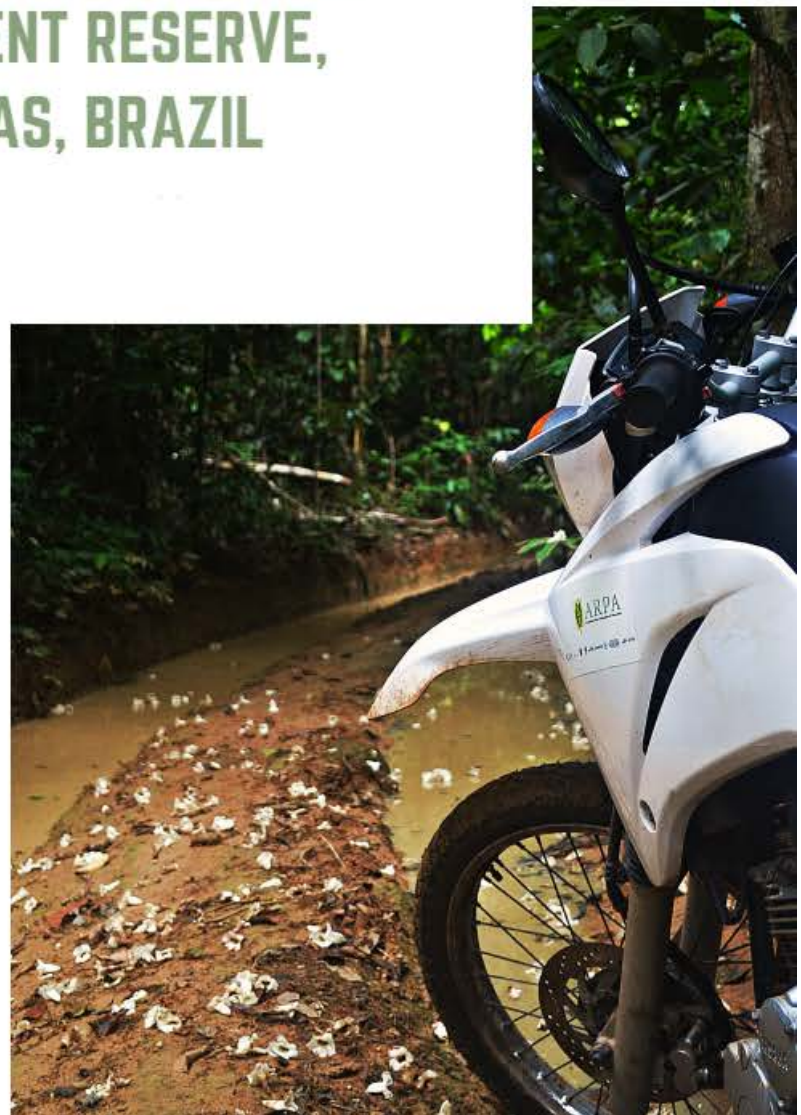


By Dayse Ferreira

HUNTING ACTIVITY IN THE RIO NEGRO SUSTAINABLE DEVELOPMENT RESERVE, AMAZONAS, BRAZIL



In this first year of the project, we identified 80 hunters and were able to effectively interview 63 of them, we also installed 110 camera traps to record the wild vertebrates species in the area. We also had the opportunity to learn about the daily lives of residents in the communities and their interaction with the fauna of the Rio Negro Sustainable Development Reserve (Rio Negro RDS).

The Rio Negro RDS, is a conservation unit for sustainable use with approximately 103 thousand ha distributed in the municipalities of Iranduba, Manacapuru, and Novo Airão. More than 700 families live there, basically living on family farming, mainly producing cassava flour, fishing for subsistence as well as for trade, and more recently, ecotourism activities have developed with the presence of inns and the sale of artisanal products (Figure 1).



Figure 1. Economic activities in Rio Negro RDS: a) flour production, b) fishing, c) handicraft house managed by a family from the 15 de Setembro community, d) miniature wooden armadillos produced by residents and sold to tourists. Photos: Dayse Ferreira.

1. Interviews

1.1 Interviewee profile

We interviewed 63 residents who claimed to hunt in Rio Negro RDS and we obtained socioeconomic and hunting information: which species are hunted, how are they used, frequency of hunting, hunting areas, etc. For these interviews, we always had the support of a local resident who helped us throughout the fieldwork, facilitating our interaction with the communities (Figure 2).



