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SMALL MAMMAL SURVEY OF CHIQUIBUL FOREST RESERVE, MAYA MOUNTAINS, BELIZE, 2001

ANDREW ENGLIS, JR., RONALD E. COLE, AND TIM CARO

ABSTRACT

The Chiquibul Forest Reserve is located in western Belize in the Maya Mountains and protects one of the largest patches of rainforest remaining in Central America. We conducted inventories of small mammals in the forest reserve from 4 July through 8 August 2001. Our five trapping sites were centered within a few kilometers of the Las Cuevas Field Station. In total, we ran 3,686 trap-nights capturing 154 specimens (4.2% trap success) representing 15 species of small mammals. We ran mist nets for ten nights capturing 39 phyllostomid bats representing six species. *Heteromys desmarestianus* was the most abundant mammal trapped; it was captured at a rate four times more frequently than all other species. *Ototylomys phyllotis* and *Handleyomys alfaroi* were next in abundance. Almost all species of rodents and bats were in a high state of reproductive activity. Our efforts confirmed an additional eleven species to the Chiquibul Forest Reserve, five non-volant: *Cryptotis mayensis*, *Oligoryzomys fulvescens*, *Handleyomys rostratus*, *Sigmodon toltecus*, *Nyctomys sumichrasti*, and six volant: *Carollia sowelli*, *Sturnira lilium*, *Artibeus jamaicensis*, *Dermanura toltecus*, *D. watsoni*, *Centurio senex*. The biogeographic affinities of small mammals of the Maya Mountains lay more nested within the Central American faunal group – less so than the Yucatan faunal region. The discovery of *Cryptotis mayensis* in the Maya Mountains provided a significant range and ecological extension. We present preliminary character traits to separate *Sigmodon toletcus* from *S. hispidus*.

Key words: Belize, Chiroptera, *Cryptotis*, Maya Mountains, Museum of Wildlife and Fish Biology, node trapping, Rodentia, *Sigmodon*, small mammals

INTRODUCTION

The Chiquibul Forest Reserve is located in the Maya Mountains of western Belize and protects one of the largest patches of rainforest remaining in Central America (Harcourt 1996). Limited inventories of small mammals in this region (at least those that included voucher specimens) have focused primarily on the pine

forests associated with the granitic soils north of the Maya Mountains (Murie 1935) and lowlands of Belize and the Yucatan Peninsula (Herskovitz 1951; Disney 1968; Bersot 2003). Few researchers have undertaken inventories in rainforest habitat associated with limestone soils further to the south (but see Rabinowitz and

Nottingham 1989; Caro et al. 2001a; Kelly and Caro 2003). Recent efforts to describe the small mammal fauna were focused on factors affecting trapping success (Kelly and Caro 2003), landscape-scale patterns of mammalian diversity (Caro et al. 2001b), and the effectiveness of using flagship species in establishing reserves (Caro et al. 2004). The only previous trapping reports from this region failed to secure vouchers to confirm the identification of small mammals in the Chiquibul (Caro et al. 2001b; Kelly and Caro 2003). The specimens reported herein were collected to docu-

ment diversity used in an assessment of overall species richness in this region (Caro et al. 2004). Recent, and at times sweeping, taxonomic revisions impacting the fauna of this region compel us to provide a list of species currently known from the region. Subsequent to our efforts, the construction and operation of a hydroelectric dam in the region has resulted in an influx of people into the northern part of the Chiquibul Forest Reserve (Conservation Strategy Fund 2000). The future of this fauna is uncertain.

STUDY AREA AND METHODS

The Chiquibul Forest Reserve, Cayo District, western Belize, is surrounded by the fully protected Chiquibul National Park (Fig. 1). The vegetation is a mosaic of subtropical evergreen and deciduous seasonal forest (Brewer and Webb 2002; Brewer et al. 2003), although stands of pines (*Pinus*) occur in the northern sector (Hartshorn et al. 1984). Some blocks of the Chiquibul Forest Reserve have been, and are still being, selectively logged for commercially important species such as mahogany (*Swietenia macrophylla*) and cedar (*Cedrela odorata*) on a >40-year rotational basis (Bird 1998). Also, a large part of the Chiquibul Forest Reserve suffered losses of trees from Hurricane Hattie in 1961 (Wolffsohn 1967). Rainfall averages about 1500 mm/year, with the rainy season starting in June and continuing through January (Caro et al. 2001). Our period of trapping was conducted at the beginning of the rainy season from 4 July through 8 August 2001.

We sampled five collecting sites roughly centered within a few kilometers of the Las Cuevas Field Station (Fig. 1; Table 1). Each site was sampled using tapping nodes along a transect. Transects were placed where habitat conditions appeared favorable for small mammals, and comprised five nodes (ca. 50 m intervals) selected on the basis of animal sign, diversity of forest floor structure, and liana growth. At each node, we set twenty traps, including six Museum Special or Victor snap traps, eight Sherman live-traps (23 x 8 x 8 cm), three similar custom-made wire mesh traps (30 x 8 x 8 cm), two medium-sized Tomahawk traps (40 x 13 x 13 cm or 40 x 17 x 17 cm), and one large Tomahawk trap (65 x 22.5 x 22.5 cm). In each of our five sites, we set three transects with this combination and number of traps. At each site we set 100 traps along a stream,

river or beside a pond; 100 traps within the forest interior; and 100 traps along forest edge, usually a trail; thus totaling 300 total traps/site. Snap traps and some small live traps were set to enhance capture of arboreal mammals, being tied to trees and vines 1- 3 m above ground; others were placed under or on fallen logs, near burrows, or on small animal trails. Traps were set for three days and three nights at each site and were baited with a variety of baits including pureed banana, peanut butter, rolled oats, banana slices, and in large Tomahawks only, sardines. Traps were baited every morning and left open for 24 hours. They were checked twice a day. Samples of each species in these transects were kept as vouchers.

In addition, two pitfall arrays with drift fences were set by herpetologists sampling frogs in the forest at the Aguada trapping locality (Fig. 1). We were able to piggy-back upon their efforts from 18 July to 1 August, checking the pitfalls twice per day, collecting small mammals. Each pitfall array comprised five 1-gallon buckets at 5 m intervals and connected with a plastic drift fence approximately 20 m in length.

To sample bats, we ran two 2 x 10 m mist nets for ten nights, set in active flyways determined by presence of water (streams or forest ponds) or gaps in the forest (natural or manmade). Each net was opened prior to sunset and left open through a portion of the night and checked at one-hour intervals until closed. When checked, bats were either released or collected as voucher specimens. Nets were then closed for the day. We also recorded and identified all species of mammals encountered by visual and or auditory means while trapping and working in the field.

