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Working placement:Technical report

Topic: Study of the Distribution of animal species in a rainforest

2012

SUMMARY

Introduction: In the wild, the distribution of different species is determined by many factors which vary the action performed by these animals. Indeed, the breeding place may not be the same as the place where the animals spends the night or the place where it finds its food, for example. If the site differ among animal species, the general order of the factors affecting this distribution are almost always common, namely order trophic of habitat quality (humidity, near water point ...) and that relationship issues between individuals (competition, predation, cooperation ...).

In this study, we will look at the distribution of different animal species (mammals, birds and reptiles) within a given environment, namely a tropical forest in the heart of a nature reserve in Costa Rica, the Reserve of Cloudbridge located at the foot of the Chirripo (the highest peak of Costa Rica). We will then try to explain this distribution by analyzing specific environments and factors outlined above. Finally, we associate these census data and analysis to understand and predict the behavior of different animal species.

The first part of this study will therefore account for observation in the field both on animal species but also on the general appearance of the community visited. In the second part we will try to understand what are the specificities of these environments and the needs of animal species observed. Then in the last part, we associate this data to show the complementarity between environment and animal species, and so understand the distribution of these species.

I-Field Observations

A-Presentation of the study sites

By going on the different paths of the reserve to do the job of identifying species, I also took the opportunity to observe the environments. So I could see that within the reserve Cloudbridge, the middle was definitely not homogeneous, but rather, it was possible to distinguish large areas with different characteristics. Thus, the major areas identified are: Primary Forest Zone (jilguero trail, Gavilan, and second part of Montana), Wetland (Uran and Quetzales Trail), Dry Zone (Skutch Trail) and Area Open (first part of Montana trail). However, in its entirety, the Cloudbridge forest is a Cloud Forest , all the areas are often in contact with clouds so all areas are wet but some more than others. So we will present these different areas one after the other based only on observations of the environment.

Let's start with the area of primary forest, found the area south of the reserve Cloudbridge. It has the peculiarity of never having been cleared (of another large part of the reserve has been cleared and replanted by farmers before the creation of the reserve), thus, found in the area of large and massive tree species, slow-growing, such as the Teca (used for making garden furniture) or the Ceiba. This forest is dense with vegetation cover composed almost exclusively of tree or shrub, canopy is very high (5 to 10m) and fully closed, it means that trees captures the maximum amount of light energy are therefore very efficient at photosynthesis, this result of course to drastically limit the amount of light reaching the ground, which is why there is a ground cover virtually nonexistent. One can also noticed on the floor of a highly decomposed humus (very fine).

