Wildlife Conservation Society
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Estimating Jaguar Population Using Traps Camera in One Hundred Square Kilometers in Rus Rus La Mosquitia, Honduras.

By: Héctor Orlando Portillo Reyes. Coordinator
Jonathan Hernandez. Assistance
Tomas Manzanares. Parabiologist
Tomas Manzanares Jr. Parabiologis
Santiago Lacut. Parabiologist
Raul Lacut. Parabilogist

Introduction

In Honduras Jaguar data abundance has been anecdotal registration, few or nothing is known about its ecological population. Historical records tell a homogeneous distribution all through the country, (Portillo & Matamoros unpublished) however now a days, its territory has been reduced to the Caribbean and Mosquitia region. During 2005 the first steps were given to try to establish the relative abundance for jaguar in the National Park of Pico Bonito in the Caribbean coast.

In 2007, with the support of the Wildlife Conservation Society (WCS) we trained a group of hondurans and started to planified a tramp camera study in Rus Rus (116,300 ha) which is a proposed protected area of the Honduran Mosquitia corridor. Ru Rus still remains as a low human pressure inhabited by a Misquito group (a honduran indigenous group). Rus Rus shows to maintain a large mammal's richness, since in 2001 biological monitoring confirm their presence.

In order to ensure that the methods and data are comparable, the study was followed under the terms of WCS trap camera protocols trying to accomplish as close as possible the methodology. Eventhough all the protocols were accomplished, they had to be adjusted to the reality of the field work done.

Study Site

According to Holdrige 1967, the Mosquitia region is a very humid tropical forest, however Wilber 1996, describe the Honduran Mosquitia in three main regions, the Atlantic humid forest, the pine savanna forest and the mangrove forest.

The proposed area of Rus Rus is located in the Southwest of the Honduran Mosquitia Region in the Department of Gracias a Dios. Its coordinates are 14º 38` 00``north and 84° 26` 00``west. Limits to the north with Las Montañas de Colón, to the south with the Rio Segovia (which borders with Bosawas protected area, Nicaragua) to the west with Awasbila Community and to the east with the pine savanna forest of Kakaopauni.

The study site is a very humid tropical forest, with carstic rocks, slopes of 5-10 %, the annual temperature is 30° celcius and annual precipitation is 3000 mm.

The site is located 26 kilometers north from the Rus Rus community, it contains around thirty kilometers of trails which used to be a old ancient route to connect the communities from the pine savanna area of Rus Rus with the Patuca river. Actually is a research site for herpetologists but also a sporadic hunting site for the community of Rus Rus (they visit the area every 3 months for hunting peccaries *Tayassu pecari* and agouties *Agouti paca*)

Methods

Jaguar evidence was taken between the years 2001-2005 by Tomas Manzanares as part of Biological Monitoring program of AFE-COHDEFOR/PROBAP project. The experience of the parabiologist Manzanares was determinant to select the area and site, previous survey was not carry out.

Local people were trained in the use of trap cameras, in order to incorporate them in the research, considering natives as a alliance for future researches, and also helping on checking up cameras through out the study.

A ten people expedition moved from Rus Rus to Las Montañas de Colón to set up the cameras (a two day boat trip). A camp was established in the middle of the study area, in order to move from site camp to the network trails.

The study was conducted sixty days camera from January 12 to March 13 to accomplish the assumption of a jaguar close population. We ploted coordinates for each station using a GPS and introducing the coordinates in Arcview 3.2 to give each station a three kilometer buffer covering a 100 hundred square kilometer, avoiding gaps in the study area. For the effective area we calculate the average of the maximun distance of all animal moved from one point to others, divided in two and using this number as buffer area in each station.
See table 2.

Station cameras were set up in trails two meters wide and thirty kilometers long where potential sites of jaguar tracks were seen. Each station had a pair of cameras of the same kind, Camtraker and DeerCam. Duracell double AA batteries were used for back up and for the inside cameras. Energizer medium size batteries were used for each camera sensor and 36 exposures Agfa asa 100 and 400 films were used.

The cameras were programmed to function continuously night and day with a three minute interval between each photo. During the study some cameras were moved not further than 20 meters looking for a better site.

We programmed the cameras to work 24 hour (1-4-8 sensor programmation) over a period of 60 days.
Every fifteen days a team of a biologist assistant and four local people went to check up cameras, batteries and films in all trails and stations: The time spent for the check up took around three to four days effort.
Films were taken to Tegucigalpa to be reveal and scannered. A group of pre-grade students of Biology worked together comparing printed photographs of the jaguar spot patterns. Once compared, all the data was arranged in Excel tables to be analyzed by Capture Software.

