

Bats of the Blancaneaux Enclave

May 6, 2010

Bruce W. Miller, Ph.D.
Carolyn M. Miller, MSc.
Gallon Jug, Belize

Introduction

Bats are critical contributors to mammalian biodiversity, particularly in the neotropics. The sheer number of individuals and the myriad of food habits represented further support the significant contribution by this group to neotropical ecosystems. Bats comprise more than 50% of the terrestrial mammal fauna in the neotropics. The ecological services provided by bats are critical. These services range from being primary pollinators and seed dispersers to key insect predators. If we lose the bats we may lose much of the intact tropical vegetation and the lungs of the planet.

In addition to many bat species being threatened or endangered throughout the region and within Belize (Miller 2009) they have enormous potential as bioindicators. Insectivorous bats occupy high trophic levels, and are sensitive to accumulations of pesticides and other toxins (Jones et al. 2009). Changes in their abundance may reflect changes in populations of arthropod prey species. Bat populations are affected by a wide range of stressors that affect many other taxa. In particular, changes in bat numbers or activity can be related to climate change, deterioration of water quality, agricultural intensification, loss of and fragmentation of forests (Jones et al. 2009).

The historical distribution of bats within Belize has been based on the work of McCarthy in the (McCarthy 1982, 1976, 1980, n.d., 1987, 1998; McCarthy and Blake 1987). In the early 1990s we began including bats in country wide surveys (Miller 2003a, 2003b, 1998, 2003c, 2009; Miller and Miller 1992b, 1998a, 2003, 1999; Miller and Villa 1999; Miller and Miller 1998b; O'Farrell and Miller 1997) including the first mapping of species distributions throughout Belize (Miller 2003b) and a risk assessment (Miller 2009).

Bat surveys within the pine ridge habitats have been limited. In 1993 bat netting was included in general biodiversity surveys (Miller and Miller 1992a, 1992c) on the Hidden Valley property (Clark 1993). This predated the availability of acoustic sampling equipment or the availability of harp traps, therefore was limited mainly to the species of the Phyllostomidae. Once we acquired acoustic recording equipment, preliminary recording was conducted in the Baldy Beacon area, Hidden Valley area and along Little Vaqueros Creek at the Pine ridge Lodge in 1996. These were however limited to a few hours at the Baldy Beacon area and single nights at the other two locations.

With the limited exceptions noted above, the pine forests of the Mountain Pine Ridge Forest Reserve and associated narrow riparian and hardwood corridors are the least known areas for bats in Belize. This is due to the majority of sampling throughout the country that has focused on the hardwood forests and riverine areas.

When the possibility arose to survey the habitats and cave sites on the Blancaneaux Lodge property and surrounding area, this was a great opportunity to begin filling in some of the distribution knowledge gaps and habitat associations for bats. For the duration of the survey we worked alongside Roni Martinez, Environmental Officer at Blancaneaux Lodge. He suggested many of the survey sites and guided us to these. During the survey period he was trained in harp trapping, mist-netting and how to set up and operate the acoustic monitoring stations.

Methods

Our surveys focused on three main areas (Figure 1) and included harp trapping, one high net set and varied acoustic survey methods.