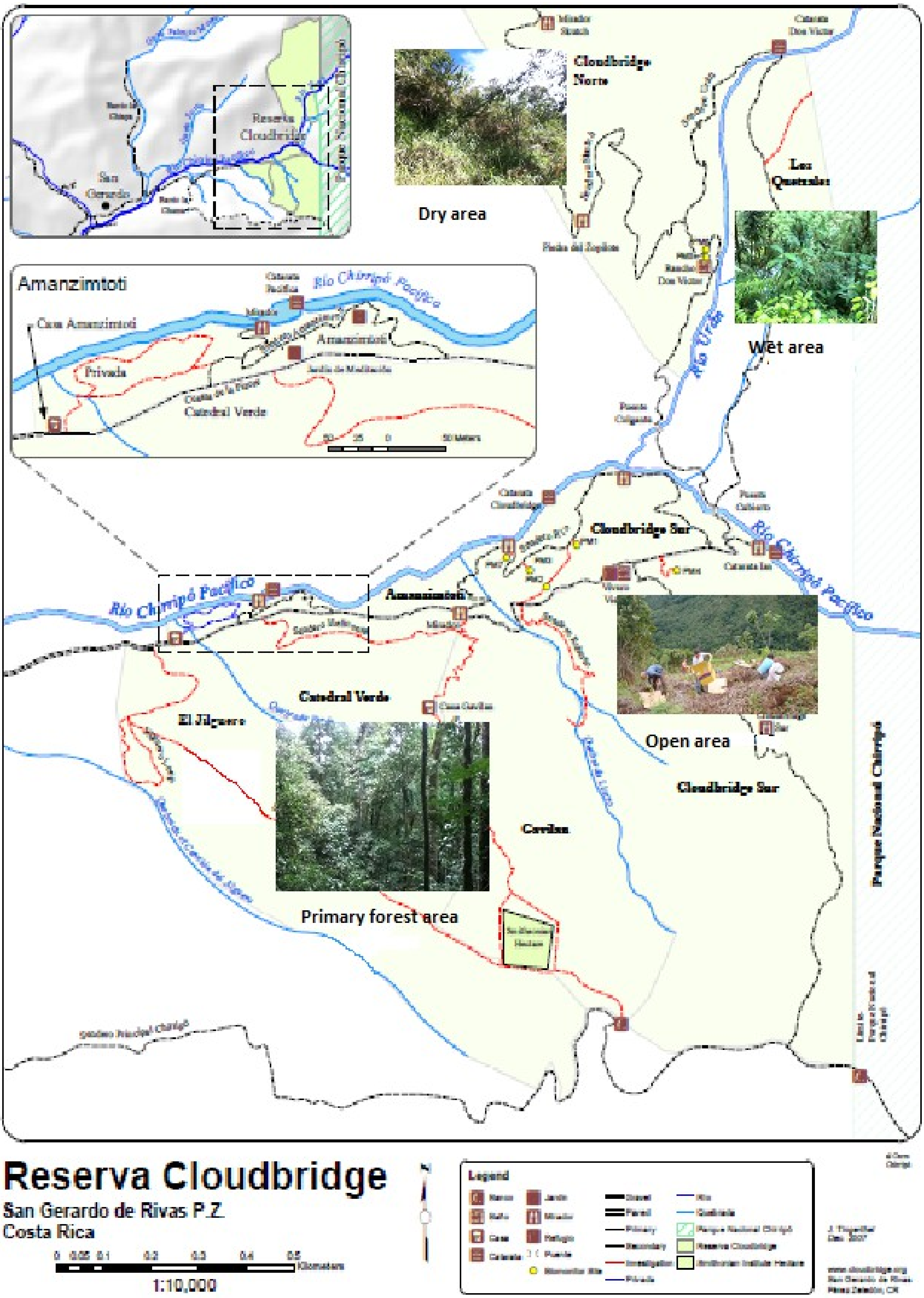
Now to the wetland or rather the wettest zone of the reserve. It is located to the east and northeast of the reserve and is very close to rivers, this area is constantly wet. During the rainy season (May-November) the soil is saturated with water creating pools of water. In this area, the vegetation is very different from that present in the area of primary forest. Indeed, in this area, we can see that the trees present are less massive, covers a floor space as well as at the lower canopy. There are also many invasive plants including ferns of various sizes and dimensions (in effect to soil moisture, ferns can reproduce quickly and efficiently). The soil has a plant cover not provided by humus.

The next area is the one I described as dry. It is located northeast of the reserve, in the same direction as the wetland but at a higher altitude. This area is open but very warm because of its higher altitude, which places it above the clouds often a part of the day (closest to the sun). One feels alternating current of hot air and very dry and fresh air flow and humidity. No species of tree mass is present on the first part of the way, we can see by the cons of dry grass and fern species with an erect very high. In the middle of the road leading to the summit area, this is an area of dense forest but dry in comparison to other areas of the reserve.

The final area shown is the one I call "open." Let me explain, this is an area in the center south of the reserve, very close to the primary forest, but it has the distinction of being almost completely deforested. Indeed this area is ongoing reforestation, the trees are so rare and scattered, the ground is covered with grass and the area fully exposed to the sun.

I also went hiking on the way to the Chirripo, but that does not belong to the reserve Cloudbridge, I have not presented the given census. However, it is important to note that on this path, the bird species observed are much more numerous, this is certainly due to the fact that the path is frequently borrowed by men, which resulted in some modification to the behavior of animal species, making them less fearful. This is another reason to ignore data collected on this path, because they are distorted.

The realization of this classification allows us to differentiate between large sets of reserves and their characteristics. This was done based solely on observations of the environment, later in this study, we will verify these characters influence the distribution of animals, then we will explain why.


Amanzimtoti
Rio Chirripó Pacifico
Dry area
Wet area
Open area
Primary forest area
Cloudbridge Norte
Los Quetzales
Cloudbridge Sur
Catedral Verde
El Jilguero
Cavilan
Parque Nacional Chirripó
Reserva Cloudbridge
San Gerardo de Rivas P.Z.
Costa Rica
1:10,000
Legend

B-Identification of animal species at different sites

The census method used is simple, every morning I went with two partner on different paths of the reserve, for every 100 meters, we noticed all the animal species and the section on which they were located (10 minutes per 100 meters). The vast majority of identified species are birds that we have accurately determined the name with a book (Birds of Costa Rica by Richard Garrigues and Robert Dean). The data obtained are presented in tabular form in Annex page at the end of the report.