Number of camera sets

20 pairs of camera

Number of days

60 days

Number of trap nights

2,400 trap nights

Quantity of films

120 films

Results

In sixty days of study we found thirteen species of mammals in ten families. Three species, (*Phanthera onca, Puma concolor, Leopardus pardalis*) of the five felids found in Honduras were captured by the cameras, the other two were not (*Leopardus weidii an Herpailurus yaguarundi*). Also three ungulates (*Tapirus bairdii, Tayassu pecari and* the *Mazama americana)* were recorded which are considered endangered species by hunting and lost habitat.

Table 1. Mammals Captured and frequency (Observations/1000 camera trap night)

Scientific name	**Family**	**Common name**	**Captures 2400**	**frequency**
Panthera onca	Felidae	Jaguar	15	6
Puma concolor	Felidae	Puma	10	4
Leopardus pardalis	Felidae	Ocelot	20	8
Tapirus bairdii	Tapiridae	Tapir	4	1.6
Tayassu pecari	Tayassuidae	White-lipped peccary	10	4
Mazama americana	Cervidae	Red brocket deer	1	0.4
Tamandua mexicana	Myrmecophagidae	Tamandua	2	0.8
Agouti paca	Dasyproctidae	Agouti	5	2
Dasyprocta punctata	Dasyproctidae	Guatuza	60	25
Nasua narica	Procyonidae	Coati	2	0.8
Dasypus novencintus	Dasypodidae	Nine-banded armadillo	17	7
Didelphis sp	Didelphidae	Oposum	7	3
Peromyscus sp	Murydae	Wild rat	18	8

Jaguar captures

Four adult jaguars(3 males, 1 female) and a cub were photographed and identified during the study. During the 60 days study, we got captures and recaptures per individuals and calculated the density using the CAPTURE as shown next.

```
title='Example Jaguar Survey'
task read captures occasions=60 x matrix
format='(2x,a1,2x,60f1.0)'
read input data

  A 000100000000100000000000000000000000000000100010000000000000
  B 000000000000000000000000000001001000010000000100000000100000
  C 000000000000000000000000000001000000000000000000000000100000
  D 000000000000000000000000000010000001000000011000000000000000

task closure test
task model selection
task population estimate ALL
task population estimate APPROPRIATE
```

CAPTURE output...

```
 Mark-recapture population and density estimation program              Page   1
                        Program version of 16 May 1994       04-Apr-08
 Input and Errors Listing

 Input---title='Example Jaguar Survey'

 Input---task read captures occasions=60 x matrix
 **  Warning  ** captures=   12.0000     assumed.

 Input---format='(2x,a1,2x,60f1.0)'

 Input---read input data

         Summary of captures read
               Number of trapping occasions       60
               Number of animals captured          4
               Maximum x grid coordinate         1.0
               Maximum y grid coordinate         1.0

 Input---task closure test
 Input---task model selection
 Input---task population estimate all
Appropriate model probably is  M(h)  or  M(o)
 Suggested estimator is jackknife.
1Mark-recapture population and density estimation program              Page   5

Program version of 16 May 1994       04-Apr-08
```

Example Jaguar Survey
Population estimation with constant probability of capture.
See model M(o) of the Monograph for details.
Number of trapping occasions was 60
Number of animals captured, M(t+1), was 4
Total number of captures, n., was 15
Estimated probability of capture, p-hat = 0.0625
Population estimate is 4 with standard error 0.3048
Approximate 95 percent confidence interval 4 to 4
Profile likelihood interval 4 to 5
1Mark-recapture population and density estimation program Page 6