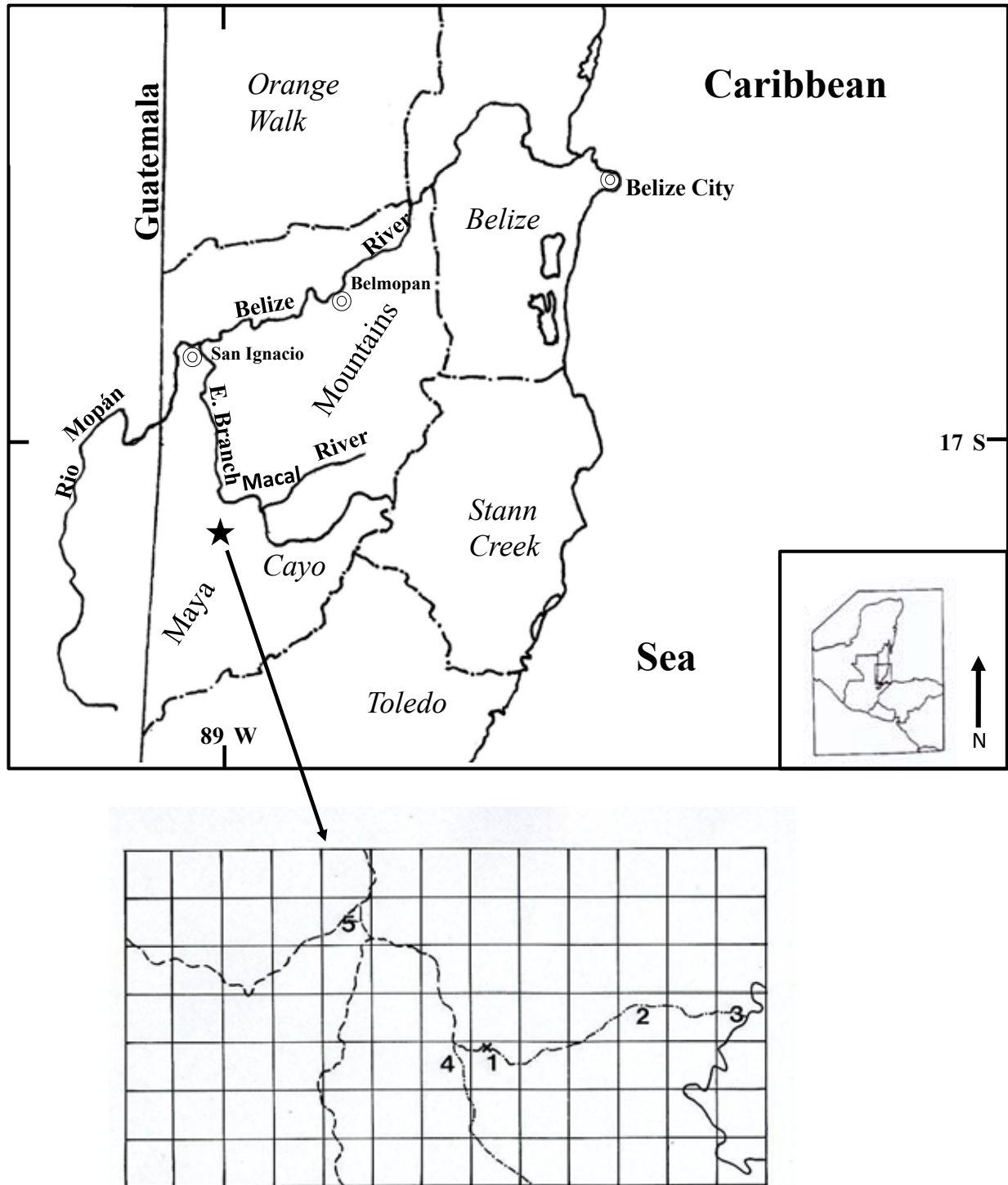


Figure 1. Location of Las Cuevas Field Station and general study area (indicated by star) in Maya Mountains, Belize. Italic names refer to political districts. Lower map shows 1-km grids of study area. Collecting sites are as follows: (1) Las Cuevas Field Station, (2) Aguada Creek, (3) Monkey Tail Branch, (4) San Pastor, (5) Millionario.

Table 1. Collecting localities in the Chiquibul Forest Reserve (refer to Fig. 1) and collecting effort per site. Trap, net, and pitfall nights reflect the number of each unit times the number of nights open (e.g., two nets open for three consecutive nights = six net nights).

Site	Collecting/Trapping Locality (as written on specimen tags)	Trap nights	Net nights	Pitfall nights
1	Belize: Cayo District, Las Cuevas Research Station, 16.732869°N 88.985952°W, 550m.	314	6	
2	Belize: Cayo District, 3.3km E, 1.1km N of Las Cuevas Research Station, Aguada Creek, 16.742952°N 88.955533°W, 600m.	843	6	14
3	Belize: Cayo District, Monkey Tail Branch, 5.4 km E, 0.5 km N of Las Cuevas Research Station, 16.740202°N 88.934717°W, 465m.	830	6	
4	Belize: Cayo District, San Pastor, 1.0 km W, 0.4 km N of Las Cuevas Research Station, 16.726200°N 88.990233°W, 590 m.	846	6	
5	Belize: Cayo District, Millionario, 2.1 km N, 2.1 km W of Las Cuevas Research, Resumadero Road, 16.756950°N 89.012833°W, 600m.	853	6	

Relative abundance of non-volant mammals was expressed as the number of individuals/100 trap nights. We did not record capture effort for netted bats. In the field, mammal identifications were aided by Reid (1997) and Emmons and Feer (1990). Determinations were primarily undertaken using known reference materials and comparisons with specimens at the US National Museum and American Museum of Natural History. Taxonomy in general follows Wilson and Reeder (2005); deviations from this reference are noted where applicable.

All collected mammals were preserved as study skins plus skulls, complete skeletons, partial skeletons,

or alcohol preserved specimens. The bulk of material was deposited at the Museum of Wildlife and Fish Biology, University of California, Davis (WFB), with a subset left at the Las Cuevas Field Station, Belize, as a reference collection. We opportunistically combed and picked ectoparasites from collected mammals. These were deposited in the Bohart Museum of Entomology, University of California, Davis, awaiting further determinations by experts. The museum operates off of an animal care and use protocol established at the University of California, Davis (protocol number 15331). We obtained collecting and export permits from the Belize Government prior to trapping and obtaining specimens.

RESULTS

In total, we ran 3,686 trap-nights capturing 154 animals (4.2% trap success) representing 15 species of small mammals (Table 2). Mist nests captured 39 individuals representing six species of bats (all Phyllostomidae; no Vespertilionidae were netted). Several female bats contained embryos indicating reproductive activity and potential timing of births for the beginning of the rainy season. *Heteromys desmarestianus* was the most abundant mammal trapped; it was captured at a rate four times more frequently than all other species. *Otodylomys phyllotis* was next in abundance (Table 2).

Rodents were also in a high state of reproductive activity across all species. We recorded 33 species of mammals through trapping and observations (Table 3).

We experienced little or no problems with ants raiding our traps, and rain impacted only one trap night. Large forest cockroaches (Blaberidae) and beetles (Scarabaeidae) sometimes tripped small live traps. We include measurements (external and cranial) for all specimens collected (Appendix).

Table 2. Results of small mammal trapping, Maya Mountains, Belize.

	Collecting Site					Total Captures	% abundance/ 100 traps
	Field Station	Monkey Tail	San Pastor	Millionario	Aguada		
<i>Didelphis virginiana</i>	0	0	2	1	1	4	0.11%
<i>Didelphis marsupialis</i>	0	0	5	2	2	9	0.24%
<i>Philander opossum</i>	0	1	0	1	0	2	0.05%
<i>Marmosa mexicana</i>	0	4	2	0	3	9	0.24%
<i>Cryptotis mayensis</i>	0	0	0	0	5	5	0.14%
<i>Heteromys desmarestianus</i>	10	12	0	11	20	53	1.44%
<i>Oligoryzomys fulvescens</i>	1	0	0	0	0	1	0.03%
<i>Handleyomys alfaroi</i>	3	0	1	4	6	14	0.38%
<i>Handleyomys rostratus</i>	1	0	1	0	2	4	0.11%
<i>Sigmodon toltecus</i>	4	0	4	6	0	14	0.38%
<i>Nyctomys sumicrasti</i>	0	1	0	0	1	2	0.05%
<i>Ototylomys phyllotis</i>	18	5	5	0	5	33	0.90%
<i>Tylomys nudicaudatus</i>	1	1	0	0	1	3	0.08%
<i>Leopardus pardalis</i>	0	0	1	0	0	1	0.03%
TOTALS	38	24	21	25	46	154	4.18%

Table 3. List of mammals observed and trapped in the Chiquibul Forest Reserve, 4 July – 8 August 2001.

<i>Didelphis marsupialis</i> - Common Opossum	<i>Handleyomys rostratus</i> - Long-nosed Rice Rat
<i>Didelphis virginiana</i> - Virginia Opossum	<i>Oligoryzomys fulvescens</i> - Fulvous Colilargo
<i>Philander opossum</i> - Gray Four-eyed Opossum	<i>Tylomys nudicaudatus</i> - Peters' Climbing Rat
<i>Marmosa mexicana</i> - Mexican Mouse-opossum	<i>Ototylomys phyllotis</i> - Big-eared Climbing Rat
<i>Cryptotis mayensis</i> - Yucatan Small-eared Shrew	<i>Nyctomys sumichrasti</i> - Sumichrast's Vesper Rat
<i>Carollia sowelli</i> - Silky Short-tailed Bat	<i>Sigmodon toltecus</i> - Hispid Cotton Rat
<i>Sturnira lilium</i> - Little Yellow-shouldered Bat	<i>Dasyprocta punctata</i> - Agouti
<i>Artibeus jamaicensis</i> - Jamaican Fruit-eating Bat	<i>Agouti paca</i> - Paca
<i>Dermanura watsoni</i> - Thomas's Fruit-eating Bat	<i>Nasua nasua</i> - Coati
<i>Dermanura tolteca</i> - Toltec Fruit-eating Bat	<i>Felis onca</i> - Jaguar
<i>Centurio senex</i> - Wrinkle-faced Bat	<i>Felis concolor</i> - Mountain Lion
<i>Alouatta pigra</i> - Black Howler Monkey	<i>Felis pardalis</i> - Ocelot
<i>Ateles geoffroyi</i> - Geoffroy's Spider Monkey	<i>Tapirus bairdii</i> - Baird's Tapir
<i>Dasybus novemcinctus</i> - Nine-banded Armadillo	<i>Dicotyles tajacu</i> - Collared Peccary
<i>Sciurus deppei</i> - Deppe's Squirrel	<i>Tayassu pecari</i> - White-lipped Peccary
<i>Heteromys desmarestianus</i> - Desmarest's Spiny Pocket Mouse	<i>Mazama temama</i> - Central American Red Brocket
<i>Handleyomys alfaroi</i> - Alfaro's Rice Rat	

SPECIES ACCOUNTS

ORDER DIDELPHIMORPHIA
 Family Didelphidae
***Didelphis virginiana* Kerr 1792**
 Virginia Opossum

Specimens examined.—Nine individuals were captured in Tomahawk live traps which were baited with a mix of fruit, vegetable matter, and peanut butter. Seven of the nine captures were in secondary forest habitat and the other two in forest edge habitat. Just one of the nine (WFB 4321) was kept as a voucher specimen. It was a subadult male with left testis = 4 x 3 mm.

