Conservation of Threatened Wildlife in Southwestern Amazonia, Brazil

Acre, Brazil, 2008-2009

FINAL REPORT

Project aims: Contribute to the conservation of globally threatened and other species of concern; inform the sustainable management of private lands and multiple-use protected areas; and promote wildlife conservation through education of schoolchildren and dialogue with stakeholder communities.

Collaborators: Institute for Wildlife Management and Conservation, Federal University of Acre, Technological Foundation of Acre, Secretary of Environment of Acre, Secretary of Forest of Acre, Brazilian Agricultural Research Corporation, University of Florida, Worldwide Fund for Nature-Brazil

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ABSTRACT

The Southeast Peruvian Lowland Endemic Bird Area (EBA) lies within the southwestern Amazon. It has high biological importance and is an area of urgent priority for conservation action. Our project aimed to contribute to the conservation of globally threatened and other species of concern through surveys and basic ecological studies within protected areas; inform the sustainable management of private lands and multiple-use protected areas by assessing the effects of forest management on indicator bird species; and promote wildlife conservation through dialogue with stakeholder communities and education of schoolchildren. We conducted our project in several sites in Acre state, southwestern Brazilian Amazon. We performed point-count surveys and vegetation measurements. We also carried out interviews with local communities and produced posters and a booklet about wildlife conservation to give to local schoolteachers.

We detected the blue-headed macaw (*Primolius couloni*) and the rufous-twistwing (*Cnipodectes superrufus*), two of our target species, in several of our study sites. We also detected other near-threatened and restricted range species. We detected logging effects on a number of indicator bird species. Based on our interviews, we identified high interest of local communities in wildlife management plans. We also identified some threats to wildlife in our sites. We make recommendations for conservation actions and future work in this region. We are working with local collaborators to implement such recommendations.

INTRODUCTION

Avian Species of Conservation Concern in the Southwestern Amazon

Acre state, Brazil, lies within the Southeast Peruvian Lowlands Endemic Bird Area (EBA) and Southwestern Amazonia. This EBA has high biological importance and is an area of urgent priority for conservation (Stattersfield et al. 1998). However, many rare and restricted-range species in the region are poorly known, impeding conservation actions.

According to data from the International Union for the Conservation of Nature and Birdlife International, four globally-threatened (IUCN-vulnerable) bird species occur or potentially occur in Acre: blue-headed macaw (*Primolius couloni*), rufous twistwing (*Cnipodectes superrufus*), selva cacique (*Cacicus koepckeae*), and wattled curassow (*Crax globulosa*). Furthermore, several near-threatened (NT) and restricted-range (<50,000 km^2 in distribution; RR) species occupy or potentially occupy the Southeast Peruvian Lowlands EBA: elusive antpitta (*Grallaria eludens;* NT; RR), rufous-fronted antthrush (*Formicarius rufifrons;* NT; RR), Amazonian parrotlet (*Nannopsittaca dachilleae*; NT), harpy eagle (*Harpia harpyja;* NT), crested eagle (*Morphnus guianensis;* NT), chestnut-throated spinetail (*Synallaxis cherriei;* NT), peruvian recurvebill (*Simoxenops ucayalae;* NT), scarlet-hooded barbet (*Eubucco tucinkae;* RR), semi-collared puffbird (*Malacoptila semicincta;* RR), white-lined antbird (*Percnostola lophotes;* RR), Goeldi's antbird (*Myrmeciza goeldii;* RR), black-faced cotinga (*Conioptilon mcilhennyi;* RR), and long-crested pygmy-tyrant (*Lophotriccus eulophotes;* RR).

Primolius couloni was recently down-listed from endangered to vulnerable status by the IUCN. The research that informed this down-listing provided a valid estimate of its minimum population size, but we still lack a good estimate of its population size. Furthermore, the distribution, habitat preferences, and breeding biology of this macaw remain uncertain. Experts recommend that researchers work with local people to determine the location of clay licks and the potential poaching pressure facing *P. couloni*. In addition, local education programs could help recover this and other hunted/threatened species (Birdlife International 2009).

Ornithologists recently described a new *Guadua* bamboo specialist, *Cnipodectes superrufus*, with an outline for future conservation measures. The species, listed as vulnerable under the IUCN Red List in 2009, is nearly restricted to the Southeast Peruvian Lowlands EBA, with a total distribution of less than 90,000 km^2. Since *C. superrufus* has only been observed at less than 15 locations, studies should improve understanding of its distribution, density, natural history, and ecological requirements (Birdlife International 2009).

The restricted-range and vulnerable species, *Cacicus koepckeae*, has been encountered at only five locations, four on the Peruvian side of the Peruvian-Brazilian border, and one in east-central Acre (Birdlife International 2009; Guilherme 2009). The species occupies "transitional forest that lines narrow, high-gradient rivers" (Gerhart 2004). Although we have a basic understanding of its habitat requirements, we know little of its dietary requirements and even less about its breeding biology. *C. koepckeae* currently appears to face minor threats, although the oncoming construction of an

intercontinental highway may lead to habitat destruction for this and many other species in the Southeast Peruvian Lowlands EBA. The distribution, abundance, natural history, and ecological requirements of this little-known, globally threatened species merit research (Birdlife International 2009).

Crax globulosa is a large, IUCN-vulnerable, cracid that once ranged throughout western Amazonia but now occupies 14 isolated, small fragments of its former distribution. Currently, the species occupies less than 30,000 km^2, with the largest population estimated at 250 individuals. This cracid inhabits lowland, riverine/varzea forest. Previous research indicates that it may not stray beyond 300 m from rivers during the dry season and that it may migrate from varzea to terra firme in the wet season. *C. globulosa* has a varied, omnivorous diet. Its primary threats are hunting, habitat loss, and negative effects of demographic stochasticity associated with small, isolated populations (Birdlife International 2009).

Reduced-impact Logging in the Southwestern Brazilian Amazon

Reduced-impact logging (RIL) has been proposed as a less destructive method for extracting timber products. It involves several techniques to minimize impacts on forest structure (Putz et al. 2001), including directional felling, vine cutting prior to logging, and inventories to decrease number and density of roads (Felton et al. 2006). In theory, RIL should minimize impacts on native forest functions, protect the long-term use of timber resources, and sustain viable populations of non-targeted species (Putz et al. 2001, Clark et al. 2009).

There is political interest in RIL at both national and state level. For instance, the Brazilian government has approved a law that permits RIL in national forests (Law #11,284, of 2006), with an estimation of 13 million ha to be open for concessions within 10 years. In addition, Acre state government plans to create a state program to implement and certify RIL in 1.5 million ha of protected areas (FSC 2006). The state government plan is in its early stages and is first being implemented in Antimary State Forest (ASF), one of our study sites. The methods applied in ASF will then serve as a model for the other protected areas of sustainable use in the state.

Private logging operations have increased substantially throughout the Amazon. Currently, owners of private areas in the Brazilian Amazon can convert up to 20% of the land. The 80% of the remaining area (named legal reserves – "reservas legais" in Portuguese) can be used for extraction of forest products, including timber. Because timber is one of the most profitable forest products and RIL is allowed in legal reserves, private concessions have increased considerably in recent years. With the growing interest in this type of management, RIL has become very important to the economy of the region.

From a conservation perspective, promotion of more sustainable logging practice is important because a large proportion of tropical forests is being logged (Nepstad et al. 1999; Asner et al. 2005). However, the success of RIL practices in guaranteeing conservation of biodiversity will depend on specific techniques applied, intensity of logging, harvest cycles employed, species-specific responses to such practices, among others (Clark et al. 2009). Thus, understanding how species respond to RIL is important

to improve management practices and seek more sustainable operations that will contribute to wildlife conservation, including threatened species.

Development Pressure in the Southwestern Brazilian Amazon

Until 1992, Acre state was remote and only accessible by unpaved roads during dry seasons (Kainer et al. 2003). Currently, around 89% of Acre is covered by forest and 45% is in reserves and indigenous areas (INPE 2007, ZEE 2007). However, the state is vulnerable to increased land exploitation because of the construction an intercontinental highway through Acre to the Pacific Coast. This highway is under construction and cuts the southeastern portion of the state. Furthermore, the Brazilian and Peruvian Governments have recently signed an agreement for a second highway. This new highway will cut the northwest portion of the Acre, which is the most remote region of the state. Currently, the road to the northwest part of the state is no paved (Figure 1). These development pressures will lead to habitat destruction and degradation, which will further threaten the species of conservation concern. In addition to the direct effect of habitat conversion, this will threaten those species that are hunted or poached (e.g., *P. couloni*). Therefore, identifying and understanding current and potential threats to wildlife in the protected areas and surrounding areas is important to guide conservation actions.

PROJECT MEMBERS

1. Project Leader: Willandia Chaves Didier
Data of birth: 04/14/1978
Education: MS in Interdisciplinary Ecology, BS in Biological Sciences
Project role: Point count survey co-leader, vegetation assessment leader, interview leader, education and outreach co-leader, and contact with local agencies.

Willandia received an undergraduate degree from the Federal University of Acre (Brazil) in 2001, and a Master's Degree from the University of Florida (US) in 2009. During her undergraduate degree, she worked as a research assistant for two years, performing surveys of primate communities and other mammals throughout Acre. Since finishing her bachelor's degree, she has completed several consulting jobs, including rapid ecological assessments and environmental impact statements.

In addition to her applied work as a biologist, she also has extensive teaching experience. In Brazil, she worked for several years as an instructor at the Federal University of Acre, teaching General Science, Ecology, and Environmental Education, and as a teaching assistant for a Tropical Ecology course. During her master's degree, she worked as a teaching assistant for courses on Avian Field Research, Wildlife Field Techniques, and Research Design.

She is currently a Ph.D. student at the University of Florida and will continue working in the Amazon towards wildlife conservation. After graduate school, she will return to South America and continue focusing on long-term conservation of tropical wildlife.

2. Project member: John J. DeLuca
Date of birth: 06/18/1983
Education: MS in Wildlife Ecology and Conservation, BA in Zoology and Environmental Science
Project role: Point-count survey co-leader, interview assistant, education assistant

John is skilled in field-based conservation, ecological research, education, and teaching. He has experience surveying, monitoring, catching, and measuring the reproductive success and physiology of dozens of wildlife species (butterflies, dragonflies, salamanders, marine turtles, shorebirds, and especially songbirds) during field work with the Student Conservation Association, the Avian Research and Education Institute, Cuyahoga Valley National Park, the Alaska Bird Observatory, and the Department of Wildlife Ecology and Conservation at the University of Florida. DeLuca is also an experienced birder.

He received an undergraduate degree from Miami University of Ohio in 2006 and a master's degree from the University of Florida in 2008. DeLuca is a member of Phi Beta Kappa. Currently, he works as a Presidential Management Fellow at the U.S. Forest Service's national headquarters. His current responsibilities deal with policy development, budget allocation, and partnership-building, especially as it relates to conserving fire-adapted ecosystems.

3. Project member: Marilene Vasconcelos da Silva
Data of birth: 08/08/1980
Education: MS in Ecology and Wildlife Management, BS in Biological Sciences
Project role: Education and outreach co-leader, interview assistant, contact with local agencies

Marilene completed her undergraduate degree in 2001 and her master's degree in 2006, both at the Federal University of Acre. She has completed several consulting jobs for different agencies in Acre to create new protected areas and elaborate management plans for existing protected areas. These jobs have included surveys of amphibians, reptiles, and mammals.

In addition to her research experience, she has several years of teaching experience. She worked as an instructor for the Federal University of Acre and the State Secretary of Environment, teaching classes such as Environmental Education, General Biology, General Zoology, Environmental Management and Policy, and Improvement of Public Management. She has also worked for local agencies where she prepared educational materials such as modules for courses and training.

In 2008, she worked as a consultant for a fresh-water turtle farm, where her colleagues and her developed environmental education materials to visitors taking guided tours of the farm. She was also a consultant for a project on participatory management of turtles in an indigenous area in Acre State. The goal of this project was to recover the population of a species (*Podocnemis unifilis*) that was nearly locally extinct. Her role included helping preparing educational materials and training local communities on how to monitor nesting beaches and care for newborns.

She is currently an employee for the Technological Foundation of Acre, a state governmental agency that manages one of our study sites (Antimary State Forest). She is also one of the volunteer coordinators of a local NGO (AMAZONFAUNA). Her work in these organizations will contribute to long term conservation efforts in our study system.

4. Project member: Danyella Paiva da Silva
Data of birth: 07/18/1983
Education: BS in Biology
Project role: Education and outreach assistant, vegetation assessment assistant, interview assistant

Danyella received her bachelor's degree from the Federal University of Acre in 2008. She has experience conducting field research and elaborating education materials. During 2004 and 2005, she worked for the Environment Institute of Acre where she participated in the preparation of education materials about ecological zoning of Acre state related to timber and non-timber forest products. During 2005 and 2006, she worked as a research assistant in a project about parasitology of aquatic systems where she assisted in the field work and analyses. In 2008, she was a field assistant in a project that included surveys of amphibians, reptiles, and mammals in different areas in Acre. Currently, she is part of the Herpetology team of the Federal University of Acre.

FIELDWORK AND RESEARCH

Acre state has a history of grass-root initiatives that has contributed to broader development policies. Forest policies of Acre state government reflect a plan to manage forests within a sustainable development framework (Kainer et al. 2003). The government is interested in creating ways of sustainably using natural resources, such as reduced-impact logging (RIL). The goal of Acre government is to create a state program to implement and certify RIL in 1.5 million ha of protected areas (FSC 2006). Furthermore, many owners of private lands are also implementing RIL in their areas. Our project arose from the need for creating guidelines to minimize potential impacts of RIL on wildlife.

Prior to our project, there was little to no baseline information on the bird species of conservation concern (e.g., whether they were present, what habitats they are using). Without this information, it was difficult to document the impacts of the threats on our species and sites, identify which threats were having the biggest impact, and implement appropriate mitigation activities. In addition, development pressure that will follow the construction of an intercontinental highway through Acre represents a threat to wildlife conservation. Thus, baseline information on species of conservation concern and identification of current and potential threats to wildlife are important to guide conservation actions in this region.

In this context, the objectives of our project were to 1) describe the distribution, occupancy, habitat preference and behavior of several species of concern within protected areas to contribute to the conservation of these species; 2) assess the effects of reduced-impact logging on indicator bird species to inform the sustainable management of multiple-use protected areas and private lands; and 3) contribute to the education school children and learn from stakeholder communities to promote wildlife conservation.

Study Sites

We conducted our project in Acre state, southwest Brazilian Amazon. We originally planned to work in two protected areas: Antimary State Forest (ASF) and Chico Mendes Extractive Reserve (CMER). These protected areas have high potential for both improving forest management and contributing to the conservation of species of concern. However, when we started our field work, we discovered that the area logged in ASF was much smaller than we were informed and too small to give us a sufficiently large sample size. Therefore, to assess the effects of reduced-impact logging on bird species, we conducted surveys in two other logging concessions: Fazenda São Jorge and Fazenda Cerejeira. We selected these areas because they were close to ASF, had the same basic type of vegetation and topography, and had been logged using reduced-impact techniques. In addition to these four sites, we worked in two other sites: Peixoto Settlement Project and the Zoological Park of the Federal University of Acre. These two areas were included in our project as a request of our local collaborators, as they needed information about the species of conservation concern in these areas to use in their ongoing projects (Figure 2).

Antimary State Forest (ASF) is a sustainable use reserve (66,168 ha; 9°15’S, 68°26’W; 47,065 ha), where the government of Acre is implementing and evaluating the

effectiveness of a management plan of multiple use. Currently, there are 73 families living in ASF. Their livelihoods are based on extraction of natural resources (especially of Brazil nuts) and small scale agriculture (FUNTAC 1995, 1996; SEF 2007). In ASF, we worked in collaboration with government agencies that manage the area (i.e., State Secretary of Environment of Acre, Technological Foundation of Acre, and State Secretary of Forest of Acre).

Chico Mendes Extractive Reserve (CMER) is a large protected-area of multiple use (931,639 ha; 10°29'S, 68°32'W; 931,062 ha) with a management plan that regulates the extraction of natural resources and land use. Around 1,500 families live in this area, with estimated human population of 10 people/km^2. People's livelihoods in this reserve are based on extraction of natural resources (rubber, fruits, etc.) and small scale agriculture (Costa 2000). In CMER, we worked in collaboration with national and state agencies that manage (Brazilian Institute for Environment and Natural Renewable Resources [IBAMA]) or have projects in this area (Secretary of Environment of Acre [SEMA], Technological Foundation of Acre [FUNTAC]).

Fazenda Cerejeira (total size of 6,427-ha; 9°23'S, 68°30'W) and Fazenda São Jorge (total size of 5,400 ha; 9°26'S, 68°40'W) are private areas where reduced-impact logging occurred. Fazenda Cerejeira is a non-certified operation, with logging intensity of 10-15 m^3/ha. Logging in this site occurred 12 months prior to our study. Fazenda São Jorge is certified by the Forest Stewardship Council, with logging intensity of 25-30 m^3/ha. Logging in Fazenda São Jorge occurred 24-36 months before our study. In these two sites, we worked in collaboration with the Worldwide Fund for Nature-Brazil (WWF-Brazil). WWF-Brazil is implementing a monitoring program in these areas to assess the effects of RIL on biodiversity. The results of the monitoring program will be used to influence public policy.

Peixoto Settlement Project (PSP) has a total area of 317,588 ha and 3,000 families. This area is regulated by the National Agency for Colonization and Agrarian Reform (INCRA). Agriculture is the main land use of this settlement. Our study occurred in a subarea of the settlement (total area of 4,000 ha; 9°48'S, 67°13'W), where one of our local collaborators (the Brazilian Agricultural Research Corporation [EMBRAPA]) has a long term project that aims to provide technical support and training to local communities in regard to sustainable agriculture and use of natural resources (e.g., extraction of timber and non-timber forest products).

The Zoological Park at the Federal University of Acre is a forest fragment of approximately 100 ha (9°57'04"S, 67°52'29"W). It is located in the town of Rio Branco, and it is used by the University for research, education, and outreach purposes.

Methods

Data collection

Avian Species of Conservation Concern

Focal species included all globally threatened, near-threatened, and restricted-range bird species in the region of eastern Acre (Figure 2). We conducted point-counts in

bamboo and riverside habitats. We conducted point-counts primarily in bamboo, as the most focal species occurred in this habitat, and only counted focal species during these point-counts. We performed these surveys from May to August of 2008.

We performed a total of 166 point-count surveys (125 in bamboo, 41 in riverside habitat), with a minimum distance of 300 m from one another. We performed 8-min point-count surveys, with variable-radius. To create detection histories for estimation of species occupancy, we subdivided the 8 min into four 2-minute periods, recording the period in which we saw or heard an individual for the first time (see Data Analyses). We followed each survey with two minutes of playback. In bamboo habitat, this playback was of *Cnipodectes superrufus*; in riverine habitat, it was of *Cacicus koepckeae.* We also performed a general description of the forest (e.g. proportion of bamboo, floodplain or upland forest). We performed these surveys from 6:00-10:00 and 15:00-18:00.

In Chico Mendes Extractive Reserve, we met with local community leaders to identify welcoming community members with trails (<1 m in width) for collecting Brazil-nuts or rubber on their properties. We conducted surveys along these trails. Although a random, stratified sampling design for survey locations would have been ideal, logistical considerations required an opportunistic design.

We conducted surveys primarily in three regions of Chico Mendes Extractive Reserve (the largest protected area in our study), near the towns of Assis Brasil, Brasileia, and Xapuri (Figure 3). We spent approximately 15 days in each of these regions. We conducted surveys in Antimary State Forest for 4 days. We visited Peixoto Settlement Project for 15 days (although we did not conduct formal surveys there), and the Zoological Park at the Federal University of Acre on several occasions while we were in the town of Rio Branco.

Indicator Species of Logging Effects

The surveys of indicator species comprised 10-min, variable-radius point-counts. During each point-count, we registered the target species that were seen or heard, and the time of observation. We divided the 10 min periods into two intervals of five min, with data on presence and absence of the species to create detection histories for estimation of the species occupancy (see Data Analyses).

The surveys included a total of 426 point-counts, 253 in Cerejeira (144 in logged areas and 109 in unlogged areas), and 173 point-counts in São Jorge (75 in logged areas and 98 in unlogged areas). The points were placed with a minimum distance of 300 m from one another within each treatment (i.e. logged or unlogged), and logged and unlogged areas were at least 1,000 m apart (Figure 4). We performed these surveys from July to November of 2008.

Prior to our field assessment, we selected bird species as indicators of logging effects based on the following criteria: 1) species with high sensitivity to habitat disturbances, expected to respond negatively to logging, and species with low sensitivity to logging (i.e. secondary growth species), expected to respond positively to logging; and 2) species that have different foraging strata (e.g. terrestrial, understory, canopy) and different food preferences (e.g. omnivores, insectivores) to represent several microhabitats potentially affected by logging; and 3) species that are fairly common and relatively easy to detect (Table 1). We inferred these characteristics based on descriptions of the species available

in the literature (Elliot et al. 1992, Stotz et al. 1996, Hoyo et al. 1997, Hoyo et al. 2002, Hoyo et al. 2003, Schulenberg et al. 2007). In addition to these indicator species, we also surveyed for *P. couloni* (one of our focal species) at all point counts performed in the concessions.

Furthermore, we characterized the vegetation structure at a sub-sample of point-count locations (time constraints prevented comprehensive sampling) to identify differences in key vegetative components of habitat between logged and unlogged areas that may affect our indicator species. Thus, we performed two types of vegetation surveys to ensure a representative sampling. First, we collected vegetation data at all points using a rapid assessment of relatively few, but important vegetation measures (e.g., understory density, canopy cover, and proportion of bamboo). This allowed identification of several broad groups of vegetation having similarities in these few characteristics. Second, within each of these vegetation groups based on rapid assessment, we randomly selected a sub-sample of over one third of the points where we performed more detailed vegetation assessment. We used the vegetation variables as covariates for the analyses of species occupancy (see Data Analyses).

Hunting Surveys

We performed a total of 70 interviews (30 in Chico Mendes Extractive Reserve, 10 in Antimary State Forest, 20 around the logging concessions, and 10 in Peixoto Settlement Project) to assess hunting profiles and people' attitudes toward wildlife species. We also wanted to identify current and potential threats to wildlife in our study sites.

In each study site, we visited or stayed at people's houses to talk about our project and to perform interviews. We only interviewed people that were hunters. We asked them questions about the last hunting event, general questions about hunting patterns (e.g. species most hunted, times of huntings/months, etc), and whether they were interested in wildlife manament in the area and why (Appendix 1). We also showed them pictures of many wildlife species to assess: 1) their perception about the species abundance; 2) whether they had some conflict with the species (e.g. whether the animals attacked the crops, livestocks, etc); and 3) how they used the species (e.g. for food, for medicine, or as pets; Appendix 2). We performed the interviews between June 2008 and June 2009.

Data Analyses

Species Occupancy

We used a removal model for both the species of conservation concern and indicators of logging effects to estimate species occupancy. The protocol consisted of separating timed surveys into sampling intervals. These sampling intervals are then used as individual surveys. This approach allows the estimation of occupancy from single visits using MacKenzie et al.'s (2006) model for missing observations (Rota 2009). The probability of detection is modeled based on time to first detection. We compared several models using the Akaike Information Criterion (AIC) to select the best models to determine our species occupancy.

When estimating occupancy for avian species of conservation concern, we only used data from the 125 surveys which we conducted in bamboo habitat, as all species that were detected enough to estimate occupancy were bamboo-obligates. To estimate the probability of detection, we compared constant probability models with probability depending on time of day. Because we performed the point-count within the same habitat type, we assumed that the species occupancy was constant across all point-counts.

When estimating occupancy of indicators of logging effects, we used the data from the point-count surveys and the vegetation measurements performed in the logging concessions (Table 2). Using vegetation measurements, we created three main vegetation types: <50% canopy cover, >50% canopy cover, and bamboo thickets. We also used classification trees (Sherrod 2004) to assess vegetation differences between logged and unlogged areas.