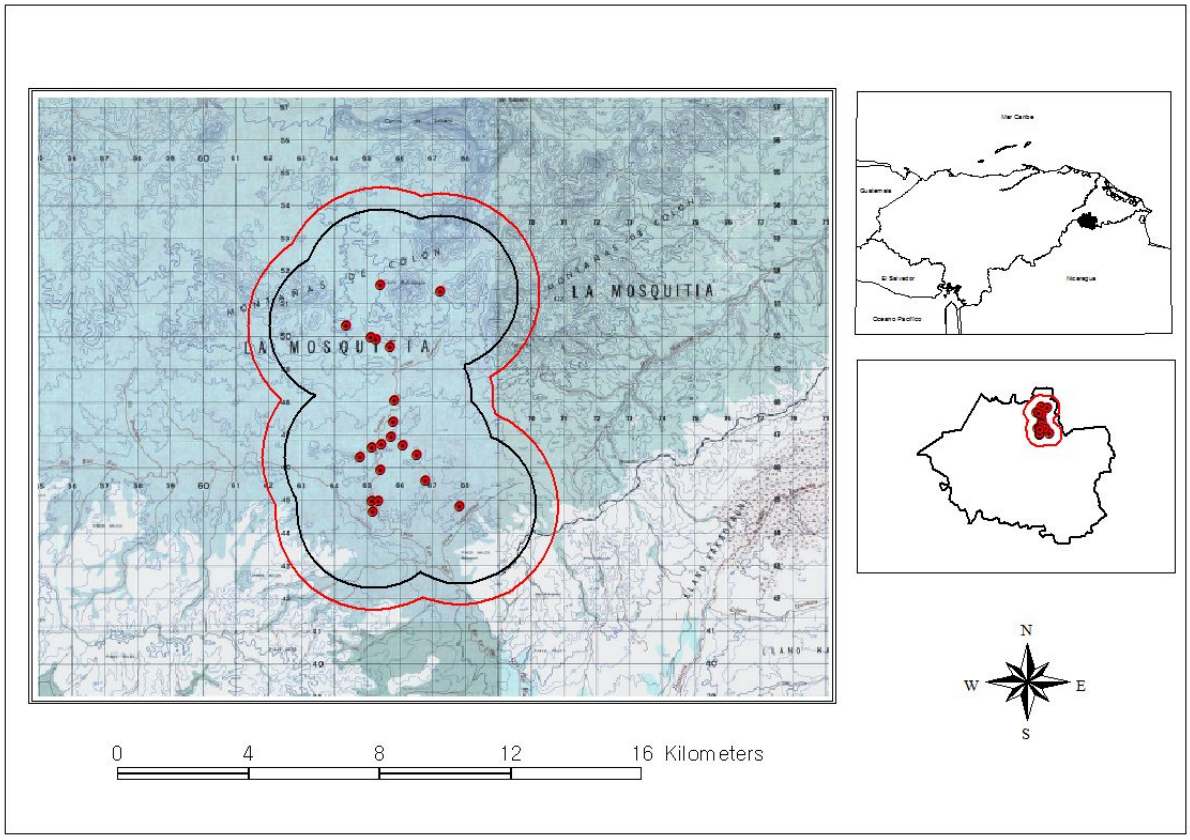
Table 2. Maximun Distance Movements and Average of Jaguars in the Study Site

Number of Animals Recaptured	**Maximun Distance Movements of Jaguar**
Jaguar A	5 Km
Jaguar B	6 Km
Jaguar C	5 Km
Jaguar D	7 Km
Average used as buffer for effective jaguar area	**2.87 Km**

We used of 2.87 Km as buffer, introducing in Arcview this average giving a total area, calulated in 96 square kilometers to estimate the effective area of jaguar.

Obteining the affective area for jaguars wich was 96 square kilometers, we estimated the density in 4.2 jaguars/100 square kilometers.

Figure 1. Red points (placement of camera traps); Red line (buffer study area) and Black line (minimun range of jaguars)



Tayassu pecari: groups of 75-100 individuals were seen during the day moving into the study area. We assumed they represented availability of food for the carnivores, eventhough relative abundance did not show such quantity of individuals. Pictures showed a healthy animal related to its with weight and size. Also pecaries are moving frecuently from one place to another, according to Marineros & Martinez 1998.

The Tayassu tajacu was not captured by cameras, but this did not mean they were not present in the study site. We assume they are relegated to marginal areas, and this could reduce the probability of being capture by the cameras, maybe this is a behavoir to feel safe from predators and competition of space, food and shelter. Pecaries travel long distances in large groups cleaning up all places they go and tajacu follow behind the pecari troops as a strategy to survive. Pecaries is one of the main prey of the big cats like jaguars and pumas. Local people report small groups of *Tayassu tajacu* a long side the Rus Rus river, using this habitat as shelter to feel safe.

***Tapirus bairdii*:** a few number of tapirs were captured in this study, however we have to consider that cameras were set up in trails specifcally looking for jaguars and not for tapirs which uses natural trails made by themselves.

Small mammals: the study showed (see table 1.) a large number of small mammals as agoutis and armadillos, like a good source of food as an alternative for carnivores.