***Didelphis marsupialis* Linnaeus 1758**
 Common Opossum

Specimens examined.—Four individuals were captured using Tomahawk live traps; two were retained as specimens, WFB 4292 and WFB 4313. Both were subadults, left testis = 11 x 8 mm and 6 x 8 mm, respectively. The two released animals also were subadults. One individual was captured in forest edge habitat and the other three were captured in secondary forest.

***Marmosa mexicana* Merriam 1897**
 Mexican Mouse Opossum

Specimens examined.—Nine individuals were collected (WFB 4233, 4269, 4289, 4301, 4302, 4305, 4317, 4319, and 4323). Of the nine specimens examined only two were adults as determined by tooth eruption patterns and size.

Diagnosis.—Our collections of *Marmosa* exhibit two distinct age classes, an arboreal cohort of subadults and a terrestrial cohort of adult males. Our first inclination was to consider these as separate species based on body size and craniodental characteristics (e.g., *M. mexicana* and *M. robinsoni*). Publication of a revision of Central American *Marmosa* (Rossi et al. 2010) led to uncertainty as to our identification and animals were sent to the American Museum of Natural History for determination. All specimens were determined as *M. mexicana* by R. Voss (pers. comm.). Rossi et al.'s (2010) thorough re-evaluation of *Marmosa mexicana*,

M. mitis, and *M. robinsoni* provided very helpful identification criteria for subadult animals. We re-examined the skulls and pelage traits of the subadults and concur with Voss that seven subadult specimens are *M. mexicana*.

Two adult males (WFB 4233 and 4305) were both old animals. WFB 4233 had a very large skull with well-developed supraorbital ridges, atypical for *M. mexicana* (Rossi et al. 2010). Furthermore this specimen had reduced palatine fenestrae, a large upper molar tooththrow (8.9 mm), a very large CB length (40.0 mm), and the black mask did not extend to touch the ears. These latter character traits coupled with the large supraorbital ridge are inconsistent with measurements and traits reported for *mexicana*; in fact this specimen's measurements exceeded those reported for *M. mexicana* (Rossi et al. 2010). In our opinion WFB 4233 exhibits more traits consistent with those reported for *M. isthmica* rather than *M. mexicana* (Rossi et al. 2010). In a recent communication with R. Voss, he stated that our animals were unusually old, and both being males, can exhibit larger inflected supraorbital ridges and were all clearly *M. mexicana*. Specimen WFB 4233 probably represents an aberrant *M. mexicana*, but our diagnosis will remain referred, *Marmosa* cf. *mexicana*, until it can be further resolved. The second specimen of adult male (WFB 4305) had less clearly developed supraorbital ridges and metrics fell more within those reported for adult male *M. mexicana*.

Remarks.—All of the subadult *M. mexicana* specimens were captured in trees rather than on the ground. Six were caught in snap traps tied to branches and lianas and the seventh was caught in a box trap, also tied to a tree limb. WFB 4233 and 4305 both were adult males with well developed, active testes. One of our two captures was made with a ground set box trap and the second was captured in a pitfall. Both animals were heavily parasitized with botfly larvae (family Oestroidea). WFB 4305 had recently survived an apparent attack with part of its facial skin missing and healed. The two old males present interesting behavioral questions relating to terrestrial dispersal in this arboreal species.

***Philander opossum* (Linnaeus 1758)**

Gray Four-eyed Opossum

Specimens examined.—Two specimens were collected (WFB 4306 and 4337); both were males, a subadult and adult respectively. WFB 4306 was captured in a box trap set in forest edge habitat. WFB 4337 was captured by the semi-feral house cat living on the grounds of the research station.

ORDER SORICOMORPHA

Family Soricidae

***Cryptotis mayensis* (Merriam 1901)**

Yucatan Small-eared Shrew

Specimens examined.—Five specimens were collected and examined (WFB 4223, 4234, 4243, 4271, 4274). Cranial and body measurements fall within those reported by Woodman and Timm (1993) for this species. All were taken from pitfall traps in a wet seep along Aguada Creek in deciduous semi-evergreen forest at 600 m elevation. The soil was very shallow on top of partially exposed limestone rock. The overstory was completely closed shading the forest floor; leaf litter covered the forest floor. The understory was sparsely vegetated. The one identified female collected was perforate, indicating recent reproductive activity, however none of the males captured showed signs of being in reproductive activity (no lateral glands present).

Diagnosis.—Specimens were sent to the USNM and determined by N. Woodman. Our animals represented a relatively large shrew, dorsal coloration a dark gray-brown with faint pale spots on the hind quarters, vent gray. All of the measurements, external and cranial, indicate it to be too large for *C. parva* (the CBL on our *C. mayensis* skulls are 20.1, 19.7, and 19.6 mm, and tail length ranges from 29 to 31 mm, $n = 5$ [Appendix]). The cranium is massive when compared with *C. tropicalis* and the unicuspid teeth are huge, U^3 displaces U^4 lingually, and U^4 is not visible from lateral view of the cranium. Our specimens are also among the largest *C. mayensis* measured to date (N. Woodman pers comm.). However, there are few modern museum-quality skins and skulls of this species (many more are from owl pellets and from archeological and paleontological sites), so there are few complete skulls (only 15 total including our specimens) (N. Woodman pers comm.). *Cryptotis mayensis* differs from *C. tropi-*

calis, the other known shrew in the area, by its grayer pelage and longer tail, longer and less circumscribed zygomatic plate, and larger size. Our animals fall well within all other cranial metrics defined for *C. mayensis* (Woodman and Timm 1993) (Appendix). The upper pelage coloration imparts a reflective nature (well described by Woodman and Timm 1993). We could not see the tricolored coloration of the dorsal hairs described for this species (Choate 1970; Woodman and Timm 1993). The specimens were too small in all measurements reported for *C. magna* and were larger than *C. hondurensis*.

Remarks.—This species has a very limited distribution and is poorly represented in collections. Most records are from the Yucatan Peninsula (Woodman and Timm 1993). *C. mayensis* is reported to be the only member of the *C. nigrescens* group to be restricted to lowlands where most records fall below 100m in dry scrub, deciduous forest, and seasonally dry evergreen forest elevation (Woodman and Timm 1993). Murie (1935) reported capturing *Cryptotis* in marshlands and a palmetto draw along a pine ridge in the Cayo District (he reported the species as *C. micrura* which has been synonymized with *C. mayensis* and *C. tropicalis* (Woodman and Timm 1993; Wilson and Reeder 2005). Choate (1970) examined Murie's specimens and assigned them to *C. parva tropicalis*. We examined Murie's specimens (from the University of Michigan, Museum of Zoology) and they are correctly assigned to *C. tropicalis* (confirmed in recent communication with N. Woodman). While it remains unclear as to the correct elevation and precise location of Murie's specimens, we mapped the general locality of his collection based on information gleaned from the original tag (Fig. 2). In Belize, pine ridges occur from near sea level to 500 m elevation. He did associate his shrews with the pine ridge top which would imply a higher elevation than recorded from our specimens of *C. mayensis* (Murie 1935). Prior to our collection, there is only one confirmed whole specimen of *C. mayensis* from Belize, a single female collected by Disney on 16 February 1966. The animal was collected in lowlands at Baking Pot, Cayo District, and was determined by R. L. Peterson (1968) (Fig. 2). Our collection extends the known distribution further south (approximately 100 km), to higher elevation (600 m) and to include mesic semi-evergreen rainforest. It is likely more common and widespread in forests of the Maya Mountains.

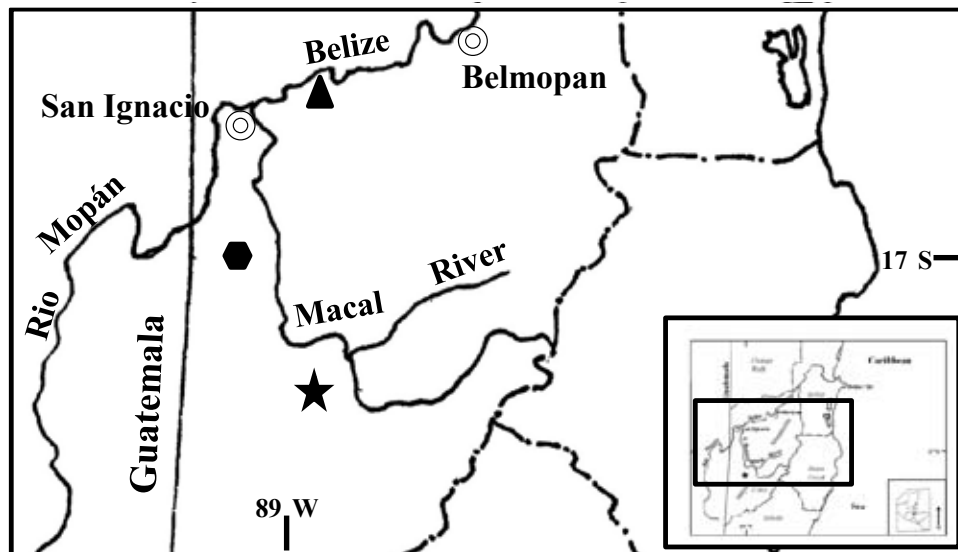


Figure 2. Location of whole specimens of *Cryptotis* shrews collected in/near the Maya Mountains, Belize. Shaded triangle = Baking Pot, *C. mayensis* (Disney 1966); shaded hexagon = Pine Ridge, *C. tropicalis* (Murie 1935); shaded star = our 2001 collection near Las Cuevas Field Station, *C. mayensis*.

