

**Biodiversidad, Conservación y Manejo en la  
Región de la Reserva de la Biosfera  
Estación Biológica del Beni, Bolivia**

**Biodiversity, Conservation and Management in the  
Region of the Beni Biological Station  
Biosphere Reserve, Bolivia**

**Editado por**

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## Herpetofauna of the Beni Biological Station Biosphere Reserve, Amazonian Bolivia: Additional Information, and Current Knowledge in Context

George Middendorf and Robert Reynolds

**Resumen.** Colecciones herpetológicas previas realizadas en el Departamento del Beni, en Bolivia tropical, solamente sugerían altos niveles de su biodiversidad (Fugler 1986, 1988; de la Riva 1990a; Fugler y de la Riva 1990). Como resultado del trabajo de campo (total 48 días) efectuado en julio-agosto de 1988 y septiembre de 1987 (estaciones secas), y noviembre-diciembre de 1990 (estación lluviosa) se colectaron e identificaron 401 ejemplares de anfibios y reptiles en El Porvenir, donde se encuentra la oficina central de la Estación Biológica del Beni (EBB). Estas colecciones incluyen 33 especies de anfibios y 17 de reptiles que pertenecen a 29 géneros (14 géneros de anfibios y 15 de reptiles). Se considera que el inventario científicamente documentado de herpetofauna que ocurre en el Departamento del Beni ha sido incrementado con 6 especies de anfibios y 10 de reptiles. Algunos ejemplares que no pudieron ser definitivamente identificados (reflejando incertidumbre taxonómica y/o especies probablemente nuevas para la ciencia) incluyen 3 especies de anfibios (anuros) y 2 de reptiles (serpientes). La EBB posee la sabana más rica en especies de anuros conocida en Sudamérica.

**Abstract.** Previous collections in the Departamento del Beni in tropical Bolivia only hinted at high levels of herpetological biodiversity (Fugler 1986, 1988; de la Riva 1990a; Fugler and de la Riva 1990). Fieldwork (totaling 48 days) in July-August 1988 and September 1987 (dry seasons) and November-December 1990 (wet season) has resulted in collection and identification of 401 amphibian and reptilian specimens from the general area of the Beni Biological Station's (EBB) headquarters at El Porvenir. These collections represent 33 amphibian and

17 reptilian species in 29 genera (14 amphibian, 15 reptilian). The inventory of herpetofauna scientifically documented to occur in the Departamento del Beni is considered to have been increased by 6 amphibian and 10 reptilian species. Specimens that could not be definitively identified (reflecting taxonomic uncertainty and/or probably species new to science) include 3 amphibian species (anurans) and 2 reptilian species (snakes). The EBB harbors the richest savanna for anuran species known in South America.

### 1 Introduction

Until relatively recently, the amphibian and reptilian faunas of Bolivia were very poorly known (*cf.* Ergueta 1987), and they remain among the least known in South America. Fugler's annual studies (1983-1986, 1988) provided one of the earliest indications of the high diversity of the Bolivian herpetofauna, particularly of the Beni region (Miranda *et al.* 1991; Beck and Moraes 1997). A dramatic increase in available knowledge especially in the last decade has resulted from diverse investigations on the amphibian and reptilian faunas throughout Bolivia (*e.g.* Aparicio 1992; de la Riva 1992a, 1993b, 1995; de la Riva *et al.* 1994, 1996; Dirksen *et al.* 1995; Emmons 1991, 1993; Harvey 1997a,b, 1998; Harvey and Guéberlet, *in press*; Harvey *et al.* 1998; Ibsch and Böhme 1993; Köhler *et al.* 1995a,b; Köhler and Böhme 1996; Lavilla *et al.* 1997; Márquez *et al.* 1993; Pacheco 1990; Reichle 1997a-d; Reichle and Köhler 1996, 1998), including the discovery of a number of species new to science in a variety of locations (*e.g.* Cannatella 1980; Cannatella and Duellman 1982; de la Riva 1990b, 1992a,b, 1993a, 1994a,b;

Harvey 1994, 1996; Harvey and Gutberlet, in press; Harvey and Keck 1995; Harvey and Smith 1993, 1994; Lynch and McDiarmid 1987; Reynolds and Foster 1992). Ergueta (1991) and Baudoin and Pacheco (1991) summarized the information on the Andean herpetofauna in the Valle de La Paz. De la Riva (1990a) provided a preliminary amphibians list for Bolivia with accounts for 112 species, indicating that probably an additional 50 species yet remained to be recorded. Köhler *et al.* (1998) provided a general ecogeographical analysis covering 166 amphibian species in Bolivia (including unpublished taxonomic results); in his thesis Köhler (1995) reviewed the anurans of Bolivia in detail. Fugler (1989) provided a preliminary list of lizards and amphisbaenians for Bolivia, and Fugler and de la Riva (1990) provided a provisional list of the snakes in Bolivia. Ergueta and Pacheco (1990) provided a summary on the crocodylians in Bolivia, which Pacheco (1993) has thoroughly augmented for the Beni region. Dirksen (1995) in his thesis reviewed the reptiles of Bolivia in detail. Additionally, Ergueta and Harvey (1996) and Pacheco and Aparicio (1996) provided overviews and assessments of Bolivian amphibians and reptiles of conservation concern.