Hunting Surveys

We used people's responses to identify important threats to our focal species (threatened species) and hunted species and to make recommendations for wildlife conservation and management in our study sites. We performed classification tree analyses (Sherrod 2004) and Fisher's Exact Test (Agresti 2007) to identify differences among our study sites.

Results

Avian Species of Conservation Concern

Blue-Headed Macaw (*Primolius couloni*)

We encountered the blue-headed macaw in the two protected areas (in all three regions of Chico Mendes Extractive Reserve and in Antimary State Forest) and in Peixoto Settlement Project (Figure 5). In CMER, we observed this species on multiple occasions in each region. We encountered the species in groups of 2-6 individuals. This species was mostly observed flying overhead. Without correcting for detectability, and only counting the maximum group size for each region (because multiple encounters per region could be the same family group flying over), we encountered at least 27 individuals. In subjective comparison to other psittacid species in the region, *P. couloni* appeared to be uncommon but not rare. For instance, we encountered all three large *Ara* spp. in the region much less often than *P. couloni*, with the blue-and-yellow macaw (*Ara ararauna*) being detected on only one occasion. We encountered *P. couloni* only once in a stationary position during point-counts. Thus, we were not able to estimate occupancy for this species.

The largest group of *P. couloni* that we encountered flew overhead in a band of 6. They flew over the one and only active clay-lick that we visited, where we also encountered 10-30 mealy parrots (*Amazona farinosa*), 10-20 yellow-crowned parrots (*Amazona ocrocephala*), 200-500 blue-crowned parrots (*Pionus menstruus*), and especially notable, 15 red-and-green macaws (*Ara chloropterus*).

We encountered *P. couloni* in a diversity of habitats, including primary and secondary forest, floodplain and terra firme, and interior and forest-edge. Most encounters were from fly-overs, but the species was seen or heard motionless in both interior forest and forest edge (bordering cow pasture).

We encountered the species in roosting trees (i.e., trees where a group arrived at dusk and departed at dawn) on two occasions; each time in the same species and size of palm (local name "paxiubão"; *Iriartea deltoidea*, Family Arecaceae; a palm of 20-30 cm diameter at breast height [DBH] and 20-30 m tall, with a bulge toward the center). Both roosting observations were on the interface of pasture and lowland forest. One encounter was in the Peixoto Settlement Project and the other in Chico Mendes Extractive Reserve. In Peixoto Settlement Project, we watched the roosting groups with a high-powered spotting scope. This group was apparently a mixed-age family, with two adults (with white irises) and two immature offspring (with dark grey irises). We did not have a spotting scope in the Xapuri region of Chico Mendes Extractive Reserve, so we were unable to age the four roosting individuals that we encountered there.

In Chico Mendes Extractive Reserve, we encountered *P. couloni* spending time in actively fruiting trees on the interface of lowland forest and small areas of pasture (<20 ha) on more than one occasion. We saw the species in *Dipteryx micrantha* ("cumaru ferro"), *Cecropia* spp. ("embaúba"), and large woody vines. The species was also seen in a fruiting "anjico" tree (*Parkia* sp.*;* Family Mimosaceae). Anecdote information provided by our local guides suggests that the blue-headed macaw and other psittacids feed on this species.

Rufous Twistwing (*Cnipodectes superrufus*)

We encountered only four individuals of this species in four different locations (Figure 5). All individuals were encountered in *Guadua* bamboo and never during a point-count (which made it impossible to estimate occupancy). Three of these records were in new locations.

We observed *C. superrufus* once in the Zoological Park at the University of Acre, within 30 m of the forest edge, confirming a previous record (Tobias et al. 2008). We observed the species twice in the region of Assis Brasil (southwestern CMER) – once in terra firme and once in streamside (seasonally flooded habitat within terra firme). We observed *C. superrufus* once in the region of Xapuri (southeastern CMER), in terra firme habitat. We are the first to record *C. superrufus* in Chico Mendes Extractive Reserve. These observations suggest that the species ranges across most of CMER. They also indicate that the distribution of this species is fairly contiguous across eastern Acre and into southeastern Peru and northwestern Bolivia.

On one occasion, in the Assis Brasil region of CMER, we recorded behavioral data, including vocal recordings and feeding behavior. The individual was responsive to playback, made counter-vocalizations, produced sound from its modified primary feathers, and flew in dashed circles around the observer. The individual often flicked its tail and wings (perhaps in agitated response to playback), and often flew directly after doing so, in 3-6 m dashes. We observed the consumption of four food items. Three food items were Coleoptera or Lepidoptera larvae of approximately 1.5-2 times bill length, which *C. superrufus* "chewed" for several seconds before gulping. One prey item was

roundish and around 0.6 times the bill-length. This prey item and at least one of the three larvae were repeatedly smacked on a branch before being eaten.

Others species detected during this encounter of *C. superrufus* included greenish elaenia (*Myiopagis viridicata*), manu antbird (*Cercomacra manu*), sulphur-bellied tyrant-manakin (*Neopelma sulphureiventer*), Peruvian recurvebill (*Simoxenops ucayalae*), and rufous-capped nunlet (*Nonnula ruficapilla*).

Focal Species Not Detected

We did not encounter *Cacicus koepckeae*. However, recent expeditions by Dante Buzetti have confirmed its presence in east-central Acre (Guilherme 2009), indicating that the species very possibly occurs along rivers such as the Icuriã River, which forms the northern border of Chico Mendes Extractive Reserve.

We did not encounter *Crax globulosa*. However, anecdote information suggests the species may be present. One person interviewed in CMER (in the region of Xapuri – Figure 3) claimed that he has seen the species, even after questioning if he was certain it was not razor-billed curassow (*Mutum tuberosa*; the only other similar cracid species in the region).

Similarly, we did not encounter elusive antpitta (*Grallaria eludens;* NT; RR), harpy eagle (*Harpia harpyja;* NT), crested eagle (*Morphnus guianensis;* NT), or semi-collared puffbird (*Malacoptila semicincta;* RR). *G. eludens* has not been confirmed to occur in eastern Acre.

Significant New Records

We made new distributional records for several species:

- We detected *Eubucco tucinkae* approximately 50 km north and 100 km east of its known distribution in eastern Acre (Guilherme 2009; Van Perlo 2009; Figure 6).
- We made several new distributional records for the near-threatened, patchily distributed *Synallaxis cherriei* (Figure 6), confirming other recent records that substantially increase the species' distribution and demonstrating that it occurs in eastern Acre (Guilherme 2009; Ridgely and Tudor 2009; Van Perlo 2009). We encountered this species in the regions of Assis Brasil and Brasiléia (two opposite ends of Chico Mendes Extractive Reserve), suggesting that the species occurs throughout the entire reserve.
- We detected *Simoxenops ucayalae* (Figure 7) approximately 50 km north of its known distribution in eastern Acre (Guilherme 2009).
- We made several new distribution records for *Percnostola lophotes* (Figure 7). This confirms other recent records (Guilherme 2009), increasing the distribution across eastern Acre, where it was previously presumed to be absent (Ridgely and Tudor 2009; Van Perlo 2009).
- We detected *Formicarius rufifrons* several times in eastern Acre (Figure 8). The species was previously encountered only on the margins of southwestern Acre (Ridgely and Tudor 2009; Van Perlo 2009). Guilherme (2009) recorded the species in

one location, at the most southern point of Acre, directly on the border with Peru. We recorded the species 75 km north and 75 km east of this point.

- We confirmed recent findings (Guilherme 2009) and detected *Conioptilon mcilhennyi* approximately 150 km northeast of its known distribution in eastern Acre (Ridgely and Tudor 2009; Van Perlo 2009; Figure 8).
- We observed M*yrmeciza goeldii* and *Lophotriccus eulophotes* in several locations in CMER and ASF (Figure 9).
- We detected *Nannopsittaca dachilleae* in one location in CMER (Figure 10).
- Although Southern caracara (*Caracara plancus*) was not a focal species in our study, we saw this species once in the Brasileia region of Chico Mendes Extractive Reserve. This confirms other recent and new records of this open-land species in eastern Acre (Guilherme 2009).

We intend to publish any new range expansions and share findings with regional experts in avian ecology and conservation. See Tables 3, 4, and 5 for more details on how commonly we encountered focal species, where focal species occurred, and estimates of occupancy for some of these species.

We saw over 230 bird species between May and August of 2008 in eastern Acre (Appendix 3), and we are comparing our records to published records. We plan to contact regional ecologists to gain minimum-maximum estimates of the area of *Guadua* bamboo in southwestern Amazonia, and minimum-maximum estimates for the territory sizes of focal species. This will allow us to estimate minimum population sizes for all species for which we were able to estimate occupancy (Table 5).

Reduced-impact Logging

We did not detect the blue-headed macaw in either logging concession (Fazenda São Jorge and Fazenda Cerejeira). However, we did not target this species habitat type (i.e., riverine) as we did in the other sites. Instead, we focused on detecting indicator species of logging effects (Table 1). Therefore, we cannot draw conclusions about the occurrence of this species in the logging concessions.

Of the total 26 species originally selected for the study of logging effects, only 10 provided sufficient sample size for estimation of occupancy (> 10% observations, equivalent to more than 42 observations; Table 6; 7; 8). Of the total 10 species included in the analyses, five species showed evidence of the effects of logging or of interaction between logging and vegetation (white-throated toucan, white-throated tinamou, cinereous tinamou, black-faced antbird, and chestnut-tailed antbird), and five species did not respond to logging (Brazilian tinamou, red-necked woodpecker, white-fronted nunbird, warbling antbird, and black-faced antthrush).

The white-throated tinamou and the cinereous tinamou responded positively to logging (Figure 11). The white-throated toucan, the black-faced antbird, and the chestnut-tailed antbird were affected by the interaction between logging and vegetation type (Figure 12).

Based on the classification tree analyses, sites were better classified than treatments, indicating that the variation between sites was higher than the variation between treatments (Figure 13; 14).

Hunting Surveys

Most people interviewed in our project sites demonstrated interest in wildlife management plans. Many of them demonstrated concern about species decline over time. In addition, we identified wildlife poaching as a potential threat to wildlife in our study sites. For instance, several people reported having wildlife as pets in the past or present. The species most commonly reported were birds (several species of psittacids) and primates. In the case of the blue-headed macaw and other psittacids, most of people interviewed reported they would keep ticks as pets if they find the nests. The interviewees also reported illegal hunting by people who do not live in the areas. This problem was reported by local people in both protected areas (see Table 9 for more details).

We found that human-wildlife conflict due to attacks on crops and size of species hunted were the most important differences among our study sites (Figure 15). People in protected areas had more conflicts with some wildlife species than people in the other study sites. People in the protected areas had more conflict with red-brocket deer and white-lipped peccary due to attacks on crops, and with jaguar due to attacks on livestock and fear of being attacked (Fisher's Exact Test, p-value = 0.05). Furthermore, people in both protected areas hunt larger, more preferable species (e.g. white-lipped peccaries, red-brocket deer) than people in the other sites, who were hunting medium-sized, less preferable species - e.g. agoutis, armadillos (Fisher's Exact Test, p-value < 0.0001).

Discussion and Conclusions

Avian Species of Conservation Concern

We were able to provide useful information on the distribution of *Primolius couloni* macaw (Figure 5). We encountered this species in 35 locations – much more frequently than *A. chloroptera, A. macao,* or *A. ararauna.* Although the species was widely distributed, we were not able to estimate the species occupancy or abundance using detectability-based methods. Thus, we cannot conclude whether the species is uncommon-common or simply rare yet highly nomadic and vocal.

We added only three new records to the existing 14 records of *C. superrufus,* giving us confidence to support its 2009 listing as an IUCN-vulnerable species. Along with *Malacoptila semicincta, Formicarius rufifrons,* and *Nannopsittaca dachilleae,* it was one of the least-detected bamboo-obligate species in our study.

We did not detect *Cacicus koepckeae* or *Crax globulosa* during our study. If *C. globulosa* occurs in eastern Acre, then it is undoubtedly threatened by hunting pressure. We recommend extensive downriver surveys by canoe on medium and large rivers in the region (including the Icuriã River, which borders the northern side of Chico Mendes Extractive Reserve). These would provide an efficient way to discover new populations of these globally threatened, riverine species. Furthermore, researchers could simultaneously survey populations of other globally threatened, riverine species in non-avian taxa (e.g., yellow-spotted river turtle [*Podocnemis unifilis*]; giant otter [*Pteronura brasiliensis*]).

We recommend reassessments of the conservation status of *Grallaria eludens, Harpia harpyja, Morphnus guianensis, Malacoptila semicincta, Formicarius rufifrons, Synallaxis cherriei, Eubucco tucinkae,* and *Nannopsittaca dachilleae*. These species were encountered at 0-3 locations during our study (see Results section for details). More extensive surveys of these species (that would allow for estimation of abundance or occupancy) would help determine their conservation status. *H. harpyja* and *M. guianensis* are threatened by hunting or persecution as pests, so we recommend they receive priority in any reassessments. We are aware that *H. harpyja* and *M. guianensis* have a large distribution, and population trends in eastern Acre might not be indicative of the species' situation elsewhere.

Reduced-impact Logging

We found evidence of logging effect or the interaction between logging and vegetation type on the occupancy of five out of 10 focal species assessed. It is important to mention that the effect on these species was detected even when vegetation differences between sites appeared to be higher than the vegetation differences between logged and unlogged areas (Figure 13, 14), suggesting that logging represents an important factor affecting these species over natural variation in habitat structure.

Our results indicate that reduced-impact logging does affect some bird species (Figure 11, 12). It is possible that other species that have similar microhabitats and ecological traits are also affected by logging. For instance, many species of understory insectivores may also be affected by logging in a similar way as the black-faced antbird and the chestnut-tailed antbird, as this group is consistently found to be affected by logging (Mason 1996; Felton et al. 2008b). Canopy frugivores such as parrots and macaws, including the blue-headed macaw, could also respond to logging similarly to the white-throated toucan. Felton et al. (2008a) reported that 40% of the species significantly associated with unlogged areas were of conservation concern. Although this part of our study focused on common species, rare species have also been reported to decline after logging (Thiollay 1997; Marsden 1998).

Hunting

Most of people interviewed across our project sites had interest in wildlife management plans. They also demonstrated concern about the decline of certain species, as they rely heavily on wild meat. These findings emphasize the importance of participatory wildlife management for the conservation of hunted species.

We also identified some threats to wildlife. We found that many of the people interviewed have or have had wildlife as pets, especially primates, psittacids, and tortoises. In the case of psittacids, including the blue-headed macaw, most people stated they would keep ticks as pets, if they find the nests. In addition, many people interviewed reported illegal hunting performed by outsiders. These findings highlight the importance of long-term education programs and better assessment the impacts of illegal activities on wildlife.

When comparing our study sites, we found that human-wildlife conflict and size of species hunted were the most important differences in hunting profiles between the protected areas and the other sites (Figure 15). People in the protected areas reported problems with several species (especially red-brocket deer, white-lipped peccary, and jaguar) whereas people in other areas rarely reported any problems. In addition, people in protected areas reported large species as the most commonly hunted, whereas in the other sites most people reported hunting medium sized species. We assessed several other variables likely to be correlated with the observed differences, such as frequency of hunting, time to find the animal, hunting technique, among others. However, these variables were similar (Table 10) and did not appear as important variables in the classification tree analysis.

Although we did not perform population estimation of hunted species, we argue that abundance of commonly hunted animals maybe higher in the protected areas, which would explain larger species being hunted in these areas. In the other sites, people tended to hunt smaller species. A shift to smaller, less preferred species often reflects depletion of larger species (Fragoso et al. 2002). In places where large sized species are relatively common, people tend to bypass many smaller and less desirable species because they are searching for larger, preferable ones (Jerozolimski & Peres 2003).

Most of the areas in both Chico Mendes Extractive Reserve and Antimary State Forest have lower human density, lower access, and more continuous forest than the other sites (Figure 2), which may provide better habitat to some large wildlife species. Access is known to bring changes to the landscape, including fragmentation (which leads to problems of connectivity, edge effects, animals movement in the landscape, etc) and increased hunting pressure, which can modify the composition of animal communities and exterminate species with low rate of reproduction (Laurance et al. 2000; Wilkie et al. 2000; Pousen et al. 2009). The differences among our study sites indicate the importance of protected areas of sustainable use for conserving wildlife in Acre.

Higher abundances of species in the protected areas and smaller crop areas may explain more events of attacks on crops. If the abundance of animals is higher, attacks on crops by these animals are more likely to occur. Furthermore, all study sites have agricultural fields. Yet, the frequency of attacks on crops is significantly higher in the protected areas. Agriculture is the main land use in Peixoto Settlement Project and the areas surrounding the logging concessions. Thus, it is possible that size and variety of crops in these areas are larger than in protected areas. We hypothesize that any event of attack on crops by wildlife would represent an issue to the people in protected areas, because of small crop areas, whereas it would be less problematic for the people in the other sites. For instance, several people interviewed in the other sites reported events of attack on their crops. However, most of them did not see that as a problem because these events were rare and represented little damage to their crops. On the other hand, most people in protected areas that reported attacks on their crops viewed that as an issue.

Education and Communications

Capacity Building

Throughout our project, we trained six local people in the use of compass, maps, and GPS units. We also taught them how to perform systematic vegetation measurements, including the use of equipment such as densiometer and clinometers (Figure 18). This training provided them with skills that they can use for future projects.

Dialogue with local communities

During our project, we stayed and visited many local people to talk about our project (Figure 19). We conducted surveys to assess their awareness and concerns about wildlife conservation issues, including whether they have noticed a decline in the populations of hunted species and if they were interested in wildlife management plans (see hunting surveys in Methods section). Our results showed that wildlife was an important source of food for these people and that most of them were interested in wildlife management plans for their sites. Also, local people reported a decline of hunted species over time and demonstrated concerns about the conservation of these species. We recommend that the agencies that manage these areas (especially the protected areas) develop wildlife management plans (see conclusions).

Education of Schoolchildren

We originally proposed to visit urban and rural schools to talk to children about wildlife conservation. However, after starting our project, we interacted with a group performing an environmental education project in Acre that aims to bring information about wildlife to schoolchildren and teachers. We wanted to learn from them before we performed the education component of our work. This education project was developed by a professor of the Federal University of Acre (Dr. Armando Calouro, a collaborator in our project) and is being performed by his students.

After our interactions with this project, we decided to make changes to our education program. We realized that the two or three visits we proposed to make at each school would not have much impact on children's perceptions and attitude towards wildlife, and decided to use a different strategy that we believe will be more effective. With the help of Tatiana Pongiluppi (CLP awardee) and the support of the CLP Mentoring Program (2009), we produced a booklet to distribute to elementary schoolteachers (Appendix 4). This booklet focuses on the importance of and threats to wildlife, and on how to conserve wildlife. Several rural and urban teachers have agreed to use our booklet and monitor its efficiency. In addition, Federal University of Acre has an ongoing continuing education program for rural school teachers. They are also interested in including this booklet as part of a pre-existing course in their program. The booklet has pre and post evaluations, so we will be able to assess the long-term success of its use. We will assess this twice (6

months and one year from the beginning of its application). In addition, we also produced three posters focused on the same topics as the booklet to give to the schoolteachers (Appendix 5).

Communications

We are disseminating the results of our project to conservation agencies and researchers. We are submitting reports to the government agencies (FUNTAC, Secretary of Forest of Acre [SEF], Institute of Environment of Acre [IMAC], and IBAMA), professors and students at the Federal University of Acre (UFAC) and conservation NGO's (e.g., AMAZONFAUNA, PESACRE, SOS Amazonia, and WWF-Brazil) operating in Acre. We are also presenting our finding at international meetings. For instance, we have presented our results on hunting and wildlife management issues at the Tropical Conservation and Development Conference, held in January 2010, at the University of Florida, USA. We will also present more results of our work in the 25th International Congress of Ornithology that will take place in Brazil, in August of 2010. We are currently preparing manuscripts to submit for publication in peer review journals.

CONCLUSION

Our project findings are important for conservation of birds and other wildlife in our study system. We have found *Primolius couloni* in three study sites (Chico Mendes Extractive Reserve, Antimary State Forest, and Peixoto Settlement Project), and *Cnipodectes superrufus* in two study sites (Chico Mendes Extractive Reserve and Zoological Park at the Federal University of Acre). We were able to provide information on these species distribution, behavior, and potential threats. We also detected several other species of conservation concern and estimated occupancy for some of them. Our finds are important to guide future conservation efforts in this region.

In regard to research and conservation efforts for *P. couloni*, we recommend:

- Conduct studies of *Primolius couloni* with the use of GPS trackers to learn about its habitat use, territoriality, and degree of nomadic behavior. GPS data might also lead to the location of nests (and thereby describe its breeding biology).
- Develop practical population estimation methods of abundance or occupancy of *P. couloni* and other threatened psittacids.
- Conduct education campaigns against keeping macaws, spider monkeys, and other uncommon or rare wildlife as pets. We do not recommend education campaigns that specifically mention *P. couloni*, but instead speak out against keeping "araras" (*Ara chloroptera, Ara macao,* and *Ara ararauna*), "maracanãs" (*P. couloni, Orthopsittaca manilata,* and *Ara severus*) and other wildlife as pets.

We detected effects of RIL on our indicator species, which will be important to improve forest management in Acre. Our findings are consistent with other studies on the effects of RIL on birds (Wunderle et al. 2006; Felton et al. 2008a; Felton et al. 2008b). However, from a regional perspective, our findings are new and very important to local conservation as this is the first project in the southwestern Brazilian Amazon that has assessed the impacts of forest management on birds. Using indicator species, we were able demonstrate to local managers that RIL is affecting bird species.

Based on our findings, our recommendations regarding forest management in Acre state include:

- Keep unlogged areas within logging concessions. This is important for the conservation and recovery of wildlife as these unlogged areas serve as 'refuge' for species that are intolerant to disturbance and as a source for recolonization of logged areas by these species (Fimbel et al. 2001; Hussin and Francis 2001).
- Retain as many mature trees (for cavity nesters) and large fruiting trees (for canopy frugivores) in logged areas as possible to guarantee the conservation of these species.
- Protect logged areas from further degradation. One way to approach this is by enforcing regulations to guarantee that employees of the logging companies do not hunt or collect animals while working in the concession. Another way is by controlling access of people to logging roads during and after logging operations, and by closing logging roads after logging operations are completed. Hunting is perhaps one of the major logging by-products that significantly degrade wildlife communities

(Robinson & Bennett 2000; Poulsen et al. 2009). Thus, it needs to be curbed in RIL areas to maintain minimal effects of RI logging.

We are working with local collaborators to improve management towards more sustainable operations. For instance, in the concessions we worked, the logging company will establish a 35-year monitoring program to assess the effects of timber harvest on biodiversity. In addition, we are contributing with WWF-Brazil in the elaboration of a book that will include guidelines for monitoring the effects of logging on biodiversity, as well as recommendations for improving forest management in logging concessions in Acre.

We learned from local communities about their hunting patterns and attitudes toward wildlife. We also identified potential threats such as wildlife poaching (especially by outsiders) and important needs such as wildlife management. Several interviewees in both protected areas (Chico Mendes Extractive Reserve and Antimary State Forest) complained about the lack of protection from the enforcement agencies. In Chico Mendes Extractive Reserve, interviewees said that IBAMA did not stay during weekends (alleging that environmental law enforcement officers do not work on weekends, providing opportunity for outsiders to illegally log or hunt in the reserve). In Antimary State Forest, local people complained about the lack of control of access to the area and highlighted problems with outside people who come to illegally hunt or extract other forest products (e.g. Brazil nuts). These problems are likely to increase with the construction of the two international highways through Acre. We recommend that these enforcement agencies increase efforts in controlling these illegal activities.

