

Volunteer Program



Surveys in March 2018

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Content

1	Introduction	3
2	Methodology.....	4
2.1	Mammals Survey Methodology	4
2.2	Herpetology Survey Methodology	4
2.3	Tropical Flora Survey Methodology	5
3	Results	6
3.1	Results of Mammals Survey	6
3.2	Results of Herpetology Survey.....	8
3.3	Results of Tropical Flora Survey.....	9
4	Discussion and Conclusion.....	12
5	Literature cited.....	14
	Appendix.....	15

1 Introduction

Selva Verde Lodge (SVL) is an Eco-Lodge and Rainforest Reserve in the lowlands of the Caribbean slope of Costa Rica, the so-called Sarapiquí region of the province Heredia. Due to high annual precipitation, high temperatures and different types of soil, SVL is known as an area with a high number of mammals, birds, insects, plants and mushrooms. The high biodiversity all over Costa Rica is being preserved by the creation of many protected areas e.g. national parks, biological reserves, wildlife refuges and private reserves. A total of 26 percent of the countryside in Costa Rica is being preserved. SVL is one of the private reserves which is trying to conserve the adjacent primary and secondary forest with the aid of different research programs and the environmental education of their guests and locals. Due to the fact, that SVL is part of the Mesoamerican Biological Corridor it is very important to connect and protect these forest areas. Furthermore, SVL is an excellent place for biological field studies and scientific excursions for interested scientists and prospective scientists. SVL offers the opportunity for students to do an internship abroad or volunteering and to gain practical experience for their studies and their future profession.

Therefore, I decided to go abroad to Costa Rica, Central America. My name is Annabelle Mall and I'm a postgraduate student of environmental engineering (M.Eng.), living in Germany, Europe. Because of my bachelor's degree in environmental science I decided to do an internship at SVL for ten weeks. I also have chosen SVL because of the reason that the Eco-Lodge has the Certificate for Sustainable Tourism and is willing to mitigate their negative environmental impact.

Thus, the objective of my internship is to get to know more about the daily work of a scientist in tropical rainforests as well as gain cross-cultural competence. Together with the biologists Alejandro Zuñiga and Daniel Ramírez I'm working in several research programs. For the first month the schedule was constructed in different topics:

1. Week: Mammals
2. Week: Herpetology
3. Week: Plants and Mushrooms
4. Data Analysis

The aim for my first month was to get a first impression of the current research programs in SVL. We were focussing in the 'Mammals Research Program', the 'Herpetology Research Program' and the 'Tropical Flora Research Program' and finally in data acquisition and analysis. Every week we utilized another type of methodology which is described in the following chapter.

2 Methodology

2.1 Mammals Survey Methodology

For the research program of mammals in SVL several methodologies were used. The experimental field comprises primary forest (PF), secondary forest (SF) and open area (OA). The habitats were carried out during day (7:00 am – 6.00 pm) and during night (6:00 pm – 10:00 pm).

The first survey dealt with walking along the trails in search of mammal's individuals, feces and footprints. Following trails were examined: Central Trail, Central Extended Trail, Almendro Trail, Nene Trail, Rana Trail, Rio Trail and Ocelot Trail. The Gardens of SVL were also part of the survey (OA). The sampling technique which was used contained visual encounter surveys (VES).

Capture bats with the use of mist-nets placed along the trails in three different habitats was also part of the Mammal Research Program. The surveys took place on three days between 5:30 pm to 9:00 pm. The captured individuals were identified of their species, gender, and development stage and released near the are where they were captured. The surveys took place along the 'Almendro Tree', 'Rio Trail' and 'Rana Trail'.

The last survey dealt with the use of four camera-traps which were set in different habitats in the PF. The data of the camera-traps were collected and evaluated by identifying the individuals.

All individuals were identified with the use of the mammals' field guide of Reid (2009).

