

EARTHWATCH INSTITUTE ANNUAL FIELD REPORT

Project Title: Jaguars and Wolves in the Brazilian Grasslands

Principal Investigator (s): Leandro Silveira, Anah Tereza de Almeida Jácomo, Mariana Malzoni Furtado, Natália Mundim Tôrres and Rahel Sollmann

Affiliations: Jaguar Conservation Fund

Date completed: June, 16, 2008

Completed by: Jaguar Conservation Fund

Period covered by this report: May 2007 to November 2007

Dear Volunteers,

Our research team would like to thank every volunteer that has been here to assist with our Project in ENP during this last year (2007). We hope all of you have spent an enjoyable time in the Brazilian grasslands and discovered that behind all that grass, the typical Cerrado fauna roams freely. In addition to the many rheas and pampas-deer, many of you had the opportunity to see colorful macaws, giant anteaters, tapirs, armadillos, crab-eating foxes, ocelots, maned-wolves and pumas.

In 2007, with your help, we captured 82 carnivores, 61 individuals recaptured and 22 new individuals: 63 maned-wolves; 4 ocelots; 1 pampas cat; 10 crab-eating foxes; 1 jaguarundi and 3 hoary foxes. This was our reward after the initial days of working hard... changing the traps, setting the traps and putting the bait in the live traps. We would especially like to thank you for waking up early every morning to check the live-traps, check camera traps and for helping us during all the time.

Your support is very helpful for us to continue this project. Most of our carnivores are still virtually unknown; therefore the data you all are helping to collect are invaluable for these species' future survival. Overall, your time with us is about more than just you learning about the ecology and conservation of the local carnivores, it also comprises the actual conservation of the uniqueness of Brazil's last great grassland refuge.

We hope that you also took home a greater sense of the people of Brazil and our day-to-day way of life. We will remember the evening meals after our hard work where we shared stories of the day. It is always our desire that, in addition to you helping us to achieve our goals and objectives, you have come to know each of us personally, and may even find opportunities in yourselves and your futures that were influenced by your time with us.

Best regards,

Leandro Silveira

Reporting on research objectives

Objective 1: Investigate home range size, habitat use, and movement patterns of the species in the continuous Park area and in the surrounding farmland

Carnivores were baited with live pigeons (for small to medium carnivores) and domestic pigs (for pumas and jaguars) and captured in live traps (Figures 1 and 2). After sedation, they were fitted with a radio-collar, had blood and biological samples collected and were released at the capture site as soon as they had recovered. Capture efforts were concentrated along the Park to catch animals living exclusively in the Park and animals using the surrounding farmland. The traps were checked every morning by vehicle (Figures 3 and 4). Individuals with radio-collar were monitored by radio-telemetry. The radio-tracking effort was spent at nights to register the period of activity of the species.

Objective 2: Investigate, in some species, behavioral aspects such as: parental care, territoriality, and sociability between pairs

Information on behavior was gathered through the interpretation of the monitoring results of the radio-tagged individuals (Figure 5). Specifically, for the maned wolf it is possible to track individuals on a 4x4 vehicle and visually collect data on their foraging and social behavior. Maned wolves in Emas National Park are very tolerant to human presence and as a result, observers accumulated data as often as possible by direct observation of individual and pair behavior (Jácomo et al; Silveira *et al.*, 1998).

Objective 3: Investigate the carnivores' diets

For the study of the carnivores' diets, feces were collected during field activities (Figure 6), and using the scats detector dogs. Some species like the maned wolf and crab-eating fox defecate in conspicuous sites, making the samples easy to detect. Feces were washed and dried at the field station, and were used to analyze the dietary ecology (Reynolds & Aebischer, 1991; Jácomo, et al. 2003).

Objective 4: Investigate prey abundance

Prey abundance was investigated through a constant camera-trapping monitoring program implemented in the park (Figures 7 and 8). Cameras were placed on natural game trails and the photographic rate (i.e. number of photos/ number of sampling hours) of every potential prey species was recorded on a monthly basis. This information associated with carnivore diet data allows a better understanding of prey preference and carnivore distribution patterns in the park.

Objective 5: Assess the impact of the two roads bordering ENP on the local carnivores due to road kill

The two roads that border ENP were used daily for radio-tracking and checking of live-traps. In that manner, those locations were constantly monitored for road-kills. Animals found had a GPS position recorded. Recent road kills were measured, had their stomach contents collected for diet analysis, and were searched for parasites. Also, age was estimated based on tooth wear (Figure 9).

