MEDIUM AND LARGE MAMMAL MONITORING

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INTRODUCTION

Larger mammals consist of a wide variety of species from different trophic levels, ranging from herbivores to carnivores. The density of medium to large mammals is smaller than lower trophic level species, and therefore the species detected per unit effort is relatively low. However, carnivores play a significant role in structuring populations and communities.

Trackplate and camera surveys and terrestrial visual encounter surveys are identified as the core survey methods for medium and large mammals. The objective of the medium and large mammal surveys is to provide reliable, standardized data on status and change in the distribution and relative frequency of a large number of mammalian species. Overall, the Multiple Species Inventory and Monitoring (MSIM) protocol is intended to serve as a consistent and efficient method for obtaining spatially and temporally coincident detection/non detection data and habitat condition data across a diversity of species. This core set of monitoring points is to be surveyed over a multiple-year sample period with no less than a 5-year resample cycle.

Within Cloudbridge reserve, wildlife knowledge is little-developed. That’s why, as volunteers, we used this method to know better medium and large mammal populations. This protocol being new in Cloudbridge, our task was mainly to adopt this method to the reserve. Firstly, we will try to get used to the material and secondly, we will analyze the results.

I – Experimental Protocol

A – Methods

1 – Indirect Observations

a – Principle

The indirect observations allow to know the presence of mammals in studying areas using two complementary techniques: trackplates station with bait and detection by camera. Indeed, trackplate survey are very effective to detecting mesocarnivores but are not to detect herbivore while cameras are effective in detecting a wide range of mammals. In addition, the use of these cameras is highly interesting because of the high probability of detecting species which is difficult to observe. The presence of bait on the trackplates station also allows to improve the reliability of the method by attracting many target species, both for trackplates station for detection by camera. Thus, the survey method described here is a combination array of trackplates and cameras designed to detect as an array of medium and large-bodied mammals that will be as broad as possible. Therefore, these observations are realized on two stations both using these techniques. The reliability of the method is better when cameras are placed on sites, where target species are lured in, with food or water.

b – Experimental device

Before to install the equipment, it is necessary to determine the location of studying areas. For this, a knowledge of the reserve is required to select areas that are regularly frequented by mammals. So Tom Gode performed this work upstream, in particular thanks to footprints observation. With 2 cameras, we are therefore working on two studying areas simultaneously for 12 days. The stations are inspected every two days for a total of 5 visits per studying area. This experiment is repeated twice for a total of four stations for 2x12 days. Initially, all studying areas have the same device, the same setting, the same bait and should all be able to be verified the same day.

Firstly, the trackplates station is installed in the studying area determined beforehand. Therefore, a coroplast (1m long and 60cm wide) is folded into a tunnel. It is important that the corrugations run in parallel to the longest length for maximum strength. This coroplast cover is based on two metal hoops located at each end and the structure is consolidated by two other hoops (see photo 1). A 70cm long wooden plank is placed within this tunnel, divided into three parts : 30cm of toner, 30cm with a white paper sheet and 10cm on which are placed the baits (see photo 2). Baits are constituted of three types of food: fruit (bananas), meat (cat food) and cereals, attracting a greater diversity of mammals. Toner, for its part, can take footprints of mammal and then print the white paper. This system is able to work only when we board up an entrance of the tunnel by another piece of coroplast cover. Thus it prevents animals to take the bait from the rear, without passing through the trackplates station.

Photo 1 : Tunnel

Photo 2 : Trackplates station

During the experiment, the bait must always be fresh, so it is necessary to replace it on each visit. Moreover, the paper sheet is renewed in case of footprinting or deterioration by insects or rain. This system works only for medium mammals, so we set up a second trackplates station adapted to large mammals. This device corresponds to a wooden box of $1m^2$ into which we placed sand on a plastic sheet (see photo 3).

Photo 3 : Trackplates station for large mammals

In a second step, the camera is installed whom it detects the visits of the tunnel. This one is fixed on the nearest tree and the best turned around the entrance of the tunnel. If there aren't appropriated trees on the studying area, a support coul be implemented, as it is stable when it exposed to weather conditions and animal activity (see photos 4 and 5).