Given the rich diversity of herpetofaunal communities in other Western Amazonian lowland regions, for example northeastern Ecuador in the Santa Cecilia area (Duellman 1978, 1990), and Peru in the Iquitos region (Dixon and Soini 1986; Rodriguez and Duellman 1994; Ortiz 1997) and the Cocha Cashu and Pakitza areas of Río Manu (Rodriguez and Cadle 1990; Rodriguez 1994; Gentry 1997; Morales and McDiarmid 1996; Wilson and Sandoval 1996), the herpetofauna of the Beni region is expected to be diverse. Indeed, just in the area of Tumi Chucua (Provincia Vaca Díez, northern Dpto. Beni), Fugler (1988) reported 19 amphibians and 45 reptiles. For the entire Beni region, Fugler (1988) recorded 27 species of frogs, 15 species of lizards and 34 species of snakes, which combined with his report (Fugler 1986) of 2 turtle and 2 crocodylian species, brought the documented total in the Departamento (213,564 km<sup>2</sup>) to 27 amphibian and 53 reptilian species. Recent publications (Reichle 1997a-d; Reichle and Köhler 1996) reported an additional 27 amphibian species from the Beni Biological Station (EBB), bringing the total to 55 amphibian species, and Reichle

(1997a,d) stated that "with respect to anurans, the EBB has the species-richest savanna known in South America", with 27 species documented. Our fieldwork has further augmented the inventories.

In 1987 the Biological Diversity of Latin America Program (BIOLAT) began field courses that included instruction in methodologies associated with measuring and monitoring faunal and floral diversity. In this chapter we present the results of three consequent herpetofaunal collection efforts conducted in ten natural to anthropogenic habitat types in the southern part of the Beni Biosphere Reserve (BBR) between 1987 and 1990. The collections provide data not previously reported and have yielded additional, essential information about this region. However, quantitative estimates from the collection efforts have not been made because of limited sampling and differences in numbers and abilities of the various persons involved both within and among the 3 years.

## 2 Methods

### 2.1 Study area

The Reserva de la Biosfera Estación Biológica del Beni (Beni Biological Station Biosphere Reserve) is located (at approximately 14°40' S, 66°30' W and *ca.* 220 m in altitude above sea level) in the Departamento del Beni (Provincias Gral. José Ballivián and Yacuma), Bolivia, roughly a quarter of the way between the cities of San Borja to the west and Trinidad farther to the east (Miranda *et al.* 1991). Collection efforts in the reserve focused primarily on areas immediately surrounding the EBB buildings at El Porvenir, trails in the vicinity of the EBB, and areas adjacent to El Trapiche (the "Palm Camp") located nearby on the Río Curiraba (maps are in Brace *et al.* 2000; Miranda *et al.* 1991).

### 2.2 Habitat types

Collection efforts surveyed seven of the eight habitat types characterized by Flores (1988), and several others. No collections were made in low floodplain forest ("bosque bajo"), and unfortunately little collecting was done in the Laguna Normandía. A brief sketch follows

for each of the ten habitat types covered in this study (Tables 9.3 and 9.4), including the Spanish names used by Flores (1988). For thorough characterization of the vegetation of the BBR, see Moraes *et al.* (2000). Haase and Beck (1989) and Hanagarth (1993) provide much detail on the region's diverse savannas, and Comiskey *et al.* (1998, 2000) provide detailed analyses of several of the forest types located in the area of El Porvenir.

The savannas ("pampas o sabanas") surrounding the EBB buildings were dominated by grasses ranging to roughly 1 m in height. Interspersed within the savannas are forest islands ("islas de bosque") seemingly comprised of vegetation typically found in nearby high forests (but see Comiskey *et al.* 1998, 2000). Collections in the high forest ("bosque alto") were made in rain forests adjacent to the Rio Curiraba and surrounding the Palm Camp research site where the land is of slightly higher elevation than the savannas. Collections in seasonally inundated forest ("bosque inundable") were carried out beyond Palm Camp in an area at a lower elevation than the high forests. Although dry during the collection effort in 1988, the floors of these forests are covered by around 1 m of water (for several months) during the wet season and so were only briefly surveyed in 1990. Collections in the seasonally "dry" old riverbed meander ("cuneta" [or "cañada"]) adjacent to the EBB were undertaken during both wet and dry seasons. During the wet season, the water was deep and slow-moving; during the dry season, the water was shallow and appeared stagnant. Scattered throughout the savannas, particularly adjacent to the EBB, along roadsides and adjacent to the corral, were small seasonally water-filled depressions, gullies and ditches ("bajios y curiches") which serve as reproductive sites for many amphibian species. Because some of the species collected in the corral area and in the area of the EBB buildings ("edificios") were seen nowhere else, these disturbed localities are recognized in this study; they represent habitat types not included in Flores (1988).

### 2.3 Collection efforts

As part of the Biological Diversity of Latin America Program's (BIOLAT) field-course program (aspects of which are now in Smithsonian/MAB), three collections

were made in dry and wet seasons over a 4-year span: two drier (and cooler) periods of 23 July - 8 August 1988 (17 days) and 6-15 September 1987 (10 days), and one wet (and warmer) period of 14 November - 4 December 1990 (21 days). The area's very approximate mean annual temperature is 26°C, rainfall over 1900 mm and relative humidity 75%. There are short-term temperature extremes to about 6-10°C ("surazos") and nearly 40°C; in the driest period — June and July — the rainfall is around 40-60 mm monthly, which increases to around 80 mm in August and 100 mm or more monthly with the ending of the drier period in September or October; see climatic diagram for El Porvenir in Eissing *et al.* (2000). Additional data and information on the regional climate and weather, which vary considerably from year to year and are not yet extensively documented, are provided in Miranda *et al.* (1991) and Hanagarth (1993).

Diurnal and nocturnal visual encounter surveys (Crump and Scott 1994) were conducted by D. Wilson, G. Middendorf, L. Pacheco, S. Barrera, J. Aparicio and a number of other course participants. Specimens were captured by hand, noosing or slingshot, and then euthanized, individually tagged, and preserved in 10% formalin. The collections were taken to the Smithsonian Institution where specimens were identified to species whenever possible and transferred to 70% ethanol. The collections were then divided, with half of the specimens cataloged into the Division of Amphibians and Reptiles at the U.S. National Museum of Natural History (USNM), Smithsonian Institution, Washington, D.C., USA and half returned to the Colección Boliviana de Fauna (CBF), Museo Nacional de Historia Natural, La Paz, Bolivia. Data collected on all specimens includes date of capture, location, habitat type, climatic conditions, and time of day. In addition, for some specimens captured in 1990, recordings of calls were made and tissue samples collected and frozen in liquid nitrogen. The recordings and samples are housed at the National Museum of Natural History (USNM).