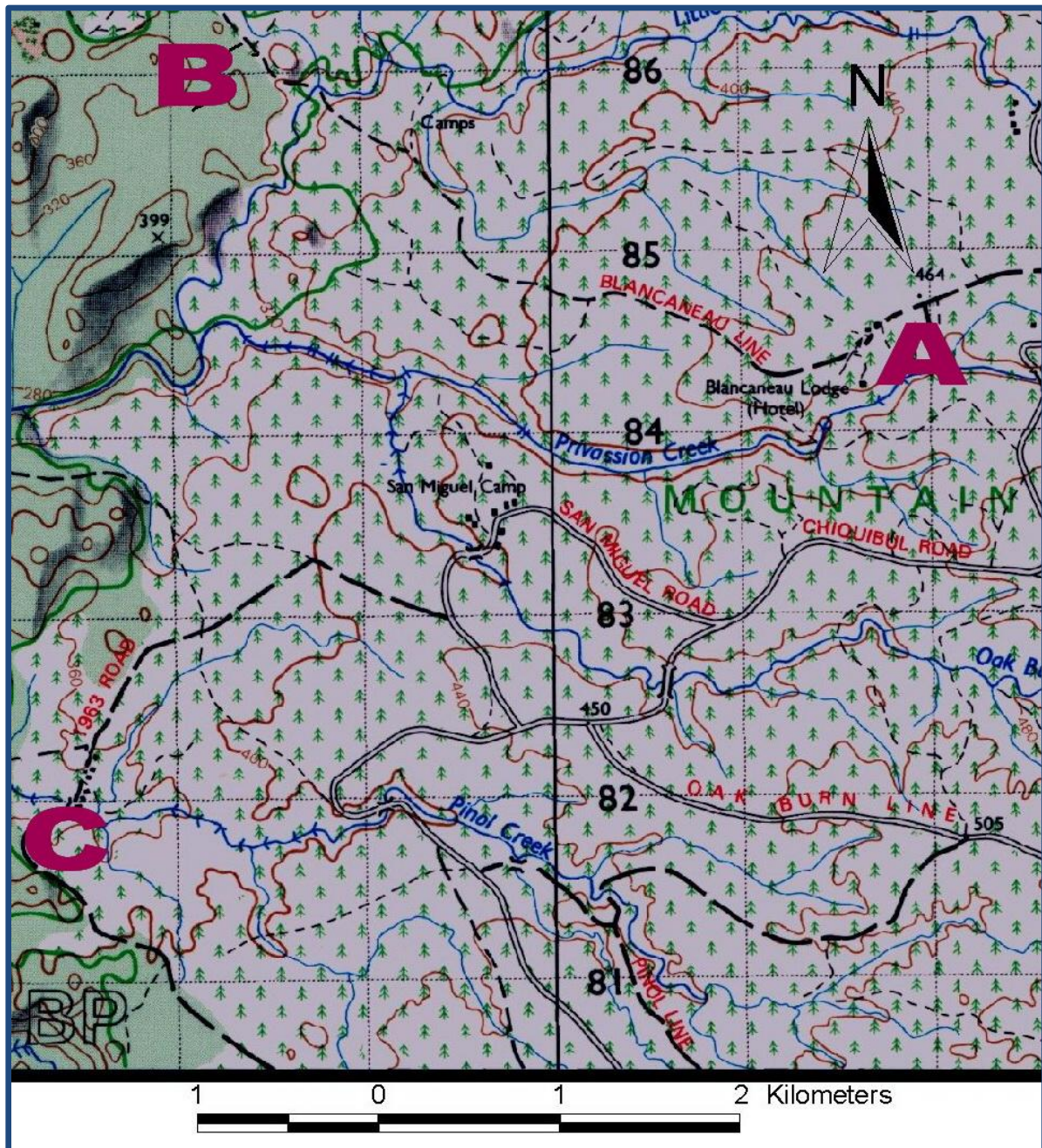


Figure 1. Survey areas: Blancaneaux Lodge and the immediately surrounding property (A), Blancaneaux Cave area (B) and Howler Hill (C).

Surveys used three sampling methods that are necessary to characterize the bat fauna of an area. This included double-frame harp traps, mist-nets for capture of bats and acoustic surveys. Acoustic sampling included passive acoustic monitoring stations deployed along trails, at cave entrances and a number of locations on the lodge grounds. Active real-time acoustic surveys were also conducted at Howler Hill, Blancaneaux Cave area and at the Enchanted Cottage as well as a walking transect on the main lodge grounds.