Photo 4 : Camera fixed on a tree at site B

Photo 5 : Camera fixed on a support at site B'

Then, we must settle the camera. The settings must be done in such a way that the orientation, the detection and observation are maximum. For orientation it only needs to tilt the camera well (using a wood piece for example), using a camera to check the angle of view. For the detection and observation, adjustments are performed on the camera itself. It is necessary to properly program it with the aid of the manual. To begin, the camera has been settled in such a way that takes four pictures as a movement is detected and put on standby for 10 minutes. We chose these settings to prevent rapid saturation of the memory card. Also the trigger distance was placed halfway between the near and far mode. Knowing better then the weight of photos, we changed the settings to increase our chances of detection.

The settings detailed above are those made at the beginning of the experience. Indeed, this project being new in Cloudbridge, it has been necessary to change settings during the experiment to improve the results. Just as for bait, each visit, we had to change the camera memory card. It allows to control the passages and avoids potential saturation of the memory. For this we have four memory cards at our disposal. Although this method is not easy to apply (settings and choice of the area), it presents the advantage of not disturbing the mammals activity and provide results in night observation.

2 – Direct observations

This method consists of watch mammals in their environment. To do this, simply observe for 10 minutes an area while remaining as discreet as possible. These direct observations are performed on the same day that the visits of indirect observation points. We choose six observation points during our travel that we try to share out uniformly. As with the indirect observations, Tom Gode advised us some observations points. Although detection rates were low, the technique was simple, inexpensive, and useful for a wide variety of species.

B – Studying places

1 – First work period

During this period, we realized our experiences in the primary forest of Cloudbridge reserve. The particularity of the primary forest is based on the fact that she hasn't suffered modification by humans, it is a virgin forest. We can suppose in this part concerning the reserve, wildlife is quite well developed. The first camera (site A) is placed on the path that leads to the primary forest, above the Casa Gavilan (see appendix 1), it is so on primary forest edge. In contrast, the second camera (site A') is in the heart of primary forest and also on the trail. Indeed, the cameras must be placed on a cleared path because the forest is very dense. To visit the two cameras, we did the same way every two days, a 2h30 hike. It is on this travel that are realized the 6 points of observation.

- The first point (No. 1) is before the Casa Gavilan in a relatively dense forest and peccaries (wild pigs) could be observed (see photo 6)

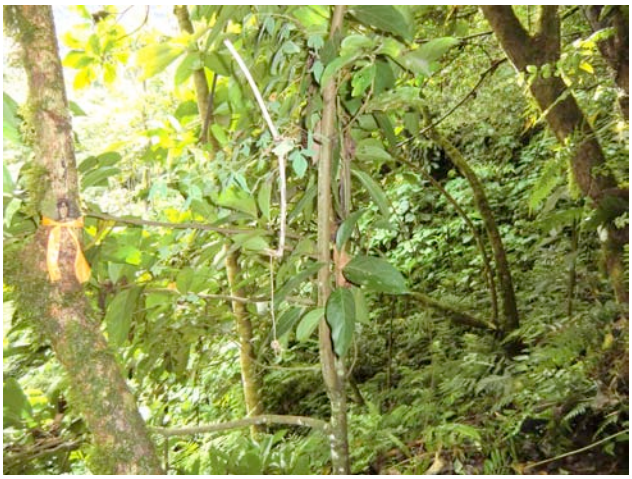


Photo 6 : Observation point No. 1

- The second point (No. 2) is between the Casa Gavilan and primary forest. This observation area presents the advantage of having a fairly cleared view on the forest (see photo7).

Photo 7 : Observation point No. 2

- The last four points (No. 3, 4, 5 and 6) are located in the heart of primary forest. We have chosen them for their open view (see photo 8).

Photo 8 : Observation point No. 3

2 – Second work period

During this period, our two studying areas are not located in the same part of the reserve. The first device is placed at the bottom of a valley along the river Uran. The presence of water in this forest area should promote the passage of mammals. In distinction from the other three sites, the last device is placed in a grassland area on the edge of the forest, located at about 30 minutes to Casa Amazimtoti. It is not installed on the path but in a place where numerous tracks of Peccaries have been observed sheltered from a big rock. We decided to make our six observation points along our travel to the first camera. Indeed, as shown on the map, this hike being much longer (3 hours), it is therefore easier to share out these six observation points.