ORDER CHIROPTERA

Family Phyllostomidae

Carollia sowelli Baker, Solari and Hoffman 2002

Silky Short-tailed Bat

Specimens examined.—Seven individuals were captured in mist nets (Appendix). Of these, six were adult males and one was an adult female. The lone female contained one embryo. Two of the males had measureable testes (6 x 6 mm and 4 x 3 mm). External characteristics to distinguish *C. sowelli* from *C. brevicauda* are poorly developed, but larger overall cranial measurements of our animals match those reported for *C. sowelli* (Baker et al. 2002; Appendix); thus we refer our animals to that species. All of these bats were netted either in forest edge or at the edge of a rainforest pool. All were netted within one meter of the ground, including two animals captured in the bottom panel of the mist net.

Sturnira lilium (E. Geoffroy 1810)

Little Yellow-shouldered Bat

Specimens examined.—Four adult males and two adult females were collected (Appendix). One of the females was carrying one embryo. Only one of the males was examined and its left testis measured 5 mm

in length. All of our captures were via mist nets set up in forest edge and rainforest pools generally below 1.5 m above the forest floor.

Artibeus jamaicensis Leach 1821

Jamaican Fruit-eating Bat

Specimens examined.—Twenty-five individuals were captured, of which 13 were examined and kept as voucher specimens (Appendix). Of these, six were adult females and seven were adult males. Three of the six females captured contained one embryo (each) and one showed a placental scar. Of the seven males kept as voucher specimens, four showed mature, active testes (the largest = 9 x 8 mm, the smallest = 3 x 2 mm). Fifteen of our 25 captures were made in one night using a mist net set over or near water in primary forest.

Dermanura tolteca (Saussure 1860)

Toltec Fruit-eating Bat

Specimens examined.—One adult male (WFB 4277) with a left testis measuring 6 x 3 mm was collected and kept as a voucher specimen. This individual was captured in a mist net set over a pond in primary rainforest.

Diagnosis.—This specimen was identified to *D. tolteca* due to its deeply incised interfemoral membrane, coupled with a forearm of 40 mm and maxillary tooth row of 6.69 mm (Hall 1981). Cranial and tooth row measurements of this specimen also align well with those reported from Honduras and Guatemala (Davis 1969). We include this species in the genus *Dermanura* following genetic relationships separating small *Artibeus* bats from larger species (Redondo et al. 2008).

***Dermanura watsoni* Thomas 1901**

Thomas's Fruit-eating Bat

Specimens examined.—One adult female (WFB 4244) and one adult male (WFB 4275) were captured and kept as voucher specimens. WFB 4244 contained one embryo. WFB 4244 was captured in forest edge near the Las Cuevas Research Station and WFB 4275 was netted at the edge of a primary rainforest pool.

Diagnosis.—This is a small bat with a broad, continuous uropatagia encompassing both legs and the terminal edge hairless (unlike *D. tolteca*). Both specimens lacked a third molar on the maxillary tooth row. Facial stripes were evident on fresh animals; these were somewhat obscured after the specimens dried. We include this species in the genus *Dermanura* following genetic relationships separating small *Artibeus* bats from larger species (Redondo et al. 2008).

***Centurio senex* Gray 1842**

Wrinkle-faced Bat

Specimen examined.—One adult female was collected (WFB 4273). No embryos or placental scars noted. This specimen was captured one meter above the ground in a mist net set at the edge of a rainforest pool. The characteristic facial pattern and folds quickly disappeared after the specimen dried.

ORDER RODENTIA
Family Heteromyidae

***Heteromys desmarestianus* Gray 1868**

Desmarest's Spiny Pocket Mouse

Specimens examined.—Fifty-three individuals were captured of which 18 (7 males and 11 females) were kept as voucher specimens (Appendix). All of

the adults were determined to be reproductively active. The males all had scrotal testes and the females were lactating. Two of these females contained embryos. Several exhibited sharply defined molt lines.

Diagnosis.—Two species of *Heteromys* are reported from Belize, *H. desmarestianus* and *H. gaumeri* (Kirkpatrick and Cartwright 2006). The latter is a smaller, lowland species restricted to northern Belize and associated with Yucatan semi-evergreen forest (Schmidt et al. 1989; Bersot 2003). Our specimens were assigned to *H. desmarestianus* based on two key external characters, lacking hair on the posterior portion of the sole of the hind foot, and possessing a sparsely haired tail lacking a penicillate tail tip (Schmidt et al. 1989). Our measurements, external and cranial, fall within the range reported by Rogers and Schmidly (1982).

Remarks.—This species was the most abundant rodent of the forest floor. It was not captured in open habitats, but preferred forest interior. Typical localities included tree falls or debris piles shaded by an overstory. We captured higher numbers in closed forest tracts (Aguada site) than recovering logged sites or edge (Millionario and Monkey Tail) (Fig. 1; Table 1). We had no captures at the more recently logged San Pastor site. These findings might suggest that this species may be susceptible to logging activities. One specimen was obtained in the kitchen of the research station. Another partial specimen was found in regurgitation from a jaguar (*Panthera onca*) (fresh tracks were associated with the regurgitated rodent).

Family Cricetidae

***Oligoryzomys fulvescens* (Saussure 1860)**

Fulvous Colilargo

Specimens examined.—One adult male was captured in a pitfall trap along Aguada Creek and vouchered (WFB 4230). The animal had scrotal testes indicating it was reproductively active.

***Handleyomys alfaroi* (J.A. Allen 1891)**

Alfaro's Rice Rat

Specimens examined.—Nine males and five females were captured and kept as voucher specimens (Appendix). Three were taken from pitfall traps along

Aguada Creek. The remaining 11 were caught in Sherman or box traps on the forest floor. All of the adult males had scrotal testes. One of the adult females had five embryos and the remaining four adult females were perforate and contained placental scars. This species was most commonly encountered in damp sites with intact overstory. Some were associated with dense tangles on the forest floor. Formerly placed in the genus *Oryzomys* (Wilson and Reeder 2005), we follow the taxonomy proposed for Oryzomyine rodents by Weksler et al. (2006) who provisionally assigns this species to *Handleyomys*, pending further revision.

***Handleyomys rostratus* Merriam 1901**

Long-nosed Rice Rat

Specimens examined.—Five individuals were captured and kept as voucher specimens (Appendix). Our captures consisted of three adult males and two adult females.

Diagnosis.—These animals were easily separable from other *Handleyomys* and *Oryzomys* species by a combination of external characteristics including prominent tufts of digital bristles projecting beyond nails of hind toes and orange colored ear hair (both characters absent in *O. cousei*). *H. rostratus* dorsal pelage is a brown infused with rich rufous coloration; this contrasts sharply with the white-gray ventral pelage. *O. cousei* is paler dorsally, lacks rufous tones and its ventral coloration is washed with rich buffy tones, blending onto the flanks (this based on comparisons with specimens in the MWFB). Adult *H. rostratus* is overall smaller than *O. cousei*. These five specimens were separated from *H. alfaroi* by their larger size, more rusty dorsal pelage (sepia brown on *H. alfaroi*) and through cranial features.

Remarks.—The three collected males had scrotal testes and the two females had placental scars, indicating recent breeding. These individuals were captured in a variety of ways and habitats, but all in forest edge. Two were captured in pitfall traps, one was captured in the kitchen of the Las Cuevas Research Station, and the remaining two were captured in Sherman traps in semi-disturbed habitat. For taxonomy we followed Weksler et al. (2006) who provisionally assigns this species to *Handleyomys*, pending further revision.

***Sigmodon toltecus* (Saussure 1860)**

Toltec Cotton Rat

Specimens examined.—Eleven individuals were captured and retained as vouchers (Appendix). Of these, nine were females, five of which either contained embryos or placental scars. The two males were both scrotal.

Diagnosis.—We examined the literature for external characteristics and craniodental measurements or differences to help confirm the identification of our specimens of *Sigmodon*; they do not exist. To date only molecular studies have been provided to ascertain the differences between *S. toltecus* and *S. hispidus* (Carroll et al. 2005; D. Carroll pers. comm.). We compared our small series of *Sigmodon* from Belize with a series in our collection from Texas, USA, and below present a brief assessment of character differences. The populations we examined represent two extremes in the geographic distribution of both and there remains a possibility that craniodental and external measurements could be clinal; more investigation is needed. The Rio Grande River provides the geographic barrier between the two species (Peppers et al. 2002); all of our *S. hispidus* examined were from north of the river. We found five character traits that helped to distinguish between *toltecus* and *hispidus*: tooth row measurements, nasal bone extension past incisors, cranium shape, overall dorsal pelage color, and length of rump spines (Table 4; Fig. 3).