Objective 6: Assess the health status of the carnivores in the region (epidemiology).

Carnivore health was assessed through the collection of blood samples and parasites from captured and road-killed individuals, and subsequent lab investigations of potential diseases (Figures 10 and 11). A clinical evaluation of the animals captured was part of the

protocol. The blood samples collected were sent to the University of São Paulo for the necessary examination.

Objective 7: Assess genetic status of carnivore populations

Carnivore genetic status was assessed through the collection of blood samples from captured and road-killed individuals, and subsequent lab investigations.



Figure 1. Live trap baited with pigeon to capture small to medium carnivores.



Figure 2. Live trap baited with domestic pig to capture pumas and jaguars.



Figure 3. PI and volunteers setting the carnivore trap.



Figure 4. Volunteers checking a jaguar trap.





Figure 5. Radio-tracking of carnivores equipped with radio-collar.



Figure 8. Volunteers testing camera trap at the field.



Figure 9. Tapir road kill near Emas National Park.



Figure 10. Veterinarian (PI) collecting blood from a hoary fox at ENP.



Figure 11. Veterinarian (PI) and volunteers weighing a maned wolf at ENP.

Non-technical summary of results

In 2007, a total of 9402 kilometers were driven in the study area, during 560 hours of field work.

During the year, 82 carnivores were captured, with 63 recaptures (individuals that had already been captured before) and 19 new individuals (Figure 12). The new captures were: 8 maned wolves (Figure 13), one ocelot, one pampas cat, five crab-eating-foxes, one jaguarundi (Figure 14) and three hoary foxes (Figure 15). At the present time, 60 carnivores are continuously monitored by radio-telemetry. Most of the carnivores (maned wolf, jaguar, puma, ocelot, and crab-eating-fox) have a crepuscular-nocturnal activity pattern.

In Emas National Park and surrounding areas, 2226 camera-trap sampling hours have been accumulated, resulting in 1288 photographic registers of terrestrial mammals weighing over 500 grams, of that 250 of different carnivore species. The four mammal species (>500g) with the highest registered abundances as indicated by photographic rates were peccaries, tapirs, maned wolves and giant anteaters. For jaguars, 27 photographs were obtained using camera traps in ENP. Peccaries have the highest registers of prey abundance.

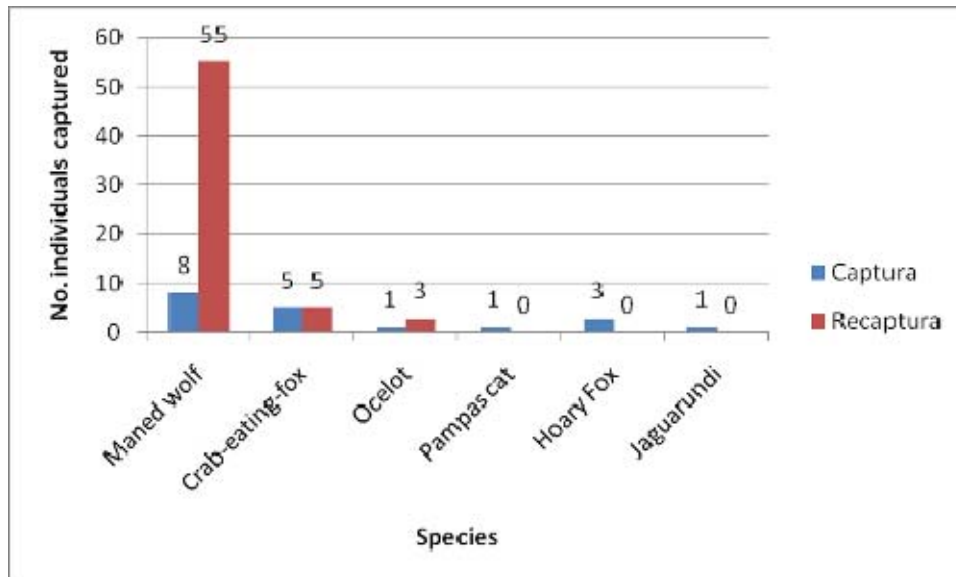


Figure 12. Number of individuals captured at Emas National Park in 2007.

In 2007, 12 road-kills were registered on the two roads (GO-341 and GO-302) that border the ENP. The six-banded armadillo (*Euphractus sexcintus*) and the crab-eating-fox (*Cerdocyon thous*) have the highest number of road kills.