- The first observation point (No. 1') is located before the crossing of the river Chirripo (Photo 9).

Photo 9 : Observation point No. 1'

- The second observation point (No. 2') allows us to observe the opposite bank of the river without being too conspicuous, and therefore seeing animals that come to drink (photo 10).

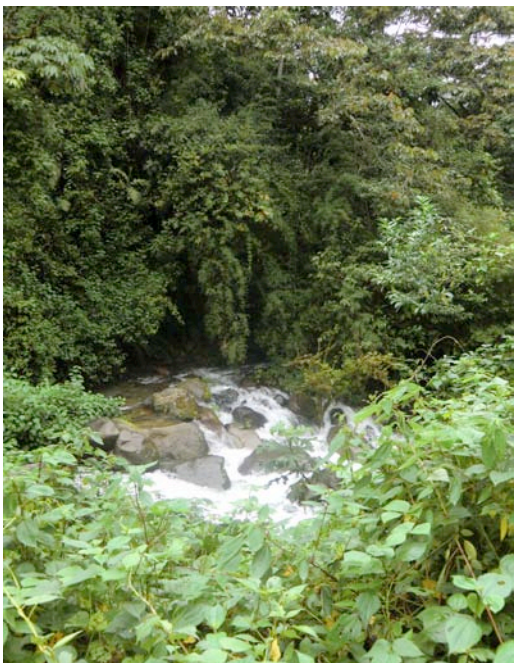


Photo 10 : Observation point No. 2'

- The third observation point (No. 3') is located close to the Ranch Don Victor, in the heart of the forest.

- The fourth observation point (No. 4') gives us an open view on the trees of the forest thereby increasing our chances to observe primates (photo 11).

Photo 11 : Observation point No. 4'

- The fifth observation point (No. 5’), as the second point, allows us to observe the opposite bank.

- The last observation point (No. 6’) is in a grassland area, which gives the advantage to see far enough into the landscape.

II – Results and interpretation

A – First work period

1 - Indirect Observations

a - Site A

α - Results and camera setting

This project being experimental, we are reporting in Table 1 the changes made in order to improve the results.

	Results	Setting
07/01/10	0	Installation of the camera
07/03/10	0	Stand by of 3 minuts between each detection
07/05/10	0	Near mode
07/07/10	0	
07/09/10	0	
07/11/10	1 Pygmy squirrel (*Microsciurus alfari)* (cf. photo 12)	removal of equipment

Table 1: Results and camera settings for the Site A

Photo 12 : Passage of a Pygmy Squirrel

We think that the presence of the squirrel on July 11 is due to hazard more than the attraction of the bait. Indeed, we can see on the picture that the squirrel is just passing through. In addition, we have often seen this squirrel in a tree near the tunnel.

β - Results and adjustments of the tunnel

Table 2 presents the results and improvements made to the tunnel.

	Results	Settings
07/01/10	0	Installation of the tunnel
07/03/10	0	Removal of papaya
07/05/10	Bugs tracks	
07/07/10	Bugs tracks	Addition of cat food
07/09/10	Rodent tracks (seee photo 13)	
07/11/10	Bugs tracks	Removal of equipement

Table 2: Results and adjustments of the tunnel for the site A

For the implementation of this system we followed the protocol detailed in the first part. In contrast, baits have evolved according to their efficiency. Indeed, at the beginning we installed only fruits (banana and papaya) and cereals, but not having results we took off the papaya which smelled repellent. Our baits attracting only insects, we used cat food to have a chance of attracting a carnivore, but our results were not conclusive. Note that the paper sheets were often soiled by rain and insects, so the rodent tracks of July 9 could not be identified properly.