Overall, *S. toltecus* averaged smaller in nearly all measurements but appears to have a somewhat longer tail proportionally to the head and body (Table 4). The dorsal coloration of *toltecus* is richer with deep rufous overtones, absent from *S. hispidus*. Also the pelage is softer in *toltecus*, lacking long guard hairs on the rump for which *S. hispidus* is named (Fig. 3). The skull of *toltecus*, from age class to age class, is shorter, with a higher brain case. The rear of the skull is angled in *toltecus* and more squared in *hispidus* (Fig. 3). The nasal bones do not project past the incisors as they do with *S. hispidus*. We noted these traits as consistent differences but these should be vetted with genetic evidence. *S. toltecus* has been confirmed from Guatemala approximately 20 km west of the Maya Mountains (Peppers et al. 2002)

Table 4. Selected external measurements (in mm; mean in parentheses) and pelage features of *Sigmodon* collected in Maya Mountains, Belize (WFB specimens) and in Texas, USA (WFB specimens). Refer to Appendix for abbreviations of cranial measurements.

	<i>Sigmodon toltecus</i> (Maya Mountains, Belize) n = 7	<i>Sigmodon hispidus</i> (Texas, USA) n = 14
Tail Length	93 – 114 (141)	93 – 116 (147)
Tail % Head and Body	71.3 – 88.2 (76.3)	54 – 81 (71)
Hind Foot	26 – 32 (29.6)	27 – 31 (30.3)
Ear (notch)	17 – 19 (18.1)	15 – 19 (17.2)
GSL	30.5 – 36 (32.4)	31.5 – 38.4 (33.7)
CBL	28.3 – 34.6 (30.6)	29.2 – 35.9 (31.6)
ZYW	16.6 – 20.8 (18.3)	17.5 – 20.6 (18.6)
LIW	4.6 – 5.4 (4.9)	4.4 – 5.3 (4.9)
NL	11.3 – 12.6 (12.1)	12 – 14.8 (13)
M1 – M3	5.4 – 5.8 (5.6)	5.6 – 6.4 (6.1)
Distal Nasal Projection	even with distal tip premaxilla	extends past distal tip of premaxilla
Brain case	slightly inflated	flattened
Dorsal pelage	sepia with rufous wash, black undercoat	light drab sepia, sepia undercoat
Belly	with rufous wash	pale gray and buff
Eye ring	rufous	buff
Rump spines	9 – 14 (12)	15 – 25 (20)

Remarks.—Formerly included in the species *Sigmodon hispidus* (Wilson and Reeder 2005), we follow the phylogenetic relationships proposed by Peppers and Bradley (2000) and Peppers et al. (2002) and confirmed by Henson and Bradley (2009). We captured all of our animals in edge and disturbed habitats, grass being a common habitat element for all captures. We did not capture this species in closed forest or second growth habitats.

***Nyctomys sumichrasti* (Saussure 1860)**
Sumichrast’s Vesper Rat

Specimens examined.—Two individuals (WFB 4270 and 4272) were captured and kept as voucher specimens. WFB 4270 was an adult female with placental scars. WFB 4272 was a subadult male. Both

of our captures were in traps set in low trees in semi-evergreen forest with intact overstory.

***Ototylomys phyllotis* (Merriam 1901)**
Big-eared Climbing Rat

Specimens examined.—Thirty-three animals were captured of which twenty-three individuals were kept as voucher specimens (Appendix). Of those collected, 13 were males and 10 were females. The captures were equally represented by adults and subadults. All adults were in reproductive condition as determined by scrotal testes (males) and with enlarged nipples and evidence of lactation and/or placental scars (females). *Ototylomys* were captured equally on the forest floor and in traps set on trees and lianas above the ground (up to 2 m above the forest floor). They were most abundant in second

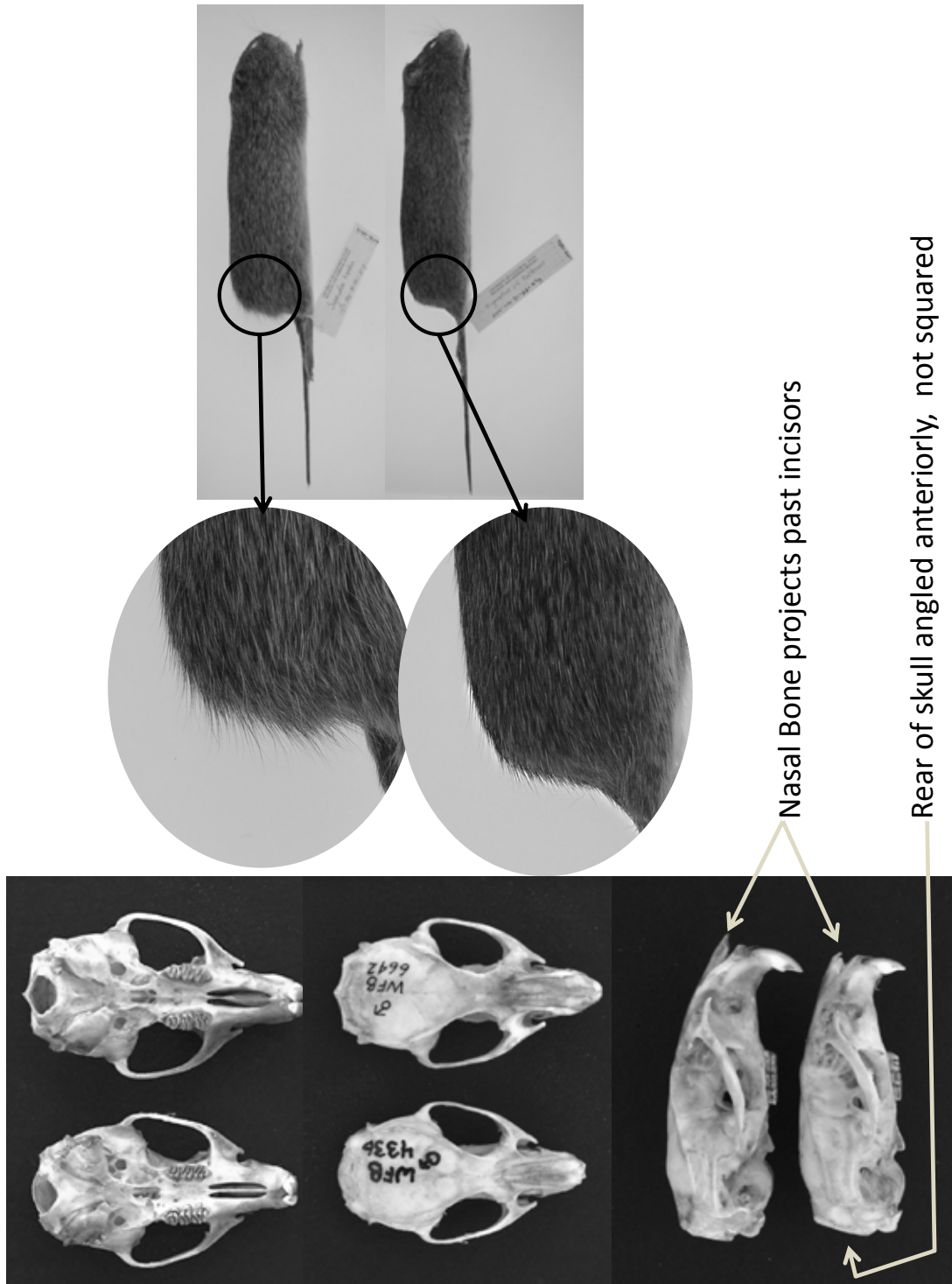


Figure 3. Specimens of *Sigmodon* from Texas (WFB 6642) and Belize (WFB 4336) showing pelage and cranial differences. Dorsal view of skulls: left is *S. toltecus* (WFB 4336), right is *S. hispidus* (WFB 6642). Lateral skull view: upper is *S. hispidus* (WFB 6642), lower is *S. toltecus* (WFB 4336), also note smaller tooth row in this image. Study skin lateral view and close-up of rump hairs: upper is *S. hispidus* (WFB 6642), lower is *S. toltecus* (WFB 4336).

growth forest, with some breaks in canopy cover. This species was second to *Heteromys* in abundance.

***Tylomys nudicaudatus* (Peters 1868)**
Peter's Climbing Rat

Specimens examined.—Three individuals were captured, of which two (WFB 4237 and 4290) were kept as voucher specimens. Both were subadult males with abdominal testes. The third animal was represented by a tail only (which is characteristically white tipped). The tail was sheared off by a museum special. All three were captured by snap traps set approximately two meters above the ground on lianas paralleling tree trunks.