2.2 Herpetology Survey Methodology

The herpetology surveys were divided in three methodologies to determine the richness of amphibians and reptiles around SVL. The experimental field comprises also PF, SF and OA. The survey took place during day (7:00 am – 6:00 pm) and night (7:00 pm – 22:00 pm) to find diurnal and nocturnal species.

One of the survey was to walk along several trails in the PF, SF and the gardens of SVL to capture the individuals and identify the species. The sampling technique which was used contained visual encounter surveys (VES).

Another survey was to create 50 m transects in the forest interior, perpendicular to the trails. The used sampling technique was also VES. The experimental field was along the Nene Trail.

There were also created 5m x 5m plots with a distance between each one of 20m. The used sampling technique was VES. The experimental field comprises the area around the Ocelot Trail and the Rana Trail.

For identifying the amphibians and reptiles the field guides of Muñoz-Chacon & Johnston (2013) and Leenders (2017) were used.

2.3 Tropical Flora Survey Methodology

Two different surveys were carried out for the Tropical Flora Research Program: ‘mushroom survey’ and ‘plant lifeforms survey’.

For examining the mushrooms around the SVL area the survey comprised walking along several trails and looking for mushrooms and identify the species. The experimental field contained the Central Trail, Nene Trail, Rana Trail and the Ocelot Trail. The surveys took place during the day (7:00 am – 6:00 pm).

For determining the phenology and plant reproduction there eight plots with the size of 5m x 1m were performed in the forest interior of the Rana Trail. Within the plots the following plant lifeforms were identified: tree, palms, bushes, lianas, herbs and fern.

3 Results

This chapter describes the results of surveys during the last four weeks in March 2018. It should be noted that these results are not the finally ones and that the surveys will be still carried on. For describing and interpreting the results, graphics and tables were created. Detailed information can be found in the appendix.

3.1 Results of Mammals Survey

The first survey dealt with the observation of several mammal found in the PF, SF and OA. The following table (**Error! Reference source not found.**) shows the mammal's family and species found between March 5th and 11th 2018, the sampling techniques used and the abundance for each species. Abundances with a “~“before the number, means that an estimation were calculated.

Family	Species	Sampling techniques			Abundance
		Direct observation	Footprints	Feces	
Bradipodidae	<i>Bradypus variegatus</i>	x			1
Dasypodidae	<i>Dasyopus novemcinctus</i>	x			2
Atelidae	<i>Alouatta palliata</i>	x			~ 10
Sciuridae	<i>Sciurus granatensis</i>	x			~ 5
	<i>Sciurus variegatoides</i>	x			~ 3
Erethizontidae	<i>Coendou mexicanus</i>	x			1
Dasyproctidae	<i>Dasyprocta punctata</i>	x			~ 5
Procyonidae	<i>Procyon lotor</i>	x			3
	<i>Potos flavus</i>	x			2
Mustelidae	<i>Lontra longicaudis</i>			x	1
Felidae	<i>Leopardus pardalis</i>		x		1
	<i>Puma concolor</i>		x		1
Tapiridae	<i>Tapirus bairdii</i>		x		~ 5
Tayassuidae	<i>Tayassu tajacu</i>		x		~ 3

There were identified 11 different mammal families living in SVL. Not every species could be found by direct observation. For example, *Lontra longicaudis* could only be identified by their faces along the Sarapiquí River. As well, *Leopardus pardalis*, *Tapirus bairdii* and *Tayassu tajacu* which were identified by their footprints. Nine species of mammals could be found by direct observation. Mammals which were found by direct observation have simultaneously the highest abundance. The most widely distributed species is *Alouatta palliata*.