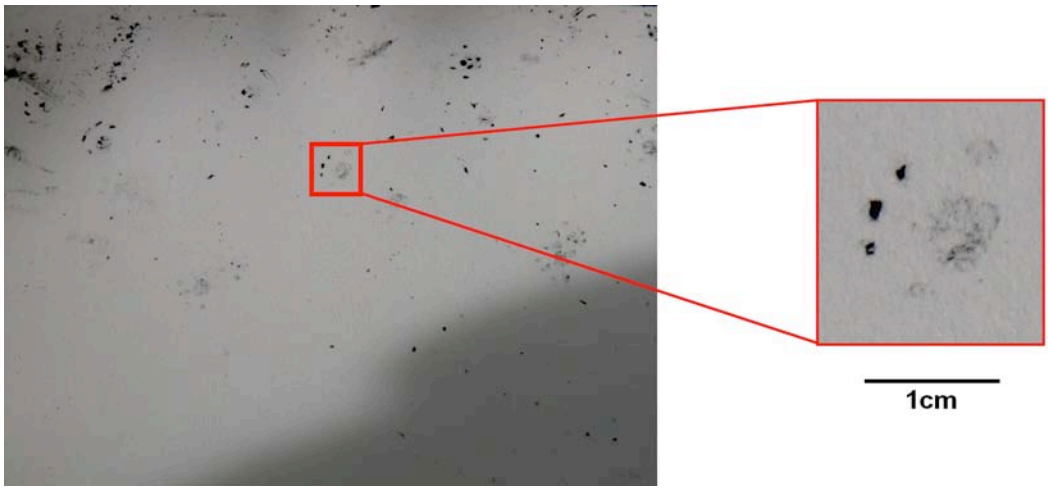


Photo 13 : Tracks of an unidentified rodent

γ – Results of sand box

This device has produced no result because it was subject to rainfalls which erased any potential track.

b - Site A'

α – Results and camera setting

	Results	Settings
07/01/10	0	Installation of the camera
07/03/10	0	Near mode
07/05/10	0	
07/07/10	0	
07/09/10	0	
07/11/10	0	Removal of the equipement

Table 3: Results and camera settings for the site A'

The initial settings of the camera are exactly the same as for site A. Then we realized the same set-up changes during the experiment.

Contrary to our expectations, the primary forest doesn't give results.

β - Results and adjustments of the tunnel

	Results	Settings
07/01/10	0	Installation of the tunnel
07/03/10	0	Removal of the papaya
07/05/10	Bugs tracks	Addition of a piece of banana at the entrance of the tunnel
07/07/10	Bugs tracks	Addition of cat food (on bait area and at the entrance on the tunnel)
07/09/10	Bugs tracks	
07/11/10	Bugs tracks	Removal of the equipement

Table 4: results and adjustments of the tunnel for the site A '

We followed the same approach as for site 1 and the results were not conclusive either.

γ – Results of sand box

There are no results with this device because it has been subjected to the rainfalls which have erased all potential tracks. We tried to solve this problem by installing a coroplast roof attached to four trees using strings (see photo 14).

Photo 14 : Improvement of the system of footprinting for large mammals

Despite this improvement, we did not get any results because the rain is very heavy during this season. Therefore, we decided with Tom to stop this device for the second period. Indeed, we already have a trackplates device within the tunnel. In addition, sand not being easy to carry, this device asks a hard physical effort.

2 – Direct Observations

Table 5 lists the species observed during the first period.

Date / Sites	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
07/01/10	X	X	X	X	Noise of Spider monkeys	X
07/03/10	X	X	X	X	X	Noise of Spider monkeys
07/05/10	X	X	1 Pygmy squirrel (*Microsciurus alfari*)	X	5 Spider monkeys (*Ateles geoffroyi*)	X
07/07/10	X	X	X	X	X	X
07/09/10	X	2 Pygmy squirrels (*Microsciurus alfari*)	1 Pygmy squirrels (*Microsciurus alfari*)	X	X	X
07/11/10	1 Spider monkey (Ateles geoffroyi)	X	X	X	X	2 Spider monkeys (*Ateles geoffroyi*)

Table 5: Results of direct observations during the first period

In this area we have only seen Spider Monkeys and Pygmy Squirrels. As our results show, places 5 and 6, located in the heart of primary forest, are more suitable for the observation of Spider Monkeys (see photo 15). Indeed, as we gather visual and auditory observations, we can assume that these places are close to their habitat.