ORDER CARNIVORA

Family Felidae

***Leopardus pardalis* (Linnaeus 1758)**

Ocelot

Remarks.—One adult male was captured in a large Tomahawk trap and released without measurements. The ocelot completely filled the trap. Despite being cramped into such a small place, it was quite nimble inside the trap and was formidable to remove. Without the availability of tranquilizing drugs, we released the cat without taking measurements or assessing its reproductive condition.

DISCUSSION

At our study site we found relative abundance dominated by two species, *Heteromys desmarestianus* and *Ototylomys phyllotis*; they accounted for 56% of total captures. This species pair, or congeners from lower altitudes, account for the highest capture rates across numerous studies in Central America (Disney 1968; Rabinowitz and Nottingham 1989; Caro et al. 2001a, b; Bersot 2003; Klinger 2006). Short-term inventories of small mammals in Central America have characteristically shown that in tropical forest habitats, total number of captures is often dominated by two species (Fleming 1975; Rabinowitz and Nottingham 1989; Bersot 2003). Biogeographic affinities as documented by the dominance of two typical Central American rainforest species, coupled with other small mammals (*Handleyomys*, *Tylomys*, *Nyctomys*) and observations of *Dasyprocta punctata* and *Mazama temama*, indicates that the mammalian affinities of the Maya Mountains lay nested within Central American faunal group. The only Yucatan “endemic” found in our study site, *Cryptotis mayensis*, may not be endemic to the Yucatan, as our record infers a more widespread geographic and ecological distribution than previously thought.

Caro et al. (2001a) report on previous grid-trapping efforts from the same study site. Using research station records, visual reports and trapping results, they documented 42 species of mammals from the region. They did not take voucher specimens to

confirm identification of small mammals. Our efforts add an additional eleven species to the Chiquibul Forest Reserve checklist, five non-volant: *Cryptotis mayensis*, *Oligoryzomys fulvescens*, *Handleyomys rostratus*, *Sigmodon toltecus*, *Nyctomys sumicrasti*, and six volant: *Carollia sowelli*, *Sturnira lilium*, *Artibeus jamaicensis*, *Dermanura toltecus*, *D. watsoni*, *Centurio senex*.

We believe that two species from previous efforts have been erroneously reported from the Chiquibul. Caro et al. (2001b) document two species of *Heteromys* from the Chiquibul Forest Reserve, *H. desmarestianus* and *H. gaumeri*. Our trapping efforts did not yield any specimens of the latter. In Belize, *H. gaumeri* is relatively common at Shipstern Natural Reserve (200 km to the north in Corozal District) (Bersot 2003). It is likely that in Belize, *H. desmarestianus* replaces *H. gaumeri* in the south and at higher elevations. It is unlikely that these species occur sympatrically in the Chiquibul Forest Reserve; confirmation through vouchers should be obtained in order to confirm the presence of *H. gaumeri* in Chiquibul.

We recorded two species of *Handleyomys* from the Chiquibul (*H. alfaroi* and *H. rostratus*). The former is a rodent of primary forest, the latter of forest edge and clearings. Caro et al. (2001a) also reported two species with similar ecological distribution, *H. alfaroi* from primary forests and *Oryzomys couesi* from forest edge. It

is likely that the latter represents a misidentification and since no vouchers were secured, we cannot confirm the presences of *O. couesi* reported for the Chiquibul. The status and distribution of *O. couesi* in Belize is poorly understood. It was not captured during surveys in the Shipstern Nature Reserve (Bersot 2003). *H. rostratus* was the second most common rodent found in the nearby Bladen Reserve (Klinger 2006) although it was not recorded by Caro et al. (2001a); we documented the species at Las Cuevas Field Station.

Previous surveys in the area report a very low trap success using grids as the primary trapping method (Caro et al. 2001a; Kelly and Caro 2003). We employed node trapping on transects and achieved better results. Using grids, Caro et al. (2001a) captured eight species of non-volant mammals with an average of 0.7 animals/100 trap nights (total 3,659 trap-nights). Using nodes, we captured 15 species of non-volant mammals with an average of 4.2 animals/100 trap nights (total 3,686 trap-nights). By coincidence our trapping efforts were nearly identical. Although we used a more diverse array of traps (ranging from large tomahawks to small museum specials), we believe that the increase in trap success is based upon placing transects and nodes in optimal forest sites where clear animal sign was noted. We recommend this method when rapid

diversity sampling is the primary goal. Our trap success is very similar to other transect-based surveys in Belize where, in the adjacent Cockscomb Basin Nature Reserve, Rabinowitz and Nottingham (1989) recorded trapping success of 5.23%, and in the Shipstern Nature Reserve Bersot (2003) documented a 3.5% overall trap success.

Our minor sampling of bats has confirmed several species from the Chiquibul Forest Reserve. Nonetheless, we believe our sampling of bats underestimates the diversity present in this reserve, and vespertilionids remain poorly documented; more work is needed.

Accurate biological inventories are central to establishing species baselines and are always important in areas where little is known about the resident fauna and flora. Recently, inventories have been given added impetus because so much of the world is now affected by human activities and inventories from relatively pristine areas provide a yardstick against which ecological change can be measured. This is especially pertinent in subtropical Central American rainforest, a habitat that has been heavily degraded and altered, and in Chiquibul itself where a new hydroelectric dam has been built following an acrimonious debate between environmentalists and development groups.

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Addresses of authors:

ANDREW ENGILIS, JR.

*Museum of Wildlife and Fish Biology
Dept. of Wildlife, Fish, & Conservation Biology
University of California, Davis
One Shields Avenue
Davis, California USA 95616
aengilisjr@ucdavis.edu*

RONALD E. COLE

*Museum of Wildlife and Fish Biology
Dept. of Wildlife, Fish, & Conservation Biology
University of California, Davis
One Shields Avenue
Davis, California USA 95616
recole@ucdavis.edu*

TIM CARO

*Dept. of Wildlife, Fish, & Conservation Biology
University of California, Davis
One Shields Avenue
Davis, California USA 95616
tmcaro@ucdavis.edu*

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APPENDIX

Measurements (in mm) for all specimens collected in the Chiquibul Forest Reserve, Cayo District, Belize. Abbreviations for material: S+S=skin and skull; Alc=alcohol preserved; skull=skull only; skel=skeleton only; skin=skin only. Abbreviations for measurements: MN=Museum Number; H&B=Head and Body; HF=Hind Foot; CBL=Condylbasal; ZYW=Zygomatic width; LIW=Least Interorbital Width; NL=Nasal Length; M1-M2=Molar 1-Molar 2; M1-M3=Molar 1-Molar 3; MTR=molariform tooth row length, Premolar through Molar⁴ (or M³ *Cryptotis*).

***Didelphis virginiana* Kerr 1792, Virginia Opossum**

WFB#	Material	Sex	Age	H&B	Tail	HF	Ear	CBL	ZYW	LIW	NL	M1-M2	M1-M3	Wt (g)
4321	S+S	M	SubA	335	311	53	47	81.96	43.17	10.88	38.55	9.98	14.81	730

M⁴ not erupted.

***Didelphis marsupialis* Linnaeus 1758, Common Opossum**

WFB#	Material	Sex	Age	H&B	Tail	Foot	Ear	CBL	ZYW	LIW	NL	M1-M2	M1-M3	Wt (g)
4313	S+S	M	SubA	329	299	50	46	79.87	42.35	11.28	23.94	9.1	13.91	685
4292	S+S	M	SubA	313	341	46	51	79.65	37.4	11.27	37.31	9.95	14.61	550

M⁴ not erupted on either specimen.

***Marmosa mexicana* Merriam 1897, Mexican Mouse Opossum**

WFB#	Material	Sex	Age	H&B	Tail	HF	Ear	CBL	ZYW	LIW	NL	M1-M2	M1-M3	MTR	Wt (g)
4269	S+S	M	SubA	93	144	16	18	27.64	15.54	5.21	12.26	3.62	5.63	M ⁴ erupt	19.5
4289	Alc	M	SubA	85	.	16	15	.	.	.	.	.	.	.	13.0
4301	S+S	F	SubA	77	123	13	16	25.12	14.25	5.01	11.5	3.3	5.1	M ⁴ erupt	13.0
4302	S+S	M	SubA	90	130	15	17	26.54	15.04	4.94	10.47	3.88	5.63	M ⁴ erupt	15.5
4305	S+S	M	Adult	174	211	22	22	38.68	22.15	6.93	18.94	3.84	5.55	10.37	129.0
4317	S+S	M	SubA	92	143	18	15	27.96	15.74	5.49	12.15	3.75	5.81	M ⁴ erupt	19.0
4319	S+S	M	SubA	100	134	15	18	28.72	16.65	5.46	12.11	3.81	5.59	8.5	25.5
4323	S+S	M	SubA	88	121	17	16	26.25	.	5.2	.	.	.	M ⁴ erupt	17.5
4233	S+S	M	Adult	178	204	23	26	40.01	23.38	6.37	18.28	3.57	5.6	10.5	140.0

Specimen 4289 in collection at Las Cuevas Field Station.