Based on our findings, we recommend for our study sites and other protected areas of sustainable-use in Acre state:

- Work with local communities to implement wildlife management within protected areas and their surrounding areas.
- Implement environmental education programs with the local communities together with the wildlife management plans.
- Investigate the impacts of wildlife poaching and trade, especially by outsiders (such as people surrounding the protected areas and from urban areas). It is important to identify which species are most affected by these threats, quantify how these illegal activities threaten these species, and test potential conservation strategies to combat such activities.

During the course of our project, two opportunities arose as a result of our efforts to work closely with local collaborators. First, one of our team members was employed by the local agency that manages Antimary State Forest. This will allow us to implement some of our recommendations. For instance, we have recently applied and received resources from the national government to initiate a wildlife management plan for Antimary State Forest. Second, we are contributing to the Ecological-Economic Zoning of Acre, which includes government publications to set priorities for land use in Acre. We are helping to set priorities for wildlife conservation and management, especially of hunted species. This opportunity will allow us to influence public policy and further contribute to wildlife conservation in this region.

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Table 1- Species selected as indicators of the effects of reduced-impact logging

Common name	Family	Scientific name	Sensitivity	Strata	Food	Prediction
White-throated toucan[1]	Ramphastidae	*Ramphastus tucanus*	H	C	Frug	Negative
White-throated tinamou[1]	Tinamidae	*Tinamus guttatus*	H	T	Omn	Negative
Great tinamou[1]	Tinamidae	*Tinamus major*	M	T	Omn	Negative
Gray tinamou[1]	Tinamidae	*Tinamus tao*	H	T	Omn	Negative
Variegated tinamou[1]	Tinamidae	*Crypturellus variegatus*	H	T	Omn	Negative
Undulated tinamou[1]	Tinamidae	*Crypturellus undulatus*	L	T	Omn	Positive or none
Cinereous tinamou[1]	Tinamidae	*Crypturellus cinereus*	L	T	Omn	Positive or none
Brazilian tinamou[1]	Tinamidae	*Crypturellus strigulosus*	H	T	Omn	Negative
Bartlett's tinamou[1]	Tinamidae	*Crypturellus bartletti*	H	T	Omn	Negative
Little tinamou[1]	Tinamidae	*Crypturellus soui*	L	T	Omn	Positive
Red-necked woodpecker	Picidae	*Campephilus rubricollis*	H	M	Ins	Negative
Crimson-crested woodpecker	Picidae	*Campephilus melanoleucos*	M	C	Ins	Positive or none
Lineated woodpecker	Picidae	*Dryocopus lineatus*	L	C	Ins	Positive
White-fronted nunbird	Bucconidae	*Monasa morphoeus*	M	M/C	Ins	Positive
Black-fronted nunbird	Bucconidae	*Monasa nigrifrons*	M	M/C	Ins	Positive
Black-faced antbird	Thamnophilidae	*Myrmoborus myotherinus*	H	U	Ins	Negative
Black-throated antbird	Thamnophilidae	*Myrmeciza atrothorax*	L	U	Ins	Negative
White-browed antbird	Thamnophilidae	*Myrmoborus leucophrys*	M	U	Ins	Negative
Chestnut-tailed antbird	Thamnophilidae	*Myrmeciza hemimelaena*	M	T/U	Ins	Negative
Warbling antbird	Thamnophilidae	*Hypocnemis cantador*	M	U/M	Ins	Positive or none
Black-faced antthrush	Formicariidae	*Formicarius analis*	M	T	Ins	Positive or none
Rufous-capped antthrush	Formicariidae	*Formicarius colma*	H	T	Ins	Negative
White-necked thrush	Turdidae	*Turdus albicollis*	M	U/M	Ins/Frug	Negative
Hauxwell's thrush	Turdidae	*Turdus hauxwelli*	H	U/M	Ins/Frug	Negative
Olive-backed foliage-gleaner	Furnariidae	*Automolus infuscatus*	H	U	Ins	Negative
Buff-throated foliage-gleaner	Furnariidae	*Automolus ochralaemus*	M	U	Ins	Negative

Note: [1] Species hunted; Sens. = sensitivity to habitat disturbance; H = high; M = medium; L = low; C = canopy; T = terrestrial; U = understory; M = midstory; Frug = frugivore; Omn = omnivore; Ins = insectivore; Prediction = direction of species response (Elliot et al. 1992; Stotz et al. 1996; Hoyo et al. 1997; Hoyo 2002, 2003; Schulenberg et al. 2007).

Table 2- Models run to estimate occupancy and probability of detection of indicator species

Model	**Model description**	**psi model**	**p model**
psi(const.), p(const.)	null model, constant p	psi = b_0	p=b_0
psi(const.), p(veg)	null model, p as a function of vegetation type	psi = b_0	p = b_0 + b_1* veg
psi(veg),(const.)	vegetation effect on psi, constant p	psi = b_0 + b_1 * veg	p = b_0
psi(veg),(veg)	vegetation effect on psi, p as a function of vegetation type	psi = b_0 + b_1 * veg	p = b_0 + b_1* veg
psi(log+veg), p(const.)	additive model, constant p	psi = b_0 + b_2 * log + b_1 * veg	p= b_0
psi(log+veg), p(veg)	additive model, p as a function of vegetation type	psi = b_0 + b_2 * log + b_1 * veg	p = b_0 + b_1* veg
psi(log), p(const.)	logging effect on psi, constant p	psi = b_0 + b_2 * log	p = b_0
psi(log), p(veg)	logging effect on psi, p as a function of vegetation type	psi = b_0 + b_2 * log	p = b_0 + b_1* veg
psi(log*veg), p(const.)	interaction between logging and vegetation, constant p	psi = b_0 + b_2 * log + b_1 * veg + b_3 * (log*veg)	p = b_0
psi(log*veg), p(veg)	interaction between and vegetation, p as a function of vegetation type	psi = b_0 + b_2 * log + b_1 * veg + b_3 * (log*veg)	p = b_0 + b_1* veg

Note: Psi = occupancy; p = probability of detection; veg = vegetation; log = logging; const. = constant

Table 3- Study sites where we detected avian species of conservation concern

Region	**Species**	*Primolius couloni* [1]	*Cnipodectes superrufus* [1]*	*Formicarius rufifrons* [2]*	*Synallaxis cherriei* [2]	*Simoxenops ucayalae* [2]*	*Malacoptila semicincta* [2]*	*Eubucco tucinkae* *	*Percnostola lophotes* *	*Myrmeciza goeldii* *	*Lophotriccus eulophotes* *	*Conioptilon mcilhennyi* *
Assis Brasil, CMER		x	x	x	x	x	x	x	x	x	x	x
Brasileia, CMER		x			x	x	x			x	x	x
Xapuri, CMER		x	x			x			x	x	x	x
Antimary State Forest		x				x			x	x	x	x
PZ UFAC			x									
Peixoto Settlement		x									x	

CMER=Chico Mendes Extractive Reserve; PZ UFAC=Zoological Park at the Federal University of Acre; [1]Vulnerable species; [2]Near-threatened species; *Restricted-range species (<50,000 km2 distribution). We spent roughly two weeks in each of the three regions of Chico Mendes Extractive Reserve and were able to conduct a roughly similar number of surveys in each of these locations; these data are fairly comparable among one another. We spent only 4 days in Antimary State Forest and a few days in the Zoological Park at the Universidad Federal do Acre. We were not very familiar with the avifauna during our time at the Peixoto Settlement Project. Therefore, Antimary State Forest, PZ UFAC, and Peixoto Settlement data should not be compared to each other or with the regions of Chico Mendes Extractive Reserve. That being said, the birdlife in Peixoto Settlement Project and the Zoological Park was noticeably less diverse and abundant than in Chico Mendes Extractive Reserve or Antimary State Forest.

Table 4- Number of times each avian species of conservation concern was encountered during surveys in bamboo habitat, surveys and riverine habitat, and opportunistic encounters (i.e., outside formal surveys)

Species	*Primolius couloni*[1]	*Cnipodectes superrufus* *[1]	*Formicarius rufifrons* [2]*	*Synallaxis cherriei*[2]	*Simoxenops ucayalae*	*Malacoptila semicincta*	*Eubucco tucinkae e**	*Percnostola lophotes **	*Myrmeciza goeldii **	*Lophotriccus eulophotes **	*Conioptilon mcilhennyi **
Bamboo Surveys Only (n=125)											
# Points Detected	1	1	1	0	6	1	0	10	19	21	14
% Points Detected	0.8	0.8	0.8	0	4.8	0.8	0	8	15.2	16.8	11.2
# Individuals Detected	2	0	1	0	6	4	0	12	27	22	20
Riverine Surveys Only (n=41)											
# Points Detected	0	0	2	1	1	0	2	2	8	0	2
% Points Detected	0	0	4.9	2.4	2.4	0	4.9	4.9	19.5	0	4.9
# Individuals Detected	0	0	2	1	1	0	2	3	11	0	2
All Surveys (n=167)											
# Points Detected	**1**	**0**	**3**	**1**	**7**	**1**	**2**	**12**	**27**	**21**	**16**
% Points Detected	0.6	0	1.8	0.6	4.2	0.6	1.2	7.2	16.3	12.7	9.6
# Individuals Detected	2	0	3	1	7	4	2	15	38	22	22
# Opportunistic Detections	**32**	**3**	**0**	**2**	**3**	**0**	**0**	**5**	**+**	**+**	**11**
Total (Points Detected + Opportunistic Encounters)	**33**	**3**	**3**	**3**	**10**	**1**	**2**	**17**	**+**	**+**	**27**

[1]Vulnerable species; [2]Near-threatened species; *Restricted-range species (<50,000 km2 distribution). Gray background = bamboo obligates. + = species were so prevalent that it was not practical to record every point where they were opportunistically detected.

Table 5- Occupancy estimates for avian species of conservation concern

Species	**psi**	**Std. Err. Psi**	**p**	**Std. Err. p**
Lophotriccus eulophotes	0.19	0.04	0.53	0.11
Myrmeciza goeldii	0.16	0.03	0.62	0.11
Percnostola lophotes	0.10	0.04	0.34	0.20
Simoxenops ucayalae	0.05	0.02	0.44	0.23

Psi: occupancy; *p:* probability of detection. We compared models that did and did not include time as a covariate; in all instances, models without time as a covariate had lower AIC values and were therefore selected (i.e., time did not affect detectability, according to our models).

Table 6 - Total number of observations of species that were pre-selected as indicator species

Name	n	Unlogged - points detected	Unlogged - individuals detected	Logged - points detected	Logged - individuals detected
White-throated toucan	112 [1]	64	69	48	49
White-throated tinamou	113 [1]	46	59	67	79
Great tinamou	5	4	4	1	1
Gray tinamou	2	2	2	0	0
Undulated tinamou	1	0	0	1	1
Variegated tinamou	30	17	21	13	15
Cinereous tinamou	64 [1]	26	33	38	42
Brazilian tinamou	56[1]	29	29	27	28
Bartlett's tinamou	21	15	17	6	7
Little tinamou	2	2	3	0	0
Red-necked woodpecker	56 [1]	30	36	26	29
Crimson-crested woodpecker	16	12	15	4	5
Lineated woodpecker	8	3	4	5	5
White-fronted nunbird	54[1]	33	75	21	53
Black-fronted nunbird	26	10	25	16	43
Black-faced antbird	166 [1]	91	142	75	96
Black-throated antbird	2	2	2	0	0
White-browed antbird	8	2	2	6	8
Chestnut-tailed antbird	72 [1]	35	36	37	42
Warbling antbird	99 [1]	51	59	48	60
Black-faced antthrush	57 [1]	28	31	29	32
Rufous-capped antthrush	22	9	10	13	13
White-necked thrush	14	12	12	2	2
Hauxwell's thrush	5	1	1	4	4
Olive-backed foliage-gleaner	16	10	12	6	6
Buff-throated foliage-gleaner	10	8	9	2	3

Note: [1] Indicator species included in analysis; n = total number of points where the species were detected.

Table 7- Baseline models for indicator species with sufficient sample size

Species	Baseline model	Δ AICc	AIC weight	Model Likelihood	# Par.
White-throated tinamou[1]	psi(const.),p(const.)	0.00	0.57	1.00	2.00
	psi(const.),p(veg)	0.54	0.43	0.76	4.00
Cinereous tinamou	psi(const.),p(const.)	1.96	0.22	0.29	2.00
	psi(const.),p(veg)	0.00	0.78	1.00	4.00
Brazilian tinamou	psi(const.),p(const.)	-0.15	0.45	0.82	2.00
	psi(const.),p(veg)	0.00	0.55	1.00	4.00
White-throated toucan	psi(const.),p(const.)	0.00	0.87	1.00	2.00
	psi(const.),p(veg)	4.08	0.13	0.15	4.00
Red-necked woodpecker	psi(const.),p(const.)	0.00	0.80	1.00	2.00
	psi(const.),p(veg)	3.52	0.20	0.25	4.00
White-fronted nunbird	psi(const.),p(const.)	0.00	0.84	1.00	2.00
	psi(const.),p(veg)	3.92	0.16	0.19	4.00
Black-faced antbird	psi(const.),p(const.)	0.00	0.60	1.00	2.00
	psi(const.),p(veg)	1.04	0.40	0.66	4.00
Chestnut-tailed antbird	psi(const.),p(const.)	0.00	0.79	1.00	2.00
	psi(const.),p(veg)	3.19	0.21	0.27	4.00
Warbling antbird	psi(const.),p(const.)	0.00	0.81	1.00	2.00
	psi(const.),p(veg)	3.26	0.19	0.23	4.00
Black-faced antthush	psi(const.),p(const.)	1.76	0.22	0.29	2.00
	psi(const.),p(veg)	0.00	0.78	1.00	4.00

Note: [1] Only data from one site was used to model this species' occupancy because the differences between sites were too large and there were so few samples from one site. AIC = Akaike Information Criterion; AICc = Corrected Akaike Information Criterion; # Par. = number of parameters; Psi = occupancy; p = probability of detection; psi(const.) = constant occupancy; p(const.) = constant probability of detection; veg = vegetation.

Table 8- Occupancy models of indicator species with sufficient sample size

Species	Model	Ranking	Δ AICc	AIC weight	Model likelihood	# Par.
White-throated tinamou[1]	psi(log),p(const.)	1	0.00	0.25	1.00	3
	psi(log+veg),p(const.)	2	0.24	0.27	0.94	5
	psi(veg),p(const.)	3	0.52	0.21	0.78	4
	psi(log*veg),p(const.)	4	1.64	0.18	0.66	7
	psi(const.),p(const.)	5	2.01	0.09	0.32	2
Cinereous tinamou	psi(log),p(const.)	1	0.00	0.44	1.00	3
	psi(log+veg),p(const.)	2	2.12	0.22	0.50	5
	psi(const.),p(const.)	3	2.56	0.11	0.25	2
	psi(log*veg),p(const.)	4	3.52	0.19	0.43	7
	psi(veg),p(const.)	5	4.61	0.05	0.12	4
Brazilian tinamou	psi(const.),p(const.)	1	0.00	0.37	1.00	2
	psi(veg),p(const.)	2	0.78	0.33	0.89	4
	psi(log),p(const.)	3	2.23	0.14	0.37	3
	psi(log+veg),p(const.)	4	2.93	0.14	0.37	5
	psi(log*veg),p(const.)	5	7.39	0.03	0.07	7
White-throated toucan	psi(log*veg),p(const.)	1	0.00	0.71	1.00	7
	psi(const.),p(const.)	2	2.95	0.1	0.14	2
	psi(veg),p(const.)	3	3.01	0.11	0.16	4
	psi(log),p(const.)	4	5.05	0.04	0.05	3
	psi(log+veg),p(const.)	5	5.13	0.04	0.06	5
Red-necked woodpecker	psi(const.),p(const.)	1	0.00	0.39	1.00	2
	psi(veg),p(const.)	2	1.58	0.26	0.66	4
	psi(log),p(const.)	3	2.18	0.15	0.39	3
	psi(log+veg),p(const.)	4	3.98	0.1	0.26	5
	psi(log*veg),p(const.)	5	5.52	0.1	0.27	7
White-fronted nunbird	psi(.),p(.)	1	0.00	0.38	1.00	2
	psi(log),p(.)	2	0.99	0.27	0.70	3
	psi(veg),p(.)	3	3.80	0.08	0.20	4
	psi(log*veg),p(.)	4	3.85	0.19	0.49	7
	psi(log+veg),p(.)	5	4.03	0.09	0.23	5
Black-faced antbird	psi(log*veg),p(const.)	1	0.00	0.79	1.00	7

Species	Model	Ranking	Δ AICc	AIC weight	Model likelihood	# Par.
	psi(veg),p(const.)	2	4.26	0.07	0.09	4
	psi(const.),p(const.)	3	4.48	0.06	0.07	2
	psi(log),p(const.)	4	5.19	0.04	0.05	3
	psi(log+veg),p(const.)	5	5.99	0.03	0.04	5
Chestnut-tailed antbird	psi(log*veg),p(const.)	1	0.00	0.48	1.00	7
	psi(veg),p(const.)	2	0.01	0.23	0.47	4
	psi(const.),p(const.)	3	1.38	0.09	0.18	2
	psi(log),p(const.)	4	1.49	0.09	0.19	3
	psi(log+veg),p(const.)	5	1.67	0.12	0.25	5
	psi(const.),p(const.)	1	0.00	0.55	1.00	2
Warbling antbird	psi(log),p(const.)	2	1.73	0.25	0.45	3
	psi(veg),p(const.)	3	3.37	0.12	0.22	4
	psi(log+veg),p(const.)	4	4.74	0.07	0.13	5
	psi(log*veg),p(const.)	5	8.87	0.01	0.02	7
Black-faced antthush	psi(veg),p(veg)	1	0.00	0.58	1.00	6
	psi(log+veg),p(veg)	2	2.42	0.27	0.46	7
	psi(const.),p(veg)	3	6.14	0.01	0.02	4
	psi(log*veg),p(veg)	4	6.20	0.13	0.21	9
	psi(log),p(veg)	5	7.97	0.01	0.01	5

Note: [1] Only data from one site was used to model this species' occupancy because the differences between sites were too large and there were few samples from one site. AIC = Akaike Information Criteria; AICc = Corrected Akaike Information Criteria; # Par. = number of parameters; Psi = occupancy; p = probability of detection; log = logging; psi(const.) = constant occupancy; p(const.) = constant probability of detection; veg = vegetation.

Table 9- Potential threats to wildlife identified during our project

Species	**Direct threat**	**Indirect threat**	**Site**	**Source of information**
Primolius couloni	Poaching Keeping as pet	Uncontrolled access to areas	CMER, ASF, PSP	Local people interviewed Local guides
Cnipodectes superrufus		Development pressure because of road construction	CMER	
Harpia harpyja	Killed by local people because it attacks livestock	Lack of appropriate conditions for raising livestock	CMER, ASF	Local people interviewed
Morphnus guianensis	Killed by local people because it attacks livestock	Lack of appropriate conditions for raising livestock	CMER	Local people interviewed
Several species: birds (e.g. psittacids), mammals (e.g. primates, ungulates), and reptiles (e.g. tortoise, turtles)	Poaching by people living outside the reserves Keeping wildlife as pets	Uncontrolled access to areas Lack of disincentives (poor enforcement) Lack of knowledge about the impacts Demand for wildlife products	CMER, ASF	Local people interviewed Local guides Direct observation

Table 10- Variables measured during interviews with local communities

Variables	Variable categories	CMER	Settlements
Distance to hunting event (km)	<1	28	25
	1-2	2	4
	>2	0	1
Time of hunting	Morning	7	8
	Afternoon	8	8
	Night	15	14
Hunting technique	Waiting	15	19
	Opportunistic	10	9
	Hunting with dogs	3	2
	Trapping	2	0
	Other	0	0
Average number of times of hunting event per month		2.63 (± 2.98)[1]	3.40 (± 3.16)
Average number of successful hunting/10 tries		3.78 (± 1.85)	4.19 (± 2.13)
Average time to find animal (hr)		1.37 (± 1.32)	1.75 (± 1.25)

Note: [1] standard error; CMER = Chico Mendes Extractive Reserve.

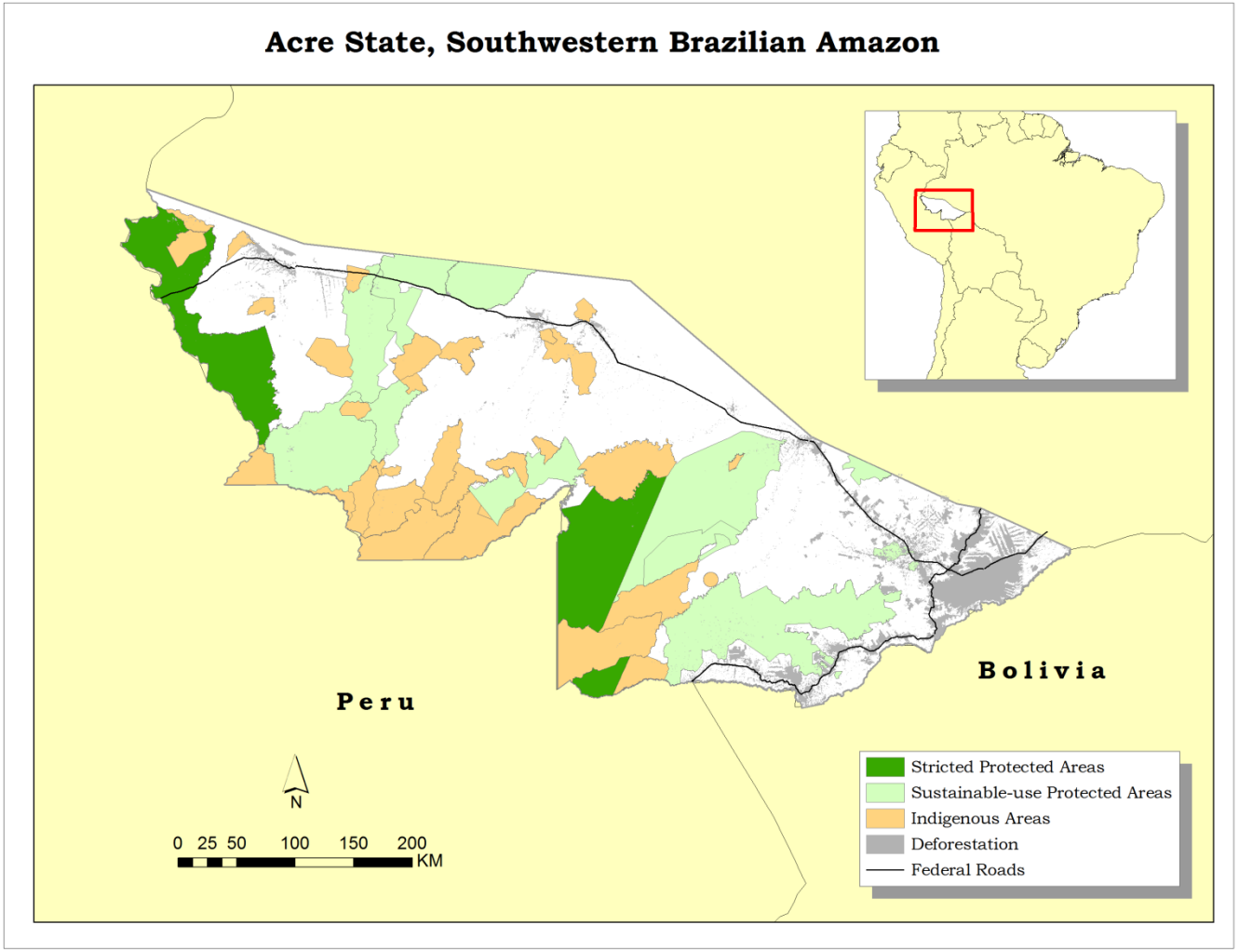


Figure 1 – Location of Acre State, Brazil.