Figure 2. Fieldwork to interview residents: a) Ronilson Bittencourt, resident of the Terra Preta community and b) Jânio Filho, resident of the Uga Uga Dirt roads, local monitors who support the interviews, c) interview, d) Seu José, community resident Tumbira who was one of the first interviewees of the project. He is showing his work as a craftsman.

Of the 63 respondents, 61 men and only two women claimed to hunt in the reserve. The age of the respondents ranged from 19 to 70 years of age, and only four (4) of them are not from the state of Amazonas. Regarding education, 12 respondents reported to never having attended school, 19 did not complete elementary school, eight (8) have completed elementary school, five (5) have not finished high school, eight (8) have

completed high school and only one interviewee received a technical education (Figure 3).

Household income ranges from R\$ 200.00 to R\$ 2,000.00 with different sources of income. We highlight that of the 63 interviewees, 43 participate in social programs. When asked about the main source of income, 15 respondents reported agriculture as the main source of income, 10 depend on daily payments mainly from civil construction sites, 10 have social programs as their main source of income, and only one interviewed resident has tourism as his main source of income (Figure 4).

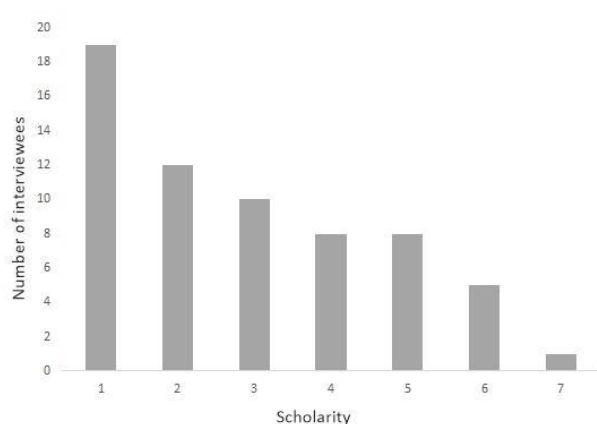


Figure 3. 1. Not schooled, 2. Incomplete elementary school, 3. Complete elementary school, 4. Incomplete high school, 5. Complete high school, 6. Not informed, 7. Technical education.

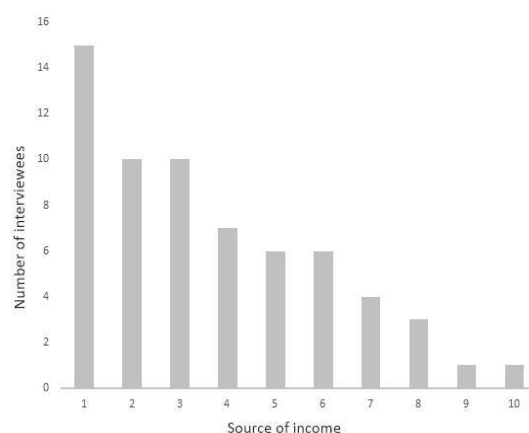


Figure 4. 1. Agriculture, 2. Daily rates, 3. Social programs, 4. Carpentry/Joinery, 5. Fishing, 6. Commerce, 7. Salary, 8. Don't know, 9. Crafts, 10. Tourism.

1.2. Game species

With the interviews, we identified that 34 species of vertebrates are hunted: seven (7) reptiles, nine (9) birds, and 18 mammals. The hunted species are mainly intended for family food, nine (9) of them can be used for medicinal purposes, and some species are used as pets by the residents (Figure 5), such as armadillos and paca were mentioned to be possibly commercialized. Retaliation hunting also occurs due to the predation of domestic species or damage to the crop. Of the species identified, six are in some degree of threat according to the International Union for Conservation of Nature (IUCN) (Table 1).

Table 1. List of game species and their respective uses in Rio Negro RDS. Threat status according to International Union for Conservation of Nature: **NE**= Not **DD** = Data Deficient; **LC** = Least Concern; **NT**= Near Threatened; **VU**= Vulnerable; **EN**= Endangered. Uses: **F**= food, **E**= Estimation, **M**= Medicine, **R**= Retaliation, **T**= Trade.