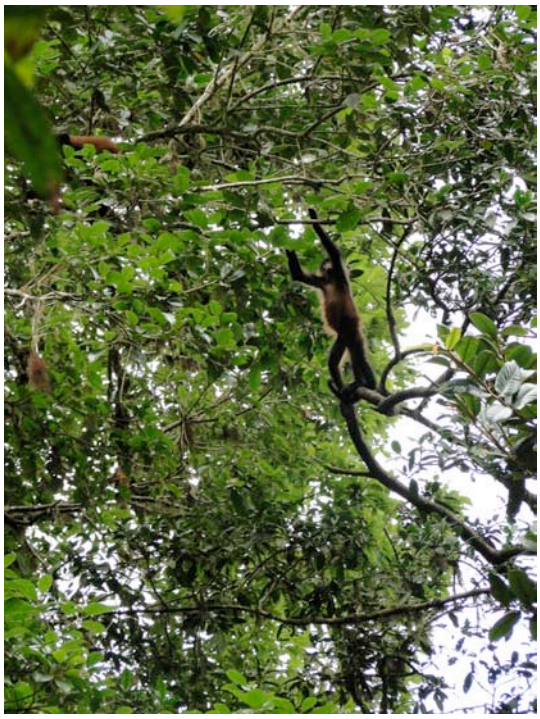


Photo 15 : Spider Monkey (Ateles geoffroyi) at observation point No. 5

Moreover, the squirrels were seen outside the primary forest. Squirrels being small animals, they are more difficult to observe in the primary forest, which is relatively dense. We also note that the visual observation rate has increased from the third visit. This can be explained by our ability to be more discreet.

B – Second work period

1 – Indirect observations

a - Site B

α – Results and camera setting

As for the first period, we are reporting in Table 6 the changes made to improve the results.

	Results	Settings
07/14/10	0	Installation of the camera
07/16/10	0	
07/18/10	0	
07/20/10	0	
07/22/10	0	
07/24/10	0	Removal of the equipement

Table 6: results and camera settings for site B

As we didn't get significant results with photo mode, we decided to use the video mode for this second part of the experience. When the camera is triggered, it shoots for 30 seconds and then standby for 3 minutes. Despite this change, there were no conclusive results.

β - Results and adjustments of the tunnel

We performed as before using three kinds of bait. The renewal of bait is due to the fact that the bait isn't eaten.

	Results	Settings
07/14/10	0	Installation of the tunnel
07/16/10	0	
07/18/10	0	
07/20/10	0	
07/22/10	0	
07/24/10	0	Removal of the equipement

Table 7: results and adjustments of the tunnel for the site B

b - Site B'

α – Results and camera setting

	Results	Settings
07/14/10	0	Installation of the camera
07/16/10	Hypotetical passage of an opossum	Modification of the camera place (addition of a support)
07/18/10	Passage of a coati	
07/20/10	An opossum entered on the tunnel	
07/22/10	0	
07/24/10	Passage of a squirrel	Removal of the equipement

Table 8: results and camera settings for site B'

As for site B, the camera has been settled with video mode. This site presented the particularity of having no adequate tree to fix the camera. Initially, we hooked the camera to a tree that was quite distant from the tunnel. For optimal efficiency we went back to check our device on July the 15th to calibrate the orientation of the camera. We had results in trackplates station but none with the camera, so we deduced that distance between the camera and the tunnel was too long. Therefore, we decided to install the camera on a banana tree with a wood stick giving another angle to the camera and putting it nearer. We had some results, but the angle of the camera was still not ideal, we were able to see a tail that we thought being from an opossum. We changed the position of the camera one more time, fixing it with a medium made of two wooden sticks crossed. Thus, the days we saw a White-nosed Coati (*Nasua narica*), yet he was not interested by bait but only by the camera (http://www.youtube.com/watch?v=vrxjmuEIKFI). Then on July the 20th, we had a visit from a Southern Opossum (Didelphis marsupialis) in the tunnel, which has let its footprints (http://www.youtube.com/watch?v=6xK3u9qMGlU).

Finally, on July the 23th, we observed several passages from a Pygmy squirrel on camera but it did not interested by the bait.