### 3 Results

The collection efforts in the Beni Biosphere Reserve resulted in capture and identification of 401 specimens:

Table 9.1 Amphibians of Beni Biological Station Biosphere Reserve, Bolivia: Collection of Wilson 1987, Middendorf 1988, 1990. Genera, species, number of specimens for each year's collection period.

Species/ Total		1987	1988	1990	Total
<b>Anura:</b>					
<b>Bufo</b>					
<i>Bufo</i>	<i>marinus</i>	—	1	1	2
<i>Bufo</i>	<i>mini</i>	7	4	6	17
<i>Bufo</i>	sp. ( <i>typhonius</i> group)	—	4	—	4
<b>Hylidae</b>					
<i>Hyla</i>	<i>fasciata</i>	2	—	—	2
<i>Hyla</i>	<i>geographica</i>	—	7	4	11
<i>Hyla</i>	<i>koechlini</i>	1	—	—	1
<i>Hyla</i>	<i>leali</i>	1	—	—	1
<i>Hyla</i>	<i>leucophyllata</i>	—	14	6	20
<i>Hyla</i>	<i>nana</i>	—	19	18	37
<i>Hyla</i>	<i>parviceps</i>	2	—	—	2
<i>Hyla</i>	<i>punctata</i>	—	—	7	7
<i>Hyla</i>	<i>raniceps</i>	—	20	9	29
<i>Phrynohyas</i>	<i>venulosa</i>	—	6	1	7
<i>Phyllomedusa</i>	<i>hypocondriasis</i>	—	—	11	11
<i>Scinax</i>	<i>fuscomarginata</i>	—	—	13	13
<i>Scinax</i>	<i>rubra</i>	—	5	8	13
<i>Scinax</i>	sp.	—	1	—	1
<b>Leptodactylidae</b>					
<i>Adenomera</i>	<i>hylaedactyla</i>	1	1	2	4
<i>Eleutherodactylus</i>	<i>fenestratus</i>	—	—	1	1
<i>Leptodactylus</i>	<i>bolivianus</i>	—	2	—	2
<i>Leptodactylus</i>	<i>chaquensis</i>	1	2	17	20
<i>Leptodactylus</i>	<i>fuscus</i>	2	3	33	38
<i>Leptodactylus</i>	<i>leptodactyloides</i>	9	26	1	36
<i>Leptodactylus</i>	<i>mystaceus</i>	—	—	1	1
<i>Leptodactylus</i>	<i>podicipinus</i>	3	7	7	17
<i>Leptodactylus</i>	sp. ( <i>gracilis</i> group)	—	1	—	1
<i>Lithodytes</i>	<i>lineatus</i>	—	—	1	1
<i>Physalaemus</i>	<i>albonotatus</i>	—	—	1	1
<i>Pseudopaludicola</i>	<i>boliviana</i>	—	16	—	16
<b>Microhylidae</b>					
<i>Elachistocleis</i>	<i>bicolor</i>	—	1	—	1
<i>Elachistocleis</i>	<i>ovalis</i>	—	—	1	1
<i>Hamptophryne</i>	<i>boliviana</i>	—	—	1	1
<b>Pseudidae</b>					
<i>Lysapsus</i>	<i>limellus</i>	—	17	17	34
<b>Genera</b>		4	9	13	14
<b>Species</b>		10	20	23	33
<b>Specimens</b>		29	157	167	353

353 amphibians (Table 9.1) and 48 reptiles (Table 9.2). The specimens represent 29 genera (14 amphibian, 15 reptilian) and 50 species (33 amphibian, 17 reptilian). Because a teaching component on herpetology was included only in the 1988 and 1990 field courses, most of the specimens were collected during those periods; only 33 of the specimens (*ca.* 8%) were collected in 1987 — but even so, 7 of these species were not found again.

### 3.1 Unidentified species

Of the 50 species reported in Tables 9.1 and 9.2, we believe that 5 species (3 anurans, 2 snakes) are undescribed. For each of these, reference specimens are as follows: *Bufo* sp. (*typhonius* group) (USNM 306560, CBF [USNM Field Tags 173790, 173791, 173835]); *Scinax* sp. (CBF [USNM Field Tag 173819]);

Table 9.2 Reptiles of Beni Biological Station Biosphere Reserve, Bolivia: Collection of Wilson 1987, Middendorf 1988, 1990. Genera, species, number of specimens for each year's collection period. Parenthetical symbol for a species (*Ameiva ameiva*) observed (Middendorf) but not collected again.

Species / Total		1987	1988	1990	Total
<b>Sauria: Iguanidae</b>					
<i>Anolis</i>	<i>punctatus</i>	—	1	—	1
<b>Teiidae</b>					
<i>Ameiva</i>	<i>ameiva</i>	—	17	(∞)	17
<i>Bachia</i>	<i>dorbignyi</i>	1	1	—	2
<i>Prionodactylus</i>	<i>eigenmanni</i>	—	—	1	1
<i>Ptychoglossus</i>	<i>brevifrontalis</i>	—	1	—	1
<b>Serpentes: Colubridae</b>					
<i>Atractus</i>	sp.	1	—	—	1
<i>Chironius</i>	<i>laurenti</i>	1	—	—	1
<i>Leptodeira</i>	<i>annulata</i>	—	1	2	3
<i>Liophis</i>	<i>almadensis</i>	—	2	—	2
<i>Liophis</i>	<i>lineatus</i>	1	—	—	1
<i>Liophis</i>	<i>reginae</i>	—	2	—	2
<i>Oxybelis</i>	<i>aeneus</i>	—	2	—	2
<i>Oxyrhopus</i>	sp.	—	2	—	2
<b>Elapidae</b>					
<i>Micrurus</i>	<i>surinamensis</i>	—	1	—	1
<b>Testudines: Chelidae</b>					
<i>Phrynops</i>	<i>geoffroanus</i>	—	1	—	1
<b>Testudinidae</b>					
<i>Geochelone</i>	<i>denticulata</i>	—	7	—	7
<b>Crocodylia: Alligatoridae</b>					
<i>Caiman</i>	<i>crocodilus</i>	—	3	—	3
<b>Genera</b>		4	12	3	15
<b>Species</b>		4	13	3	17
<b>Specimens</b>		4	41	3	48