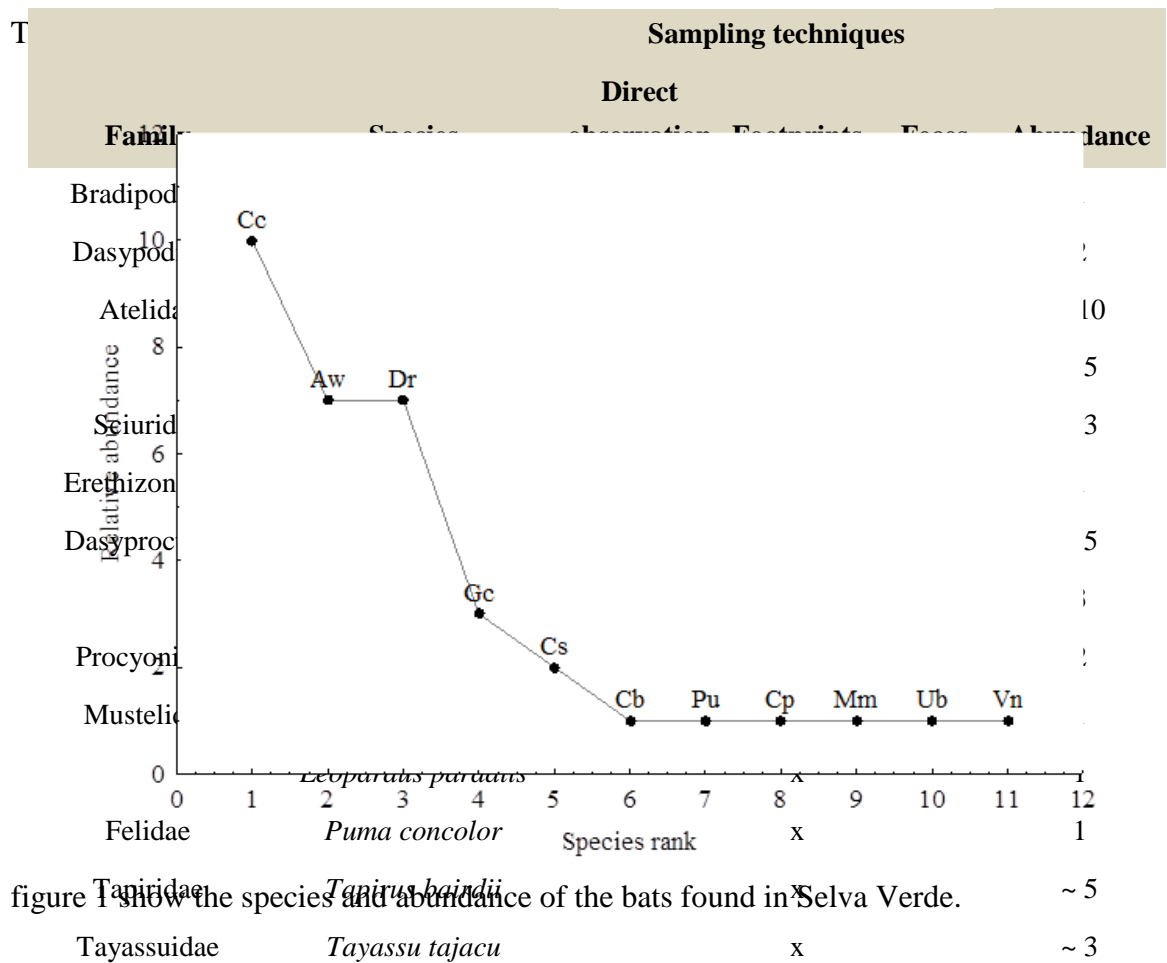


figure 1 show the species and abundance of the bats found in Selva Verde.