Also other mammals were observed during walks through trails as spider monkey (*Ateles geoffroy*, white faced monkey (*Cebus capucinus*) and howler monkey (*Allouata palliata*).

We assumed the existance of a sympatric relationship among felids in the study area, (see figure 2 Anex) because of the availability of food (large and small mammals as an alternative source of food) even when the area has been used as a hunting area for local communities specially looking for pecaries and agouties (personal communication). The long distance between the closest village and the study site is taken in consideration for the abundance of the species used as food for jaguars. We assume a healthy ecosystem in balance beetwen sustenible human activities by local indigenus communities and the jaguar population in the study site

Jaguar conservation status

Nine colonization fronts are coming up from differents regions of Honduras looking for land in the Mosquitia region. The west region of the Rio Platano Biosphere Reserve, the National Park of Patuca and the Biosphere Reserve of Tawahka are the most impacted by human intervention. Many species of mammals have been affected in number and distribution. Native people report that to hunt a pecari they have to spend more that 9 hours walking.

Jaguar populations in Mosquitia corridor were assumed to be in a great numbers, however this is a very anecdotal appreciation, since agricultural activities and cattle ranchers are advancing from West to East. All felids are under a very high pressure of hunting, loss of habitat and competition for food.

Nevertheless the East region of the corridor is inhabited mostly by local native groups (misquitos) with other perspective of use of natural resource, with less presure just taking what they need in hunting, fishing and logging. This attitude has allowed all species a better opportunity to have enough space and food to survive including the jaguar.

The jaguar is seen as a predator for a very low cattle ranching activity in Rus Rus. In very rare ocassions it hunts cattles. We assume they still have plenty of food and space for their survival.

At least the jaguar population in the study site looks healthy and in good number, taking in consideration that they are sharing food and space with other felids.

We assume that almost all Central East corridor (a continuous landscape) of la Mosquitia mantain a wellness ecosystem to keep a good number of jaguars including other felids (we assume the five felids inhabit the area) and their preys also other arboreal mammals and the rest of the biodiversity which is contained in this corridor.

Is urgent to try to give a legal status to Rus Rus as a protected area for its richness in mammals, birds (two big parrots, red and green macao), reptiles (endemic reptiles) and amphibians. Also because their ecosystems as pine savanna, huge gallery forest are present. But, overall, because Rus Rus forest keeps conectivity with Bosawas Reserve of Nicaragua and the Honduran mosquitia which is a core of the mesamerican corridor and the second largest forest from South of Mexico to Panama.

The density of the jaguar shows an ecological integrity in the study site. We recommend to Paseo Jaguar Project to extend and cover these areas as an important site to be conserve as one of the last places where jaguars still live under almost undisturbe habitats.