*Leptodactylus* sp. (*gracilis* group) (CBF [USNM Field Tag 173849], to be deposited); *Atractus* sp. (USNM 283276); and *Ocyrhopus* sp. (USNM 306643, CBF [USNM Field Tag 173825]).

### 3.2 Herpetofaunal ratios

Approximately the same number of amphibian species were collected in 1988 and 1990, but the majority of the reptiles were collected in 1988 (Table 9.2). The decrease in the number of reptilian species encountered during the early part of the wet season (November-December 1990) probably reflects seasonal differences in amphibian and reptilian activity especially, and is unlikely to have been influenced by the focus of the field course (as there was a herpetological collection unit in both years) or by differences in time spent in the study area (17 vs. 21 days). During the dry season (July-August 1988), the ratio of amphibian to reptilian species documented was ca. 3:2 (20:13 spp.). The ratio during the wet season was dramatically higher, at ca. 15:2 (23:3 spp.). These facts are reinforced by the data on numbers of species documented per day (Tables 9.1 and 9.2). For amphibians, the average number of species collected per day of collection effort was fairly constant regardless of season (dry: 1.2, wet: 1.1); for reptiles, the average number of species encountered per day in the wet season dropped dramatically (dry: 0.8, wet: 0.1). The data in 1987 from late in the dry season (September) are not truly comparable, as herpetology was not in the field course and there was considerably less collection effort (during 10 days). The ratio of amphibians to reptiles collected was 5:2 (10:4 spp.) and the respective collection averages per day were 1.0 and 0.4. Still, this data are not contradictory and perhaps supportive of the pattern reported for 1988.

Present publications provide insufficient information to thoroughly document relative differences in seasonal activity in this heterogeneous region, for example to establish whether many reptiles reduce their activities during the wet season of the year. In southeastern Peru at Pakitza, Morales and McDiarmid (1996) noted that diversity and density of lizards seemed to be higher during the dry season. In the EBB some extended studies on

anurans have been undertaken (Reichle 1997a-d; Reichle and Köhler 1998). Further collection efforts in the EBB area need to take into account the time periods of our intensive collection efforts and those months for which our data are quite limited or lacking (in December through June, as well as August and October).

### 3.3 Ecology

Examination of our amphibian collections by locality reveals a number of apparent habitat generalists, observed in three to seven habitats: *Bufo mini*, *B. sp.*, *Hyla geographica*, *H. raniceps*, *Leptodactylus chaquensis*, *L. fuscus*, *L. podicipinus* and *Lysapsus limellus* (see Table 9.3). However, most of these species are probably not actual generalists, but instead affiliated with the same microhabitat in each habitat type. For instance, *Hyla geographica* was almost always associated with water, either found on vegetation overhanging water or in plants (bromeliads) containing water. *Bufo* sp. (*typhonius* group) was almost always associated with mud, e.g. on the mudbank of the Río Curiraba, in mud at the bottom of trash pits, and on muddy litter adjacent to trails. *Lysapsus limellus* was almost always located on floating vegetation, regardless of habitat type.

The less widely distributed amphibian species were often restricted to particular habitat types or localities (Table 9.3). *Hyla nana* was found adjacent to or on vegetation above the seasonally drier old riverbed, whereas *Hyla punctata* was only found calling from vegetation above that riverbed. *Leptodactylus bolivianus*, *L. leptodactyloides*, *L. mystaceus* and *L. sp.* (*gracilis* group) were only found in the area of the Río Curiraba and the inundated forest. Both *Lithodytes lineatus* and *Hamptophryne boliviana* were restricted to the high-forest habitat, but the *Lithodytes* was only observed calling from entrances of *Atta* (leaf-cutter ant) mounds. *Pseudopaludicola boliviana* was always found in muddy depressions, regardless of the surrounding vegetation. Whereas both *Scinax fuscomarginata* and *S. rubra* were most often noted in the area immediately around the EBB buildings, *S. fuscomarginata* was more closely affiliated with water and only observed near the old riverbed.



Table 9.3 Amphibians by habitat type where located; collection (x) of Wilson 1987, Middendorf 1988, 1990. Habitat types described by Flores (1988) and/or in text.

