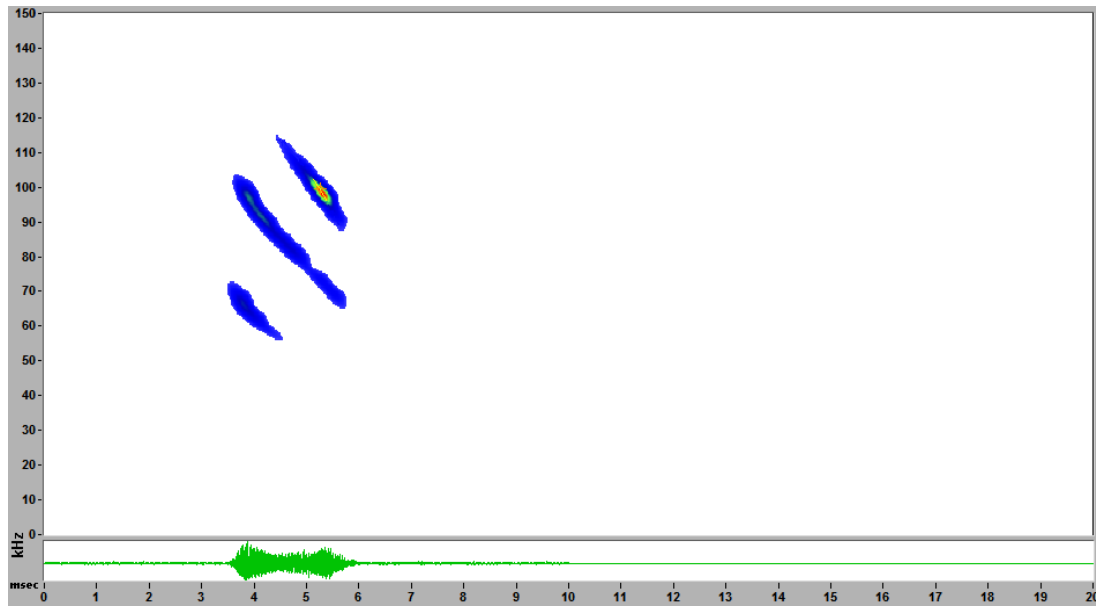


Figure 2. Second call structure for *Artibeus jamaicensis*.

The second call recorded possessed an average frequency of 99.5 khz, with a low frequency of 85.5 khz and a high frequency of 120 khz (Figure 2).

Discussion

Although not visible to the naked eye, based upon statistical testing of the measurements taken there is strong evidence of sexual dimorphism in *Artibeus jamaicensis* in relation to forearm length. Data revealed that females of the species have a statistically longer forearm in relation to body size when compared to males. A possible explanation for these results may be drawn from the females' ability to reproduce. A greater wing loading may be necessary to support both the weight of the female and, if she were pregnant, the growing fetus, and a longer forearm would facilitate this.

Further morphological studies of the species could be conducted over such variables as ear length, hind foot length, and skull size, among other measurements, in order to discover further points of sexual dimorphism in *Artibeus jamaicensis*.

Acknowledgements

I would like to offer both Dr. Woolley and Dr. Lacher heartfelt thanks for all the time, energy, and patience they've put into developing this wonderful study abroad experience. I've never felt so immersed in and amazed by the nature surrounding me. Dominica is truly a special place.

Dr. Lacher, thank you especially for helping to bring my project to fruition. Without your expertise and guidance I would have been utterly lost on what to do.

Literature Cited

Duffie, Laura. 2010. A Comparison of Factors Affecting Bat Maneuverability around a Stationary Obstacle. Dominica Study Abroad Project Report. Texas A&M University.

Evans, Peter G.H.; James, A. 1997. *Dominica: Nature Island of the Caribbean: Wildlife Checklists*. Faygate Printing, Sussex, First Edition. Pp. 45-46.

Honeychurch, Lennox. *Dominica: Isle of Adventure: An Introduction and Guide*. MacMillan Education LTD, London and Basingstoke, Third Edition. Pp. 1-3.

Ortega, J., I. Castro-Arellano. 2001. *Artibeus jamaicensis*. Mammalian Species: 662. Pp. 1-9.