Acknowledgements

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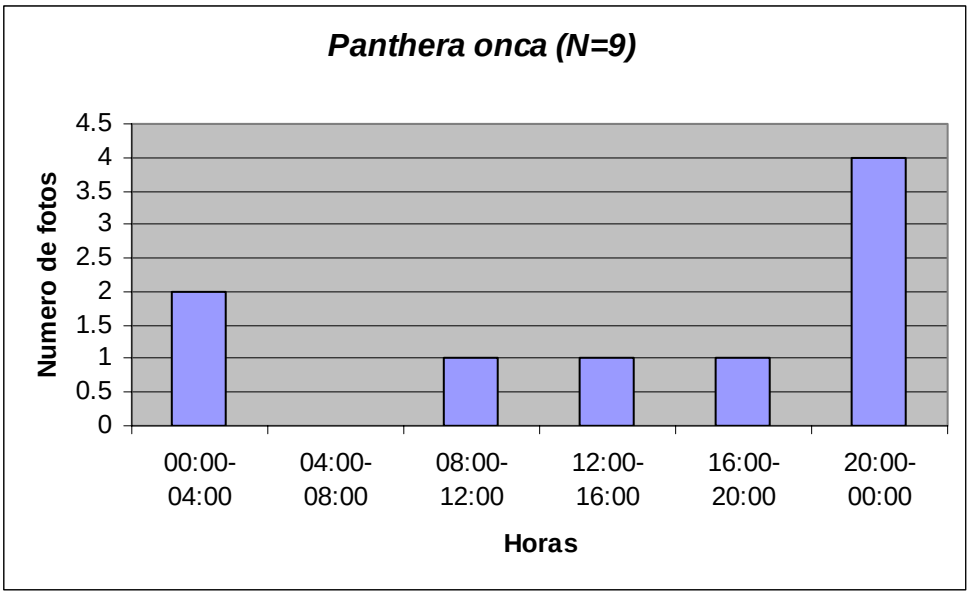
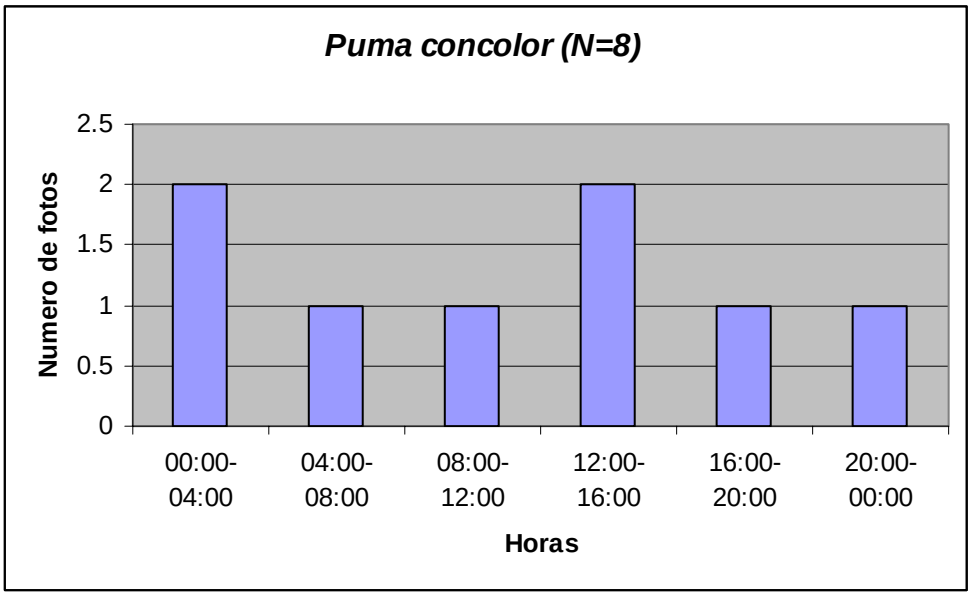
ANEX

Activity Patterns:
Figure 1 presents the activity patterns for jaguar, puma and ocelot,

Figure 1. Camera trap captures by time periods for sympatric felids.