Habitat type:	LN	BC	Cu	EB	Co	PS	BIs	RC	BIn	BA
<b>Bufo</b>										
<i>Bufo marinus</i>				x						
<i>Bufo mini</i>			x	x	x	x		x	x	
<i>Bufo</i> sp.								x	x	x
<b>Hylidae</b>										
<i>Hyla fasciata</i>								x		
<i>Hyla geographica</i>		x	x				x			
<i>Hyla koechlini</i>								x		
<i>Hyla leali</i>								x		
<i>Hyla leucophyllata</i>		x	x							
<i>Hyla nana</i>		x	x							
<i>Hyla parviceps</i>								x		
<i>Hyla punctata</i>			x	x						
<i>Hyla raniceps</i>			x	x					x	
<i>Phrynohyas venulosa</i>			x	x						
<i>Phyllomedusa hypochondrialis</i>					x	x				
<i>Scinax fuscomarginata</i>			x		x					
<i>Scinax rubra</i>	x			x						
<i>Scinax</i> sp.							x			
<b>Leptodactylidae</b>										
<i>Adenomera hylaedactyla</i>					x			x		
<i>Eleuthrodactylus fenestratus</i>									x	
<i>Leptodactylus bolivianus</i>								x	x	
<i>Leptodactylus chaquensis</i>			x	x	x					
<i>Leptodactylus fuscus</i>			x	x	x	x	x		x	
<i>Leptodactylus leptodactyloides</i>								x	x	
<i>Leptodactylus mystaceus</i>									x	
<i>Leptodactylus podicipinus</i>			x	x	x	x	x	x	x	
<i>Leptodactylus</i> sp.								x		
<i>Lithodytes lineatus</i>										x
<i>Physalaemus albonotatus</i>			x							
<i>Pseudopaludicola boliviana</i>						x	x			
<b>Microhylidae</b>										
<i>Elachistocleis bicolor</i>										x
<i>Elachistocleis ovalis</i>						x				
<i>Hamptophryne boliviana</i>										x
<b>Pseudidae</b>										
<i>Lysapsus limellus</i>		x	x	x						
<b>Number of species</b>	<b>1</b>	<b>4</b>	<b>13</b>	<b>10</b>	<b>7</b>	<b>6</b>	<b>5</b>	<b>11</b>	<b>12</b>	<b>1</b>

LN = Laguna Normandia

Cu = Cmota

Co = Corrales

BIs = Islas de bosque

BIn = Bosque inundable

BC = Bajios &amp; curiches

EB = Edificios de la EBB

PS = Pampas o sabanas

RC = Río Curiraba

BA = Bosque alto

**Table 9.4** Reptiles by habitat type where located (except *Phrynops* from Chimane midden); collection (x) of Wilson 1987, Middendorf 1988, 1990. Habitat types described by Flores (1988) and/or in text.

Habitat type:	LN	BC	Cu	EB	Co	PS	BIs	RC	BIn	BA
<b>Iguanidae</b>										
<i>Anolis punctatus</i>										x
<b>Teiidae</b>										
<i>Ameiva ameiva</i>						x	x		x	x
<i>Bachia dorbignyi</i>								x	x	
<i>Prionodactylus eigenmanni</i>						x				
<i>Ptychoglossus brevifrontalis</i>									x	
<b>Colubridae</b>										
<i>Atractus</i> sp.								x		
<i>Chironius laurenti</i>								x		
<i>Leptodeira annulata</i>				x					x	
<i>Liophis almadensis</i>						x				
<i>Liophis lineatus</i>				x						
<i>Liophis reginae</i>				x					x	
<i>Oxybelis aeneus</i>							x			
<i>Oxyrhopus</i> sp.									x	
<b>Elapidae</b>										
<i>Micrurus surinamensis</i>									x	
<b>Chelidae</b>										
<i>Phrynops geoffroanus</i>										
<b>Testudinidae</b>										
<i>Geochelone denticulata</i>									x	
<b>Alligatoridae</b>										
<i>Caiman crocodilus</i>	x									
<b>Number of species</b>	1	0	0	3	0	3	2	3	8	2
LN = Laguna Normandía	Cu = Cuneta		Co = Corrales		BIs = Islas de bosque	BIn = Bosque inundable				
BC = Bajos & curiches	EB = Edificios de la EBB		PS = Pampas o sabanas		RC = Río Curiraba	BA = Bosque alto				

Although only collected in 1988, numerous individual *Ameiva ameiva* were seen in 1990. During all of the fieldwork, other reptile species were seen rarely. The reptiles constitute 34% of the species but just 12% of the specimens collected. It is difficult, therefore, to draw conclusions regarding their distributions and habitat specificity. However, 4 of the 5 lizard species, 4 of 9 snake species, and the 1 tortoise species were found in the areas of seasonally inundated and high forests (Table 9.4), suggesting the potential for many more reptile species to

be recorded from these habitat types, especially as only a small portion of the total collection effort was spent there. The habitat(s) of *Phrynops geoffroanus* could not be determined, as the presence of this aquatic turtle in the region was documented only by skeletal remains in a Chimane (Tsimane, T'simane) midden. Miranda *et al.* (1991) categorize this species as very rare throughout the BBR. Aquatic turtles of the Río Maniqui (farther north in the BBR) have been studied by Aramayo (1989) and Guayao (1997) with the goals to restore and manage

Table 9.5 Amphibia (amphibians) of Departamento del Beni, Bolivia (Fugler 1988; Reichle and Köhler 1996; Reichle 1997b-d; Middendorf and Reynolds 2000 [this chapter]); x = specimen reported, r = revised report (see footnotes).