The tables allow us to note that the species identified are not the same from one area to another. Indeed, it may be noted for example that are not found in mammals that the area of primary forest and no (during my visits) in other areas. The census of mammals, however, was difficult because, as shown in the tables of results, very few have been observed. However, some clues allow us to assert that some mammals such as monkeys regularly pass in the area of primary forest, in fact, I noticed the high concentration of plant residues from the canopy at ground level. These envelopes are a part of plant food diet of primates and mammals moving through the trees (see picture), and I could not find that these residues in the area of primary forest.

Ground plant residues

Birds are everywhere but the species found are not consistent from one area to another. These results clearly demonstrate that the environment influences the distribution of animals of the rainforest.

But why these species have preferences environment? This is what we will explain in Part II.

II-specific environments and needs of animals

A-Chemical properties, structural and textural environments

After the simple observation of phase circles, I wanted to know more detail about the different parameters which characterizing the different environments determined. I'm interested in the ph of the soil, their structures and textures of the areas studied. We will present these features by considering successively each zone individually. However we will start by explaining the methods used to determine these parameters as these methods are common from one area to another.

To calculate the ph of the soil considered, we used a pH meter to measure the pH of liquid solution, so we had to prepare filtered solutions composed of water and soil samples previously collected from the field. The ph of the water used to achieve these solutions was 7. The pH meter was then simply placed in the solution, then you could just wait for the stabilization of the value of ph.

Concerning the determination of the structure and soil texture, I proceeded by observation of soil samples collected in the field and hand separation of soil particles by the method of sieve, which allowed to determine the approximate composition soil into fine particles (sand), medium (silt), or large (clay). The overall texture of the land remains common, because by doing the test of "sausage" (try to form a sausage with a small amount of soil removed and check its strength), I found that this test was positive for all soils This means that the land of the reserve consist of a large proportion of clay. However, this test is indicative and not infallible, is therefore necessary to complement this with a grain size analysis.

Let us begin with the area of primary forest, the PH test gives a score of 6.23 which is slightly acidic. Before rendering assumptions to explain this pH, we need to compare it to other ph in other areas. On soil structure of the soil, can be observed fine particles with spherical shapes of corner, the structure is specifically particulate and polyhedral or even lumpy. The texture to this, it is mostly clay with a proportion of 60% of particles below 2µm, 30% sand (particles greater than 20 microns) and finally 10% of particles intermediate (between 2 and 20µm).

The wetland now, we obtain a pH of 4.71, which is close to being highly acidic. The structure in turn is quite close to that of the soil of the primary zone and texture. The texture is less clay with a proportion of 40% clay, 40% silt and 20% sand, which makes the soil clay and silt.

Regarding the dry zone, the pH of 5.55 is obtained, which corresponds to a slightly acid soil but this is not necessarily a limiting factor for plant development. Structure when it is different in older areas because the soil is made up of long thin particles, thus a lamellar structure. The texture on it was sandy loam with 60% of sand particles, 30% silt particles and 10% clay.

Conclude now by the open zone, the pH obtained is 5.78, slightly acid. The texture and structure of this area are almost equivalent to the area of primary forest.

We can explain the higher pH of the area of primary forest by the fact that the rain falling on the soil of this area is considerably reduced by the canopy of large trees present, and thus the acidification reaction $H_2O + CO_2 = H_2CO_3 = 2H^+ + CO_3^{2-}$ will produce less frequently. The open area, although exposed to rain has a slightly acid pH and a good structure, the operation of reforestation has a good chance of being successful.

B-What are looking animal species studied in their living environment?

To understand what attracts different animals to a particular area requires everything to do first a study of their needs. Indeed, animal species have not identified all the same types of needs. We will therefore present in this part of the expectations of the animal species in terms of their environment.

Let's start with the birds, as can be seen in the census tables in the comments box, bird species not found in all types of environments. Indeed, the tables show that the presence of certain bird species depends on: altitude, vegetation density, the presence of insect or bay and thus the type of vegetation and moisture parameter (related to vegetation and insects). For example, it will be virtually impossible to observe a Toucanet Emerald (Emerald Toucan) at an altitude higher than 2000m.