***Philander opossum* (Linnaeus 1758), Gray Four-eyed Opossum**

WFB#	Material	Sex	Age	H&B	Tail	HF	Ear	CBL	ZYW	LIW	NL	M1-M2	M1-M3	MTR	Wt (g)
4306	S+S	M	SubA	221	256	35	31	57.12	28.62	7.98	29.06	7.03	10.33	.	226
4337	S+S	M	Adult	218	241	36	31	58.25	29	7.9	27.72	7.05	10.6	13.55	255

***Cryptotis mayensis* (Merriam 1901), Yucatan Small-eared Shrew**

WFB#	Material	Sex	Age	H&B	Tail	HF	Ear	GSL	CBL	CB	ZP	IO	MTR	PL	Wt (g)
4223	Skel	..	Adult	81	29	12	0	20.76	19.69	8.98	2.4	4.6	5.1	8.7	6
4234	S+S	F	Adult	63	31	12	0	.	.	.	.	.	.	.	7
4243	S+S	M	Adult	71	29	11	0	20.89	19.58	9.51	2.35	4.57	5.3	8.7	7.5
4271	S+S	.	Adult	68	31	12	0	20.79	20.16	9.3	2.25	4.59	5.4	8.8	5.5
4274	Alc	M	Adult	71	29	11	0	.	.	.	.	.	.	.	7.5

Specimen 4274 in collection at Las Cuevas Field Station. Additional measurements: GS=greatest skull length; CB=cranial breadth; ZP=zygomatic plate; IO=interorbital breadth; PL=palatal length.

***Carollia sowelli* Baker, Solari and Hoffman 2002, Silky Short-tailed Bat**

WFB#	Material	Sex	Age	H&B	Tail	HF	Ear	Tragus	Forearm	GSL	CBL	LIW	C1-M3	Wt (g)
4247	S+S	M	Adult	60	-	13	17	5	39	.	.	.	.	14.5
4249	Skull	M	Adult	57	-	12	15	4	40.4	22.38	20.36	5.8	6.8	15
4254	Alc	M	Adult	58	-	11	17	8	40.6	.	.	.	.	.
4276	S+S	F	Adult	62	-	14	18	6	41	22.7	21.18	5.8	7.29	18.5
4309	Skel	M	Adult	75	14	12	18	7	40	22.6	20.8	5.6	6.7	14
4310	S+S	M	Adult	76	12	11	18	7	41	.	.	.	.	17
4329	S+S	M	Adult	64	7	12	18	7	39	22.37	21.33	5.46	7.41	19

Specimens 4254 and 4310 in collection at Las Cuevas Field Station. Additional measurements: C1-M3=tooth row length from canine to last molar.

***Sturnira lilium* (E. Geoffroy 1810), Little Yellow-shouldered Bat**

WFB#	Material	Sex	Age	H&B	Tail	HF	Ear	Tragus	Forearm	GSL	CBL	ZYW	LIW	C1-M3	Wt (g)
4250	S+S	M	Adult	54	0	11	13	3	37.1	20.83	20.22	12.63	5.26	6.38	13.5
4253	S+S	M	Adult	56	0	11	16	5	38.9	21.33	20.67	12.89	5.65	6.47	17
4245	Skin	F	Adult	60	0	12	15	4	37.5	.	.	.	.	.	14
4246	Skin	M	Adult	63	0	11	17	7	39	.	.	.	.	.	12
4297	Alc	M	Adult	55	0	11	18	7	41	.	.	.	.	.	13
4311	Skin	F	Adult	66	0	14	15	6	38	.	.	.	.	.	14

Additional measurement: C1-M3=tooth row length from canine to last molar.

***Artibeus jamaicensis* Leach 1821, Jamaican Fruit-eating Bat**

WFB#	Material	Sex	Age	H&B	Tail	HF	Ear	Tragus	Forearm	GSL	CBL	ZYW	LIW	C1-M3	Wt (g)
4278	Skel	F	Adult	86	0	16	22	7	61	.	.	.	.	.	43
4279	S+S	F	Adult	76	0	16	21	7	65	28.04	26.82	16.88	7.65	10.29	41
4280	S+S	F	Adult	88	0	16	21	7	63	28.24	26.77	16.48	7.4	9.8	48
4281	S+S	F	Adult	84	0	16	21	6	63	28.2	26.55	17.18	6.98	10.2	47
4282	Alc	M	Adult	87	0	15	22	7	61	.	.	.	.	.	35
4283	S+S	M	Adult	85	0	17	20	7	60	27.26	26.18	16.43	7.44	10	34
4284	S+S	F	Adult	85	0	18	21	7	61	27.9	26.57	16.44	7.48	10.03	38
4285	Skel	M	Adult	86	0	16	21	7	64	.	.	.	.	.	41
4286	S+S	M	Adult	93	0	17	23	7	64	28.56	27.09	17.48	6.81	10.29	49
4287	S+S	M	Adult	87	0	17	21	7	62	28.67	27.21	17	7.06	9.93	44
4312	S+S	M	Adult	81	0	15	19	6	61	.	.	.	.	.	35
4320	S+S	M	Adult	78	0	14	19	6	62	28.56	27.61	16.72	8.29	10.5	36
4328	S+S	F	Adult	84	0	16	21	7	58	28.67	27.32	17.11	7.37	10.39	41

Specimens 4282 and 4312 in collection at Las Cuevas Field Station. Additional measurement: C1-M3=tooth row length from canine to last molar.

***Dermanura tolteca* (Saussure 1860), Toltec Fruit-eating Bat**

WFB#	Material	Sex	Age	H&B	Tail	HF	Ear	Tragus	Forearm	GSL	CBL	ZYW	LIW	C1-M3	Wt (g)
4277	S+S	M	Adult	58	0	12	16	6	40	20.28	19.32	12.23	4.85	6.69	13.5

Additional measurement: C1-M3=tooth row length from canine to last molar.

***Dermanura watsoni* Thomas 1901, Thomas's Fruit-eating Bat**

WFB#	Material	Sex	Age	H&B	Tail	HF	Ear	Tragus	Forearm	GSL	CBL	ZYW	LIW	CI-M3	Wt (g)
4244	Skin	F	Adult	56	0	9	17	7	34.5	.	.	.	.	.	14.5
4275	S+S	M	Adult	53	0	10	15	6	41	20.51	19.4	12.03	5.02	6.45	13

Additional measurement: CI-M3=tooth row length from canine to last molar.

***Centurio senex* Gray 1842, Wrinkle-faced Bat**

WFB#	Material	Sex	Age	H&B	Tail	HF	Ear	Tragus	Forearm	GSL	CBL	ZYW	LIW	CI-M3	Wt (g)
4273	S+S	F	Adult	55	0	11	13	5	39	17.82	16.26	14.25	4.92	5.14	12

***Heteromys desmarestianus* Gray 1868, Desmarest's Spiny Pocket Mouse**

WFB#	Material	Sex	Age	H&B	Tail	HF	Ear	CBL	ZYW	LIW	NL	MI-M2	MI-M3	MI-M4	Wt (g)
4202	S+S	F	Adult	142	152	35	17	32.92	17.15	9.39	16.52	3.31	4.33	5.65	75
4212	S+S	M	Adult	115	131	36	17	30.14	16.52	8.76	16.01	3.33	4.22	5.18	60
4213	S+S	M	Adult	126	132	38	17	28.67	15.2	8.52	13.7	3.48	4.36	5.43	53
4232	S+S	M	Adult	118	149	36	18	31.01	16.29	8.92	14.02	3.36	4.39	5.34	90
4238	S+S	F	Adult	118	129	34	18	.	.	.	.	.	.	.	56
4251	S+S	M	Adult	41	[87]	35	17	.	.	.	.	.	.	.	62
4255	S+S	F	SubA	116	129	34	15	29.39	16.04	9.17	12.69	3.75	4.57	5.71	49.5
4256	S+S	F	Adult	[136]	[86]	33	17	31.74	16.66	9.57	15.42	3.59	4.64	5.94	92
4257	S+S	F	Adult	[154]	[94]	36	17	33.66	17.8	9.56	15.41	3.88	4.63	5.84	100
4258	S+S	F	Adult	136	180	35	18	33.55	18	9.99	15.98	3.53	4.79	5.85	99
4263	Skel	F	Adult	131	[119]	34	19	.	.	.	.	.	.	.	74
4264	Alc	M	SubA	127	147	35	16	.	.	.	.	.	.	.	59
4266	S+S	M	SubA	113	137	31	15	29.19	NT	8.06	11.87	3.49	4.43	5.24	44
4299	Skel	F	Adult	143	173	27	19	.	.	.	.	.	.	.	98
4303	S+S	F	Adult	155	176	36	20	32.85	17.83	9.96	15.93	3.47	4.23	5.82	94
4325	S+S	M	Adult	128	156	36	17	30.41	16.74	9.39	13.71	3.25	4.02	5.31	58
4339	S+S	F	SubA	128	171	36	18	30.59	16.59	9.16	15.2	3.34	4.25	5.25	65
4340	S+S	F	Adult	145	183	36	19	33.87	17.9	10.43	17.25	3.94	4.91	6.11	91

Specimens 4238, 4251, 4299 in collection at Las Cuevas Field Station.