Family	Genus	Species	Fugler	Reichle	M&R
Bufonidae	<i>Bufo</i>	<i>marinus</i>	x <sup>1</sup>	x <sup>1</sup>	x, r
	<i>Bufo</i>	<i>mini</i>	x <sup>2</sup>	x <sup>2</sup>	x, r
	<i>Bufo</i>	sp. A <sup>3</sup>	x <sup>4</sup>		x, r
	<i>Bufo</i>	sp. B		x <sup>5</sup>	
Dendrobatidae	<i>Colostethus</i>	<i>marchesianus</i>		x	
	<i>Epipedobates</i>	<i>pictus</i>	x <sup>6</sup>		r
Hylidae	<i>Hyla</i>	<i>acreana</i>		x	
	<i>Hyla</i>	<i>bifurca</i>		x	
	<i>Hyla</i>	<i>fasciata</i>	x	x	x
	<i>Hyla</i>	<i>geographica</i>		x	x
	<i>Hyla</i>	<i>koechlini</i>			x
	<i>Hyla</i>	<i>lanciformis</i>	x	x	
	<i>Hyla</i>	<i>leali</i>		x	x
	<i>Hyla</i>	<i>leucophyllata</i>	x	x	x
	<i>Hyla</i>	<i>minuta</i>	x		
	<i>Hyla</i>	<i>nana</i>	x	x	x
	<i>Hyla</i>	<i>parviceps</i>			x
	<i>Hyla</i>	<i>punctata</i>	x	x	x
	<i>Hyla</i>	<i>raniceps</i>	x	x	x
	<i>Hyla</i>	<i>riveroi</i>		x	
	<i>Hyla</i>	<i>tritaeniata</i>		x	
	<i>Osteocephalus</i>	<i>pearsoni</i>	x		
	<i>Osteocephalus</i>	<i>taurinus</i>	x	x	
	<i>Phrynohyas</i>	<i>venulosa</i>	x	x	x
	<i>Phyllomedusa</i>	<i>hypocondrialis</i>	x	x	x
	<i>Phyllomedusa</i>	<i>palliata</i>		x	
	<i>Phyllomedusa</i>	<i>cf. tarsiis</i>		x	
	<i>Scinax</i>	<i>chiquitanus</i>		x	
<i>Scinax</i>	<i>fuscmarginata</i>		x <sup>7</sup>	x, r	
<i>Scinax</i>	<i>fuscovarius</i>			x	
<i>Scinax</i>	<i>garbei</i>			x	
<i>Scinax</i>	<i>nasicus</i>			x	
<i>Scinax</i>	<i>rubra</i>	x	x <sup>8</sup>	x, r	
<i>Scinax</i>	sp.			x	
<i>Sphaenorhynchus</i>	<i>lacteus</i>	x <sup>9</sup>	x	r	
Leptodactylidae	<i>Adenomera</i>	<i>andreae</i>		x	
	<i>Adenomera</i>	<i>hylaedactyla</i>		x	x
	<i>Ceratophrys</i>	sp.		x	
	<i>Eleuthrodactylus</i>	<i>fenestratus</i>	x	x	x

Continued

Table 9.5 Continued.

Family	Genus	Species	Fugler	Reichle	M&R
	<i>Leptodactylus</i>	<i>bolivianus</i>	x	x	x
	<i>Leptodactylus</i>	<i>chaquensis</i>	x	x	x
	<i>Leptodactylus</i>	<i>elenae</i>	x		
	<i>Leptodactylus</i>	<i>fuscus</i>	x	x	x
	<i>Leptodactylus</i>	<i>leptodactyloides</i>		x	x
	<i>Leptodactylus</i>	<i>mystaceus</i>			x
	<i>Leptodactylus</i>	<i>petersii</i>	x <sup>10</sup>	x	r
	<i>Leptodactylus</i>	<i>podicipinus</i>	x	x	x
	<i>Leptodactylus</i>	<i>rhodomystax</i>		x	
	<i>Leptodactylus</i>	sp. <sup>11</sup>			x
	<i>Lithodytes</i>	<i>lineatus</i>		x	x
	<i>Physalaemus</i>	<i>albonotatus</i>			x
	<i>Physalaemus</i>	sp.		x <sup>12</sup>	
	<i>Pseudopaludicola</i>	<i>boliviana</i>		x	x
<b>Microhylidae</b>	<i>Chiasmocleis</i>	<i>ventrimaculata</i>		x	
	<i>Elachistocleis</i>	<i>bicolor</i>		x	x
	<i>Elachistocleis</i>	<i>ovalis</i>		x	x
	<i>Hamptophryne</i>	<i>boliviana</i>		x	x
<b>Pipidae</b>	<i>Pipa</i>	<i>pipa</i>	x	x	
<b>Pseudidae</b>	<i>Lysapsus</i>	<i>limellus</i>	x	x	x
	<i>Pseudis</i>	<i>paradoxa</i>		x	
<b>Ranidae</b>	<i>Rana</i>	<i>palmipes</i>	x		

<sup>1</sup> Reported as *Bufo paracnemis*.

<sup>2</sup> Reported as *Bufo granulatus*.

<sup>3</sup> *Bufo* sp. (*typhonius* group); <sup>4</sup> reported as *Bufo typhonius*.

<sup>5</sup> Reported as *Bufo margaritifera* complex.

<sup>6</sup> Reported as *Dendrobates pictus*.

<sup>7</sup> Reported as *Scinax fuscomarginatus*.

<sup>8</sup> Reported as *Scinax ruber*.

<sup>9</sup> Reported as *Sphaenorhynchus eurhostus* (as "*eurhostis*").

<sup>10</sup> Reported as *Leptodactylus wagneri*.

<sup>11</sup> *Leptodactylus* sp. (*gracilis* group).

<sup>12</sup> Reported as *Physalaemus* sp. (*cf. cuvieri*).

populations there and elsewhere that are heavily overutilized (for meat, eggs and oil). *Podocnemis unifilis* is categorized as of patchy distribution and endangered in the BBR (Miranda *et al.* 1991).

Laguna Normandia is notable in our survey for the presence of *Caiman crocodilus yacare* ("lagarto",

yacaré spectacled caiman), which also occurs elsewhere in the BBR (Ruiz 1988; Vaca 1992; Pacheco 1993; Godshalk 1994). Adults and juveniles of *Melanosuchus niger* ("caimán" or "caimán negro", black caiman) were (re)introduced to the lagoon in 1990 as part of a management program for the species (Pacheco *et al.* 1991; Ergueta and Sarmiento 1992; Pacheco 1993, 1995).

Table 9.6 Reptilia (reptiles) of Departamento del Beni, Bolivia (Fugler 1986, 1988; Middendorf and Reynolds 2000 [this chapter]); x = specimen reported, r = revised report (see footnotes), t = see text (specimen not reported).