Acoustic sampling used AnaBat™ detectors linked to AnaBat™ CF-ZCAIM which store recorded data on compact flash memory cards. Real time recording used the AnaBat™ SD1 storage detector linked either to a laptop or handheld computer. Passive monitoring stations were programmed to begin recording at sunset and cease recording at sunrise. Acoustic data was transferred to the laptop computer at the conclusion of each monitoring period. Bat calls were then identified by matching each species the unique echolocation call parameters or vocal signature to those archived in a master acoustic database.

Results

Thirty one species of bats representing four families were documented during this survey. Eighteen acoustic survey sites resulted in 3369 acoustic files being recorded. Seven trapping sites and 1 netting site resulted in 44 individual bats being captured and released (Table 1).

Table 1. Summary of bats documented in the Blancaneaux Lodge and surrounding area.

Method	Sites	Total Records	Families	Genera	Species
Acoustic	18	3369	4	12	21
Capture	7	44	3	10	15
Total			4	19	31

The first evening April 12 we spent approximately an hour conducting a walking transect survey with an AnaBat™ SD1 linked to a PDA and GPS to determine where and what species were present on the lodge grounds (Figure 2). This resulted in 159 distinct recordings with 7 identified species: Northern Ghost Bat (*Diclidurus albus*), Lesser Dog-like Bat (*Peropteryx macrotis*), Greater Dog-like Bat (*Peropteryx kappleri*), Davy's Naked-backed Bat (*Pteronotus*

davyi), Argentine brown bat (*Eptesicus furinalis*), Southern Yellow Bat (*Lasiurus ega*), Northern yellow bat (*Lasiurus intermedius*) and one unidentified mastiff bat.

This same evening an acoustic monitoring station was also deployed on the veranda in front of the lodge dining room and bar. The microphone was aimed at the building roof that was an assumed roost site. This station recorded from dusk until dawn and while there was no indication of bats exiting or re-entering a roost site, 7 species were recorded during the night. Three species, Wagner's mustached bat (*Pteronotus personatus*), Black mastiff bat (*Molossus rufus*) and Pallas's mastiff bat (*Molossus molossus*), were recorded in addition to many of the species recorded during the transect.