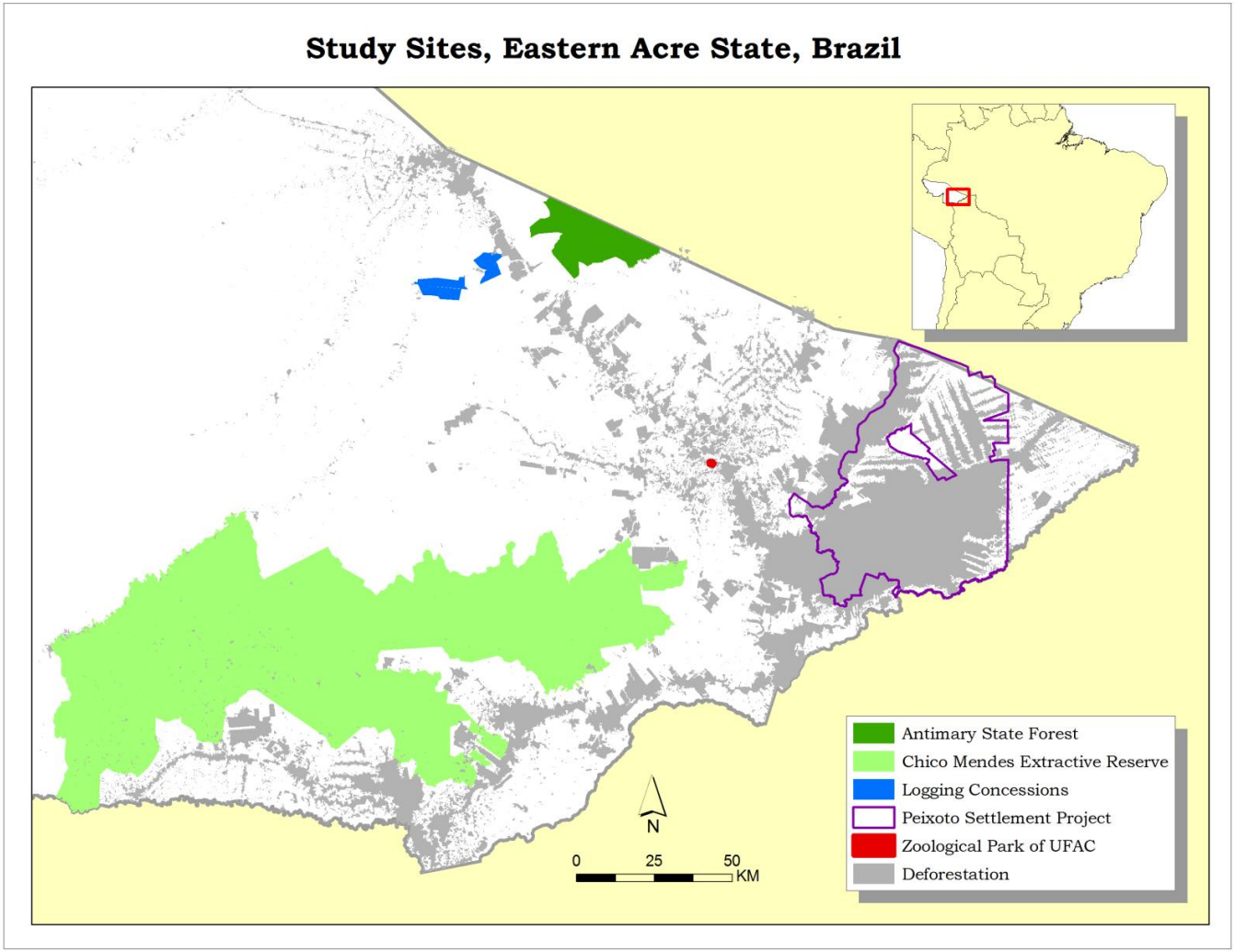


Figure 2 – Locations of study sites, Acre State, Brazil.

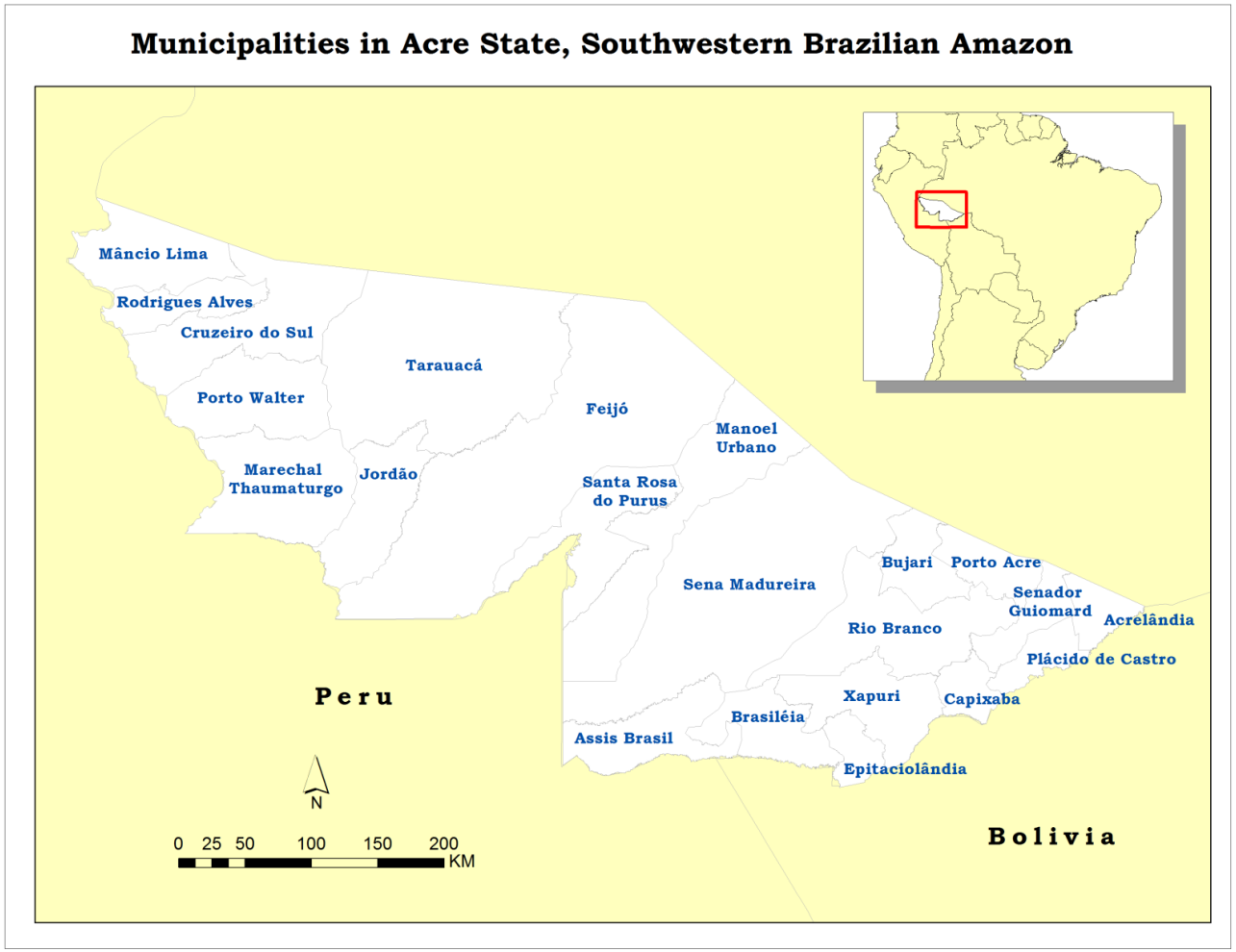


Figure 3 – Municipalities in Acre State, Brazil.

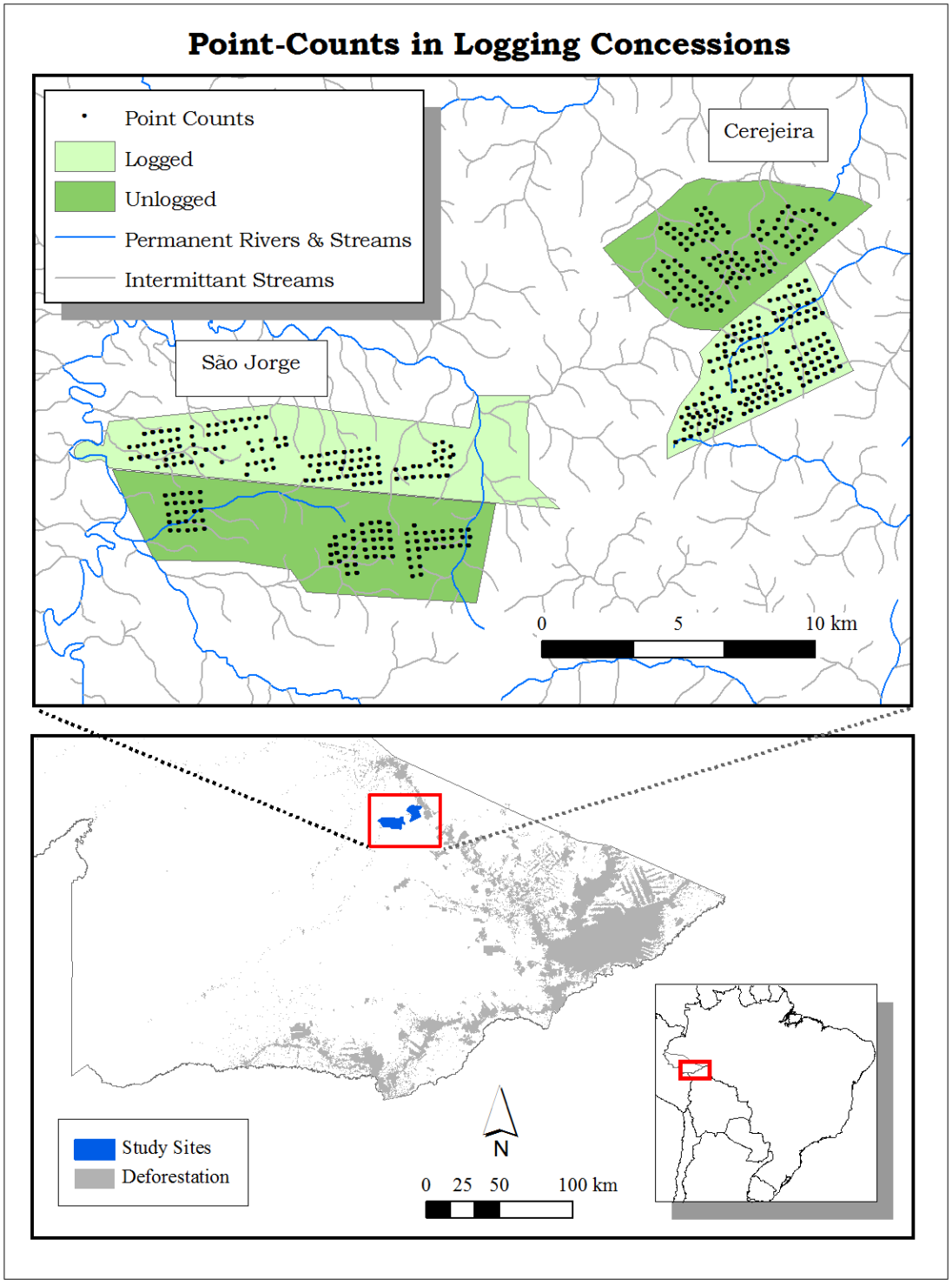


Figure 4 – Point-counts in logging concessions, Acre, Brazil.

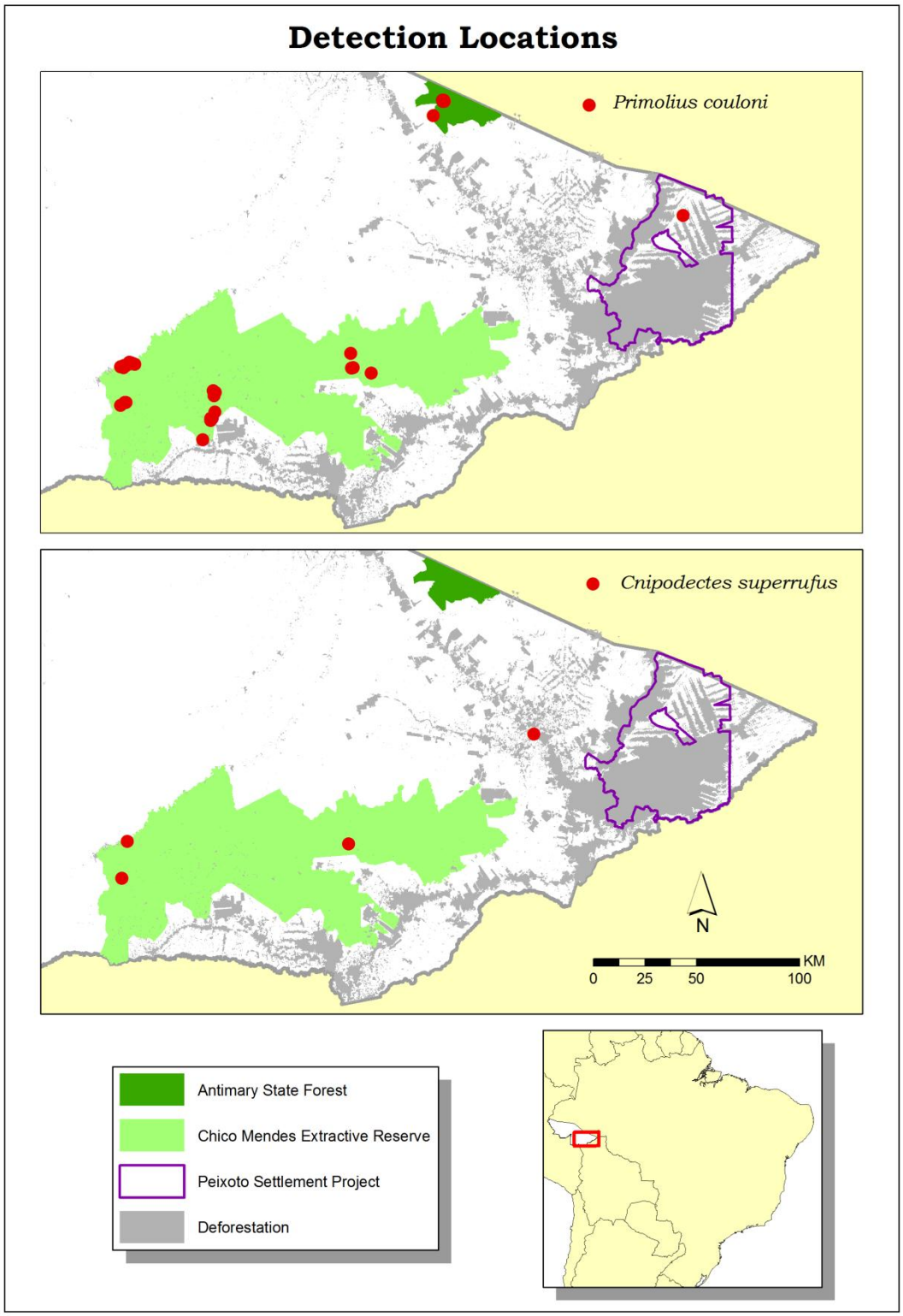


Figure 5 – Locations in eastern Acre where we detected *Primolius couloni* and *Cnipodectes superrufus.*

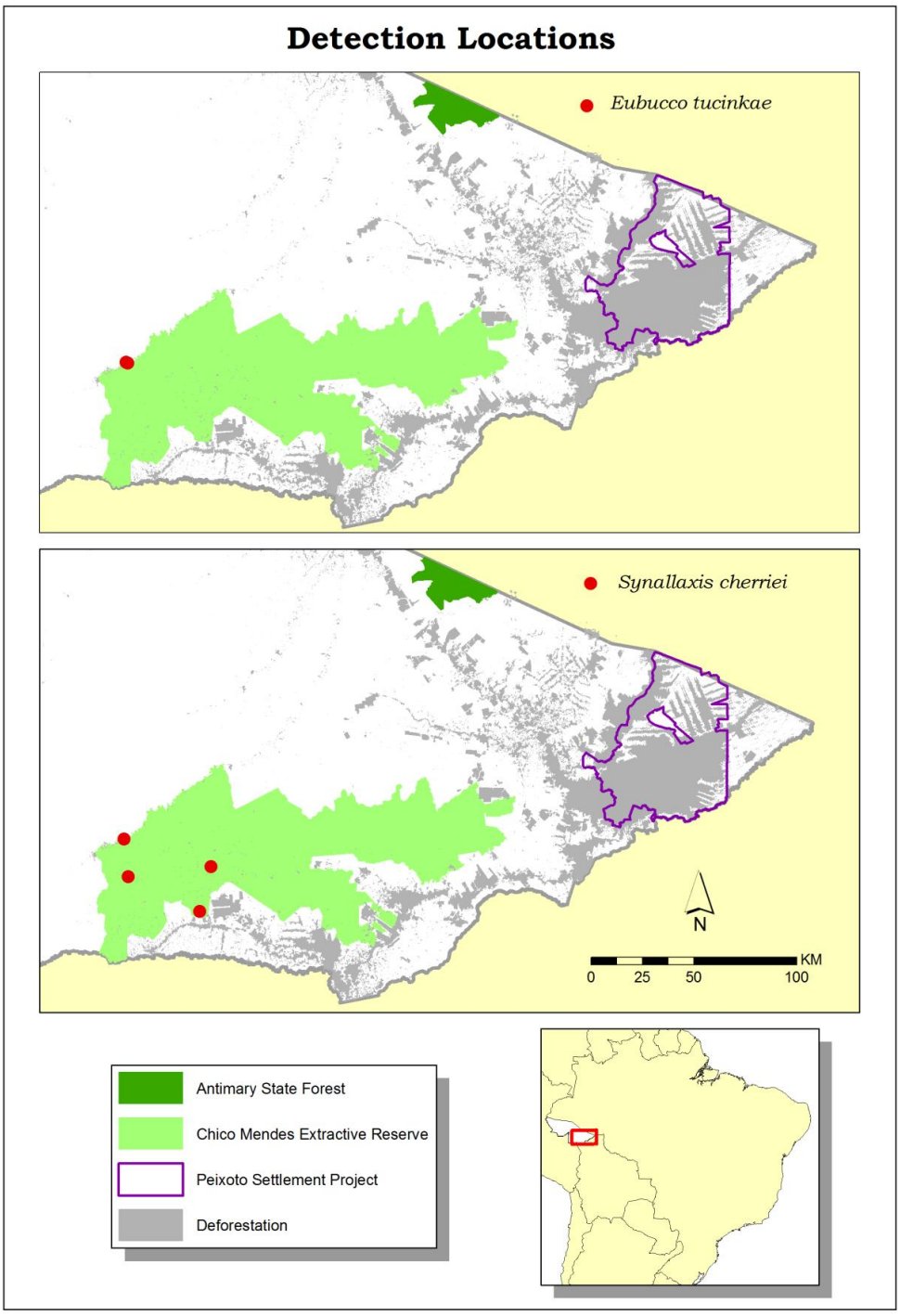


Figure 6 – Locations in eastern Acre where we detected *Eubucco tucinkae* and *Synallaxis cherriei.*

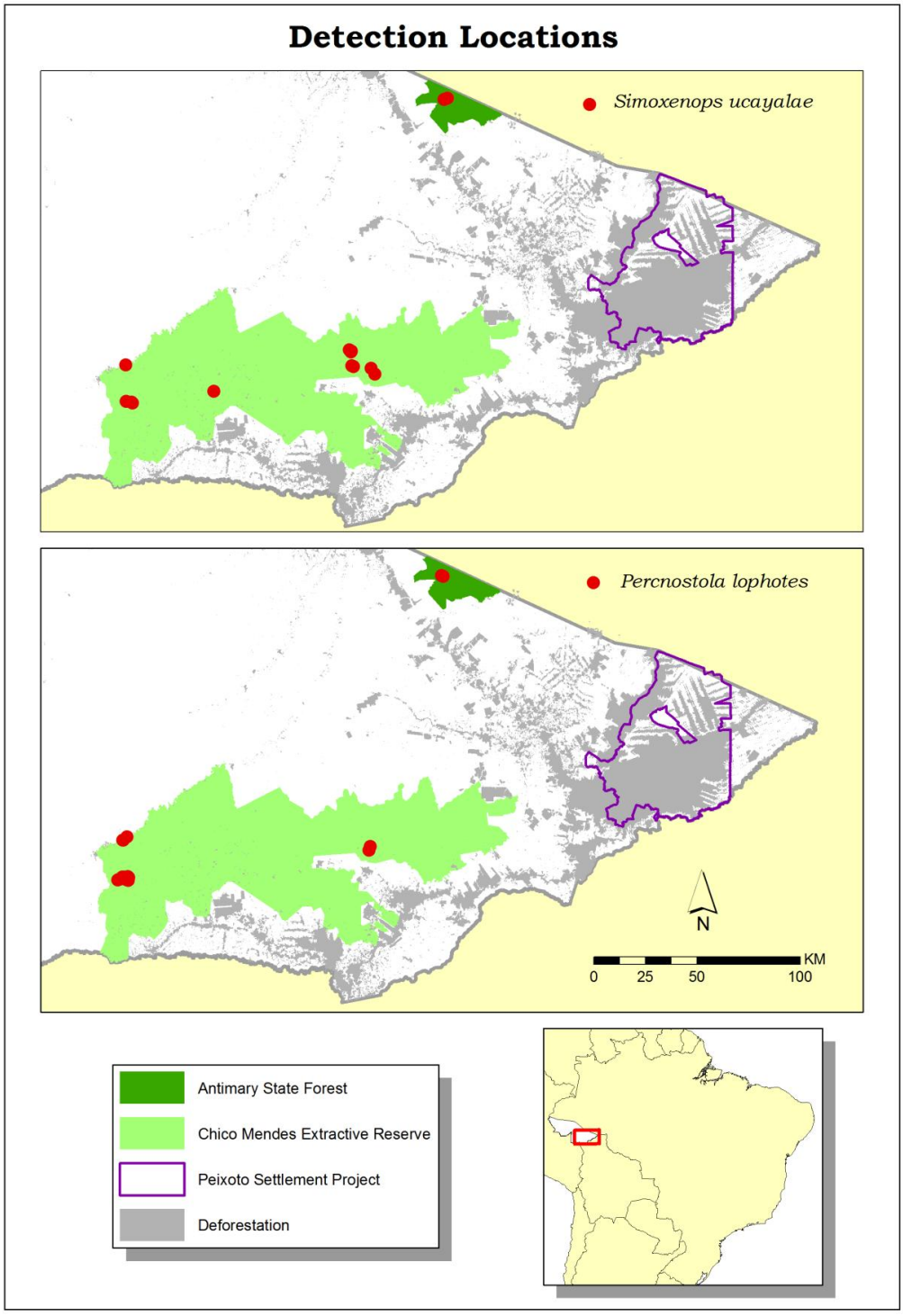


Figure 7 – Locations in eastern Acre where we detected *Simoxenops ucayalae* and *Percnostola lophotes.*