Family	Genus	Species	Fugler	M&R	Other
<b>Crocodylia:</b>					
<b>Alligatoridae</b>	<i>Caiman</i>	<i>crocodilus</i>	x	x	
	<i>Melanosuchus</i>	<i>niger</i>			t <sup>1,2</sup>
	<i>Paleosuchus</i>	<i>palpebrosus</i>			t <sup>1,2</sup>
	<i>Paleosuchus</i>	<i>trigonatus</i>	x		
<b>Sauria:</b>					
<b>Gekkonidae</b>	<i>Gonatodes</i>	<i>hasemanni</i>	x		
	<i>Gonatodes</i>	<i>humeralis</i>	x		
	<i>Hemidactylus</i>	<i>mabouia</i>	x		
	<i>Thecadactylus</i>	<i>rapicauda</i>	x <sup>3</sup>	r	
<b>Iguanidae</b>	<i>Anolis</i>	<i>fuscoauratus</i>	x		
	<i>Anolis</i>	<i>punctatus</i>	x	x	
	<i>Iguana</i>	<i>iguana</i>	x		
	<i>Ophryoessoides</i>	<i>aculeatus</i>	x		
	<i>Plica</i>	<i>plica</i>	x		
	<i>Plica</i>	<i>umbra</i>	x		
<b>Scincidae</b>	<i>Polychrus</i>	<i>liogaster</i>	x		
	<i>Mabuya</i>	<i>bistriata</i>	x		
	<i>Mabuya</i>	<i>mabouia</i> <sup>4</sup>	x <sup>4</sup>	r <sup>4</sup>	
<b>Teiidae</b>	<i>Ameiva</i>	<i>ameiva</i>	x	x	
	<i>Bachia</i>	<i>dorbignyi</i>			x
	<i>Neusticurus</i>	<i>ecpleopus</i>	x		
	<i>Prionodactylus</i>	<i>eigenmanni</i>			x
	<i>Ptychoglossus</i>	<i>brevifrontalis</i>			x
	<i>Tupinambis</i>	<i>rufescens</i>			t <sup>2</sup>
	<i>Tupinambis</i>	<i>teguixin</i>	x		
<b>Amphisbaenia:</b>					
<b>Amphisbaenidae</b>	<i>Amphisbaena</i>	<i>alba</i>	x		
<b>Serpentes:</b>					
<b>Boidae</b>	<i>Boa</i>	<i>constrictor</i>	x		
	<i>Corallus</i>	<i>caninus</i>			t <sup>2</sup>
	<i>Corallus</i>	<i>hortulanus</i>	x <sup>5</sup>	r	
	<i>Epicrates</i>	<i>cenchria</i>	x		
	<i>Eunectes</i>	<i>murinus</i>	x		
	<b>Colubridae</b>	<i>Atractus</i>	<i>elaps</i>	x	
<i>Atractus</i>		<i>occipitoalbus</i>	x		
<i>Atractus</i>		<i>sp.</i>			x
<i>Chironius</i>		<i>exoletus</i>	x		
<i>Chironius</i>		<i>fuscus</i>	x		
<i>Chironius</i>		<i>laurenti</i>			x
<i>Clelia</i>		<i>clelia</i>	x		
<i>Dipsas</i>		<i>boettgeri</i>			t <sup>2</sup>

Continued

Table 9.6 Continued.

Family	Genus	Species	Fugler	M&R	Other
	<i>Dipsas</i>	<i>catesbyi</i>	X		
	<i>Dipsas</i>	<i>variegata</i>	X		
	<i>Drepanoides</i>	<i>anomalus</i>	X		
	<i>Drymoluber</i>	<i>dichrous</i>	X		
	<i>Erythrolamprus</i>	<i>aesculapii</i>	X		
	<i>Helicops</i>	<i>angulatus</i>			t <sup>2</sup>
	<i>Helicops</i>	<i>polylepis</i>	X		
	<i>Hydrodinastes</i>	<i>gigas</i>	X		
	<i>Imantodes</i>	<i>cenchoa</i>			t <sup>2</sup>
	<i>Leptodeira</i>	<i>annulata</i>	X	X	
	<i>Leptophis</i>	<i>ahaetulla</i>	X		
	<i>Liophis</i>	<i>almadensis</i>		X	
	<i>Liophis</i>	<i>cobella</i>	X		
	<i>Liophis</i>	<i>lineatus</i>		X	
	<i>Liophis</i>	<i>reginae</i>	X	X	
	<i>Mastigodryas</i>	<i>boddaerti</i>	X		
	<i>Oxybelis</i>	<i>aeneus</i>	X	X	
	<i>Oxybelis</i>	<i>argenteus</i>			t <sup>2</sup>
	<i>Oxyrhopus</i>	<i>melanogenys</i>	X		
	<i>Oxyrhopus</i>	sp.		X	
	<i>Pseudoboa</i>	<i>coronata</i>	X		
	<i>Pseudoeryx</i>	<i>plicatilis</i>	X		
	<i>Pseustes</i>	<i>poecilonotus</i>	X		
	<i>Psomophis</i>	<i>genimaculatus</i>	X <sup>6</sup>	I	
	<i>Spillotes</i>	<i>pullatus</i>	X		
	<i>Tantilla</i>	<i>melanocephala</i>	X		
	<i>Thamnodynastes</i>	<i>pallidus</i>	X		
	<i>Xenodon</i>	<i>rabdocephalus</i>	X		
<b>Elapidae</b>	<i>Micrurus</i>	<i>spixii</i>	X		
	<i>Micrurus</i>	<i>surinamensis</i>		X	
<b>Leptotyphlopidae</b>	<i>Leptotyphlops</i>	<i>melanotermus</i>	X		
<b>Typhlopidae</b>	<i>Typhlops</i>	<i>brongersmianus</i>	X		
	<i>Typhlops</i>	<i>reticulatus</i>	X		
<b>Viperidae</b>	<i>Bothriopsis</i>	<i>bilineata</i>			t <sup>2</sup>
	<i>Bothrops</i>	<i>atrox</i>	X		
	<i>Bothrops</i>	<i>neuwiedi</i>			t <sup>2</sup>
	<i>Bothrops</i>	<i>sanctaecrucis</i>			t <sup>2,7</sup>
	<i>Crotalus</i>	<i>durissus</i>			t <sup>2</sup>
	<i>Lachesis</i>	<i>muta</i>			t <sup>2</sup>
<b>Testudines:</b>					
<b>Chelidae</b>	<i>Phrynops</i>	<i>geoffroanus</i>	X	X	
	<i>Platemys</i>	<i>platycephala</i>	X		

Continued

Table 9.6 Continued.