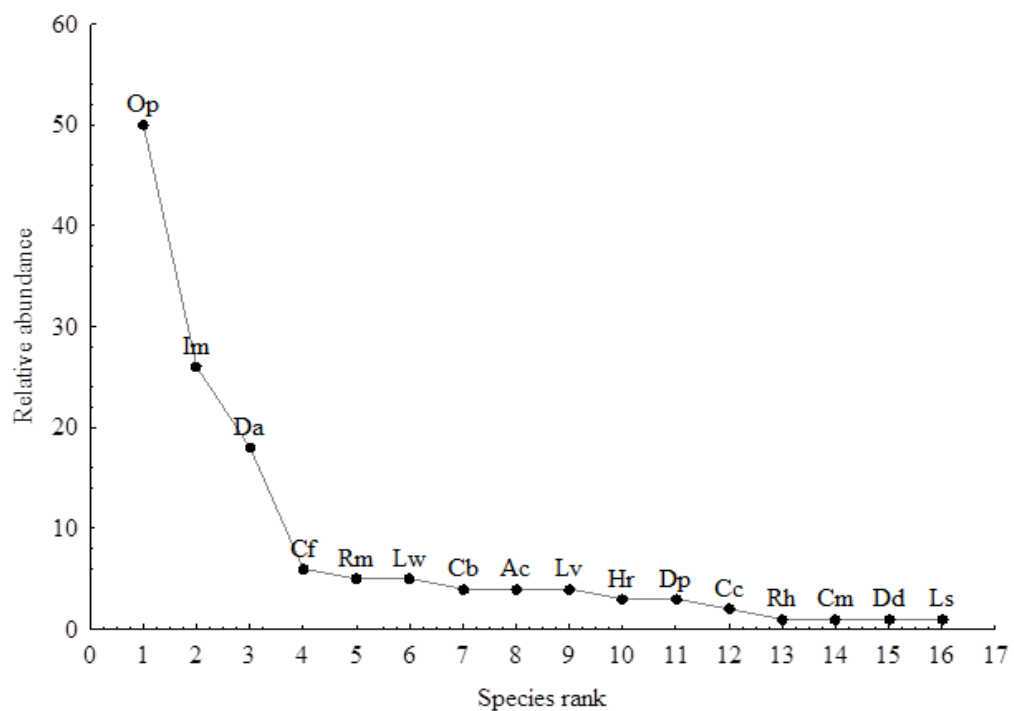
Fig.1: Rank abundance curve for bats found in SVL. Abbreviations are as follow: Cc = *Carollia castanea*, Aw = *Artibeus watsoni*, Dr = *Desmodus rotundus*, Gc = *Glossophaga commissarisi*, Cs = *Carollia subrufa*, Cb = *Cormura brevirostris*, Pu = *Pteronotus parnellii*, Cp = *Carollia perspicillata*, Mm = *Micronycteris microtis*, Ub = *Uroderma bilobatum*, Vn = *Vampyriscus nymphaea*.

The figure 1 shows that in total 11 species of bats could be caught during the survey. The three habitats had different bat species, being the Rana Trail the one highest number of species. *Carollia castanea*, *Artibeus watsoni* and *Desmodus rotundus* were the species with the highest number of individuals, therefore they were the most widespread species around SVL as well. For more details of the bats and their gender and development stage see appendix 1.

3.2 Results of Herpetology Survey

The herpetology survey was classified in ‘reptiles’ and ‘amphibians’. In total there were found more amphibians than reptiles around SVL between March 12th and March 18th, 2018. The following graphic illustrates the species rank of amphibians around the PF, SF and OA in SVL.

Fig.



2:

Rank abundance curve for the amphibians found in SVL. Abbreviations are as follow: Op = *Oophaga pumilio*, Im = *Incilius melanochlorus*, Da = *Dendrobates auratus*, Cf = *Craugastor fitzingeri*, Rm = *Rhinella marina*, Lw = *Lithobates warszewitschii*, Cb = *Craugastor bransfordii*, Ac = *Agalychnis callidryas*, Lv = *Lithobates vaillanti*, Hr = *Hypsiboas rufitelus*, Dp = *Dendropsophus phlebodes*, Cc = *Craugastor crassidigitus*, Rh = *Craugastor crassidigitus*, Cm = *Craugastor mimus*, Dd = *Diasporus diastema*, Ls = *Leptodactylus savage*.