Taxon	English name	F	E	M	R	T	IUCN Status
Reptile							
<i>Eunectes murinus</i>	Anaconda			X			NE
<i>Boa constrictor</i>	Boa				X		NE
<i>Melanosuchus niger</i>	Black Caiman	X		X			NE
<i>Podocnemis erythrocephala</i>	Red-headed Amazon River Turtle	X	X				VU
<i>Podocnemis unifilis</i>	Yellow-spotted River Turtle	X	X				VU
<i>Podocnemis sextuberculata</i>	Six-tubercled Amazon River Turtle	X	X				VU
<i>Chelonoidis denticulata</i>	Yellow-footed Tortoise		X	X			VU
Bird							
<i>Tinamus major</i>	Great Tinamou	X					NT
<i>Psophia ochroptera</i>	Yellow-winged Trumpeter	X					LC
<i>Mitu tuberosum</i>	Razor-billed Curassow	X					LC
<i>Cairina moschata</i>	Muscovy Duck	X					LC
<i>Ara macao</i>	Scarlet Macaw		X				LC
<i>Amazona amazônica</i>	Orange-winged Parrot		X				LC
<i>Dendrocygna autumnalis</i>	Black-bellied Whistling-Duck		X				LC
<i>Penelope jacquacu</i>	Spix's Guan		X				LC
<i>Pulsatrix perspicillata</i>	Spectacled Owl		X				LC
Mammal							
<i>Didelphis marsupialis</i>	Common Opossum				X		LC
<i>Tapirus terrestris</i>	Lowland Tapir	X		X			VU
<i>Mazama americana</i>	Amazonian Brown Brocket	X		X			LC
<i>Mazama nemorivaga</i>	Red Brocket	X		X			LC
<i>Tayassu pecari</i>	White-lipped Peccary	X	X				VU
<i>Pecari tajacu</i>	Collared Peccary	X	X		X		LC
<i>Dasyopus sp</i>	Armadillo	X				X	LC
<i>Cabassous unicinctus</i>	Southern Naked-Tailed Armadillo	X					LC
<i>Hydrochoerus hydrochaeris</i>	Capybara			X			LC
<i>Dasyprocta fuliginosa</i>	Black agouti	X	X		X		LC
<i>Cuniculus paca</i>	Agouti	X	X	X		X	LC
<i>Coendou prehensilis</i>	Brazilian Porcupine	X		X			LC
<i>Puma concolor</i>	Cougar				X		LC
<i>Speotus venaticus</i>	Bush Dog		X		X		NT
<i>Saimiri sciureus</i>	Squirrel Monkey		X				LC
<i>Sapajus apella</i>	Capuchin	X	X				LC
<i>Cacajao ouakary</i>	Black-Faced Uacaris		X				LC
<i>Alouatta macconnelli</i>	Guianan Red Howler Monkey		X				LC