Now to mammals, and primarily to Coatis observed in the area of primary forest. These are the Coatis mammals that have been observed in most of my various passages. However, they remain wild and try to flee when men are nearby. Let us talk about around their habitats, white-nosed coatis live in forested areas (dry and moist forests) of the Americas. They are at any altitude from sea level to 3000 m (9800 feet), one can conclude that the elevation is not a parameter for determining the presence or absence. From a food standpoint, they are omnivorous, preferring small vertebrates, fruit, carrion, insects and eggs. They can easily climb trees, their tails which they use for balance, but it is mostly on the ground they seek their food. Their predators are raptors, boas, wild cats. Finally, in terms of their social behavior, coatis are active during the day, at night, they choose a specific tree and descend at dawn to begin their daily search for food. Adult males are solitary, but females and sexually immature males may form social groups (The wildlife of Costa Rica by Fiona A.Reid, Twan Leenders, Jim Zook and Robert Dean).

Now for the primates and especially to those observed during the census, the spider monkeys. The spider monkeys are large groups of 15-25 animals. During the day, groups are divided into subgroups of two to eight animals. This social structure (fission-fusion) occurs in only two other types of primates, chimpanzees and Homo sapiens. The size of subgroups and the degree to which they avoid during the day depends on the food competition and predation risk. The average size subgroup is less than four animals. The spider monkeys are diurnal and spend the night in trees carefully selected. (The wildlife of Costa Rica by Fiona A.Reid, Twan Leenders, Jim Zook and Robert Dean). The diet of spider monkeys consist of approximately 90% of fruits and nuts. They can live for long periods while consuming only one or two kinds of fruits and nuts. They eat the fruits of many large trees in the forest. . If food is scarce, they can eat insects, bark and honey. (The wildlife of Costa Rica by Fiona A.Reid, Twan Leenders, Jim Zook and Robert Dean)

Now talking rodents like possums and squirrels seen. Possums initially, are opportunistic omnivores with a very broad diet. Their diet consists mainly of carrion. They are also known to eat insects, frogs, birds, snakes, small mammals, slugs and earthworms. Some of their favorite foods are fruit, and they are known to eat avocados, apples and clementines. Regarding their behavior, opossums are solitary and nomadic, however, they prefer to stay in one area as long as food and water are available. . Although they temporarily occupy abandoned burrows, they do not dig or give little trouble to build their homes. As nocturnal animals, they favor the dark areas more secure. These areas may be underground or surface. (The wildlife of Costa Rica by Fiona A.Reid, Twan Leenders, Jim Zook and Robert Dean)

Now to the squirrels, they are generally diurnal or crepuscular. Squirrels can not digest cellulose, so they must rely on foods rich in protein, carbohydrates and fats. However, some

squirrels may also consume meat, especially when faced with hunger. Squirrels are known to eat insects, eggs, small birds, snakes and small rodents youth. Tropical species have a diet consisting almost exclusively of insects. (The wildlife of Costa Rica by Fiona A.Reid, Twan Leenders, Jim Zook and Robert Dean)

Finally, speaking of peccaries, which is a species of mammal close to the European wild boar. Under natural conditions, the feeding habits of collared peccaries are determined by the availability of food. . In tropical forests, they are mainly frugivorous, eating mainly fruit, leaves, roots and tubers, but possibly eat the larvae, insects, amphibians, reptiles, among others, as a protein source. (The wildlife of Costa Rica by Fiona A.Reid, Twan Leenders, Jim Zook and Robert Dean)

III-The animals and their environments

A-Parameters influencing the distribution of animal species

As we have seen in previous sections, we do not find any animal species in all areas of the reserve. We also highlighted the main characteristics of different areas. We will now explain why species occur more frequently in certain areas than in others.
We will therefore present the factors, varying animal species, which determine this distribution.
Birds, as we have seen, are present everywhere but the species that may be encountered varies with altitude, vegetation density and vegetation type. Regarding mammals, the information presented in tables and census in the previous sections, we can deduce that the parameters influencing their distributions are of a trophic (need to find fruit trees, small animals for food) and environmental order (need to be in a forest, at the same time to protect themselves from predators but also for the night).
These factors affecting the distribution of animals is directly related to the physical and chemical characteristics of the medium, in fact the type of soil present in the areas enables the development of certain plants over others, thus, acidic soil foster the expansion of fast-growing plants such as ferns and conifers, vegetation that is unsuitable for such mammals.
Everything is linked and the ground determines the type of vegetation that itself determines the presence of animals

B-The case of Cloudbridge: Where can I get the animal species of the reserve?