There are four species of amphibians which are the most common: *Oophaga pumilio*, *Incilius melanochlorus*, *Dendrobates auratus* and *Craugastor fitzingeri*. Other species are rare and can be found in specific habitats of SVL. To see more details about the habitats of the amphibians, see the appendix 2. Overall 16 species of amphibians were found during the survey.

Figure 3 shows the rank abundance curve for the reptiles found in SVL. In total there were found eight species of reptiles around SVL. The most common one was *Anolis capito* with nine observed individuals. The second most widespread species was *Anolis limifrons* with a total of seven individuals. For more details s. appendix 3.

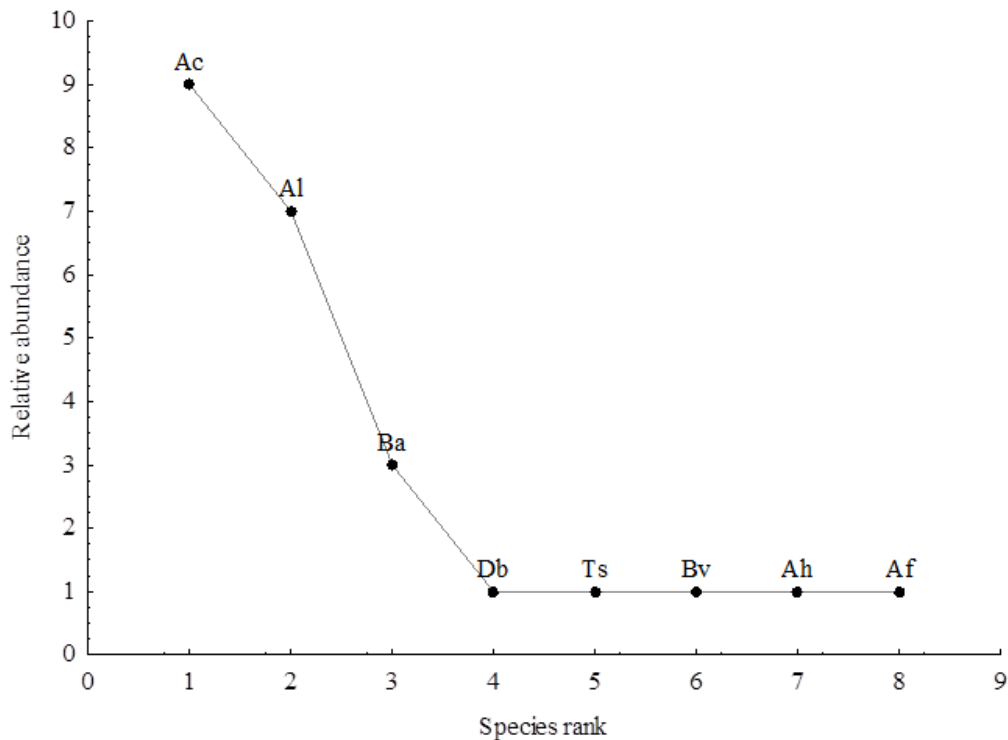


Fig. 3: Rank abundance curve for the reptiles found in SVL. Abbreviations are as follow: Ac = *Anolis capito*, Al = *Anolis limifrons*, Ba = *Bothrops asper*, Db = *Diploglossus bilobatus*, Ts = *Tantilla supracincta*, Bv = *Basiliscus vitattus*, Ah = *Anolis humilis*, Af = *Ameiva festiva*

All in all, there could be found 134 individuals of amphibians (16 species) and 24 individuals of reptiles (8 species) during the surveys in SVL

3.3 Results of Tropical Flora Survey

The surveys of Tropical Flora comprised mushrooms and plant lifeforms. During the survey of mushrooms many species couldn't be identified because of missing information in the field guide of Mata (2003). All in all, 14 species of mushrooms were identified. Most of the species were growing in colonies on fallen logs. Table 2 gives an overview of all species and their associated family.