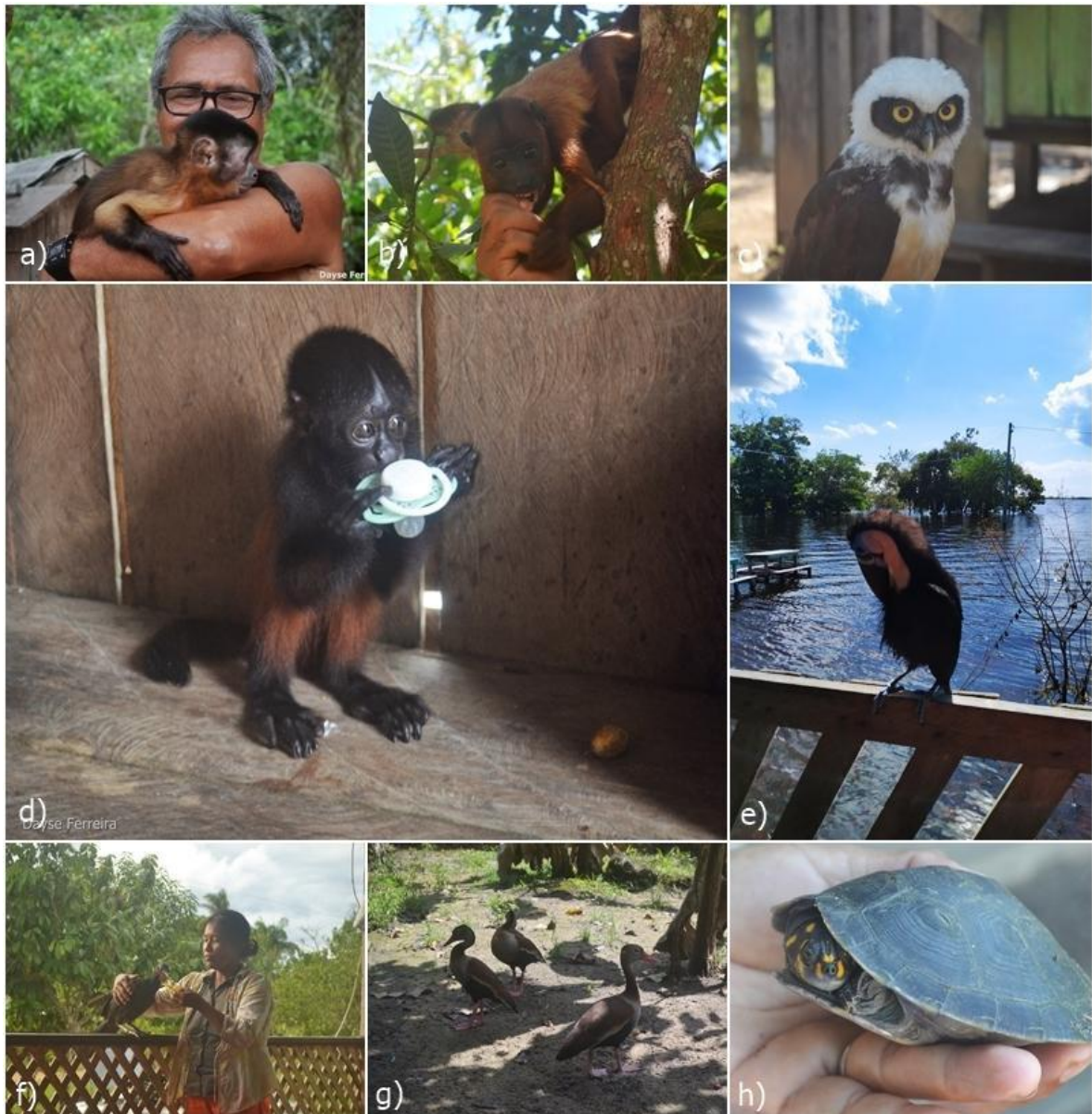


Figure 5. Wild pets: a) *Sapajus apella*, b) *Alouatta macconnelli*, c) *Pulsatrix perspicillata*, d) *Cacajao ouakary*, e) *Ramphastos vitellinus*, f) *Penelope jacquacu*, h) *Podocnemis unifilis*. Photos: Dayse Ferreira.

2. Mammals recorded in camera traps

Similar to the interviews, to install the camera traps in the Rio Negro RDS (Figure 6) we had the support of the residents, they learned about handling, operation, the process of installing and removing the cameras (Figure 7b e 7c). In addition, for each sampling point of the camera traps, we installed 5X30 m plots for measuring tree species with CAP above 15 cm (Figure 7d). We have 64 gigabytes of photo and video files with the registration of wild and domestic species, because of that, we have not yet finished screening and analyzing all the camera traps (Figure 7e).

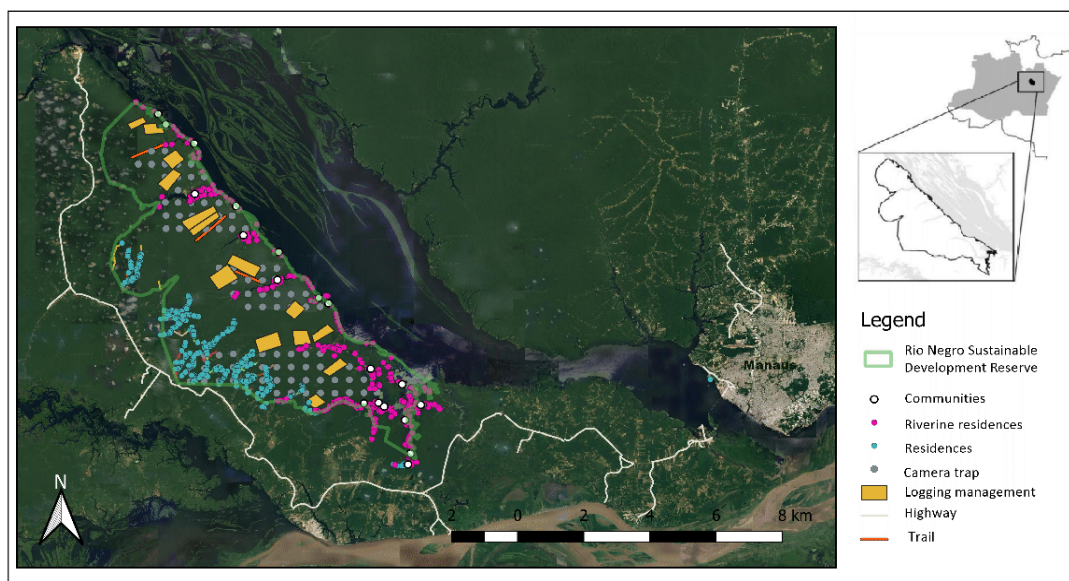


Figure 6. Distribution of camera traps in Rio Negro RDS.