β - Results and adjustments of the tunnel

	Results	Settings
07/14/10	0	Installation of the tunnel
07/16/10	Unidentified footprint (see photo 16)	
07/18/10	Opossum footprints (See photo 17)	
07/20/10	Opossum footprints checking by the camera	
07/22/10	0	
07/24/10	0	Removal of the equipement

Table 9: results and adjustments of the tunnel for the site B'

As before, we changed the baits, which have been eating every time. At the first visit, we observed footprints (see photo 16) that we failed to identify despite the help of Tom Gode. At the second visit, we obtained footprints that we thought being from an opossum (see photo 17), however it should be noted that this time, the closing end of the tunnel has been removed, so we can suppose that was not the opossum which ate the three kinds of bait.

Photo 16 : Footprints taken on July 16th

Photo 17 : Opossum footprints taken on July 18th

2 – Direct observations

Table 10 lists the species observed during the second period.

Site / Date	Site 1’	Site 2’	Site 3’	Site 4’	Site 5’	Site 6’
07/14/10	X	X	X	X	X	X
07/16/10	X	X	X	X	X	X
07/18/10	1 Collared pecari (*Pecari tajacu*)	X	1 Racoun (*Procyon lotor*)	X	X	X
07/20/10	X	X	X	X	X	X
07/22/10	1 Pygmy squirrel (*Microsciurus alfari)*	X	X	X	X	X
07/24/10	X	X	X	X	X	X

Table 10: Results of direct observations during the second period

III – Reviews and improvements

It should be noted here that the project we conducted is experimental. Although we didn't have very good results, our project allowed the understanding of the method MSIM's use. This part is devoted to criticisms and to possible technique's improvements.

A - The equipement

1 – The camera

As our results show, it seems that the video mode was more efficient than the photo mode. Furthermore, we think that the camera had a long time between detection and triggering. The use of the camera was complex, that's why next volunteers should still work on the camera setting. Settings should be adapted to each studying area.

2 - The tunnel

Initially, it should be noted that the tunnel with its dimensions was not adapted to large number of mammals. Indeed, it can essentially contain medium mammals, as rodents. Therefore, it is necessary to consider the use of a larger tunnel for future experiments.

Secondly, our experiments showed that it is necessary to better secure the enclosed end of the tunnel to prevent animals to take the bait from the rear without letting any tracks.

Finally, many of our paper sheets were soiled by the rain, it should consider a way to seal the coroplast cover.

3 – The bait

The bait being the only way to attract mammals, it is the functioning key of our experiments. As our results show, it seems obvious that our baits were not adapted to the target species. We knew that animals find food thanks to the sense of smell : it seems that our baits were not fragrant enough. It would be better to use a bait equivalent to a mixture of Gusto ™ (Minnesota Trapline Products, http://www.minntrapprod.com). On the other hand, it could also be interesting to use a visual bait suspended above the camera.

B - Environment

Cloudbridge reserve is very maintained. Indeed, the job of the employees is to plant trees and maintain the trails passable. Therefore, there is an intense human activity in this reserve which may limit the development of some mammals. For instance, during our experience, an employee used a strimmer near our studying areas, so we think it could have scared away animals.

On the other hand, our frequent presence on the area could have discouraged some mammals which detect human smell. In response to this problem, it would have been possible to buy products hiding the human odor. Otherwise, it might be helpful to wear latex gloves when installing the bait. This solution is less expensive.