Family	Species	Location					Substrate
		Rana Trail	Río Trail	Nene Trail	Ocelot trail	Central trail	
Agaricaceae	<i>Leucocoprinus cepistipes</i>	1					Ground
Auriculariomycetidae	<i>Auricularia delicata</i>		Colony			2	Fallen log
Geastraceae	<i>Geastrum saccatum</i>				3		Tree
Hymenochaetaceae	<i>Inotus splitgerberi</i>				Colony		Fallen log
	<i>Hymenochaete luteo-badia</i>				1		Fallen log
Marasmiaceae	<i>Caripia montagnei</i>				2 Colonies		Fallen log
	<i>Polyporus tenuiculus</i>					Colony	Fallen log
	<i>Coriolopsis polyzona</i>					10	Root
Polyporaceae	<i>Datronia caperata</i>			6	12		Fallen log
	<i>Hexagonia papyracea</i>	Colony	Colony				Fallen log
			1				Fallen log
	<i>Marasmiellus guadalupensis</i>		Colony				Fallen log
	<i>Trichaptum sector</i>		Colony				Fallen log
Sarcoscyphaceae	<i>Cookeina speciosa</i>	2					Ground
		34					Fallen log
	<i>Cookeina tricholoma</i>	7					Fallen log

The figure 4 represents the relative abundance of several lifeforms of plants in the PF of SVL. Determined were 'Trees', 'Palms', 'Bushes', 'Lianas', 'Herbs' and 'Ferns'. In total eight plots were investigated.

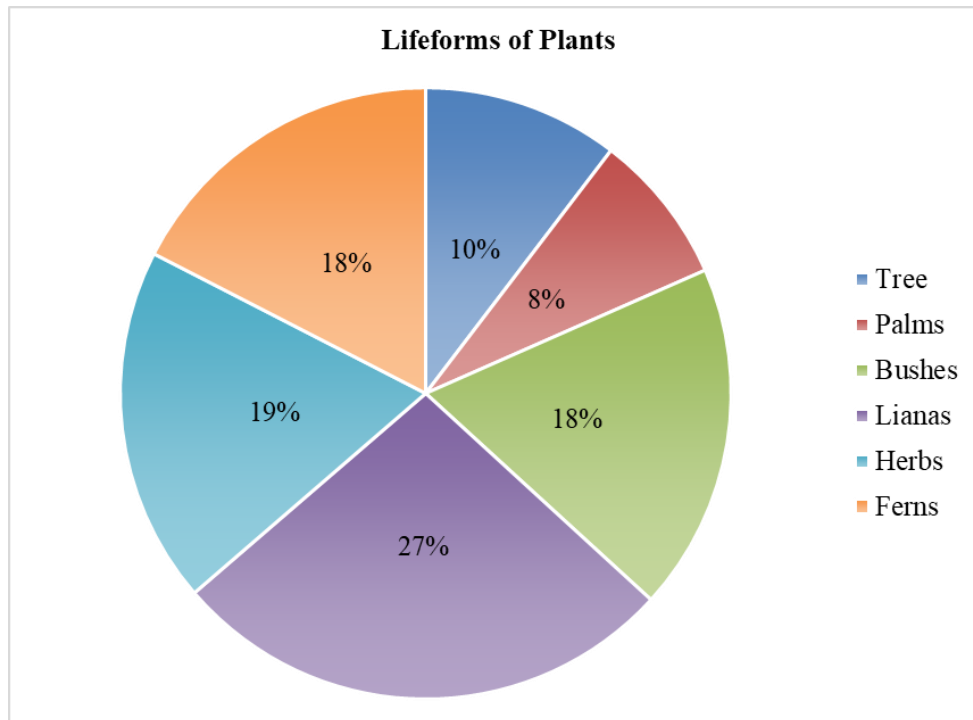


Fig. 4: Lifeforms of Plants in the PF of SVL

Figure 4 shows that especially Lianas and Herbs were widespread whereas trees and palms had a lower abundance. To figure out correlations between growth rate of lifeforms and their habitat, detailed information about environmental conditions have to be determined.