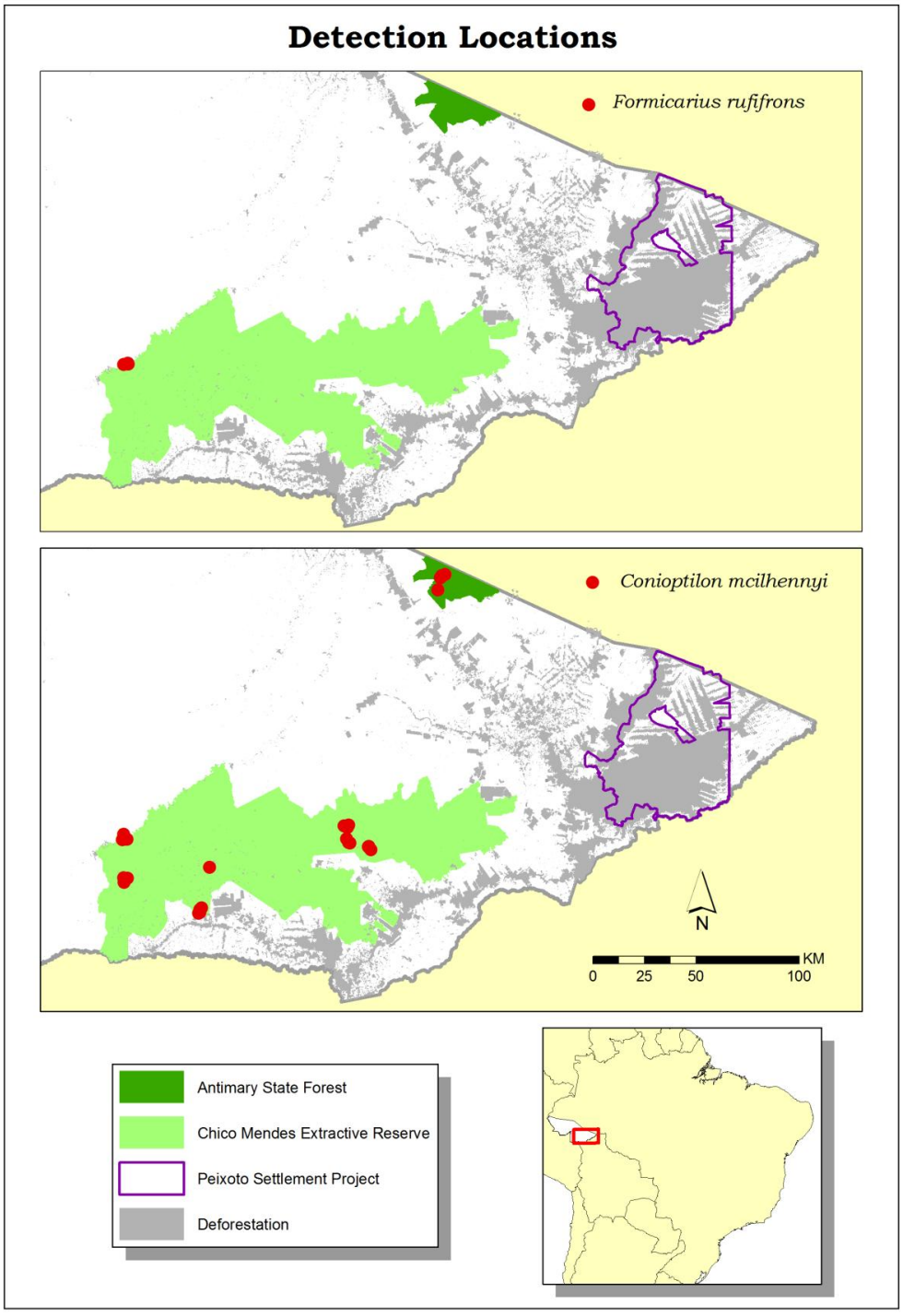


Figure 8 – Locations in eastern Acre where we detected *Formicarius rufifrons* and *Conioptilon mcilhennyi.*

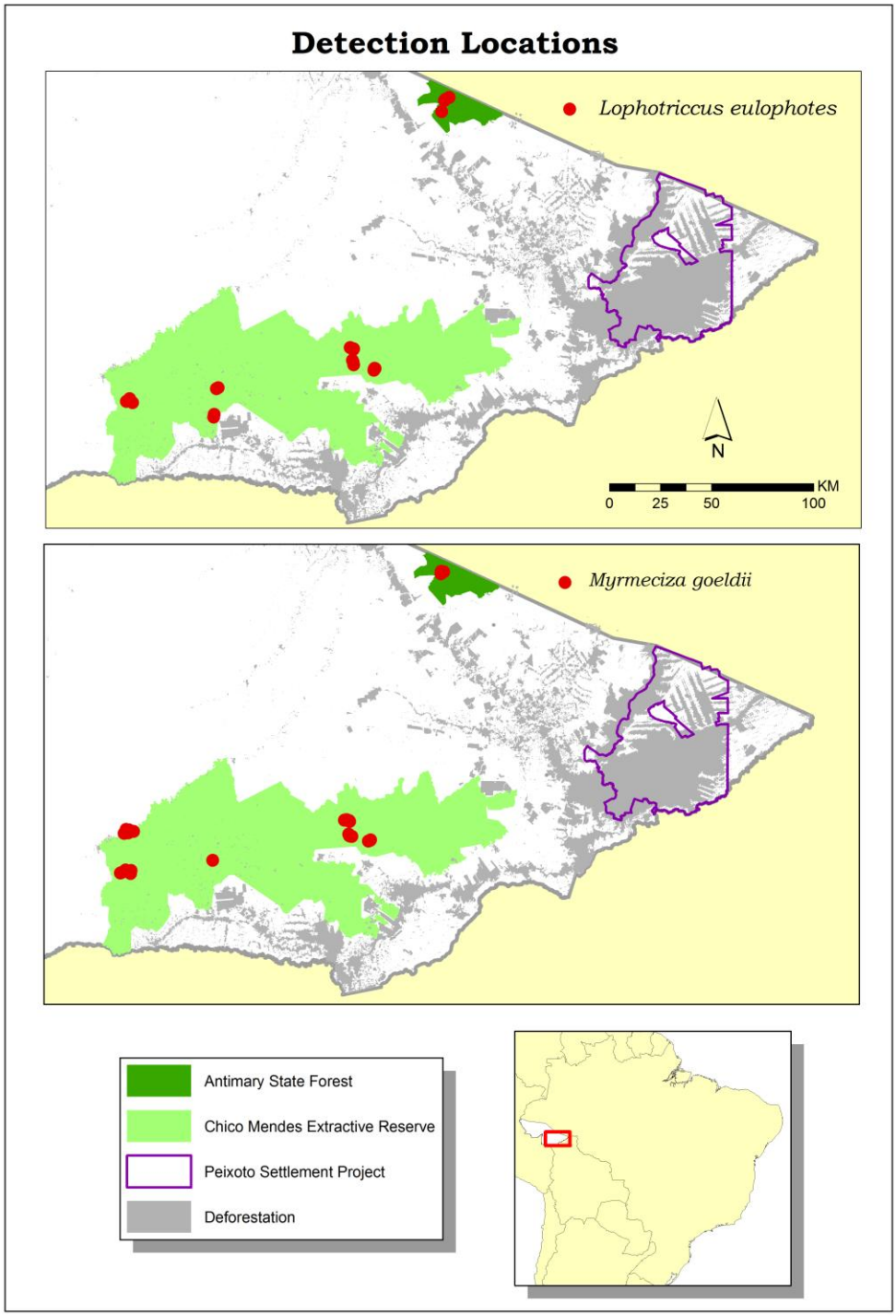


Figure 9 – Locations in eastern Acre where we detected *Lophotriccus eulophotes* and *Myrmeciza goeldii.*

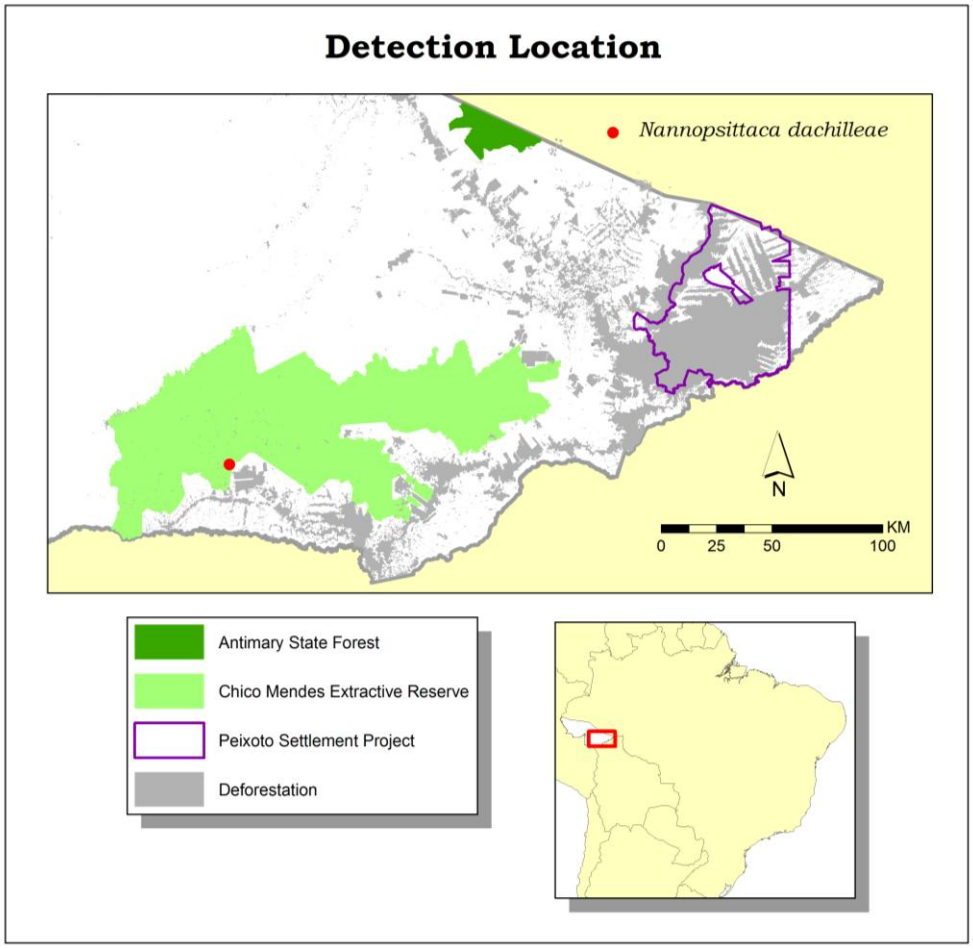


Figure 10 – Location in eastern Acre where we detected *Nannopsittaca dachilleae.*

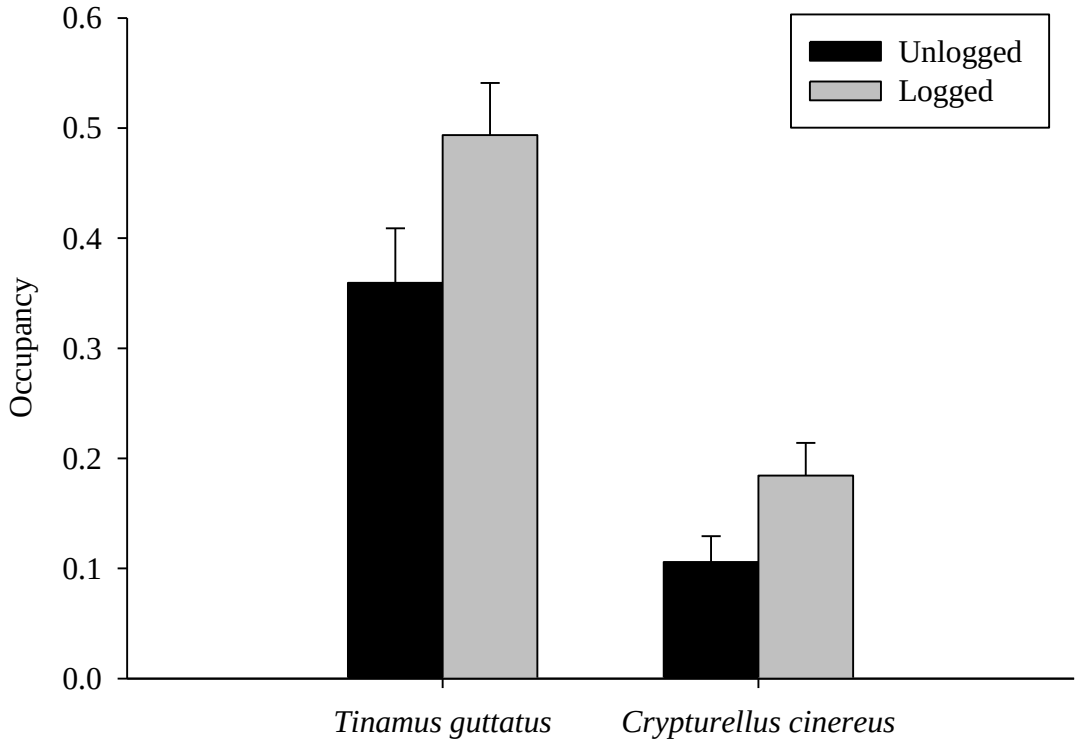


Figure 11 – Positive effects of reduced-impact logging on white-throated tinamou (*Timamus guttattus*) and cinereous tinamou (*Crypturellus cinereus*).

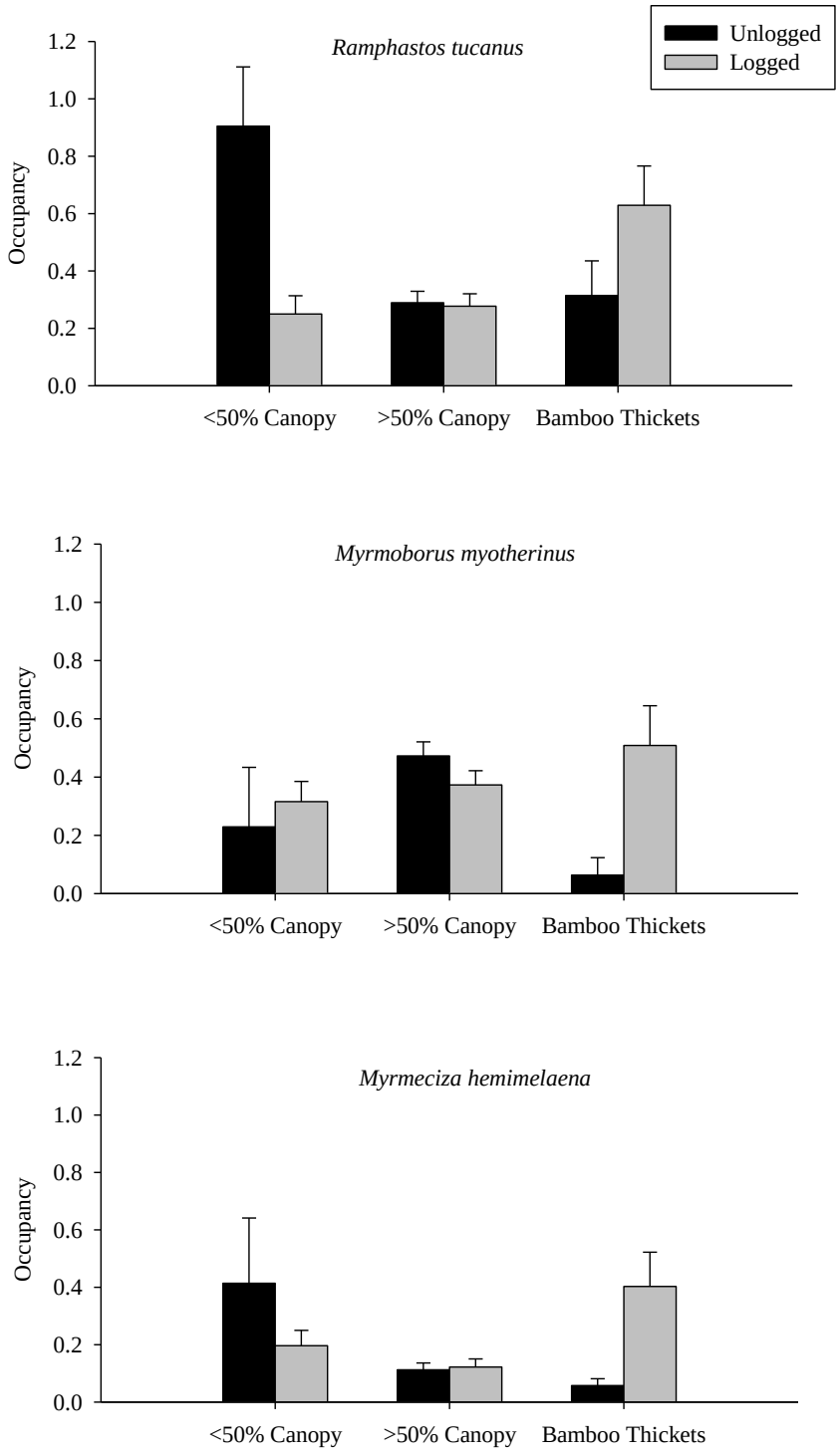


Figure 12 – Effects of the interaction between logging and vegetation on white-throated toucan (*Ramphastos tucanus*), black-faced antbird (*Myrmoborus myotherinus*), and chestnut-tailed antbird (*Myrmeciza hemimalaena*).

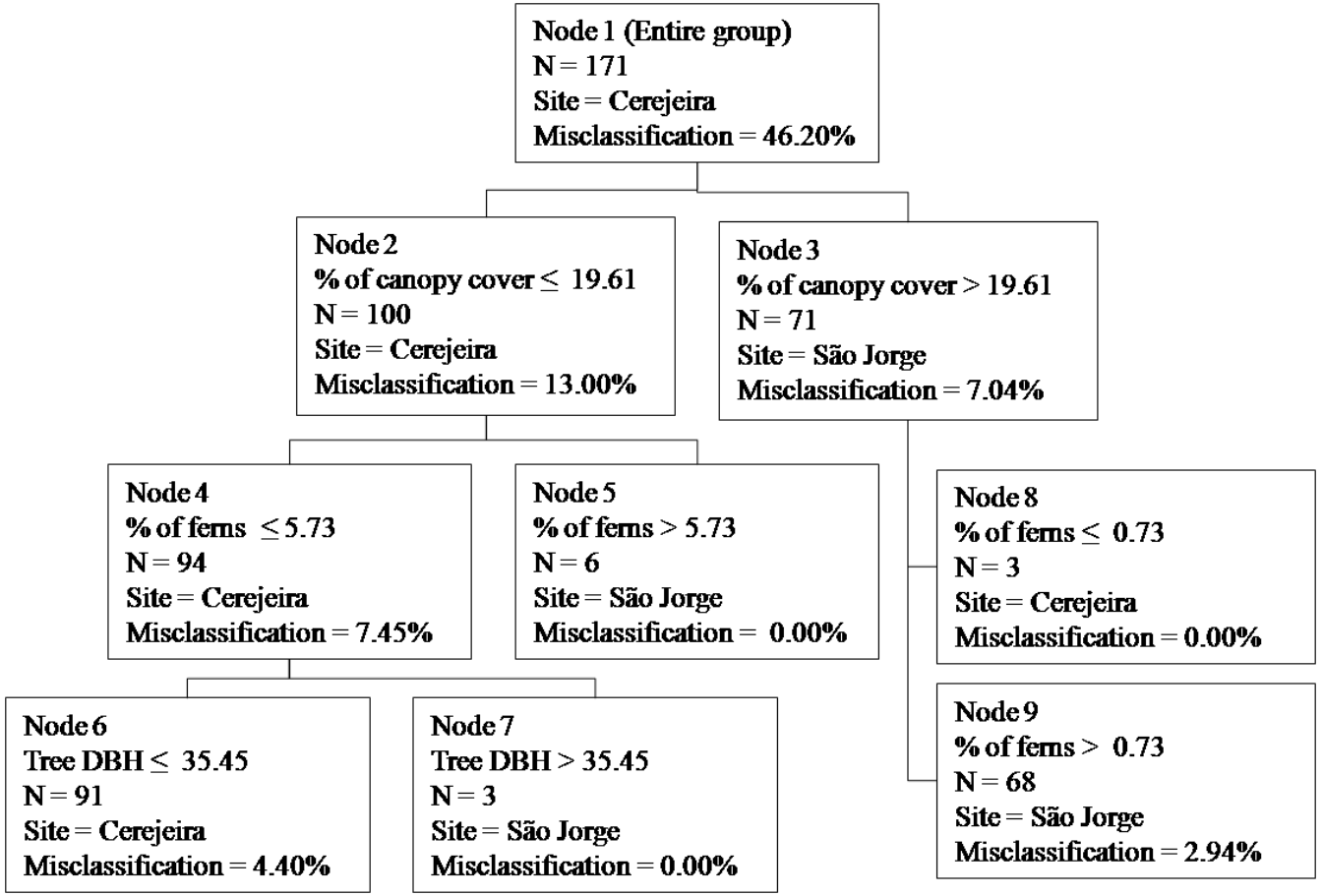


Figure 13. Classification tree vegetation variables in the logging concessions: Cerejeira and São Jorge. All the variables presented in the tree are very important to distinguish between sites (importance value >40%). Misclassification = 3.51%. [Source: Chaves 2009]

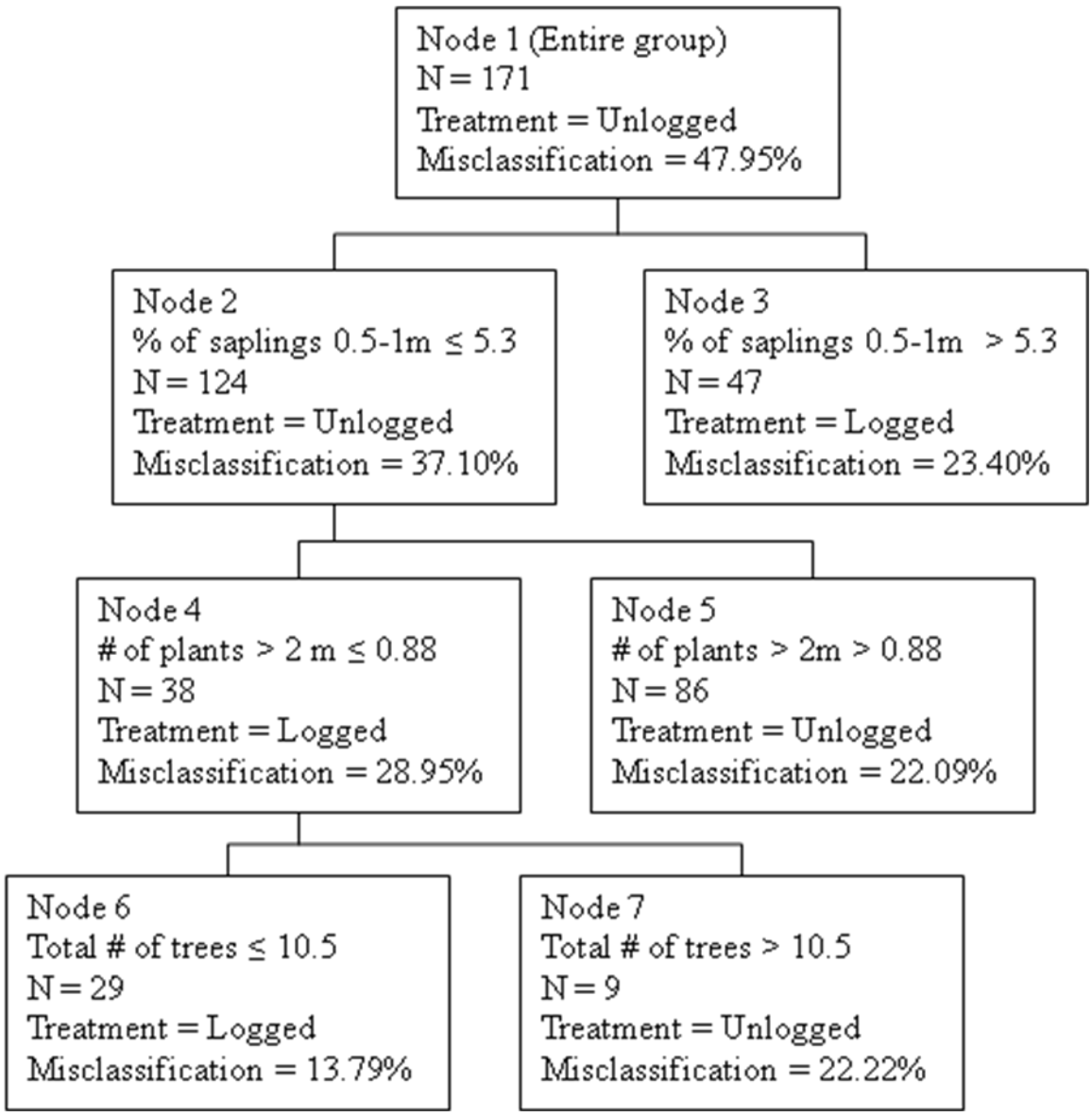


Figure 14 - Classification tree of vegetation of logged vs. unlogged areas within the logging concessions. Saplings 0.5-1 m, plants larger than 2 m, and total number of trees are the most important variables distinguishing between logged and unlogged areas (importance value > 40%). Misclassification = 21.05%. [Source: Chaves 2009]