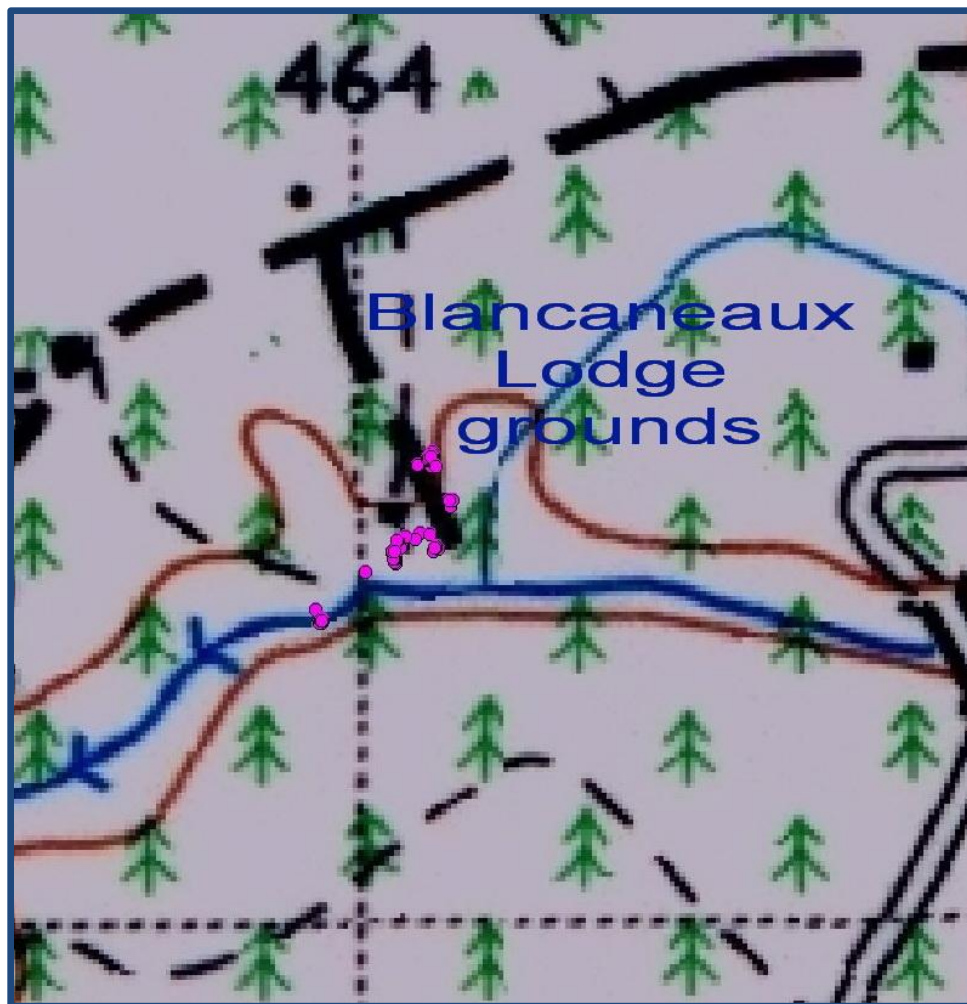


Figure 2. Pink dots indicate locations where bats were recorded April 12, 2010 during the walking transect on lodge grounds.

Table 2. Diversity of the bats documented in the Blancaneaux Lodge and surrounding area by survey method, A= acoustic, C= capture.

Family	Subfamily	Common name	Species	Method
Emballonuridae		northern ghost bat	<i>Diclidurus albus</i>	A
		greater dog-like bat	<i>Peropteryx kappleri</i>	A
		lesser dog-like bat	<i>Peropteryx macrotis</i>	A
		greater white-lined bat	<i>Saccopteryx bilineata</i>	A
Mormoopidae		Peter's ghost-faced bat	<i>Mormoops megalophylla</i>	A
		Davy's naked-backed bat	<i>Pteronotus davyi</i>	A/C
		common mustached bat	<i>Pteronotus parnellii</i>	A/C
		Wagner's mustached bat	<i>Pteronotus personatus</i>	A
Phyllostomidae	Stenodermatinae	intermediate fruit-eating bat	<i>Artibeus intermedius</i>	C
		Jamaican fruit-eating bat	<i>Artibeus jamaicensis</i>	C
		pygmy fruit-eating bat	<i>Artibeus phaeotis</i>	C
		Toltec fruit-eating bat	<i>Artibeus toltecus</i>	C
		Thomas's fruit-eating bat	<i>Artibeus watsoni</i>	C
	Caroliinae	Sowell's short-tailed bat	<i>Carollia sowelli</i>	C
	Glossophaginae	brown long-tongued bat	<i>Glossophaga commissarisi</i>	C
		Underwood's long-tongued bat	<i>Hylonycteris underwoodi</i>	C
	Phyllostominae	common sword-nosed bat	<i>Lonchorhina aurita</i>	C
		Cozumelan golden bat	<i>Mimon cozumelae</i>	C
Vespertilionidae		Van Gelder's bat	<i>Bauerus dubiaquercus</i>	A/C
		Argentine brown bat	<i>Eptesicus furinalis</i>	A
		red bat	<i>Lasiurus blossevillii</i>	A
		southern yellow bat	<i>Lasiurus ega</i>	A
		northern yellow bat	<i>Lasiurus intermedius</i>	A
		elegant myotis	<i>Myotis elegans</i>	A
		Yucatan yellow bat	<i>Rhogeessa aeneus</i>	A/C
		unid. vespertilionid	Fc at 40 kHz	A
		unid. vespertilionid	Fc at 45 kHz	A
	Molossidae		Pallas's mastiff bat	<i>Molossus molossus</i>
		black mastiff bat	<i>Molossus rufus</i>	A
		broad-eared free-tailed bat	<i>Nyctinomops laticaudatus</i>	A
		unid. molossid	<i>Eumops spp</i>	A