4 Discussion and Conclusion

Four weeks of carrying out surveys in the forests of SVL indicates a first impression of the high biodiversity in this area. It should be noted that every specific investigation was carried out for only one week during the dry season. To draw more precise conclusions, it is very important to continue with the different types of surveys as well as in the rainy season. Because Flora and Fauna change their structure and composition during the seasons, it is necessary to collect more data during the whole year. These data can be a recommendation of how to manage conservation at SVL.

Until now the following conclusion can be drawn:

1. **Terrestrial Mammals:** As Table 1 shows *Alouatta palliata* is the most widespread mammal species in SVL. This is related to the high biodiversity of trees and their structure. There were also species found to be endangered as *Tapirus bairdii*, *Puma concolor* and *Leopardus pardalis*. To conserve the habitats of these endangered species it is necessary to continue with the mammalogy investigation.

Flying Mammals: Most of the captured bats are species which feed on fruits (*Phyllostomidae*) and only one species (*Desmodus rotundus*) which feeds blood. A few captured bat species feed on insects (*Cormura brevirostris*) (s. Fig.1).

2. Herpetology

Amphibians: Due to the existing density of leaf litters *Oophaga pumilio* is the most common frog in SVL (s. Fig.2). Other species of amphibians have a more equal abundance because they need specific habitats, for example closeness to water bodies. Anurans was the only group which appeared during the surveys.

Reptiles: Lizards were the most common reptiles (*Anolis capito*) which were found in the surveys. There were also seen two species of snakes (*Tantilla supracincta* and *Bothrops asper*). One of the species (*Bothrops asper*) belong to the Viperidae family, which are venomous snakes.

3. Tropical Flora:

Mushrooms: Because of the high humidity around SVL there were found a lot of mushroom species. Most of the mushroom species belong to the family *Polyporaceae*.

Plants: The regeneration under the canopy in the PF is dominated by lianas and herbs. For detailed conclusions and comparisons between PF and SF more plots must be carry out.

5 Literature cited

Leenders, T. (2017). *Amphibians of Costa Rica. A Field Guide*. New York: Cornell University Press.

Mata, M. (2003). *Macrohongos de Costa Rica. Vol. 2*. Santo Domingo: INBio.

Muñoz Chacón, F. & Johnston, R. D. (2013). *Amphibians and Reptiles of Costa Rica. A Pocket Guide*. New York: Cornell University Press.

Reid, F. A. (2009). *A Field Guide to the Mammals of Central America and Southeast Mexico. Vol. 2*. Oxford: OUP USA.

Appendix

Appendix 1. Sampling of Bats

Location	Family	Species	Gender	Forearm length (mm)	Development stage
Rana trail	Phyllostomidae	<i>Glossophaga commissarisi</i>	Female	32	Subadult
		<i>Artibeus watsoni</i>	Female	37	Subadult
		<i>Carollia Castanea</i>	Male	35	Adult
		<i>Carollia Castanea</i>	Female	36	Adult
		<i>Carollia Castanea</i>	Male	35	Subadult
		<i>Carollia Castanea</i>	Female	37	Subadult
		<i>Glossophaga commissarisi</i>	Female	33	Subadult
		<i>Artibeus watsoni</i>	Female	39	Juvenile
		<i>Artibeus watsoni</i>	Male	37	Subadult
		<i>Carollia Castanea</i>	Female	35	Adult
		<i>Carollia Castanea</i>	Male	36	Adult
		<i>Carollia Castanea</i>	Male	34	Adult
		<i>Uroderma bilobatum</i>	Female	37	Subadult
		<i>Carollia Castanea</i>	Female	37	Adult (Pregnant)
		<i>Artibeus watsoni</i>	Male	37	Subadult
		<i>Carollia Castanea</i>	Female	34	Adult
				<i>Glossophaga commissarisi</i>	Female
	Mormoopidae	<i>Pteronotus parnellii</i>	Female	51	Adult (Pregnant)
Almendo Trail	Emballonuridae	<i>Cormura brevirostris</i>	Female	48	Juvenile