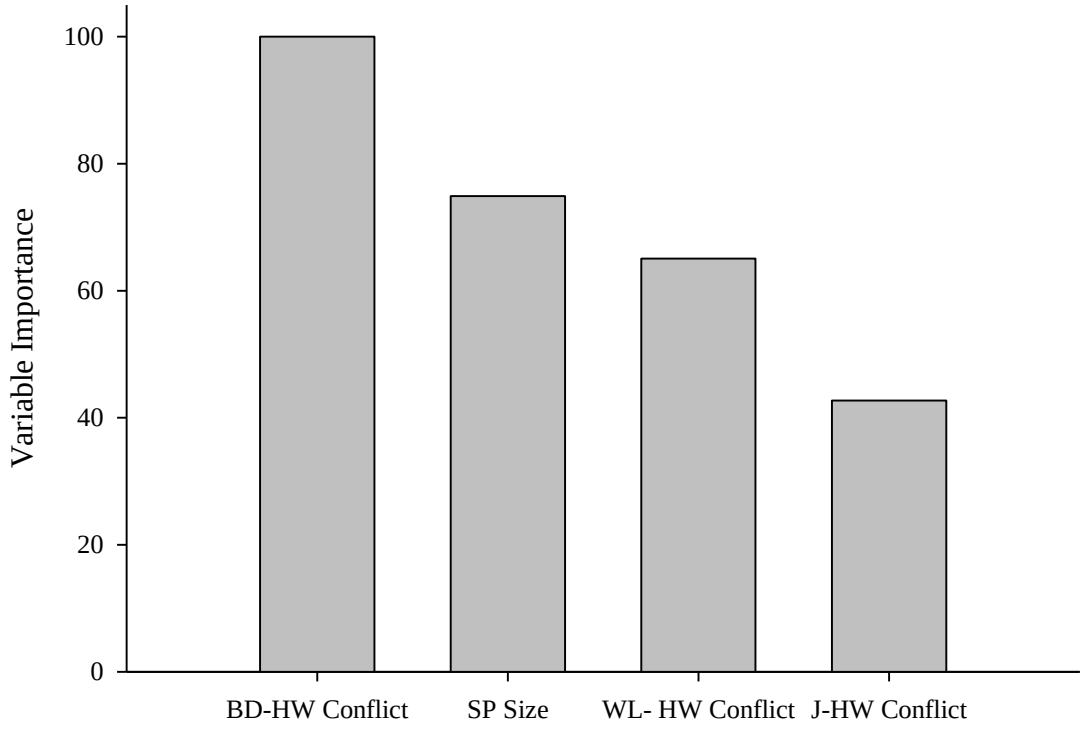


Figure 15- Variable importance at distinguishing between the two protected areas (Chico Mendes Extractive Reserve and Antimary State Forest) and the other sites (logging concessions and Peixoto Settlement Project). BD-HW Conflict = Brocket deer human wildlife conflict due to attacks on crops; SP Size = Size of species most hunted; WL-HS Conflict = White-lipped peccary human-wildlife conflict due to attacks on crops; J-HW Conflict = Jaguar human-wildlife conflict due to attacks on livestock or fear. Misclassification: 2.78%.

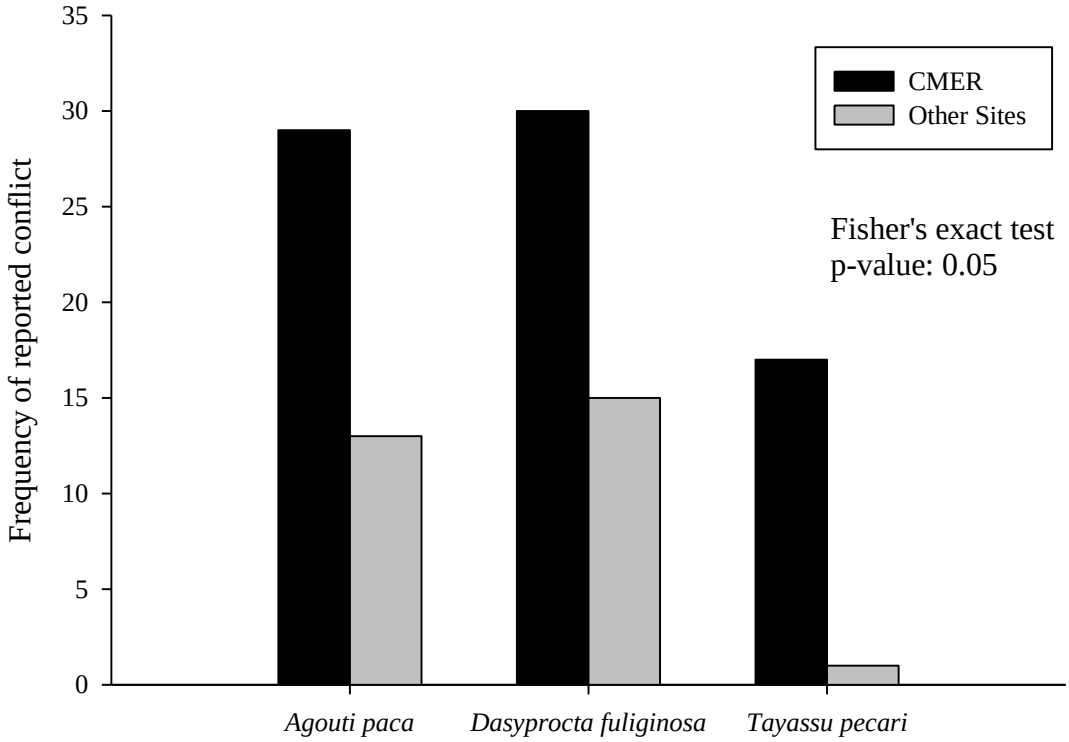


Figure 16 – Human-wildlife conflicts with paca (*Agouti paca*), agouti (*Dasyprocta fuliginosa*), and white-lipped peccary (*Tayassu pecari*) due to attacks on crops in Chico Mendes Extractive Reserve (CMER) compared with the other study sites.

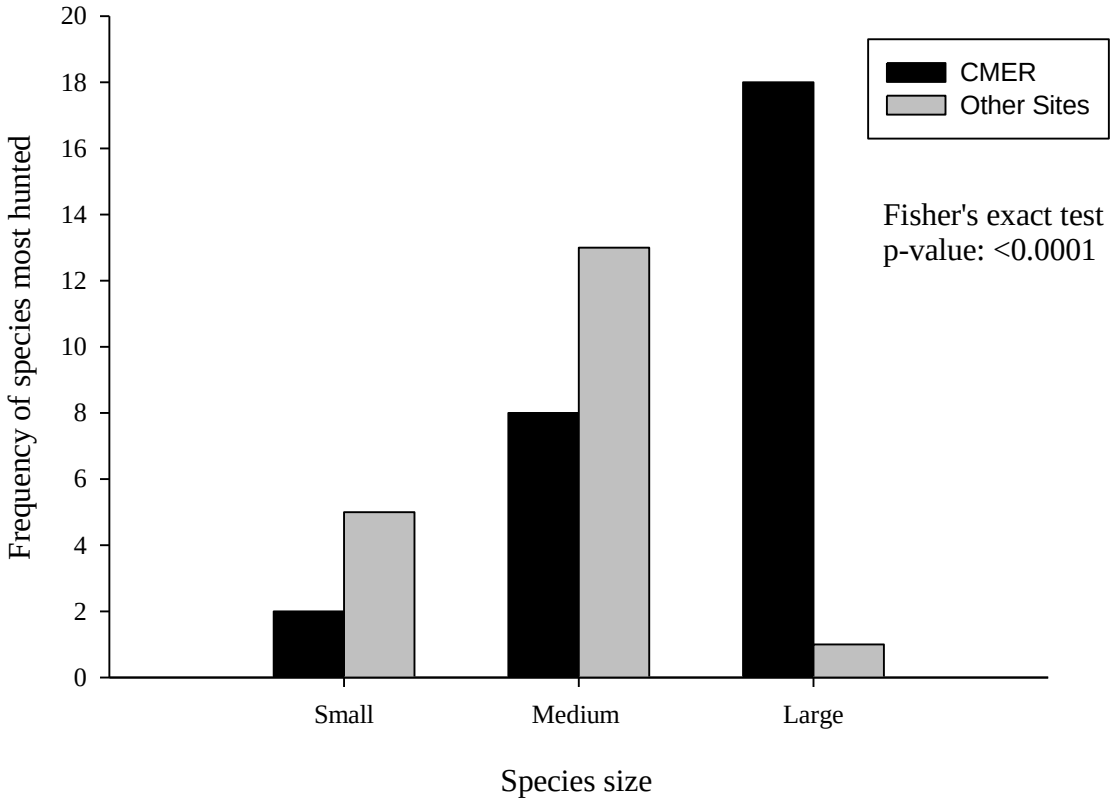


Figure 17 – Size of species most hunted in Chico Mendes Extractive Reserve (CMER) compared with the other study sites.

Figure 18 – Capacity building of local guides in our study sites.

Figure 19 – Visit to local communities in Chico Mendes Extractive Reserve (left) and Antimary State Forest (right).

Appendix 1

Questionnaire Used for Interviews with Local Communities

Area: _____
Number of family members: women ( ) men ( ) children ( )
Data: _____

Last hunting event:

1- When was the last time you hunted? _____
2- Did you get something? What?_____
3- Was that a: male ___ female ___ female with baby ___ pregnant female___?
4- What was the animal age? Young___ Juvenile ___ Adult ___
5- Where did you find the animal:
   Close to home (< 1 h)_____ relatively close (1-2 h)_____ far (> 2 h)_____
6- What time did you go hunting? Morning____ Afternoon_____Night_____
7- What technique did you use: waiting[1]____ opportunistic[2]_____ hunting with dogs____ trapping_____ other_____
8- How long did you take to find the animal: _____ hours

General information:

9- How long do you take to find a large animal (such as a tapir, a deer, a peccary)?_____ medium (such as a paca, a agouti, a armadillo)?_____ small(such as a tinamou, a parrot)?_____
10- How many times do you hunt per month:
Every day___ one a week___ once ___ other____
11- For every 10 times you go hunting, how many times do you get something?_____
12- Of the times you get something, how many are large?_____ medium?_____ small?_____
13- Which species do you hunt the most?
14- Do you hunt more in the dry season, wet season, or is it the same year around?
15- Would you be interested in a wildlife management[3] plan for the area? Why?
16- Would you be interested in ecotourism for the area? Why?

[1] When hunter hides and waits for animals at a fruiting tree.
[2] When hunter walks in the forest and looks for animals (e.g. looks for tracks and other signs) or when hunter is doing something else and finds an animal by chance.
[3] Wildlife management defined as agreements made by the local communities to regulate hunting, including: not hunt with dogs, not hunt or hunt less certain species, not hunt in certain areas, etc.

Appendix 2

List of Species Used for Interviews with Local Communities

List of species used for interviews with local communities. Number refers to the number on the picture of each species showed during the interview. Abundance categories are rare-less common, common, and very common. Conflict refers to problems that the person interviewed was experiencing with wildlife (e.g. species attack crops or livestock, or pose threat to humans). Use included hunting, medicine, and having the animal as pet.

Number	Common name	Scientific name	Abundance	Conflict	Use
1	Amazon Weasel	*Mustela africana*			
2	Black agouti	*Dasyprocta fuliginosa*			
3	Black tinamou	*Crypturellus cinereus*			
4	Black-faced spider monkey	*Ateles chamek*			
5	Black-headed Owl Monkey	*Aotus negriceps*			
6	Blue-headed macaw	*Primolius couloni*			
7	Bolivian Squirrel	*Sciurus ignitus*			
8	Brown capuchin monkey	*Cebus apella*			
9	Brown Woolly Monkey	*Lagothrix lagothrica*			
10	Capybara	*Hydrochoerus hydrochaeris*			
11	Coati	*Nasua nasua*			
12	Collared peccary	*Tayassu tajacu*			
13	Cougar	*Puma concolor*			
14	Emperor tamarin	*Saguinus imperator*			
15	Giant anteater	*Myrmecophaga tridactyla*			
16	Giant armadillo	*Priodontes maximus*			
17	Goeldi's marmoset	*Callimico goeldii*			
18	Gray brocket deer	*Mazama gouazoubira*			
19	Gray tinamou	*Tinamus tao*			
20	Great tinamou	*Tinamus major*			
21	Jaguar	*Panthera onca*			
22	Jaguarundi	*Puma yaguarondi*			
23	Lowland tapir	*Tapirus terrestris*			
24	Monk saki	*Pithecia monachus*			
25	Ocelot	*Leopardus pardalis*			
26	Oncilla	*Leopardus tigrinus*			
27	Other armadillo species	*Dasypus* spp.			

Number	Common name	Scientific name	Abundance	Conflict	Use
28	Paca	*Agouti paca*			
29	Pacarana	*Dinomys branickii*			
30	Pale-winged Trumpeter	*Psophia leucoptera*			
31	Razor-billed Curassow	*Mitu tuberosum*			
32	Red brocket deer	*Mazama americana*			
33	Red howler monkey	*Alouatta seniculus*			
34	Red titi monkey	*Callicebus cupreus*			
35	Red-and-green macaw	*Ara chloropterus*			
36	Rufous-twistwing	*Cnipodectes superrufus*			
37	Scarlet macaw	*Ara macao*			
38	Selva cacique	*Cacicus koepckeae*			
39	Short-eared dog	*Atelocynus microtis*			
40	Southern Amazon Red Squirrel	*Sciurus spadiceus*			
41	Southern tamandua	*Tamandua tetradactyla*			
42	Speckled chachalaca	*Ortalis guttata*			
43	Spix guan	*Penelope jacquacu*			
44	White-fronted capuchin monkey	*Cebus albifrons*			
45	White-lipped peccary	*Tayassu pecari*			
	White-throated tinamou	*Tinamus guttatus*			
47	Yellow-foot tortoise	*Geochelone denticulata*			

Appendix 3
Species Detected in Eastern Acre

Species seen in eastern Acre by DeLuca from May to August, 2008

Scientific Name	Common Name
Agamia agami	Agami Heron
Amazilia lactea	Sapphire-spangled Emerald
Amazona farinosa	Mealy Parrot
Amazona ochrocephala	Yellow-crowned Parrot
Amazonetta brasiliensis	Brazilian Teal
Ammodramus aurifrons	Yellow-browed Sparrow
Anabazenops dorsalis	Dusky-cheeked Foliage-gleaner
Ancistrops strigilatus	Chestnut-winged Hookbill
Anhima cornuta	Horned Screamer
Anthracothorax nigricollis	Black-throated Mango
Ara ararauna	Blue-and-yellow Macaw
Ara chloropterus	Red-and-green Macaw
Ara macao	Scarlet Macaw
Ara severus	Chestnut-fronted Macaw
Aratinga weddellii	Dusky-headed Parakeet
Ardea alba	Great Egret
Ardea cocoi	Cocoi Heron
Athene cunicularia	Burrowing Owl
Atticora fasciata	White-banded Swallow
Attila bolivianus	Dull-capped Attila
Automolus ochrolaemus	Buff-throated Foliage-gleaner
Baryphthengus martii	Rufous Motmot
Brotogeris sanctithomae	Tui Parakeet
Bubulcus ibis	Cattle Egret
Buteo magnirostris	Roadside Hawk
Buteo nitidus	Gray Hawk
Buteogallus urubitinga	Great Black-Hawk
Cacicus cela	Yellow-rumped Cacique
Campephilus melanoleucos	Crimson-crested Woodpecker
Campephilus rubricollis	Red-necked Woodpecker
Campylorhamphus trochilirostris	Red-billed Scythebill
Campylorhynchus turdinus	Thrush-like Wren
Capito auratus	Gilded Barbet
Caracara plancus	Southern Caracara
Cathartes aura	Turkey Vulture
Cathartes melambrotus	Greater Yellow-headed
Celeus spectabilis	Rufous-headed Woodpecker

Scientific Name	Common Name
Cercomacra cinerascens	Gray Antbird
Chaetura brachyura	Short-tailed Swift
Charadrius collaris	Collared Plover
Chelidoptera tenebrosa	Swallow-winged Puffbird
Chloroceryle aenea	American Pygmy Kingfisher
Chloroceryle amazona	Amazon Kingfisher
Chloroceryle americana	Green Kingfisher
Chloroceryle inda	Green-and-rufous Kingfisher
Cissopis leverianus	Magpie Tanager
Claravis pretiosa	Blue Ground-Dove
Coccycua cinerea	Ash-colored Cuckoo
Coccyzus melacoryphus	Dark-billed Cuckoo
Colaptes punctigula	Spot-breasted Woodpecker
Columba livia	Rock Pigeon
Columbina talpacoti	Ruddy Ground-Dove
Conioptilon mcilhennyi	Black-faced Cotinga
Conothraupis speculigera	Black-and-white Tanager
Crotophaga ani	Smooth-billed Ani
Crypturellus bartletti	Bartlett's Tinamou
Crypturellus cinereus	Cinereous Tinamou
Crypturellus erythropus	Red-legged Tinamou
Cyanocompsa cyanoides	Blue-black Grosbeak
Cyanocorax violaceus	Violaceous Jay
Cymbilaimus lineatus	Fasciated Antshrike
Cymbilaimus sanctaemariae	Bamboo Antshrike
Dacnis cayana	Blue Dacnis
Dacnis lineata	Black-faced Dacnis
Daptrius ater	Black Caracara
Deconychura longicauda	Long-tailed Woodcreeper
Egretta thula	Snowy Egret
Elanoides forficatus	Swallow-tailed Kite
Electron platyrhynchum	Broad-billed Motmot
Epinecrophylla haematonota	Stipple-throated Antwren
Epinecrophylla leucophthalma	White-eyed Antwren
Epinecrophylla ornata	Ornate Antwren
Euphonia minuta	White-vented Euphonia
Eurypyga helias	Sunbittern -
Falco rufigularis	Bat Falcon
Formicarius analis	Black-faced Antthrush
Forpus sclateri	Dusky-billed Parrotlet
Furnarius leucopus	Pale-legged Hornero
Galbalcyrhynchus purusianus	Purus Jacamar

Scientific Name	Common Name
Galbula cyanescens	Bluish-fronted Jacamar
Galbula dea	Paradise Jacamar
Gampsonyx swainsonii	Pearl Kite
Gymnopithys salvini	White-throated Antbird
Habia rubica	Red-crowned Ant-Tanager
Hemithraupis flavicollis	Yellow-backed Tanager
Hemitriccus flammulatus	Flammulated Pygmy-Tyrant
Herpetotheres cachinnans	Laughing Falcon
Hydropsalis climacocerca	Ladder-tailed Nightjar
Hypocnemis sp.	warbling-antbird sp.
Hypocnemoides maculicauda	Band-tailed Antbird
Ibycter americanus	Red-throated Caracara
Ictinia plumbea	Plumbeous Kite
Jacamerops aureus	Great Jacamar
Jacana jacana	Wattled Jacana
Lamprospiza melanoleuca	Red-billed Pied Tanager
Lanio versicolor	White-winged Shrike-Tanager
Lepidocolaptes albolineatus	Lineated Woodcreeper
Leucopternis albicollis	White Hawk
Leucopternis kuhli	White-browed Hawk
Leucopternis schistaceus	Slate-colored Hawk
Liosceles thoracicus	Rusty-belted Tapaculo
Lipaugus vociferans	Screaming Piha
Lophotriccus eulophotes	Long-crested Pygmy-Tyrant
Megaceryle torquata	Ringed Kingfisher
Megarynchus pitangua	Boat-billed Flycatcher
Melanerpes cruentatus	Yellow-tufted Woodpecker
Mesembrinibis cayennensis	Green Ibis
Micrastur gilvicollis	Lined Forest-Falcon
Microrhopias quixensis	Dot-winged Antwren
Mitu tuberosum	Razor-billed Curassow
Momotus momota	Blue-crowned Motmot
Monasa morphoeus	White-fronted Nunbird
Monasa nigrifrons	Black-fronted Nunbird
Myiarchus tuberculifer	Dusky-capped Flycatcher
Myiarchus tyrannulus	Brown-crested Flycatcher
Myiodynastes maculatus	Streaked Flycatcher
Myiopagis viridicata	Greenish Elaenia
Myiozetetes cayanensis	Rusty-margined Flycatcher
Myiozetetes similis	Social Flycatcher
Myrmeciza fortis	Sooty Antbird
Myrmeciza goeldii	Goeldi's Antbird

Scientific Name	Common Name
Myrmeciza hemimelaena	Chestnut-tailed Antbird
Myrmoborus leucophrys	White-browed Antbird
Myrmoborus myotherinus	Black-faced Antbird
Myrmotherula axillaris	White-flanked Antwren
Myrmotherula hauxwelli	Plain-throated Antwren
Myrmotherula longipennis	Long-winged Antwren
Myrmotherula menetriesii	Gray Antwren
Myrmotherula multostriata	Amazonian Streaked-Antwren
Nannopsittaca dachilleae	Amazonian Parrotlet
Neopelma sulphureiventer	Sulphur-bellied Tyrant-Manakin
Nonnula ruficapilla	Rufous-capped Nunlet
Notharchus macrorhynchos	White-necked Puffbird
Nyctidromus albicollis	Common Pauraque
Ochthornis littoralis	Drab Water-Tyrant
Odontophorus gujanensis	Marbled Wood-Quail
Opisthocomus hoazin	Hoatzin -
Ortalis guttata	Speckled Chachalaca
Orthopsittaca manilata	Red-bellied Macaw
Pachyramphus minor	Pink-throated Becard
Pachyramphus polychopterus	White-winged Becard
Paroaria gularis	Red-capped Cardinal
Penelope jacquacu	Spix's Guan
Percnostola lophotes	White-lined Antbird
Phaeothlypis fulvicauda	Buff-rumped Warbler
Phaethornis hispidus	White-bearded Hermit
Phaethornis philippii	Needle-billed Hermit
Phaethornis ruber	Reddish Hermit
Phaethornis superciliosus	Long-tailed Hermit
Phaetusa simplex	Large-billed Tern
Phalacrocorax brasilianus	Neotropic Cormorant
Philydor erythrocercum	Rufous-rumped Foliage-gleaner
Phlegopsis nigromaculata	Black-spotted Bare-eye
Piaya cayana	Squirrel Cuckoo
Piculus flavigula	Yellow-throated Woodpecker
Piculus leucolaemus	White-throated Woodpecker
Pionus menstruus	Blue-headed Parrot
Pipile cumanensis	Blue-throated Piping-Guan
Pipra chloromeros	Round-tailed Manakin
Pitangus sulphuratus	Great Kiskadee
Platyrinchus coronatus	Golden-crowned Spadebill
Porphyrio martinica	Purple Gallinule
Primolius couloni	Blue-headed Macaw