Figure 7. Fieldwork: a) team during the trip to install the cameras, b) and c) local monitors installing the camera traps, d) obtaining the CAP measurements, e) individual from *Geotrygon montana* Linnaeus, 1758 registered by one of the camera traps, the screening of the videos has been carried out in the TimeLapse program.

The preliminary results presented here refer to the first sampling with 72 camera traps that have enabled us, so far, to register 22 species of medium and large mammals in

the Rio Negro Sustainable Development Reserve. In total, five species are on the International Union for Conservation of Nature (IUCN) endangered species list: jaguar, tapir, white-lipped peccary, giant armadillo, and giant anteater. There are also some species whose data are deficient according to IUCN, such as the red deer, which is very popular for hunting (Table 2).

Tabela 2. List of medium and large mammal species recorded by camera traps in the Rio Negro RDS, Amazonas, Brazil. Threat status according to International Union for Conservation of Nature: **DD** = Data Deficient; **LC** = Least Concern; **NT**= Near Threatened; **VU**= Vulnerable; **EN**= Endangered.

Taxon	English name	IUCN Status
Artodactyla		
Cervidae		
<i>Mazama americana</i>	Amazonian Brown Brocket	DD
<i>Mazama nemorivaga</i>	Red Brocket	LC
Artodactyla		
Tayassuidae		
<i>Pecari tajacu</i>	Collared Peccary	LC
<i>Tayassy pecari</i>	White-lipped Peccary	VU
Carnivora		
Felidae		
<i>Leopardus pardalis</i>	Ocelot	LC
<i>Leopardus wiedii</i>	Margay	NT
<i>Panthera onca</i>	Jaguar	NT
<i>Puma concolor</i>	Mountain lion	LC
Cingulata		
Dasypodidae		
<i>Dasypus sp</i>	Armadillo	LC
<i>Priodontes maximus</i>	Giant Armadillo	VU
<i>Cabassous unicinctus</i>	Southern Naked-Tailed Armadillo	LC
Didelphimorphia		
Didelphidae		
<i>Didelphis marsupialis</i>	Common Opossum	LC
<i>Metachirus nudicaudatus</i>	Brown Four-eyed Opossum	LC
Perissodactyla		
Tapiridae		
<i>Tapirus terrestris</i>	Lowland Tapir	VU
Pilosa		
Myrmecophagidae		
<i>Myrmecophaga tridactyla</i>	Giant Anteater	VU
<i>Tamandua tetradactyla</i>	Southern Tamandua	LC
Primates		
Atelidae		
<i>Sapajus apella</i>	Capuchin	LC
<i>Cebus albifrons</i>	Humboldt's White-fronted Capuchin	LC
Rodentia		

Dasyproctidae

<i>Myoprocta</i> sp	Cotiara	LC
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<i>Dasyprocta fuliginosa</i>	Black agouti	LC
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<i>Cuniculus paca</i>	Agouti	LC
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Echimyidae

<i>Proechimys</i> sp	Spiny Rat	LC
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Erethizontidae

<i>Coendou prehensilis</i>	Brazilian Porcupine	LC
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Although it was not recorded in the camera traps, we have records of the occurrence of bush dog for Rio Negro RDS in areas under the influence of dirt roads (personal communication by professor Albertina Lima) (Fig.8a). Older residents also reported that they saw the species in the forest and a family raised one in 2018. In 2019, a resident reported having hunted an adult male with a bush dog to protect the chicken coop in the house where he worked (Fig.8b). We emphasize that this is an endangered species and little is known for the Central Amazon region.