CONCLUSION

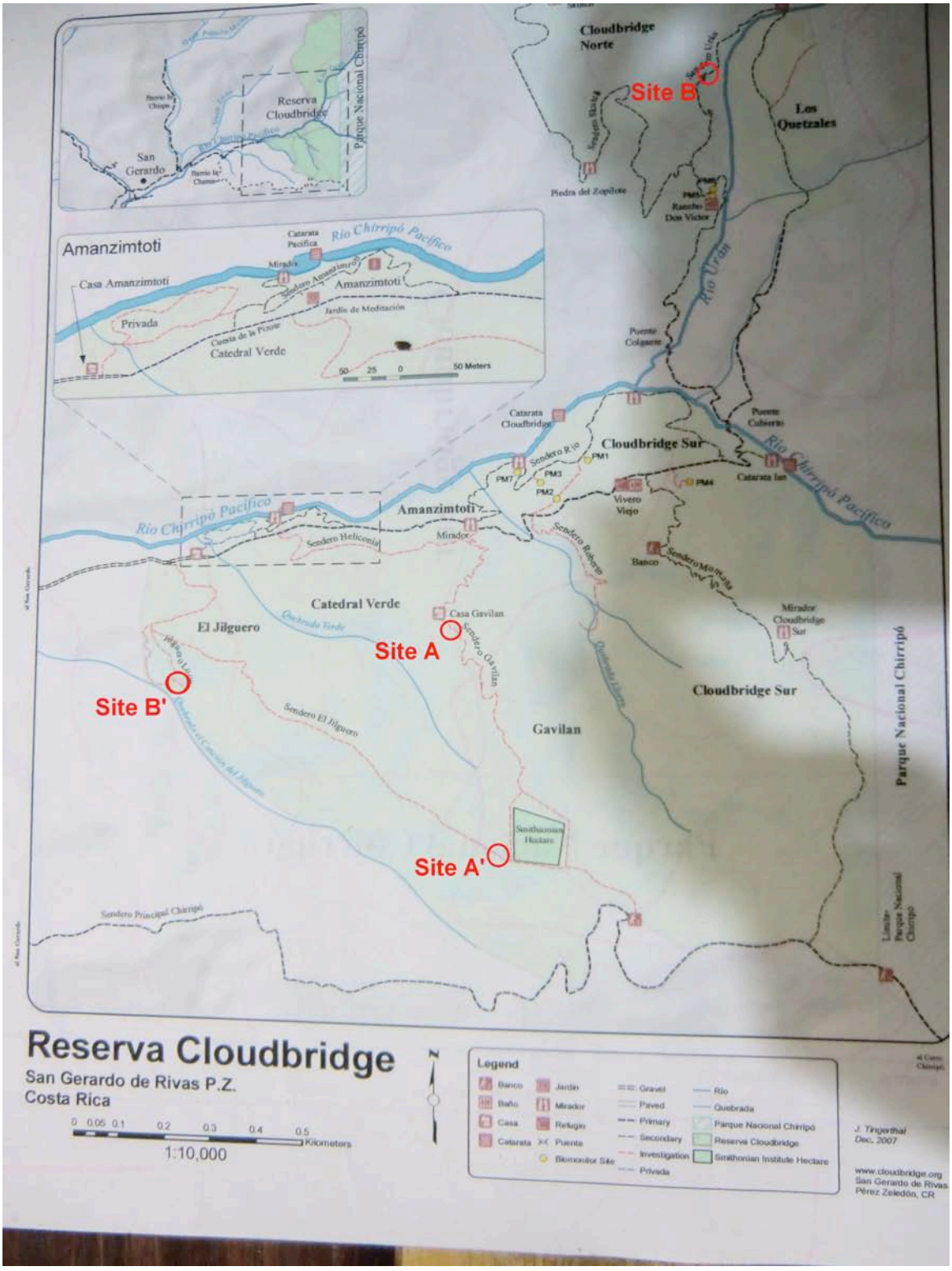
As we have noticed, the wildlife's study and more particularly medium and large mammals, is a delicate work. Indeed, many factors have a lot of influence on the presence or absence of target species. These factors can be human presence, climate or the mammal's lifestyle.

Our project allowed to identify some mammals of Cloudbridge reserve. However, our results do not permit to conclude on a spatial-temporal distribution of our target species.

Despite bad results, we think that the method MSIM is relatively adapted to Cloudbridge reserve. Indeed, this reserve being at human scale, it is possible to share out studying areas in different point and to visit them in the same day. In addition, this method requires little labor and no special capability.

Now, this work being initiated, next volunteers will probably get better results. Indeed, they can learn from the mistakes we did and that are described above and use the improvements quoted in the third part of this report. From what we have learned during our experiences, we can say that a longer work period could afford spending too much time by determining the location of studying areas.

APPENDIX



Appendix 1: Map of Cloudbridge reserve showing the location of our four studying areas