Discussion

A notable species documented was Van Gelder's bat (*Bauerus dubiaquercus*) captured and recorded on the trail near Ever's Cave (Figure 3). This is a species of conservation concern and is listed by I.U.C.N. as near threatened (Miller and Medina 2008) and these records contributed significantly to our understanding of this species' habitat requirements and distribution within Belize. Another species of conservation concern (Lim et al. 2008) we were hoping to find roosting in the caves was Thomas'sac-winged bat (*Balantiopteryx io*). The vocal signatures are well known and distinct; however, we had no recordings from any of the three cave sites (Blancaneaux cave, Swallow cave, Ever's cave) that we monitored acoustically. It was also noteworthy that, due to the proximity of the many small caves in the Blancaneaux Cave survey area, we captured a large number (12) of the common sword-nosed bat (*Lonchorhina aurita*), a cave roosting species (Figure 4)..



Figure 3. Van Gelder's bat (*Bauerus dubiaquercus*)



Figure 4. Common sword-nosed bat (*Lonchorhina aurita*).

The possibility of Roni Martinez deploying an acoustic monitoring station is quite exciting. This will certainly contribute new distribution and habitat association data for bats throughout the broader Mountain Pine Ridge area and the smaller hardwood forest islands where he is already working with camera traps and raptor point counts. We agreed to provide an AnaBat™ monitoring station for his use that can be linked to the conservation programs of Blancaneaux Lodge.

Further training in the procedures necessary for recording locations and data management will be necessary in the future if this effort moves forward (figure 5). Additional support and mentoring will be part of such a joint effort in the future. In his role as principle natural history guide at the lodge, we will also develop a PowerPoint presentation on bats that he can use to entertain and educate guests.



Figure 5. Roni Martinez with Bruce Miller learning how to set up a harp trap.

Bats are often maligned by the public, primarily out of ignorance. Their nocturnal habitats lend an additional aura of mystery to these important creatures. While the common vampire bat and a few of the fruit bats can become pests in agricultural settings, the majority of the species known to occur in Belize are rarely encountered directly by people. Most people, who have a chance to learn of the role they play in the ecosystem, tend to be more understanding and less likely to harm them.

Acknowledgments

We thank Anne Wood and Neil Rogers for the invitation to survey bats at Blancaneaux. We appreciated Roni Martinez' assistance and keen interest in the bat project. Our warm thanks to the management and staff for accommodating our special needs during the course of the survey.

Literature cited

- Clark, W. A. 1993. Contribution to the Mammals of the Mountain Pine Ridge; Hidden Valley Inn, Cayo District, Belize, Central America, Research Paper Report. Number: 1-41.
- Jones, G., D. S. Jacobs, T. H. Kunz, M. R. Willig, and P. A. Racey. 2009. Carpe noctem: the importance of bats as Bioindicators. *Endangered Species Research*. 8:93-115.
- Lim, B. K., B. W. Miller, F. Reid, J. Arroyo-Cabrales, A. D. Cuarón, and P. C. de Grammont. 2008. I.U.C.N status of *Balantiopteryx io*.
<http://www.iucnredlist.org/apps/redlist/details/2532/0/print>
- McCarthy, T. J. 1976. The Bats of Belize. *Belize Audubon Society Bulletin*. 8:3-4.
- McCarthy, T. J. 1980. Belize Mammalogy, Research Paper Report. Number: 1-27.
- McCarthy, T. J. 1982. Bat records from the Caribbean Lowlands of El Petén, Guatemala. *Journal of Mammalogy*. 63:683-685.
- McCarthy, T. J. 1987. Distributional records of bats from the Caribbean lowlands of Belize and adjacent Guatemala and Mexico Pp. 137-162 in *Fieldiana Zoology New Series* (B. D. Patterson and R. M. Timm, eds.). Field Museum of Natural History, Chicago.
- McCarthy, T. J. 1998. *Mammals of Belize: A Checklist* Belize Audubon Society, Belize City.
- McCarthy, T. J. n.d. *Belizean Mammalogy: A Mammal Fauna in Transition* Belize Audubon Society Newsletter.
- McCarthy, T. J., and M. Blake. 1987. Noteworthy bat records from the Maya Mountains Forest Reserve, Belize. *Mammalia*. 51:161-164.
- Miller, B. W. 1998. Rapid Appraisal of Bats at the El Pilar Archaeological Site, Cayo District, Belize A Technical Paper of the Wildlife Conservation Society, Belize Tropical Forest and Planning Project, Research Paper Report. Number: 1-7.