		<i>Micronycteris microtis</i>	Male	33	Juvenile
		<i>Carollia perspicillata</i>	Female	43	Adult (Pregnant)
		<i>Desmodus rotundus</i>	Male	57	-
		<i>Desmodus rotundus</i>	Male	59	Subadult
	Phyllostomidae	<i>Desmodus rotundus</i>	Male	60	Subadult
		<i>Desmodus rotundus</i>	Male	55	Adult
		<i>Desmodus rotundus</i>	Female	63	Adult
		<i>Carollia Subrufa</i>	Male	41	Adult
		<i>Desmodus rotundus</i>	Male	58	Adult
		<i>Carollia Subrufa</i>	Male	41	Adult
		<i>Desmodus rotundus</i>	Female	61	Subadult
		<i>Carollia Castanea</i>	Female	36	Adult
		<i>Artibeus watsoni</i>	Female	39	Subadult Pregnant
Río Trail	Phyllostomidae	<i>Vampyriscus nymphaea</i>	Male	36	Subadult
		<i>Artibeus watsoni</i>	Male	38	Subadult
		<i>Artibeus watsoni</i>	Female	37	Adult Pregnant

Appendix 2. Herpetology Survey – Amphibians

Family	Species	Location									Total
		Rana Trail	Río Trail	Nene Trail	Ocelot trail	Almendro trail	Small lagoon	Big Lagoon	Gardens	Sarapiquí river	
Bufonidae	<i>Rhinella marina</i>						5				5
	<i>Incilius melanochlorus</i>			1			1			24	26
	<i>Rhaebo haematiticus</i>			1							1
	<i>Craugastor fitzingeri</i>	2			1		2	1			6
Craugastoridae	<i>Craugastor crassidigitus</i>	1						1			2
	<i>Craugastor bransfordii</i>	1	1	1	1						4
Dendrobatidae	<i>Craugastor mimus</i>				1						1
	<i>Oophaga pumilio</i>	13	6	14	1	16					50
	<i>Dendrobates auratus</i>	2	5	9	1	1					18
Eleutherodactylidae	<i>Diasporus diastema</i>	1									1
Hylidae	<i>Agalychnis callidryas</i>						3	1			4
	<i>Hypsiboas rufitelus</i>							3			3
	<i>Dendropsophus phlebodes</i>							3			3
Leptodactylidae	<i>Leptodactylus savagei</i>						1				1
Ranidae	<i>Lithobates vaillanti</i>							4			4
	<i>Lithobates warszewitschii</i>			2	3						5
	Richness	6	3	6	6	2	5	6	0	1	16

Abundance	20	12	28	8	17	12	13	0	24	134
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Appendix 3. Herpetology Survey – Reptiles

Family	Species	Location									Total
		Rana Trail	Río Trail	Nene Trail	Ocelot trail	Almendro trail	Small lagoon	Big Lagoon	Gardens	Sarapiquí river	
Anguidae	<i>Diploglossus bilobatus</i>				1						1
Colubridae	<i>Tantilla supracincta</i>								1		1
Corytophanidae	<i>Basiliscus vitattus</i>				1						1
	<i>Anolis limifrons</i>		1			2	4				7
Dactyloidae	<i>Anolis humilis</i>				1						1
	<i>Anolis capito</i>		5			4					9
Teiidae	<i>Ameiva festiva</i>									1	1
Viperidae	<i>Bothrops asper</i>				2	1					3
	Richness	0	2	0	4	3	1	0	1	1	8
	Abundance	0	6	0	5	7	4	0	1	1	24