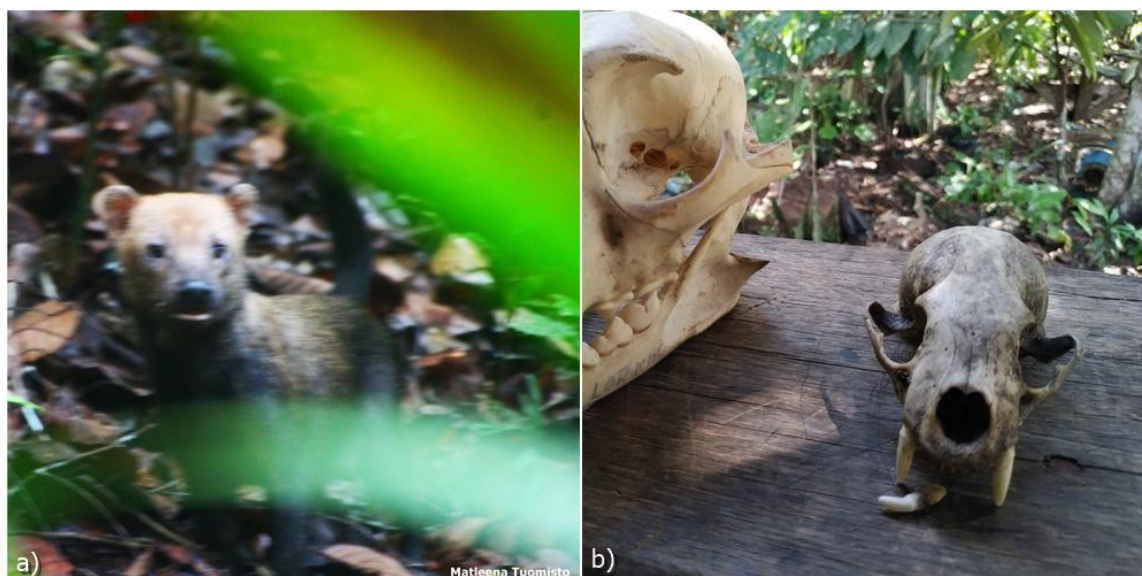


Figure 8. a) Bush dog photographed in 2018 by Matleena Tuomisto during a course in the Graduate Program in Ecology carried out at the Rio Negro RDS Uga Uga Dirt roads, b) Bush dog skull donated by a resident who reported hunting the individual in February 2019.

3. Registration of illegal activities in Rio Negro RDS

During the process of installing and removing the camera traps and talking to the residents, it was possible to verify the occurrence of illegal hunting in the areas of the reserve by non-residents or by vacationers who take people to hunt inside the reserve. The residents reported the entry of hunters through the areas surrounding the reserve,

mainly by the dirty roads that give access to the river, especially Prainha, a place where people embark and disembark. With the camera traps located in the dirt roads, it was also possible to record the action of poachers who use dogs to hunt in the Rio Negro RDS (Figure 9).



Figure 9. Hunting dogs registered by two camera traps located in areas under the influence of the dirty roads.

Another concern is the intense action of illegal loggers who also hunt during the removal of timber from the reserve. We have also seen the illegal sale of houses and land. Figure 10 shows a dirt roads and bridge that are active for timber removal in the vicinity of the camera at location $3^{\circ} 4'5.31'' S$ $60^{\circ} 41'39.28'' O$. In this dirty road we found peccary leather hunted recently.



Figure 10. Active dirty roads to remove wood and peccary traces hunted by loggers.

In April 2019 we noticed the existence of active dirt roads for the removal of wood near the 15 de Setembro community. Figure 11 shows how the dirty roads was found in April and figure 12 the same dirty roads in September. The trees felled on this dirt roads are about 20 meters from the camera we installed in the location $3^{\circ} 3'0.19'' S$ $60^{\circ} 40'27.99'' O$.



Figure 11. Images obtained in April 2019.



Figure 12. Images obtained on 03rd September 2019.

Figure 13 shows the situation found only 800 meters from camera 19 at location 3 ° 2'59.21 "S 60 ° 39'17.67" O. We verified the existence of another active dirty road, a burned area, an overnight shack. In addition, in the shack, there were two recently hunted pacas and a motorcycle without license plate.



Figure 13. Active extension 800 meters from the camera 19.

Figure 14 shows the species registered in the câmeras located near the dirt roads they can be directly affected by the irregularities committed in these áreas.