Scientific Name	Common Name
Progne chalybea	Gray-breasted Martin
Progne tapera	Brown-chested Martin
Psarocolius angustifrons	Russet-backed Oropendola
Psarocolius bifasciatus	Olive Oropendola
Psarocolius decumanus	Crested Oropendola
Psophia leucoptera	Pale-winged Trumpeter
Pteroglossus azara	Ivory-billed Aracari
Pteroglossus beauharnaesii	Curl-crested Aracari
Pteroglossus castanotis	Chestnut-eared Aracari
Pyrocephalus rubinus	Vermilion Flycatcher
Pyrrhura rupicola	Black-capped Parakeet
Ramphastos tucanus	White-throated Toucan
Ramphastos vitellinus	Channel-billed Toucan
Ramphocaenus melanurus	Long-billed Gnatwren
Ramphocelus carbo	Silver-beaked Tanager
Ramphotrigon fuscicauda	Dusky-tailed Flatbill
Ramphotrigon megacephalum	Large-headed Flatbill
Rhynchocyclus olivaceus	Olivaceous Flatbill
Saltator maximus	Buff-throated Saltator
Sarcoramphus papa	King Vulture
Schistocichla humaythae	Humaita Antbird
Selenidera reinwardtii	Golden-collared Toucanet
Simoxenops ucayalae	Peruvian Recurvebill
Sirystes sibilator	Sirystes
Sittasomus griseicapillus	Olivaceous Woodcreeper
Spizaetus tyrannus	Black Hawk-Eagle
Sporophila caerulescens	Double-collared Seedeater
Sporophila castaneiventris	Chestnut-bellied Seedeater
Stelgidopteryx ruficollis	Southern Rough-winged Swallow
Sternula superciliaris	Yellow-billed Tern
Sturnella militaris	Red-breasted Blackbird
Synallaxis cherriei	Chestnut-throated Spinetail
Tachornis squamata	Fork-tailed Palm-Swift
Tachybaptus dominicus	Least Grebe
Tachycineta albiventer	White-winged Swallow
Tachyphonus cristatus	Flame-crested Tanager
Tachyphonus luctuosus	White-shouldered Tanager
Tangara callophrys	Opal-crowned Tanager
Tangara chilensis	Paradise Tanager
Tangara mexicana	Turquoise Tanager
Tangara schrankii	Green-and-gold Tanager
Tangara velia	Opal-rumped Tanager

Scientific Name	Common Name
Terenotriccus erythrurus	Ruddy-tailed Flycatcher
Tersina viridis	Swallow Tanager
Thalurania furcata	Fork-tailed Woodnymph
Thamnomanes ardesiacus	Dusky-throated Antshrike
Thamnomanes schistogynus	Bluish-slate Antshrike
Thamnophilus aethiops	White-shouldered Antshrike
Thraupis episcopus	Blue-gray Tanager
Thraupis palmarum	Palm Tanager
Thryothorus genibarbis	Moustached Wren
Tinamus tao	Gray Tinamou
Tityra inquisitor	Black-crowned Tityra
Tityra semifasciata	Masked Tityra
Troglodytes aedon	House Wren
Trogon collaris	Collared Trogon
Trogon curucui	Blue-crowned Trogon
Trogon melanurus	Black-tailed Trogon
Turdus hauxwelli	Hauxwell's Thrush
Turdus ignobilis	Black-billed Thrush
Tyrannus melancholicus	Tropical Kingbird
Vanellus cayanus	Pied Lapwing
Vanellus chilensis	Southern Lapwing
Veniliornis affinis	Red-stained Woodpecker
Veniliornis passerinus	Little Woodpecker
Vireo olivaceus	Red-eyed Vireo
Volatinia jacarina	Blue-black Grassquit
Willisornis poecilinotus	Scale-backed Antbird
Xenops minutus	Plain Xenops
Xenops rutilans	Streaked Xenops
Xiphocolaptes promeropirhynchus	Strong-billed Woodcreeper
Xiphorhynchus elegans	Elegant Woodcreeper

Appendix 4

Module – Education Component – *in Portuguese*

VAMOS CONVERSAR SOBRE OS BICHOS DA MATA

Por que os animais são importantes para o meio ambiente e para nós?
Porque quando estão se alimentando, muitos desses animais deixam as sementes caírem pela floresta, ajudando assim na **dispersão** das mesmas. Também, ao se alimentar de néctar, os animais saem espalhando este líquido doce entre as flores, **polinizando-as**. Esses processos ajudam a garantir a manutenção da floresta. Muitos animais servem também para alimentação de várias pessoas que vivem na floresta, como os seringueiros e os índios. Além disso, servem para nos dizer e alertar se o meio ambiente está em bom estado. Ou seja, alguns animais são ótimos **indicadores** da qualidade ambiental. Por isso devemos ajudar na preservação dos animais silvestres, para que possamos garantir um meio ambiente cada vez melhor.

Dispersão de sementes: o ato de espalhar sementes. Isso é feito, muitas vezes, por animais, o que pode aumentar as chances das sementes de germinarem.
Germinação: é o processo inicial de crescimento de uma planta a partir da semente.

Polinização: é o processo em que o pólen da flor (parte masculina) é levado ao encontro da parte feminina de outra flor. Este processo pode ser realizado pelas aves, morcegos, abelhas e outros insetos. Através disso é que ocorre a reprodução das plantas.

Indicadores: são espécies usadas para entender as condições do ecossistema por serem espécies que dão um sinal da situação do ambiente. Ou seja, a presença, ausência ou abundância dessas espécies podem indicar se as condições da qualidade do ambiente para essas e outras espécies.
Ecossistema: é o conjunto formado por todas as comunidades (conjunto de espécies) que vivem e interagem entre si e com o ambiente em uma região.

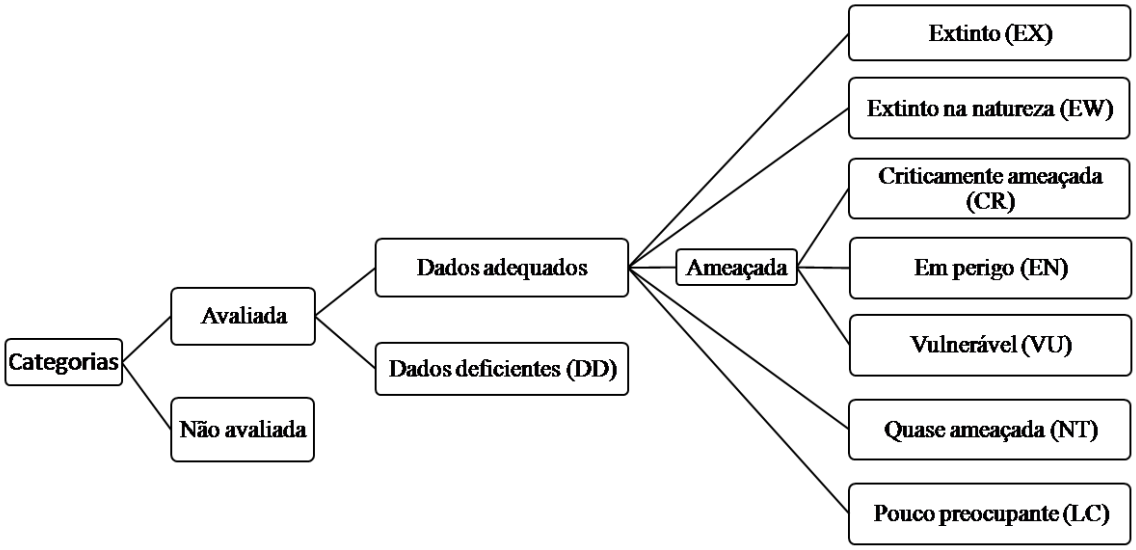
Ameaças à fauna silvestre

Apesar de sua importância, a fauna silvestre (nome que damos aos animais que vivem livres na natureza) estão sendo ameaçados de extinção por vários fatores:
- Perda do hábitat ou lugar onde vivem, por causa da interferência dos seres humanos, como por exemplo: o desmatamento para criar pastos e a exploração madeireira.
- Caça e tráfico de animais silvestres. Existem vários tipos de caça: caça para subsistência, onde as pessoas caçam somente o que vão comer. Caça para comercialização, que serve tanto para venda de carne ou couro, quanto para serem criados em casa como animais domésticos, além de outros tipos que também ameaçam esses animais.
- Poluição: diversos tipos de lixos são jogados pelas pessoas no meio ambiente, causando a poluição dos rios, solos e ar.
- Animais invasores: espécies que não deveriam estar em um determinado local, mas, por algum motivo estão. Essas espécies são normalmente trazidas de outros lugares por pessoas. Isso pode

causar muitos problemas ambientais como doenças e etc. E esta é a segunda maior causa de perda de **biodiversidade** do planeta.
Falando em perda da biodiversidade, segundo a IUCN (União Internacional para a Conservação da Natureza e dos Recursos Naturais), no Brasil existem 798 espécies de anfíbios, sendo 116 ameaçadas de extinção; 1.704 espécies de aves, das quais 122 estão ameaçadas e 648 mamíferos, onde 82 espécies são ameaçadas. Muitos desses animais estão sofrendo sérios riscos de extinção, ou seja, podem deixar de existir um dia.

Biodiversidade: grau de variedade da natureza, incluindo o número de organismos vivos e suas intereções.

A IUCN possui uma classificação que compreende a situação de conservação de muitas espécies de animais e plantas. Essa classificação vai desde espécies muito abudantes, as quais não estão ameaçadas, até espécies que já foram extintas. Ver abaixo:



Extinta (EX): é quando não existe dúvida razoável de que o último indivíduo morreu.
Extinta na natureza (EW): espécie que é apenas conhecida como sobrevivendo por cultivo, em cativeiro ou como população naturalizada, fora da sua área de distribuição conhecida.
Em perigo crítico (CR): espécie considerada como estando a sofrer um risco extremamente elevado de extinção na natureza
Em perigo (EN): espécie considerada como estando a sofrer um risco muito elevado de extinção na natureza.
Vulnerável (VU): considerada como estando a sofrer um risco elevado de extinção na natureza.
Quase ameaçada (NT ou LR/nt): perto de ser classificada ou provavelmente qualificável para ser incluída numa das categorias de ameaça num futuro próximo.
Segura ou pouco preocupante (LC ou LR/lc): categoria de risco mais baixo. Não qualificável para uma categoria de maior risco. Taxones abundantes e amplamente distribuídos são incluídos nesta categoria.
Dados insuficientes (DD): quando não há informação adequada para fazer assessoria direta ou indireta do risco de extinção.
Não avaliada: é quando a espécie não passou por uma avaliação dentro dos critérios.
[Fonte: IUCN (2001)]

A Amazônia é uma região que possui várias espécies de animais e plantas. Muitos desses animais são macacos, peixes, pássaros, cobras, sapos, dentre muitos outros. Abaixo podem ser lidos alguns exemplos de espécies de animais que ocorrem no Estado do Acre, sua importância para a floresta e algumas ameaças que eles sofrem [Fontes: Aurichio et al (1995); Emmons & Feer (1997); Eisenberg (1999); Schulenberg et al. (2007)]:

- Macaco aranha (*Ateles chamek*):
  Possui braços e pernas longas e é rápido ao subir em árvores, semelhante a aranha, por isso tem esse nome. É grande (65 cm de comprimento e 90 cm de cauda) e tem **cauda preênsil**, ou seja, uma cauda que serve como quinto membro para agarrar, pular de galho em galho e segurar a comida. Essa espécie vive em árvores e se alimenta de frutos, sendo um importante dispersor de sementes. É também uma espécie em perigo de extinção.

> **Cauda preênsil:** cauda capaz de agarrar coisas (como galhos) por possuírem uma superfície como uma palma da mão. Dessa forma, a cauda preênsil serve como um quinto membro.

- Macaco prego (*Cebus* sp): É um macaco de tamanho médio que usa ferramentas (pedras para quebrar frutos e galhos finos para comer larvas e lagartas), sendo considerado o macaco mais inteligente das Américas!!! Ele é onívoro, ou seja, pode comer praticamente de tudo (frutos, flores, sementes, ovos e outros animais). A perda do hábitat, a caça e a captura como animais de estimação são ameaças para esta espécie.

- Guariba ou capelão (*Alouatta seniculus*): É um macaco grande que possui uma cauda preênsil que ajuda na movimentação. Na garganta, ele apresenta o osso hióide, o que faz com que essa espécie tenha uma vocalização muito alta, podendo ser ouvida a quilômetros de distância. Se alimenta principalmente de folhas e frutos, sendo um importante dispersor de sementes na floresta. Os machos são maiores que as fêmeas, chamado de **dimorfismo sexual**. Essa espécie sofre principalmente com a caça.

> **Dimorfismo sexual:** é uma condição em que o macho e a fêmea de uma mesma espécie apresentam diferenças físicas, como tamanho, cor etc.

- Soim bigodeiro (*Saguinus imperator*): É um macaco pequeno que tem esse nome por apresentar um longo bigode branco. Se alimenta de frutos e insetos, ajudando na dispersão de sementes de diversas plantas. A principal ameaça é a perda do ambiente onde vive (hábitat) e o uso como animal de estimação.

- Anta (*Tapirus terrestris*): É um mamífero (animal que mama quando pequeno e que têm pelos) terrestre, mas nada muito bem. Os seus principais predadores são as onças e o jacaré-açu. Os desmatamentos e a caça são as principais ameaças para essa espécie, que é considerada vulnerável à extinção.

- Maracanã-da-cabeça-azul (*Primolius couloni*): É habitante da Floresta Amazônica, em países como Peru e Bolívia. No Brasil, o maracanã-da-cabeça-azul só é encontrado no Estado do Acre. É uma ave grande (40 cm) e o que chama muita atenção é sua cauda longa e seu bico

grande e pesado, característica típica do grupo das araras, periquitos e maracanãs, conhecidos como Psitacídeos. Esta maracanã é ameaçada de extinção na categoria vulnerável, principalmente, porque as pessoas a capturam para criar em gaiolas.

- Arara vermelha (*Ara macao*): É uma ave que se alimenta de frutos e sementes e também ajuda na dispersão de sementes na floresta. Vivem em casais (um macho e uma fêmea) e podem passar dos 50 anos de idade!!! É muito utilizada como animal de estimação, sendo essa a principal ameaça para a espécie.

- Tucano (*Ramphastos tucanus*): Este tucano amazônico mede cerca de 55 cm e possui um típico bico longo e comprido que funciona como uma tesoura, auxiliando-o a se alimentar de frutos, insetos e outros animais pequenos e, até mesmo, filhotes de outras aves. Eles vivem nas copas das árvores a procura de alimentos e fazem seus ninhos em ocos, por isso precisam de árvores grandes. É uma espécie comum, mas por precisar dessas árvores pode sofrer com os desmatamentos que ocasionam a fragmentação florestal, ou seja, a floresta fica dividida em pedacinhos. Além do desmatamento, a caça também é uma ameaça para essa ave.

- Jabuti (*Geochelone denticulata*): Espécie grande e terrestre que pode atingir até 82 cm de comprimento do casco. Habita toda a região amazônica e parte do sul da Bahia. Se alimenta de frutas, folhas e matéria orgânica em decomposição como fezes e carniça. Como várias outras espécies de quelônios, o jabuti é uma espécie ameaçada pelo grande consumo de sua carne ou por sua criação como animal de estimação.

- Sapo-da-vacina (*Phyllomedusa bicolor*): Também conhecido popularmente como Kambô, seu veneno vem sendo usado por índios da região Amazônica para prevenir e tratar doenças. Sua principal ameaça é o tráfico de animais. O modo de vida deste sapo é muito pouco conhecido.

- Mutum (*Mitu tuberosum*): O mutum é uma ave grande (89 cm) e desajeitada, fazendo muito barulho quando se locomove no meio da floresta. Essas características fazem com que ele seja um alvo fácil para os caçadores, pelos quais é muito procurado para alimentação. A atividade de caça já fez esta ave desaparecer de muitos lugares na Amazônia. Geralmente, os mutuns são encontrados sozinhos ou em pares e sua principal característica é o bico vermelho com uma crista.

- Periquitos (diversas espécies): Na Amazônia são encontrados muitos tipos de periquitos e o Brasil é o país que tem o maior número de aves deste grupo no Planeta. Eles são da mesma família que as araras e as maracanãs, só que o seu tamanho é menor. Por possuírem um colorido especial são muito apreciados pelas pessoas para criação como animais domésticos, representando uma ameaça para essas espécies.

- Veados (*Mazama* spp): O veado vermelho é maior, com até 30 quilos e o veado roxo é menor, com 17 quilos. São animais que gostam de sair à noite, por isso é difícil vê-los. Se alimentam de folhas e frutos. A caça e o desmatamento representam uma das principais ameaças aos veados.

- Tamanduá-bandeira (*Myrmecophaga tridactyla*): É um animal grande que pode chegar até 40 quilos e 1,8 metros de comprimento, incluindo a sua longa e bela cauda. Comem formigas e cupins, que são pegos com sua enorme língua. Sua principal ameaça é a caça e o desmatamento.

- Pico-de-jaca (*Lachesis muta*): É uma cobra que pode chegar a 3,5 m de comprimento, sendo a maior cobra venenosa das Américas. Também conhecida popularmente como surucucu, é importante no controle de roedores e anfíbios. É uma espécie muito temida e cercada de diversas lendas. Suas principais ameaças são a perda de hábitat e o extermínio pela população humana.

- Gogó-de-sola (*Potos flavus*): É um mamífero de hábito noturno e arborícola (vive nas árvores). Apesar de, frequentemente, ser chamado de macaco, na verdade, pertence a família dos quatis. Possui cerca de 60 cm de comprimento e pesa em torno de 3 quilos. Se alimenta de frutos e insetos, sendo considerado um importante dispersor de sementes. É ameaçado especialmente pela caça e desmatamento.

Conservação da fauna silvestre

A conservação da nossa fauna silvestre depende da contribuição de todos nós. Ela pode ser alcançada através de simples ações como:

- Para as pessoas que vivem na zona rural, com o apoio técnico adequado:

  - Aplicar o manejo comunitário de animais silvestres, ou seja, realizar em conjunto com toda a comunidade local a caça de forma sustentável, respeitando o ciclo de vida desses animais. Como fazer isso? Não caçando animais jovens ou que estejam na época de reprodução (fêmeas prenhas ou com filhotes), pois assim você estará comprometendo a possibilidade de crescimento dessa população. Não caçar com cachorro (pois isso espanta os animais) e não permitir que pessoas de foram entrem na área para caçar.

  - Não praticar a caça de animais de forma exagerada, matando todos os bichos que encontrar. Cace apenas o suficiente para o sustento de sua família. Com estas ações você estará contribuindo para a conservação desses animais e para garantia de fonte de alimento para seus filhos e netos.

  - Não realizar a venda ou mesmo a troca de fauna silvestre por outros produtos ou benefícios, pois com isso você prejudicará esses animais, podendo levar até a extinção local dessas espécies que são tão importantes para o funcionamento da floresta. Além disso, essa prática pode estimular o comércio ilegal de carne de caça e animais silvestres.

  - Buscar alternativas para o melhor uso da terra e diminuir o desmatamento das florestas. Isso pode ser feito com práticas simples como a criação de animais de pequeno porte (galinhas, porcos e patos) e também com o uso e a comercialização de produtos florestais não

madeireiros, como frutos, sementes, látex, resinas e fibras, cuja utilização sustentável não provoca a destruição dos ambientes florestais.

- Para as pessoas que vivem na zona urbana:

  - Não comprar animais silvestres para servirem de bichos de estimação, pois, além de evitar os maus tratos que estes animais sofrem durante o deslocamento até os pontos de comercialização, você também estará colaborando com o fim desta prática ilegal.

  - Não comprar carne de caça (ou animais silvestres vivos para comer), pois esta prática é ilegal, causa sérios danos a nossa fauna e estimula a atividade predatória dos caçadores.

  - É muito importante denunciar o tráfico de animais e o comércio ilegal de carnes, peles e etc. Assim você colabora para a preservação de nossa natureza!

Tráfico de animais silvestres: É o terceiro maior comércio ilegal do mundo, perdendo apenas para o tráfico de drogas e armas. Fontes do governo estimam que essa atividade ilegal é responsável pelo desaparecimento de cerca de 12 milhões de espécimes (indivúduos). Em cada 10 animais traficados, apenas um chega ao destino (comercialização) e nove morrem durante a captura ou tranporte. Os animais traficados sofrem terríveis ações dos traficantes, incluindo a prática de furar os olhos (no caso das aves), para não enxar para não enxergarem a luz do sol e não cantarem, evitando chamar a atenção da fiscalização. Outros animais são anestesiados para que pareçam dóceis e mansos.
Fonte: RENCTAS

Sugestões de atividades:

Biomapa

Objetivo: localização espacial, cultural, social e ambiental.
Conteúdo: Orientação geográfica, reflexão sobre os impactos ambientais e pertencimento, inventário socioambiental.
Estratégia: Pedir para que se separem em grupos referentes às escolas que trabalham e desenhem um mapa das ruas, com elementos importantes na estrutura espacial do bairro, por exemplo: casas, a escola, igreja, galpões, córregos. Poderão ter ajuda do mapa de ruas do município, ou, se não for possível, desenhem com suas lembranças. Foque nos elementos relacionados à biodiversidade e animais da região para que a atividade envolva e sensibilize os alunos sobre a importância das áreas verdes no bairro.
Tempo:1h a 1:30h
Recurso: Flip shart, canetões, lápis, giz de cera, mapas de ruas, revistas, jornais e etiquetas.
Local: sala de aula
Tema sugerido: áreas verdes e animais encontrados.

Mata Ciliar

Objetivo: Atentar para a importância da mata ciliar na preservação dos cursos d'água e para as negociações entre setores diversos sobre sua conservação.
Temas: Uso sustentável e responsável da água; áreas verdes; transformações do meio; mediação de conflitos ambientais.
Materiais necessários: Nenhum.
Desenvolvimento: Divida a sala em 4 grupos:
Grupo 1: Mata Ciliar (grupo maior).
Grupo 2: Lixo (grupo médio).
Grupo 3: Madeireiros (grupo médio).
Grupo 4: Ambientalistas (grupo pequeno).
Distribua os representantes da mata ciliar em duas fileiras, uma de frente para outra, deixando um corredor no centro que representará o rio a ser preservado;
Distribua os representantes do lixo nas margens;
Indique a função de cada grupo, ou seja:
- Mata Ciliar: proteger o rio do lixo.
- Lixo: tentar furar a barreira da mata ciliar e entrar no rio.
- Madeireiros: negociar com os ambientalistas o corte da mata ciliar, indicando seus interesses.
- Ambientalistas: negociar com os madeireiros a preservação da mata ciliar, indicando seus propósitos.
Peça para que interpretem seus papéis durante 15 minutos;
No final, peça para que relatem como foi a experiência, qual a importância da mata ciliar, etc.
Duração: 30 min.
Local: Espaço amplo.

Biodiversidade

Objetivo: Vivência e trabalho coletivo, acolhimento, diálogo, participação e concentração.
Temas: Visão sistêmica, biodiversidade e redes.
Materiais necessários: Conhecimento de algumas espécies de árvores da Amazônia.
Desenvolvimento:

- Oriente seus alunos para que façam um círculo e fiquem de braços dados, bem juntos;
- Passe de um em um, falando no ouvido o nome de um animal brasileiro, de preferência da Amazônia, já que é o bioma do município, e peça para que guardem o nome com eles e não comentem com os colegas;
- Quando todos tiverem os nomes, vá ao centro da roda e conte breves histórias de caçada, como: "durante uma caçada consegui pegar 10 pacas";
- Nesse momento, todos os alunos que são "pacas" deverão despencar no chão, sendo segurados pelos outros colegas que não o são;
- No final, discuta sobre a visão sistêmica da natureza, sobre a questão dos desequilíbrios e do equilíbrio no mundo natural.

Tempo: 20 min.
Local: Espaço amplo.

Brincando de Biólogo(a)

Objetivo: Proporcionar para as crianças uma vivência diferente do que a do dia-dia e debater sobre a biodiversidade e a sua importância na qualidade de vida da comunidade.
Temas: Biologia, biodiversidade
Materiais necessários: Papel, Caneta, Lápis de cor
Desenvolvimento:

- Para começar é indispensável explicar para as crianças que elas serão biólogos por um dia, ou seja, estudarão, pesquisarão e conversarão sobre a fauna e a flora existentes no local visitado.
- Após isso, é necessário levar os alunos até o jardim da escola ou até uma área verde próxima e mapear as diferentes espécies de plantas, animais, aves, insetos, entre outros, existentes nas proximidades do local.
- Além de avaliar as espécies, peça para os alunos observarem a convivência entre elas, o que é compartilhado, do que dependem e o que oferecem para a qualidade de vida da comunidade.
- Pergunte o que eles podem aprender com a natureza. Registre toda essa experiência para utilizá-la no dia-a-dia da escola.