- Miller, B. W. 2003a. Columbia River Forest Reserve Little Quartz Ridge Expedition 17-23 February, 1997, Bat Survey The Columbia River Forest Reserve Little Quartz Ridge Expedition - A Biological Assessment. Wildlife Trust, Research Paper Report. Number: 78-83.
- Miller, B. W. 2003b. Community Ecology of the Non-phylostomid bats of Northwestern Belize, with a landscape level assessment of the bats of Belize Dissertation. University of Kent at Canterbury, Durrell Institute of Conservation and Ecology, Gallon Jug.
- Miller, B. W. 2003c. Results of a follow-up survey of the bats of the Mayflower-Bocawina National Park March 20-21, 2003, Research Paper Report. Number: 1-12.
- Miller, B. W. 2009. A Risk Assessment of the Bats of Belize, Phase I, in the context of the Selva Maya Region. Neotropical bat project and the Critical Ecosystems Partnership Fund, Research Paper Report. Number: 1-236.
- Miller, B. W., and A. Medina. 2008. I.U.C.N. status of *Bauerus dubiaquercus*.
<http://www.iucnredlist.org/apps/redlist/details/1789/0/print>
- Miller, B. W., and C. M. Miller. 1992a. Avian Studies at Hidden Valley December 5- 15 1992 Wildlife Conservation Society, Research Paper Report. Number: 1-11.
- Miller, B. W., and C. M. Miller. 1992b. Biodiversity Reconnaissance in the Chiquibul National Park, Las Cuevas and Puente Natural, 13 - 19 July, 1992. Technical Report of the Belize tropical Forest and Reserve Planning Project, Wildlife Conservation International., Research Paper Report. Number: 15.
- Miller, B. W., and C. M. Miller. 1992c. Biodiversity studies at Hidden Valley, Research Paper Report. Number.
- Miller, B. W., and C. M. Miller. 1998a. Las Sierritas, Toledo District, Belize Rapid Environmental Appraisal Wildlife Conservation Society Technical Report for Mott MacDonald Ltd., Research Paper Report. Number: 1-16.
- Miller, B. W., and C. M. Miller. 1999. Results of a survey of bats of the Cockscomb Basin Wildlife Sanctuary. WCS Technical Report Series: Tropical Forest and Reserve Planning Project, Belize, Research Paper Report. Number: 1-16.
- Miller, B. W., and C. M. Miller. 2003. Results of a preliminary survey of the bats of the Mayflower-Bocawina National Park December 10-11, 2002 WCS-Belize Technical Report. WCS, Research Paper Report. Number.

- Miller, B. W., and Y. Villa. 1999. Results of a survey of Bats of Jaguar Creek and the Blue Hole National Park ,November 17-20, 1999 Research Paper Report. Number: 11.
- Miller, C. M., and B. W. Miller. 1998b. Mollejon Dam, Cayo District, Belize: Rapid Environmental Evaluation for Belize Electric Co. Ltd. WCS, Research Paper Report. Number: 1-18.
- O'Farrell, M. J., and B. W. Miller. 1997. A New Examination of Echolocation Calls of Some Neotropical Bats (Emballonuridae and Mormoopidae). *Journal of Mammalogy*. 87:954-963.