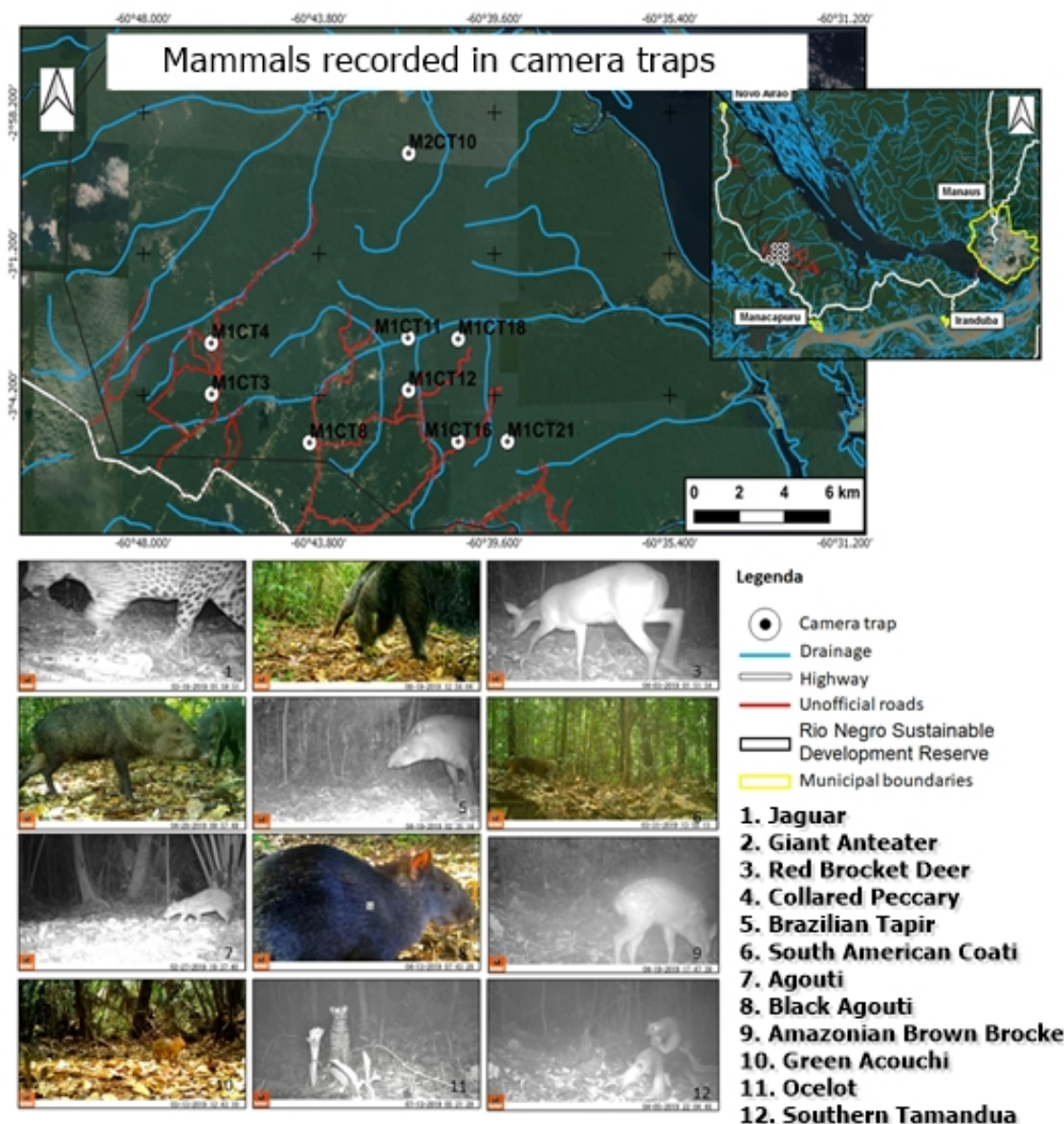


Figure 14. Species recorded in the cameras near the dirt roads to remove wood.

Recently, a criminal group that acted in illegal deforestation actions within the Rio Negro Sustainable Development Reserve (RDS) was identified by the legal authorities, see: <https://g1.globo.com/am/amazonas/noticia/2020/05/23/operacao-flagra-desmatamento-em-area-de-reserva-sustentavel-no-am.ghtml>.

Figure 15 shows the location of the inspection between several cameras that we use to monitor the fauna.