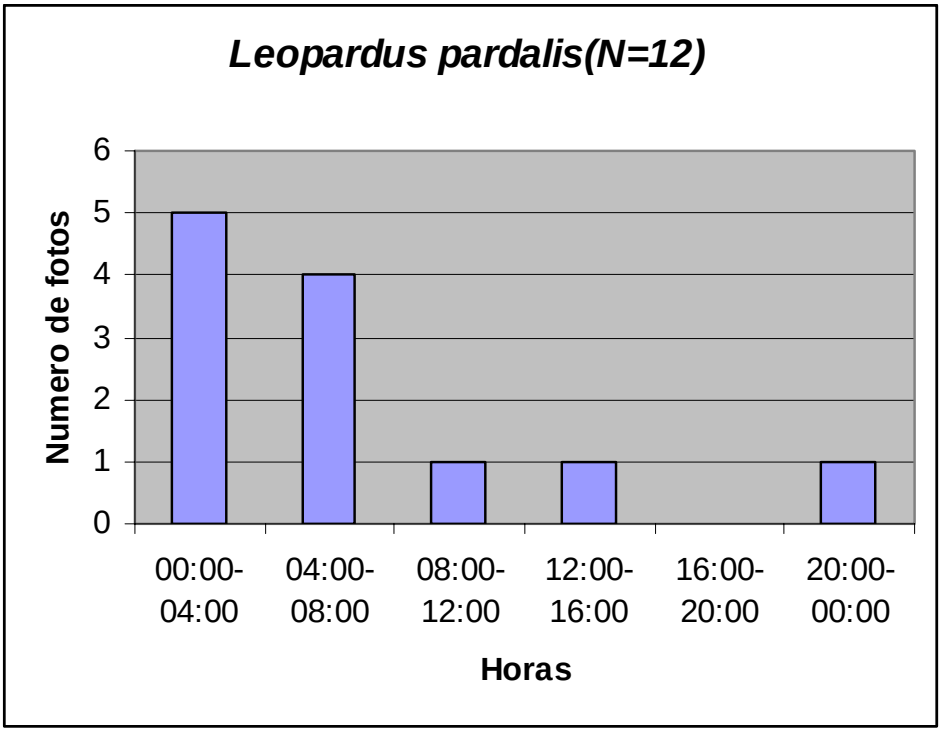


Figure 3. Activity patterns of tayassu found in Rus Rus

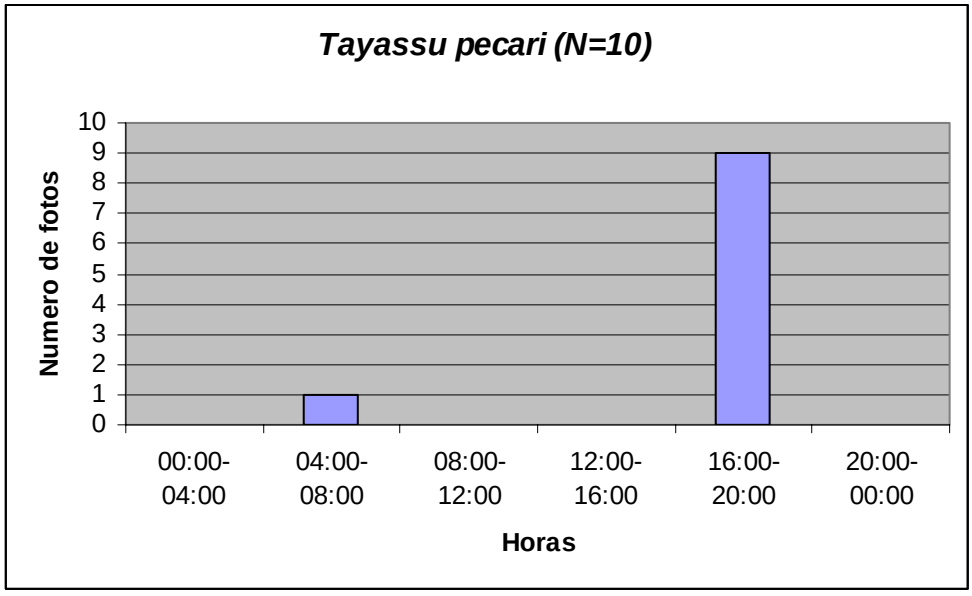
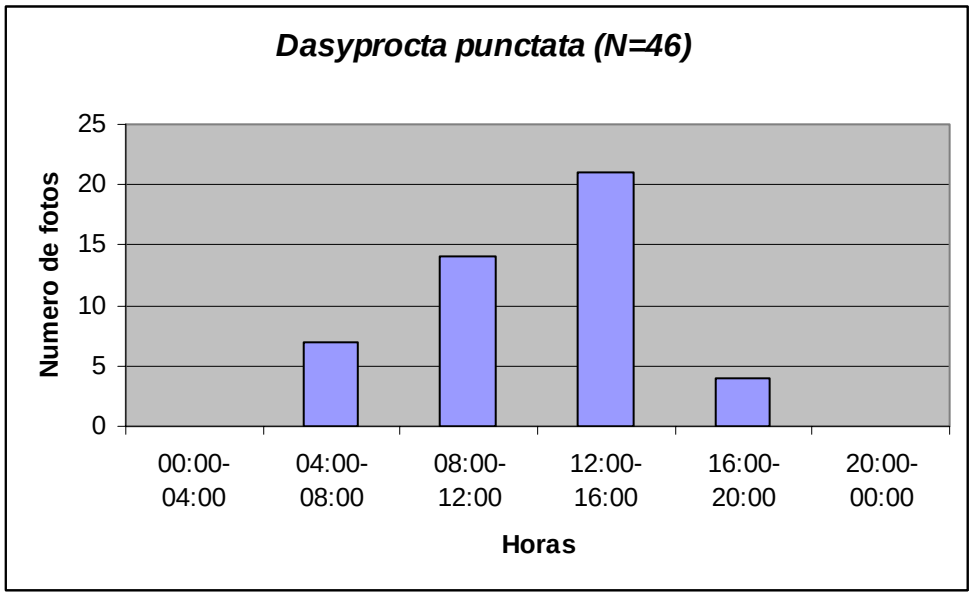


Figure 4. Activity patterns of Agouti in the area of study, showing diurnal activities



Pictures

Héctor Portillo Reyes/Jonathan Hernández/WCS/Cámara trampa
RusRus, La Mosquitia Honduras 2008

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Trainig local people in cameras trap

Setting up cameras in the study site