Thanks to the previous parts, it is possible to map the distribution of species present in Cloudbridge, ie areas where it is most likely to find some animal species. Indeed, the area of primary forest, on both the structure of its soil and its chemical characteristics allows the development of plant species such as slow-growing towering trees like fruit trees or oaks. This type of vegetation can provide mammals such as Coatis or primates, rodents and wild boars both a habitat, a possible hiding place against predators and the food they need.
It is in this area of the reservation it is most likely to find mammals, the census also confirms these findings. One can assume that more species like cats (puma, jaguar ...) present in the reserve can also be found in these areas.

Other areas of the reserve has differences seen from one point of soil type, although sometimes, as in the case of the open area, the characteristics are the same as the area of primary forest. Once the reforestation project completed, the secondary forest will establish that there will be an interesting habitat for all these species.

For some species of birds, it is undeniable that the environment influences their distribution as we can see in the census tables. However, my information is insufficient to assert that a certain species of birds can be found in one area rather than another, because the birds are too nomadic species to ascertain an area Residential clean. However, areas where the largest varieties of birds have been identified are the wetlands and open areas. The wetland indeed contains a large

concentration of insects thus allowing these species to feed.
The area less attractive to the observation of animals is the dry zone which does not offer an ideal environment for animals and has a lower quality soil, not allowing easy development for forest plant species dense.

CONCLUSION:

In this study, we were able to demonstrate the presence of different distinct characteristics, resulting in different animal distributions. This is due, as we have seen the potential for animal species, of the reserve to find enough food and a habitat consistent with their expectations. This habitat is directly related to the field observed at the different areas (pH, texture, structure ....). We can therefore consider the soil type quee indirectly influences the distribution of fauna in the reserve.
However, in ecology, it is known that an environment is constantly changing, and tends to looks like a state of climax, it mean a stage of evolution in which the internal energy flow in the middle only serve to maintain the state of the environment, no further growth is possible at this stage. We can therefore assume that all areas tend to an evolution similar to that of primary forest is at its climax. , the animal species present in the zones "young" or undeveloped are made to change and to move closer to what is observed in the primary forest, there will be a move towards more specialized species, most demanding environment. Animal species in less developed areas will move to other area that corresponde to their needs. Paradoxically, these are the same species, those areas of youth who participate without realizing the change in their living environment to an environment less hospitable to them.

However, this move toward this final stage can not be observed in all areas, because each environment has a climax of its own and can be very different from one environment to another depending on the characteristics of each environment. So we see an undeniable evolution of the fauna and flora of the reserve in future years but this will vary from one area to another. It would be interesting in a few years to conduct a new study of the distribution of fauna in the reserve Cloudbridge.

Thanks

I would like to thank Mr. Tom Gode, manager of the Nature Reserve Cloudbridge for his hospitality help he has given me during my stay in Costa Rica and my tutor Mr. Chemidlin. I would also like to thank all the volunteers present with me during this internship that I have provide assistance or support, namely Olivia Kerns, Claire Vincent, Yan-Yee Lau, Marloes Frölig, Ricks, Armelle Budnik, Sandrine Canas and Ali Brown.

This internship was really an amazing experience for me.