Family	Genus	Species	Fugler	M&R	Other
Pelomedusidae	<i>Podocnemis</i>	<i>expansa</i>			t <sup>2</sup>
	<i>Podocnemis</i>	<i>unifilis</i>			t <sup>2</sup>
Testudinidae	<i>Geochelone</i>	<i>carbonaria</i>			t <sup>2</sup>
	<i>Geochelone</i>	<i>denticulata</i>		x	

<sup>1</sup>Ergueta and Pacheco (1990) and Pacheco (1993).

<sup>2</sup>Stated in Miranda *et al.* (1991).

<sup>3</sup>Reported as *Thecadactylus "rapicaudatus"*.

<sup>4</sup>Reported as *Mabuya mabouia*, which is not known near this region (*cf.* Ávila-Pires 1995); not included in species total.

<sup>5</sup>Reported as *Coralus enydris*.

<sup>6</sup>Reported as *Liophis joberti*.

<sup>7</sup>Likely – stated as *Bothrops alternatus*.

This Amazonian species, which King and Videz (1989) considered commercially extinct in Bolivia, is well dispersed through the BBR in low densities (which sometimes are locally rather high) (Pacheco 1997).

#### 4 Discussion

Our report of an additional 6 amphibian and 10 reptilian species collected (Tables 9.5 and 9.6) expands the numbers of species reported for the Beni by Fugler (1986, 1988) and Reichle (Reichle 1997a-d; Reichle and Köhler 1996). Coupled with the information provided by de la Riva (1990a), Köhler *et al.* (1998), Fugler (1989), Fugler and de la Riva (1990) and Ergueta and Pacheco (1990), our data are suggestive of high herpetofaunal diversity in the Beni region. As these 401 specimens represent field efforts over only a short period of time (48 days) and brief portions of the year (10 to 21 days, in parts of 5 months), and given that 10% of the taxa collected (5 of 50 spp.) could not be assigned to known species, additional collecting in this area will surely yield many more (including several new) species. Morales and McDiarmid (1996) emphasized the well-known problem that snakes are always under-represented in short-term tropical surveys — which is borne out by our recognition (in Table 9.6) of an additional 10 snake species among 15 reptiles probably occurring in this region, but for which we are aware of only secondary (unvouchered) reports (Miranda *et al.* 1991). The need for further museum and literature analyses as well as fieldwork are highlighted by Miranda *et al.* (1991) stating that the CDC-Bolivia (1990) indicated

in a *Diagnóstico* that 111 species of reptiles (and 26 spp. of amphibians) were known in the Departamento del Beni.

Although detailed comparison of the herpetofauna from this region to other surveyed and better documented Amazonian regions may be premature, some conjectures can be made. We might expect the actual herpetological diversity of Bolivian tropical lowland forest habitats to be lower than in similar forest habitats of Amazonian Peru, as the Bolivian forests are at the southern end of such tropical forest distribution and thus would be expected to be less diverse. However, this perspective may be offset by two factors. First, the overall habitat diversity in the Beni region is probably greater than in southern Amazonian Peru (*e.g.* Foster *et al.* 1994; Gentry and León 1997), having greater extent and types of open formations, as the Beni includes diverse tropical rain forests, swamp forests, savanna forests and seasonally dry forests as well as savannas, lagoons, lakes and rivers. Second, a number of different historically derived herpetofaunal assemblages meet in the Beni (Lynch 1979; Dixon 1979). Both factors might serve to increase the regional biodiversity. Unfortunately, because herpetofaunal data for the habitat types are incomplete (with one partial exception), we cannot yet evaluate the relative diversity of habitat types in the Beni with other Amazonian regions. The exception is the savanna habitat — the amphibian collections of Reichle plus the present study reveal the highest anuran diversity by far for any savanna in South America.

The herpetofaunal surveys of the Departamento del Beni to date also indicate a relatively high regional diversity, with 61 amphibian and 66 reptilian species documented, and at least 82 reptiles with the secondary reports (not verified) in Miranda *et al.* (1991) (Tables 9.5 and 9.6). Although still somewhat low, these inventories already approach (if not exceeding) those of several better studied areas or regions, for example in Peru: in the Manu region, Pakitza — 68 amphibians, 60 reptiles and nearby Cocha Cashu — 82 amphibians, 64 reptiles (Morales and McDiarmid 1996; Rodríguez and Cadle 1990; Rodríguez 1994), in Cuzco Amazónico — 64 amphibians, 81 reptiles (Duellman and Salas 1991; Duellman and Koechlin 1991), and in Iquitos — 112 anurans (Rodríguez and Duellman 1994), 106 reptiles (Dixon and Soimi 1986); and in lowland Amazonian Ecuador at Santa Cecilia — 93 amphibians, 92 reptiles (Duellman 1978, 1990).

It is clear that much more fieldwork needs to be done, particularly in many of the habitat types not located near the EBB buildings and for other portions of the year, as well as undertaking intensive museum and literature studies. Given the likelihood of undocumented, unreported and undescribed species, it is critical that future herpetofaunal studies in this region provide voucher specimens and include records of locality, habitat, vegetation associations, and whenever possible, tissue samples and sound recordings.

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