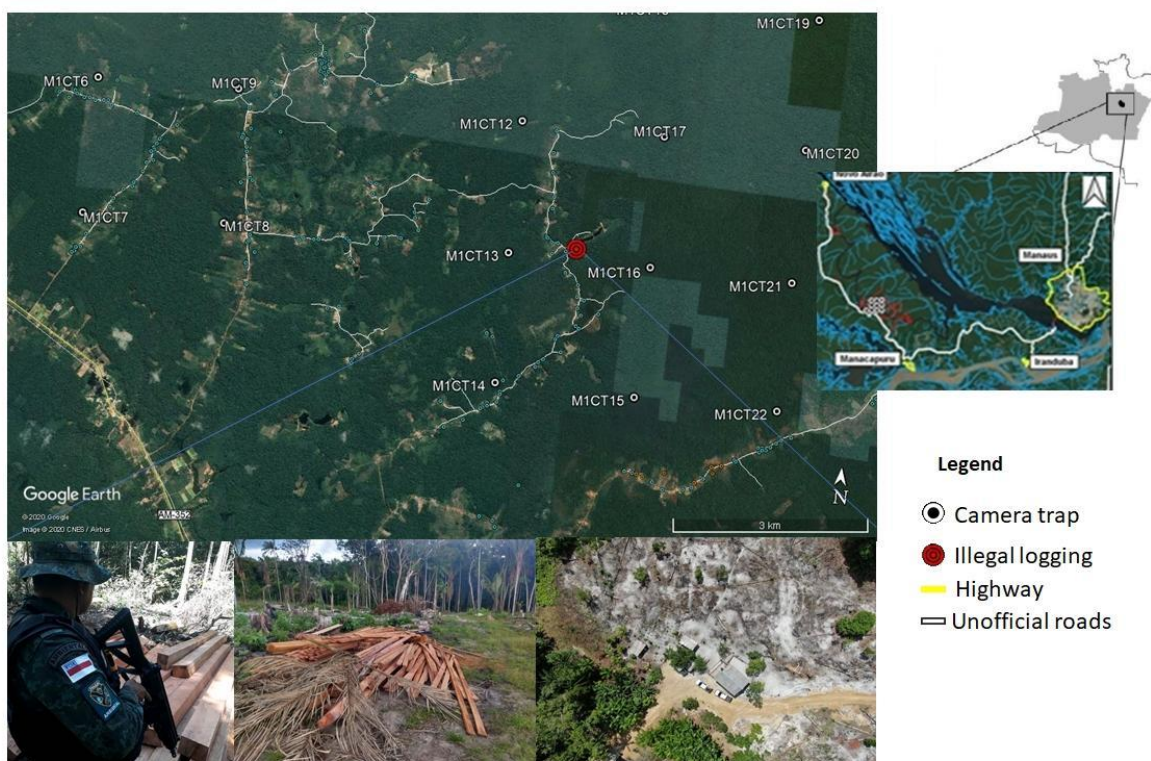


Figure 15. Location of the inspection action carried out at Rio Negro RDS between May 20 - 22, 2020. Photos: Maycon Castro / Sema-AM.

4. Difficulties

Unfortunately due to bureaucratic and priority issues, we have not received sufficient support from the State Environment Department of the State of Amazonas and we ended up losing a lot of fund for purchases of batteries and part of the gasoline/fuel, but fortunately we managed to establish a partnership with an Amazonian company ARTEK that provided us with required batteries for the second sampling.

We also had problems with the theft of three trap cameras and we were unable to recover them. In addition, we also began to worry about our physical security due to unexpected encounters with loggers and armed poachers. Since March 14, our activities have been halted due to the Pandemic Covid-19 and at this moment, any ongoing research activity in the conservation units of the state of Amazonas has been suspended and we still have no forecast about when we will be able to access the Rio Negro RDS again. Right now we are working remotely and trying to keep in touch with the residents. We have been informed that there are about 90 confirmed cases of Covid-19 within the reserve.

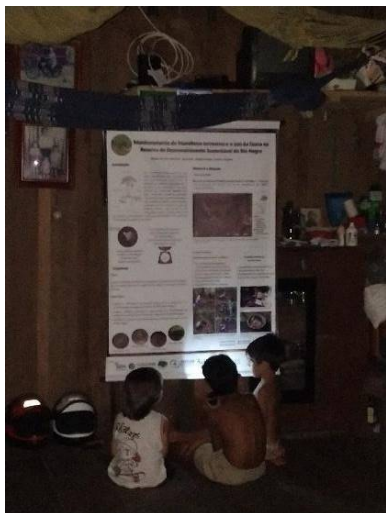


Figure 16. Children from Rio Negro RDS reading about the Project.

The figure 16 represents a moment of hope with children from Rio Negro RDS reading about the work we do in the reserve and they identified with great joy the family members who have participated in the fieldwork. So, despite the difficulties we are facing, we hope that soon we can return to field activities.