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Annex

Montana Trail			
Species	**How much**	**Section**	**Comment**
Common bush-tanager	1	0-100m	One of the most common middle elevation species (600-2200m).Almost always in small groups that are regularly accompanied by other species (three-striped warblers for example)
Common bush-tanager	2	100-200m	....
Frog	1	100-200m	
Peg-billed finch	2	200-300m	Fairly uncommon in overgrown bushy narras and forest edges, between 1500m and timberline.Feeds mostly on berries, but also eat insects, seeds (bamboo), and even flower nectar.
rufous tailed humming	1	400-500m	Widespread; very common in wet habitat, to 1600m but uncommon from 1600-2200m.The common hummer found in most human-altered habitats.
White naped brush finch	1	600-700m	Fairly common between 900-2000m, rare above 2000m.
Magenta-throated woodstar	1	600-700m	Uncommon at middle elevation, from 700-1800m. Often feeds on low-growing flowers at forest edges, but tends to perch on high, exposed twigs.
Common bush-tanager	1	700-800m	.....
Gray-breasted wood-wren	2	800-900m	Abundant from 800m to timberline. Dwells in understory of wet montane forest and forest edges. Its loud, lenghty, rollicking melody is one of the most commonly heard and attention-grabbing sounds in its habitat.
Black cheeked warbler	1	800-900m	Fairly common in highlands of central and talamanca cordilleras, from 1600m to above timberline. Forages activly at lower levels of highlands forest and forest edges.
Streaked xenops	1	800-900m	Rare in middle elevations and highlands, from central cordillera south, between 1200 and 2500m. Forages at all levels in mature wet forest and at forest edges.
emerald toucanet	1	900-1000m	Fairly common at middle elevations, from 800-2400m,. Forages at middle levels in montane wet forests and adjacent gardens and second growth.
Common bush-tanager	1	900-1000m	.....
Flame throated warbler	1	900-1000m	Fairly common in highlands of central and talamanca cordilleras, from 1600m to above timberline. Pairs or small groups forage at middle and upper levels of forests, forest edges, and adjacent gardens.
Spot-crowned woodcreeper	1	900-1000m	Fairly common from timberline down to 1500m, rarely to 1000m. Forages at all levels, both in garden habitats and mature oak forest
Red-headed barbet	1	900-1000m	Fairly uncommon at middle elevations from Tilaran Cordillera south; between 400 and 1800m. Forages at middle and upper levels of wet forests.
Black cheeked warbler	1	900-1000m	.....
Slate throated redstart	1	900-1000m	Common at middle elevations, from 700 to 2100m. Forages in middle and lower levels of mature forest, second growth, and forest edges; usually in pairs and often with mixed flocks.
brown jay	5	1000-1100m	Common at middle elevations, to 2300m; fairly uncommon in Caribbean and Pacific lowlands. Boisterous parties roam through trees, avoiding mature-forest habitats.
Black cheeked warbler	2	1200-1300m	.....
Black cheeked warbler	1	1300-1400m	.....
Collared redstart	1	1300-1400m	Common in highlands, from Tilaran cordillera south, between 1500m and timberline. Forages in middle and lower levels of mature forest, second growth, and forest edges; usually in pairs and often with mixed flocks.
black cheeked warbler mountain	4	1400-1500m	Fairly common from 1600m to above timberline. Forages actively at lower levels of highland forest and at forest edges.
Purple-throated mountain gem	1	1400-1500m	female

Jilguero			
Species	How much	section	Comments
Buff-throated saltator	1	0-100m	Common in wet lowlands and middle elevations, to 1800m; uncommon to rare in northwestern Pacific and in western Central Valley. Found in gardens, brushy areas with scattered trees, and at forest edges.
Peccary	5	100-200m	Two adults with three little. Behavior absolutely not aggressive, just run away when they saw me.
slate throated redstart	2	100-200m	Common at middle elevations, from 700 to 2100m. Forages in middle and lower levels of mature forest, second growth, and forest edges; usually in pairs and often with mixed flocks.
Opossum	1	200-300m	One adults alone. Behavior not aggressive.
black+white becard	1	200-300m	Rare at middle elevations, from Tilaran cordillera south, mostly on caribbean slope, from 500 to 1800m ; descends to adjacent lowlands during latter half of year. Individuals or pairs accompany mixed flocks at middle levels of mature forest.
slate throated redstart	1	400-500m	.....
Red-faced spinetail	1	400-500m	Fairly common at middle elevations, from 700 to 2000m. Forages acrobatically on mossy limbs of mature wet forest and at forest edges, mostly at middle levels.
golden bellied flycatcher	1	500-600m	Fairly common at middle elevations of carribean slope, from Miravalles Volcano south, between about 800 and 1800m; also on Pacific slope of Tilaran and northern Talamanca cordilleras , to 2300m. Found at middle levels of gaps in wet forest.
slate throated redstart	1	500-600m	Common at middle elevations, from 700 to 2100m. Forages in middle and lower levels of mature forest, second growth, and forest edges; usually in pairs and often with mixed flocks.
white throated mountain gem	1	600-700m	
Hummingbird green violet ear	1	600-700m	Uncommon in wet foothills and middle elevations, including hills of Osa Peninsula, from 400 to 1600m. Feeds on a variety of plants with small flowers. Occurs in forest canopy; also found at all levels of forest edges and gardens.
slate throated redstart	1	800-900m	.....
slate throated redstart	2	800-900m	.....
white nose coati	2	900-1000m	Confere to the report
buff fronted quail dove	1	1000-1100m	Extremely rare in highlands, from 900 to 3000m. Forages on ground in dense undergrowth at edges of highland forests.
white nose coati	2	1000-1100m	.....
while nosed coati	4	1000-1100m	.....
slate throated redstart	2	1000-1100m	.....
common bush tanager		1200-1300m	One of the most common middle elevation species (600-2200m).Almost always in small groups that are regularly accompanied by other species (three-striped warblers for example)
Spider monkeys	3	1200-1300m	Confere to the report
red tailed squirrel		1200-1300m	
slate throated redstart		1400-1500m	.....