Duração: 1h30
Local: Área verde

Animais com arte

Objetivo: Trabalhar a questão do bioma Amazônia e levar as crianças a pensarem em seus animais preferidos e como retratá-los.
Desenvolvimento: Organizar junto aos alunos uma coleção de espécies de animais. Para isso, junte várias cartolinas e proponha aos alunos uma atividade diferente. Na folha de papel cada um desenha o seu bicho preferido com tinta ou aquarela no local desejado, após secar deixe o material exposto para apreciação. Outra sugestão é ensinar os alunos a pintarem telas com a tinta óleo.
Material Necessário: tintas, cartolinas, pincéis, sulfites.
Tempo: 1 hora
Local: sala de aula

Bingo das aves

Recomendada para 3ª, 4ª e 5ª séries do Ensino Fundamental. As questões podem ser adaptadas para as demais séries.
Objetivo: Conhecer as principais características das aves.
Desenvolvimento: Utilize as questões que estão na lista abaixo, separe os alunos em trios e entregue as cartelas. A ordem das perguntas deve ser aleatória, e a ordem das questões deve ser diferente caso o jogo seja repetido.
Passo-a-passo:

- Distribua as cartelas para cada time e, antes de fazer as perguntas, informe aos alunos se é uma questão de **verdadeiro ou falso**, **complete** ou **resposta curta** e então faça a pergunta.
- Cada equipe terá 1 minuto para discutir a resposta, escrevê-la e apresentar ao professor. Se a resposta estiver correta, o grupo receberá um feijão para marcá-la. O primeiro time que fizer uma quadra vence o jogo.
- A ordem das perguntas deve ser alterada a cada novo jogo. Após o término, repasse todas as questões com os alunos dando a resposta correta.

Sugestões de questões para o Bingo

1. Verdadeiro ou falso? O gogó de sola é um macaco noturno.
2. Verdadeiro ou falso? A jibóia é uma serpente venenosa.
3. É verdade que os ratos velhos viram morcegos?
4. O peixe-boi é um mamífero ou um peixe?
5. Verdadeiro ou falso? A capivara é o maior roedor do mundo.
6. É verdade que o xixi do sapo deixa as pessoas cegas?
7. Você pode criar um animal silvestre em casa?
8. Verdadeiro ou falso? A cauda preênsil dos macacos serve para ajudá-lo a se movimentar.
9. O desmatamento pode levar os animais a extinção?
10. Verdadeiro ou falso? Os macacos e araras comem barro.
11. Verdadeiro ou falso? Os animais só atacam quando se sentem ameaçados.
12. Verdadeiro ou falso? O kambô ou sapo-da-vacina possui em sua pele uma secreção que é utilizada pelos índios para o tratamento e prevenção de doenças.

13. Verdadeiro ou falso? Os morcegos se alimentam de sangue.
14. Verdadeiro ou falso? O poraquê é uma serpente que habita os rios da Amazônia.
15. Verdadeiro ou falso? Durante a época reprodutiva todas as araras trocam de parceiro.

Respostas:

1. Falso. É um mamífero da família dos quatis.
2. Falso. A jibóia não é um animal peçonhento (venenoso), ela mata as suas presas por constrição, ou seja, se enrola no animal e o estrangula com seu corpo.
3. Falso. Um animal não se transforma em outro, são espécies diferentes.
4. É um mamífero da ordem dos pirênios.
5. Verdadeiro. Ela pode chegar a pesar 65 quilos.
6. Falso. O seu xixi pode apenas irritar a pele, mas nunca cegar.
7. Não. Todo animal tem seu papel na natureza e o direito de viver livre. Além disso, criação de animais silvestres é crime previsto por lei.
8. Verdadeiro. Eles utilizam para se movimentar, se balançar e se segurar em galhos.
9. Sim. Com a destruição de seus ambientes muitos animais não conseguem sobreviver.
10. Verdadeiro. Eles consomem barro para repor os sais minerais do corpo.
11. Verdadeiro. Eles só atacam com o intuito de se defender.
12. Verdadeiro. A secreção desse sapo é muito utilizada para fins medicinais.
13. Verdadeiro. Existem algumas espécies que se alimentam de sangue de outros animais.
14. Falso. O poraquê é um peixe.
15. Falso. As araras possuem apenas uma parceiro durante toda a sua vida.

Modelo de Cartela de Bingo

1	**2**	**3**	**4**
5	**6**	**7**	**8**
9	**10**	**11**	**12**

Animais, letras e traços

Habilidades desenvolvidas: raciocínio rápido, socialização, agilidade, conhecimento dos nomes das aves.
Material: Cartões com letras escritas em cada um.
Procedimento:
Os cartões com letras do alfabeto serão distribuídos entre duas equipes. Um integrante de cada equipe irá ao centro, ao mesmo tempo em que o da outra equipe. Cada participante receberá uma palavra. Estes deverão utilizar os cartões com as letras para montar a palavra. Após, um novo participante da equipe deve comparecer ao centro e fazer um desenho da ave. A equipe vencedora será aquela que terminar primeiro a formação do nome da ave e a confecção do desenho.
Faixa etária: acima de 6 anos.
Quantidade de participantes: 30 (sendo 5 para cada equipe).
Sugestões de animais:

Onça	Quati
Queixada	Gavião-real
Mutum	Bigodeiro
Boto	Guariba
Mucura	Macaco-prego
Pico-de-jaca	Morcego
Paca	Irara
Capivara	Gogó-de-sola
Tamanduá	Parauacu
Quatipuru	Arara

O que dizer sobre os bichos?

Habilidades desenvolvidas: conhecimentos gerais sobre fauna, atenção, raciocínio rápido e socialização.
Material:
- Cartões com os nomes de representantes da fauna colados em um quadro.
Procedimento:
Serão colocados no quadro seis cartões com nomes de animais. Os participantes serão divididos em duas equipes, um animal será sorteado entre os participantes, este animal será o tema do jogo. Uma equipe de cada vez deverá falar alguma informação sobre o animal. A equipe que não falar ou repetir alguma informação previamente falada perde o jogo.
Faixa etária: acima de 7 anos.
Quantidade de participantes: 40 (sendo 5 para cada equipe).
Local da atividade: sala de aula.
Sugestões de animais:

Soim-bigodeiro	Arara-vermelha
Jabuti	Sapo-da-vacina
Onça	Queixada
Paca	Morcego
Capivara	Cotia
Mutum	Tatu

Obstáculos para os mamíferos

Habilidades desenvolvidas: coordenação motora, atenção, concentração, cooperação, identificação de ameaças às aves.

Material:

- Papel filme e papel crepom vermelho;
- Fita crepe;
- Impressão de imagens;
- Cadeiras;
- Garrafas Pet.

Procedimento:

Serão montadas 4 estações, sendo que cada uma delas representa os perigos que as aves sofrem em seu dia-a-dia. Cada participante deve passar por todas as estações e quem fizer o menor tempo é o vencedor.

Estação 1. Pastos

TNTs verdes serão colocados no chão representando os pastos. As crianças tem que pular entre os pedaços de TNT sem encostar neles.

Estação 2. Queimadas

Devem ser feitas marcações no chão e em volta devem ser colocados alguns papéis vermelhos (representando fogo). As crianças só poderão pisar nas marcações.

Estação 3. Caçadores

Devem ser colocadas garrafas pet com a imagem de um caçador (como se fosse um cone). As crianças devem correr em zigue-zague em volta destes.

Estação 4. Desmatamento

Devem ser colocadas figuras de florestas espaçadas entre si (representando o ambiente fragmentado). As crianças devem tentar passar por todos os "fragmentos florestais".

Faixa etária: acima de 4 anos.

Quantidade de participantes: até 40.

Local da atividade: ao ar livre.

Animais e seus alimentos

Objetivo: Aprender sobre os animais e seus alimentos.

Material:

- Vide sugestões abaixo.

Procedimento:

- Organize 5 estações diferentes, cada uma com um tipo especial de comida que serve a um dos diferentes tipos de animais (veja as sugestões a seguir). Em cada estação devem conter três diferentes imagens de animais.
- Os alunos devem ser divididos em grupos e levarem consigo o caderno e uma caneta ou lápis. Os participantes devem qual daqueles animais consome o alimento que está em cima da mesa.
- Depois que os participantes escreverem o nome do animal em seu caderno, eles devem se mudar para a próxima estação.

- Depois de passar por todas as estações o grupo com o maior número de respostas corretas ganha o jogo.

Faixa etária: acima de 7 anos.
Quantidade de participantes: até 20.
Local da atividade: ao ar livre ou em uma sala.

Sugestão de montagem das estações:

Estação 1 – Fruto
Colocar um fruto na mesa e a imagem de 3 animais (macaco/onça/cobra).
Resposta: macaco.

Estação 2 – Carne
Carne e a imagem de 3 animais (jacaré/tamanduá/arara)
Resposta: jacaré.

Estação 3 – Néctar
Água com açúcar e imagem de 3 animais (beja-flor/cotia/capivara)
Resposta: beija-flor.

Estação 4 – Sementes
Sementes e imagens de 3 animais (cotia/gato-do-mato/gavião-real)
Resposta: cotia

Estação 5 – Insetos
Inseto de plástico e 3 imagens de 3 animais (sapo/onça/quatipuru)
Resposta: sapo.

Percepção Ambiental – Atividade dos Olhos Vendados

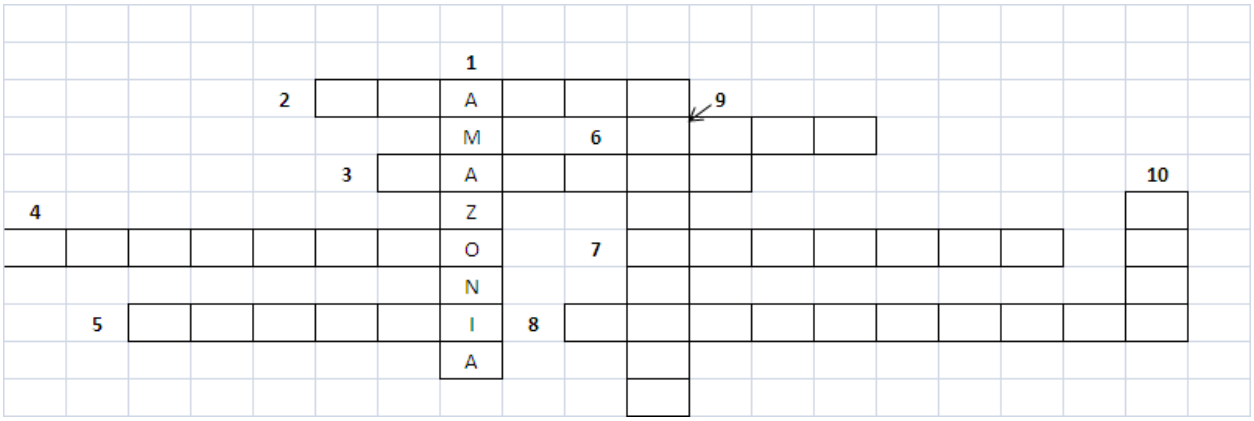
Objetivo: Sensibilizar os participantes quanto à interação com o meio natural e a relação de interdependência com ele e com as outras pessoas, através do estímulo aos sentidos (audição, tato, paladar e olfato).
Temas: Percepção ambiental e confiança.
Materiais necessários: Vendas para os olhos da metade dos alunos e frutas para que eles degustem durante o trajeto.
Desenvolvimento da atividade: Peça para metade dos alunos ficar descalça e vende os olhos deles. Oriente a outra metade dos alunos sem venda para conduzir os de olhos vendados através das árvores. Esse processo estimula a confiança daqueles que são conduzidos naqueles que os conduzem;
Durante a atividade, os alunos de olhos vendados devem perceber o ambiente por meio dos sentidos (sentindo o cheiro das flores, ouvindo os pássaros, sentindo a grama ou terra e experimentando o sabor de diferentes frutas);

Na seqüência, você deve formar uma teia com utilização de novelos de lã e os alunos que estiverem de olhos vendados devem ser orientados a ir ao encontro uns dos outros, guiando-se apenas pela lã. Essa ação exigirá mais cautela para que eles não se esbarrarem uns nos outros;
Inverta as posições e as duas etapas anteriores devem ser replicadas pelos alunos que ainda não tiveram os olhos vendados.
Tempo: 40 min.
Local: Espaço amplo ao ar livre, com árvores e sombra.

Passatempos

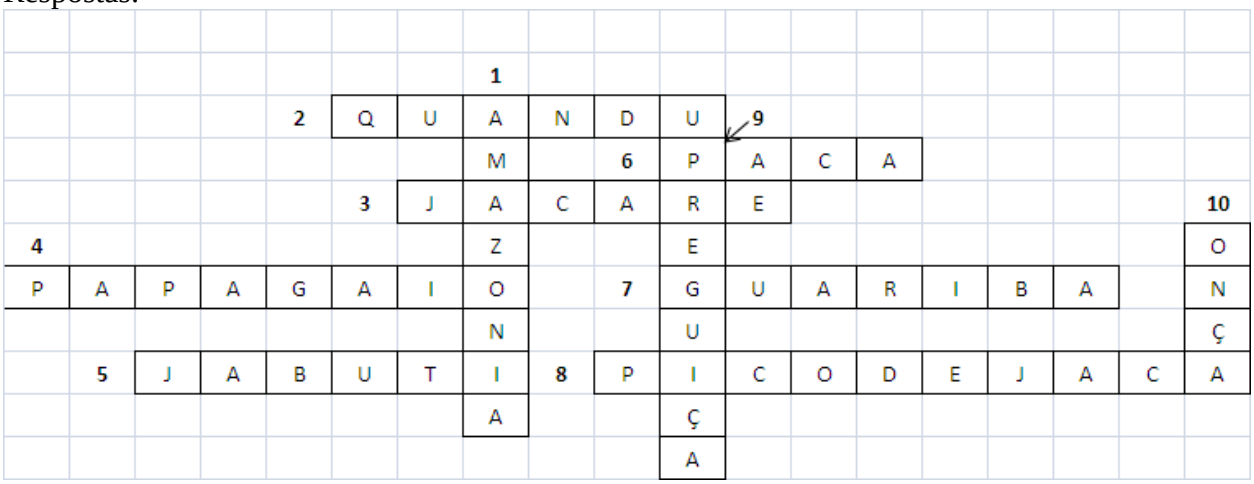
1. Caça palavras
Procure no quadro abaixo as seguintes palavras:
MACACO-PREGO – CAPIVARA – ONÇA – MUCURA – MORCEGO – ANTA – ARARA
TUCANO – VEADO – TAMANDUÁ-BANDEIRA

2. Palavras cruzadas



1) Maior floresta tropical do planeta.
2) Mamífero de odor forte e com espinhos nas costas.
3) Réptil aquático que tem cauda longa e a boca cheia de dentes.
4) Ave colorida e barulhenta que imita o ser humano.
5) Animal lento e de casco duro.
6.) Mamífero parecido com a cotia, mas possui pintas nas costas. Sua carne é muito apreciada pelos caçadores.
7) Macaco barulhento, cujo maior macho é chamado de Capelão.
8) Maior serpente das Américas. É venenosa e possui escamas em sua pele que lembram os poros de uma jaca.
9) Mamífero lento que vive a maior parte do tempo na copa das árvores.
10) Maior felino das Américas e está ameaçado de extinção.

Respostas:



3. Ligue o animal a sua pegada:
Capivara
Veado
Gato-do-mato
Mucura

4. Jogo dos 7 erros
Ilustração com 7 desenhos de más ações
Caçador, gaiola, fogo, desmatamento, animal silvestre com coleira, pele de animal silvestre.

5. Ligue o animal ao seu ambiente:

Pirarucu	Rio (ilustração)
	Aquário
Papagaio	Gaiola (ilustração)
	Floresta
Macaco	Quintal de casa (ilustração)
	Floresta

6. Ligue os pontos e descubra que animal é esse:

Desenho de um tucano

Fontes de Referências

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- Sugestões de atividades:

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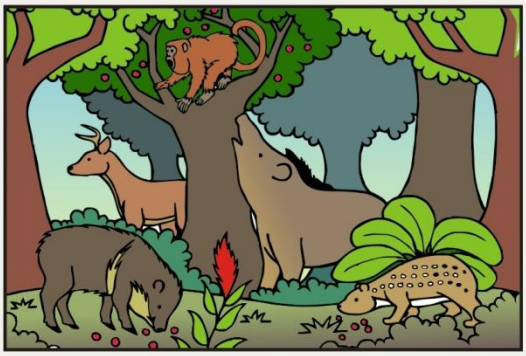
Appendix 5

Posters – Education Component - *in Portuguese*

VAMOS CONVERSAR SOBRE OS BICHOS DA MATA?

BICHOS NA ESCOLA

Os animais são parte fundamental da natureza. Se forem extintos ou se tornarem raros, comprometem todo o seu funcionamento.Os animais que vivem na floresta são diferentes dos que temos em casa (gatos e cachorros, por exemplo), eles não estão acostumados com a presença humana. Por isso não devemos tirá-los da floresta para prendê-los em gaiolas ou jaulas, mesmo que nós os criemos livres no quintal, eles nunca serão tão felizes como na natureza.



MAS... QUE ACONTECE COM OS BICHOS QUANDO DESTRUÍMOS A MATA?

Quando derrubamos florestas e fazemos queimadas para criarmos gado ou tirar madeira, estamos destruindo a casa dos animais silvestres. Eles ficam sem lugar para fazer seus ninhos ou construir suas tocas, ficam sem árvores para buscar seus alimentos então eles precisam procurar outro lugar pra viver só que o homem cada vez mais esta destruindo a natureza e os animais não terão para onde ir.

Com o avanço do desmatamento as onças pintadas (*Panthera onca*) na busca por alimento passam a atacar o gado, gerando conflitos com moradores locais,um dos motivos pelos quais as onças pintadas vêm sendo perseguidas.

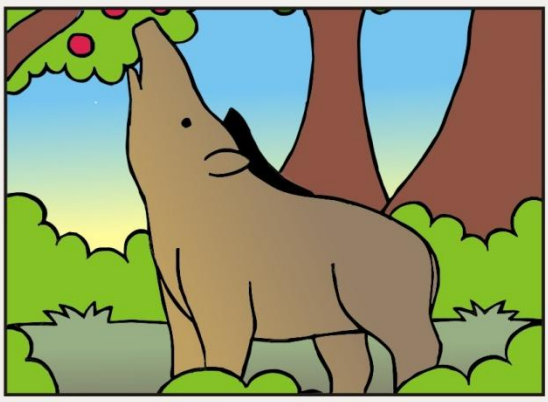
Outro exemplo é a maracanã de buriti (*Primolius couloni*) que pelo fato de utilizar muitas frutas dos roçados como alimento também acaba como alvo da caça. Além da caça, a venda ilegal desses animais colocam em risco essa simpática ave de nossas florestas.

VAMOS CONVERSAR SOBRE OS BICHOS DA MATA?

Nós sabemos que muitas pessoas que moram na floresta precisam caçar para sobreviver, o que chamamos de caça de subsistência. Apesar de muitas dessas pessoas retirarem somente o necessário para sua sobrevivência, quando existem muitas pessoas numa área, a caça de subsistência pode causar sérios impactos sobre as espécies caçadas.

MAS... O QUE ACONTECE COM OS BICHOS QUANDO CAÇAMOS DEMAIS?

O problema é quando algumas pessoas praticam a caça predatória, caçando grande quantidade de animais para vender. Essas pessoas não conhecem a importância dos animais, não conhecem os períodos de reprodução, retiram filhotes e interferem no ciclo de vida dos animais. Ás vezes essa interferência é tão séria que a natureza leva muitos anos para se recuperar.



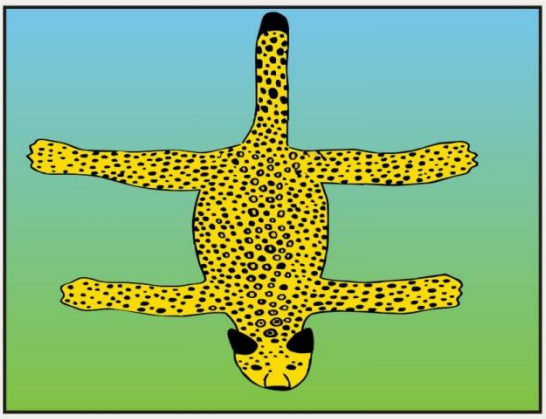
Em muitos casos a caça é altamente seletiva, isso significa que as epécies mais caçadas normalmente são as maiores, como a Anta (*Tapirus terrestris*) um animal que por apresentar baixas reprodutivas - um filhote ao ano - sofre com a pressão de caça e encontra-se ameaça de extinção em muitas localidades do Brasil.

Espécies de aves de grande porte como o Mutum (*Mitu tuberosum)* também são alvo de grande pressão de caça. Assim como a tartaruga da Amazônia, o tracajá (*Podocnemis unifilis*) que já esteve sobre altos níveis de ameaça de extinção, porém esforços para repovoar os rio da região vêm apresentando resultados positivos.

Não queremos dizer que a caça praticada pelas comunidades que vivem da floresta é feita de maneira errada. No entanto, as comunidades que utilizam essa fonte alimentar devem saber respeitar os períodos de reprodução e áreas de refúgio de fauna, para que sempre existam animais nas matas.

VAMOS CONVERSAR SOBRE OS BICHOS DA MATA?

Comercializar animais significa capturá-los na natureza, prendê-los e vendê-los com o objetivo de ganhar dinheiro. Os animais são transportados nas piores condições possíveis. São escondidos em fundos de malas ou caixotes, sem ventilação e ficam vários dias sem comer e sem beber. Resultado: de cada 10 animais capturados, nove morrem no caminho e um chega às mãos dos compradores.



Existem algumas espécies que apresentam características muitos apreciadas, como o caso das peles. Nesse caso o tráfico é antecedido pela caça predatória, contribuindo com a diminuição de suas populações. A onça pintada (*Panthera onca*) já foi muito perseguida pelas beleza de suas rosetas - as pintas pretas que apresenta.

MAS... O QUE ACONTECE COM OS BICHOS QUANDO PASSAM A SER VENDIDOS COMO ANIMAIS DE ESTIMAÇÃO?

As araras vermelhas (*Ara macao*), devido ao seu tamanho e colorido característico, é muito visada pelo comércio ilegal de animais, existem milhares de exemplares dessa espécies espalhados pelo mundo, na posse de colecionadores particulares e nas casas de venda de animais de estimação.

Appendix 6

Financial Summary

Itemized expenses	Total expenses	Other sources	CLP funding
Project preparation			
Communications	100.00	100.00	0.00
Insurance	140.44	0.00	140.44
Visa	437.78	0.00	437.78
Team training	100.00	100.00	0.00
Medical supplies	136.44	100.00	36.44
Field equipment	1693.60	1276.00	417.60
Photographic equipment	700.00	700.00	0.00
Camp equipment	1154.69	200.00	954.69
Fuel	1401.05	1000.00	401.05
Others: Accommodation in the city for team members	79.10	0.00	79.10
Project implementation			
Accommodations for team member and local guides	400.00	150.00	250.00
Food for team and local guides	3252.20	2500.00	752.20
Transportation	3283.49	400.00	2883.49
Outreach	848.00	400.00	448.00
Other: local guides	6198.89	1245.00	4953.89
Post-project			
Administration	0.00	0.00	0.00
Report production & result dissemination	200.00	200.00	0.00
GRAND TOTAL	20125.67	8371.00	**11754.67**

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