Oligoryzomys fulvescens (Saussure 1860), Fulvous Collilargo

WFB#	Material	Sex	Age	H&B	Tail	HF	Ear	CBL	ZYW	LIW	NL	M1-M2	M1-M3	Wt (g)
4230	S+S	M	Adult	60	91	20	12	18.64	NT	3.72	7.6	2.12	2.67	9.5

Handleyomys alfaroi (J.A. Allen 1891), Alfaro's Oryzomys

WFB#	Material	Sex	Age	H&B	Tail	HF	Ear	CBL	ZYW	LIW	NL	M1-M2	M1-M3	Wt (g)
4219	S+S	M	Adult	80	95	25	15	22.27	12.06	5.42	9.74	3.05	3.74	26
4231	S+S	M	Adult	87	94	24	15	22.77	12.29	5	9.9	3.13	3.86	21
4239	S+S	M	Adult	108	119	26	16	26.22	14.45	5.24	11.24	3.02	3.81	33
4240	S+S	M	Adult	105	116	25	16	26.13	14.05	5.29	11.4	3.01	3.62	33
4241	S+S	M	Adult	93	121	26	17	24.91	13.42	5.33	10.86	3.15	3.87	26
4252	S+S	F	SubA	83	89	25	14	21.43	11.45	4.68	8.88	2.85	3.55	14.5
4259	S+S	M	Adult	83	92	25	15	22.86	12.35	5.11	9.65	3.23	3.86	17
4293	S+S	M	Adult	93	107	24	15	24.35	13.27	4.99	10.71	3.08	3.82	27.5
4294	S+S	F	Adult	84	90	23	14	.	12.22	4.85	9.03	3.01	3.62	23
4300	S+S	M	SubA	67	75	23	14	20.52	11.54	5.1	8.58	3.1	M ³ erupt.	11.5
4322	S+S	F	Adult	105	118	24	14	24.56	13.82	5.03	10.71	2.79	3.52	41
4332	S+S	M	Adult	104	124	26	18	25.38	13.89	5.02	11.82	3.02	3.8	38
4334	Alc	F	Adult	84	90	24	17	.	.	.	.	.	.	19.5
4335	S+S	F	Adult	83	86	23	18	.	12.13	5.16	9.33	2.95	3.71	19.5

Specimen 4334 in collection at Las Cuevas Field Station.

Handleyomys rostratus Merriam 1901, Long-nosed Oryzomys

WFB#	Material	Sex	Age	H&B	Tail	HF	Ear	CBL	ZYW	LIW	NL	M1-M2	M1-M3	Wt (g)
4210	S+S	F	Adult	125	131	29	16	28.57	15.08	4.88	12.32	3.59	4.6	49
4214	S+S	M	Adult	128	131	31	15	28.81	16.27	4.46	13.07	3.51	4.65	55
4236	S+S	F	Adult	125	119	27	18	27.69	14.55	5.28	12.99	.	.	48
4330	S+S	M	Adult	122	142	30	20	27.93	16.17	4.82	13.29	3.01	3.93	53
4333	S+S	M	Adult	112	116	27	18	27.54	15.13	5.2	13	2.93	3.77	42.5

Sigmodon toltecus (Saussure 1860), Toltec Cotton Rat

WFB#	Material	Sex	Age	H&B	Tail	HF	Ear	GSL	CBL	ZYW	LIW	NL	MI-M2	MI-M3	Wt (g)
4224	S+S	F	Adult	126	111	30	17	31.3	29.8	17.7	5	12	3.7	5.5	81
4225	S+S	F	Adult	126	[25]	29	18	30.5	28.7	17.1	4.8	11.3	3.9	5.8	68
4226	S+S	F	SubA	99	80	27	16	.	26.3	14.8	4.5	9.9	4.1	M ³ erupt.	36
4227	Skel	F	Adult	124	112	31	18	.	23.3	13.7	4.7	8.6	4	M ³ erupt.	111
4314	S+S	M	SubA	151	64	23	14	.	23.1	13.9	4.9	7.8	4	M ³ erupt.	18.5
4315	S+S	F	SubA	151	65	23	13	36	34.6	20.8	5.4	12.6	3.8	5.7	18.5
4316	S+S	F	Adult	171	122	31	19	32.5	30.2	18.4	4.8	12.4	3.7	5.5	142
4324	S+S	F	Adult	134	105	30	18	30.9	28.3	16.6	4.6	11.9	3.6	5.4	79
4326	S+S	F	Adult	130	93	27	17	32.3	30.4	18.4	4.9	12.8	3.7	5.6	59
4331	S+S	F	Adult	152	101	29	19	33.1	32.5	18.9	4.8	12	3.7	5.5	79
4336	S+S	M	Adult	150	114	31	19	32.53	19.1	5.03	5.03	11.4	4.16	5.79	97

Nyctomys sumichrasti (Saussure 1860), Sumichrast's Vesper Rat

WFB#	Material	Sex	Age	H&B	Tail	HF	Ear	CBL	ZYW	LIW	NL	MI-M2	MI-M3	Wt (g)
4270	S+S	F	Adult	132	[113]	29	17	31.65	19.58	6.29	10.61	3.49	4.49	67
4272	S+S	M	SubA	73	101	22	16	25.03	14.31	5.72	7.73	3.87	M ³ erupt.	21

Otodylomys phyllotis Merriam 1901, Big-eared Climbing Rat

WFB#	Material	Sex	Age	H&B	Tail	HF	Ear	CBL	ZYW	LIW	NL	MI-M2	MI-M3	Wt (g)
4201	S+S	F	Adult	165	147	27	27	37.75	19.97	6.06	15.26	4.75	6.63	110
4203	S+S	F	Adult	124	111	25	28	32.15	17.74	5.4	12.83	4.55	6.25	57
4205	S+S	F	SubA	110	108	26	20	30.24	16.46	5.98	11.52	4.68	6.34	40
4206	S+S	M	SubA	124	111	26	20	31.47	16.87	5.23	12.03	4.94	6.77	45
4207	S+S	M	Adult	152	120	28	25	36.83	20.34	6.2	14.64	4.87	6.76	96
4208	S+S	F	Adult	116	118	27	23	32.29	17.36	5.64	12.78	4.61	6.53	56
4209	S+S	M	Adult	144	141	28	23	34.41	18.2	5.55	13.19	4.7	6.61	60
4211	S+S	M	SubA	124	99	26	22	31.07	16.93	5.66	11.61	4.49	6.54	47
4215	S+S	F	SubA	120	115	25	20	.	.	.	.	.	.	47
4216	S+S	M	Adult	116	122	26	21	.	.	.	.	.	.	53
4217	S+S	M	Adult	126	110	27	22	32.91	17.9	5.8	12.86	4.84	6.66	55
4220	S+S	M	SubA	105	101	25	19	29.45	16.26	5.2	10.82	4.77	M ³ erupt.	31

Ototylomys phyllotis (cont.)

WFB#	Material	Sex	Age	H&B	Tail	HF	Ear	CBL	ZYW	LIW	NL	M1-M2	M1-M3	Wt (g)
4221	S+S	F	Adult	122	110	25	21	32.45	17.36	5.71	11.33	4.64	6.91	50
4222	S+S	F	Adult	113	138	27	27	32.28	17.97	5.44	13.19	4.43	6.3	51
4228	S+S	F	SubA	112	94	24	19	29.99	16.83	5.3	10.85	4.33	6.39	38
4229	S+S	F	SubA	114	103	26	19	30.68	16.57	5.9	10.61	4.73	M ³ erupt.	41
4242	S+S	M	Adult	130	110	27	16	.	.	.	.	.	.	51
4288	Alc	M	Adult	134	[122]	24	21	.	.	.	.	.	.	55
4291	S+S	F	Adult	155	164	26	24	36.18	18.99	5.65	13.54	4.65	6.3	83
4304	S+S	M	Adult	155	155	26	25	36.89	19.25	6.11	14.25	4.69	6.61	89.5
4318	S+S	M	SubA	120	112	25	20	30.82	17.23	5.57	11.97	4.77	6.65	35
4327	S+S	M	Adult	143	131	28	23	34.7	17.83	6.86	13.23	4.95	7.32	65
4338	Alc	M	Adult	110	87	23	19	.	.	.	.	.	.	65

Specimens 4216, 4242, 4288, 4338 in collection at Las Cuevas Field Station.

Tylomys nudicaudatus (Peters 1868), Peter's Climbing Rat

WFB#	Material	Sex	Age	H&B	Tail	HF	Ear	CBL	ZYW	LIW	NL	M1-M2	M1-M3	Wt (g)
4237	S+S	M	SubA	111	111	30	20	32.46	17.39	7.34	11.24	5.99	M ³ erupt.	42
4290	S+S	M	SubA	133	127	30	21	33.18	18.05	7.86	11.36	5.94	M ³ erupt.	59

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