	Gavelan		
Slate throated redstart	2	0-100m	Common at middle elevations, from 700 to 2100m. Forages in middle and lower levels of mature forest, second growth, and forest edges; usually in pairs and often with mixed flocks.
Red tailed squirrel	1	0-100m	
slate throated red start	1	100-200m	Common at middle elevations, from 700 to 2100m. Forages in middle and lower levels of mature forest, second growth, and forest edges; usually in pairs and often with mixed flocks.
red tailed squirrel	1	300-400m	
Gray-breasted wood wren	1	300-400m	Abundant from 800m to timberline. Dwells in understory of wet montane forest and forest edges. Its loud, lengthy, rollicking melody is one of the most commonly heard and attention-grabbing sounds in its habitat.
black cheeked warbler	1	300-400m	Fairly common in highlands of central and talamanca cordilleras, from 1600m to above timberline. Forages activly at lower levels of highlands forest and forest edges.
slate throated redstart	1	400-500m	.....
Hummingbird green violet ear	1	500-600m	Uncommon in wet foothills and middle elevations, including hills of Osa Peninsula, from 400 to 1600m. Feeds on a variety of plants with small flowers. Occurs in forest canopy; also found at all levels of forest edges and gardens.
slate throated redstart	1	600-700m	.....
violet sabrewing	2	700-800m	Common at middle elevations, from 1000 to 2400m; some descend to lower elevationsfrom November to April, occasionally even to sea level. Found at lower levels of mature wet forest, often at openings and forest edges. Males lek in low, dense vegetation inside forest.
White nose coati	9	700-800m	.....
White nose coati	1	700-800m	.....
slate throated redstart	1	700-800m	.....
gray-breasted wood wren	2	800-900m	.....
red tailed squirrel	1	800-900m	
emerald toucanet	2	800-900m	Fairly common at middle elevations, from 800-2400m,. Forages at middle levels in montane wet forests and adjacent gardens and second growth.
Hummingbird green violet ear	1	900-1000m	.....
elegant euphonia	1	1000-1100m	Fairly uncommon in middle and upper elevations, from Tilaran cordillera south, between 1200 and 2200m. Frequents forests edges and gardens.
elegant euphonia	1	1000-1100m	.....
Common bush tanager	1	1100-1200m	One of the most common middle elevation species (600-2200m).Almost always in small groups that are regularly accompanied by other species (three-striped warblers for example)

River trail			
Species	How much	Section	Comments
Slate throated red start	1	1000-900m	Common at middle elevations, from 700 to 2100m. Forages in middle and lower levels of mature forest, second growth, and forest edges; usually in pairs and often with mixed flocks.
Common bush tanager	1	900-800m	One of the most common middle elevation species (600-2200m).Almost always in small groups that are regularly accompanied by other species (three-striped warblers for example)
Slate throated red start	2	900-800m	....
Common bush tanager	1	700-600m	....
Slate throated red start	1	600-500m	....
Elegant euphonia	1	500-600m	Fairly uncommon in middle and upper elevations, from Tilaran cordillera south, between 1200 and 2200m. Frequents forests edges and gardens.
Black Guan	1	500-600m	Fairly common in protected areas of highlands, uncommon to rare elsewhere; from 1100m to timberline. Mostly arboreal, usually seen singly or in pairs; favors mature forest, but also come to fruiting trees in adjacent gardens.
Tufted flycatcher	1	300-200m	Common at middle and upper elvations, from 500 to 3000m. Perches on exposed twigs in treefall gaps and other openings in mature forest, also at forest edges and gardens; often in pairs.
Gray breasted Woodwren	2	200-100m	Abundant from 800m to timberline. Dwells in understory of wet montane forest and forest edges. Its loud, lengthy, rollicking melody is one of the most commonly heard and attention-grabbing sounds in its habitat.

Quetzales			
Species	How much	Section	Comments
Common bush tanager	2	0-100m	One of the most common middle elevation species (600-2200m).Almost always in small groups that are regularly accompanied by other species (three-striped warblers for example)
Rufous collared sparrow	1	100-200m	The common sparrow throughout middle and upper elevations, from about 600m to above timberline. Found in essentially all nonforest habitats , including fields, gardens, and even dowtown San José.
Common bush tanager	1	300-400m	.....
Russet antshrike	1	300-400m	Fairly common in Caribbean foothills and in southern Pacific lowlands and foothills, to 1500m; rare in Caribbean lowlands. Behaves more like a foliage gleaner than an antshrike; individuals or pairs travel with mixed flocks in middle levels of mature wet forest, advanced second growth, and forest edges, often poking into dead leaf clusters.
common bush tanager	3	400-500m	.....
Yellow thighed finch	2	400-500m	Common from Cordillera Central south, between 1400m and timberline; less common in higher parts of Tilaran Cordillera. Pairs or small actively forage in mature forest, second growth, forest edges, and gardens, usually quite low, but sometimes venture high up into trees.
Hummingbird green violet ear	1	600-700m	Uncommon in wet foothills and middle elevations, including hills of Osa Peninsula, from 400 to 1600m. Feeds on a variety of plants with small flowers. Occurs in forest canopy; also found at all levels of forest edges and gardens.
Dark hummingbird magnificient	1	700-800m	Common in highlands of Central and Talamanca Cordilleras, from 1800m to timberline; fairly uncommon down to 1300m on Caribbean slope. Frequents edges and openings in highland oak forest, also in gardens.
Collared trogon	1	700-800m	Fairly common in central and southern highlands, from 800 to 2800m; descends to foothills on both Pacific and Caribbean slopes, from June to December. Found in middle levels of mature wet montane forest, forest edges, and gardens.
slate throated redstart	1	700-800m	Common at middle elevations, from 700 to 2100m. Forages in middle and lower levels of mature forest, second growth, and forest edges; usually in pairs and often with mixed flocks.
common bush tanager	1	800-900m	.....

Uran trail			
Species	How much	Section	Comments
Slate throated redstart	2	0-100m	Common at middle elevations, from 700 to 2100m. Forages in middle and lower levels of mature forest, second growth, and forest edges; usually in pairs and often with mixed flocks.
Tufted flycatcher	1	0-100m	Common at middle elevations, from 500 to 3000m. Perches on exposed twigs in treefall gaps and other openings in mature forest, also at forest edges and gardens; often in pairs.
Hummingbirds Green, violet ear	1	200-300m	Uncommon in wet foothills and middle elevations, including hills of Osa Peninsula, from 400 to 1600m. Feeds on a variety of plants with small flowers. Occurs in forest canopy; also found at all levels of forest edges and gardens.
Black guan	1	600-700m	Fairly common in protected areas of highlands, uncommon to rare elsewhere; from 1100m to timberline. Mostly arboreal, usually seen singly or in pairs; favors mature forest, but also come to fruiting trees in adjacent gardens.
Yellow-thighed finch	2	800-900m	Common from Cordillera Central south, between 1400m and timberline; less common in higher parts of Tilaran Cordillera. Pairs or small actively forage in mature forest, second growth, forest edges, and gardens, usually quite low, but sometimes venture high up into trees.
Black cheeked warbler	1	800-900m	Fairly common in highlands of central and talamanca cordilleras, from 1600m to above timberline. Forages activly at lower levels of highlands forest and forest edges.
Yellow-thighed finch	2	1000-1100m	....
Scintillant hummingbird	1	1000-1100m	Fairly common at middle elevations on Pacific slopes of central and Talamanca Cordilleras, and uncommon on Caribbean slopes, from 900 to 2200m; rare at upper elevations of Tileran Cordilleras. Typically feeds low at forest edges, brushy pastures and gardens.
Gray-breasted wood-wren	1	1200-1300m	Abundant from 800m to timberline. Dwells in understory of wet montane forest and forest edges. Its loud, lengthy, rollicking melody is one of the most commonly heard and attention-grabbing sounds in its habitat.

Skutch trail			
Species	How much	Section	Comments
Scintillant hummingbird mountain	1	300-400m	Fairly common at middle elevations on Pacific slopes of central and Talamanca Cordilleras, and uncommon on Caribbean slopes, from 900 to 2200m; rare at upper elevations of Tileran Cordilleras. Typically feeds low at forest edges, brushy pastures and gardens.
White throated gem	1	400-500m	Female
Flame throated warbler	1	600-700m	Fairly common in highlands of central and talamanca cordilleras, from 1600m to above timberline. Pairs or small groups forage at middle and upper levels of forests, forest edges, and adjacent gardens.
Black cheeked warbler	1	600-700m	Fairly common in highlands of central and talamanca cordilleras, from 1600m to above timberline. Forages activly at lower levels of highlands forest and forest edges.