Direct observation of fauna noted 1116 mammals and rheas during fauna census, including 68 observations of carnivores (Table 1).

Table 1. Species observed during fauna census at ENP in 2007.

SPECIES	Scientific Name	No. Individuals
---------	-----------------	-----------------

Rhea	<i>Rhea americana</i>	700
Pampas deer	<i>Ozotocerus bezoarticus</i>	223
White lipped peccary	<i>Tayassu pecari</i>	64
Crab-eating-fox	<i>Cerdocyon thous</i>	56
Hoary fox	<i>Pseudalopex vetulus</i>	17
Tapir	<i>Tapirus terrestris</i>	13
Collared peccary	<i>Tayassu tajacu</i>	12
Hairy armadillo	<i>Euphractus sexsintus</i>	8
Giant anteater	<i>Myrmecophaga tridactyla</i>	7
Skunk	<i>Conepatus semitriatus</i>	6
Maned wolf	<i>Chrysocyon brachyurus</i>	5
Pampas cat	<i>Lynchailurus colocolo</i>	2
Grison	<i>Galictus cuja</i>	2
Southern tamandua	<i>Tamandua tetradactyla</i>	1
TOTAL		1116

In dietary study, 340 samples of feces of maned wolves, jaguars and pumas were collected, washed, and analyzed (16). The analyses of the jaguar scats revealed that giant-anteater and white-lipped peccary are the most important jaguar prey and armadillos and white-lipped peccary are the most important puma prey. The maned wolf is an omnivorous species and its diet is composed of animal and vegetal items.

In the epidemiology study, 125 samples of carnivores were analyzed and revealed the presence of antibodies against *Toxoplasma gondii* and *Leptospira spp* in the wild animals and in the domestic dogs of the farms surrounding the ENP. This is the first survey about diseases in carnivore populations in this region.

How do these data contribute to achieving conservation impacts? (e.g. actions based on results, management plans, site protection)

Emas National Park is what remains of the natural grasslands of central Brazil. Situated in a highly productive area, the Park is under a severe isolation threat. If connectivity with other natural areas is not restored and/or maintained, several species that depend on large areas to maintain genetic viable populations may become extinct in the near future. This is especially true for large carnivores such as the jaguar, puma and maned-wolf.

Understanding species distribution and abundances of carnivores in ENP is the first step toward designing regional conservation efforts. Also, there is clearly a need for the identification of characteristic or indicator species. Contrary to the common use of species richness to assess conservation value of sites (that can be influenced by several factors), representative diversity, obtained by an analysis of indicator species can be useful in evaluating the comparative richness of sites, or the effect of isolation or fragmentation (Dufrêne & Legendre, 1997). ENP protects populations of eight carnivore species officially listed as threatened. Strategies for the conservation of these species can be better delineated when one knows the sizes and the

population dynamics of the species under study (Meffe & Carroll, 1997; Smirnov & Miquelle, 1999). Overall, this study is obtaining population data of the carnivore species of ENP in such a way that it can be used as a guideline for long-term conservation and management strategies of the entire local carnivore community.

What is/ are the significance/ benefits of your research at the following levels?

- Local (to the area of the research site):

Although ENP is a considerably large reserve, its fauna suffers from impacts by the park's converted surroundings like the highways that cause mortalities, isolation due to habitat fragmentation, or direct persecution. Understanding the state of local carnivore populations and how these are affected by the impacts described above is necessary for the species conservation.

- National / Regional:

In the close vicinity of Emas National Park are the springs of the Araguaia River. The Araguaia River is one of the most important watercourses of central Brazil and connects the Cerrado with the Amazon biome. The relatively well preserved habitat along the Araguaia turns it into an important potential biodiversity corridor between the two biomes. Carnivores of ENP probably use the Araguaia corridor and there for the study of ENP Carnivores is important on a original level. Apart from that, the Carnivore Action Plan developed by the Brazilian Environmental Government Agency (CENAP-IBAMA), 2004, called for carnivore population studies Brazil-wide.

- International

The Cerrado is considered a biodiversity hotspot and Emas National Park is one of the most important Cerrado reserves. Morrison et al. (2007) cite ENP as an area that still retains a complete assemblage of large mammals, including various carnivores. With 17 species, the park probably protects the most complete Cerrado carnivore community compared with others Cerrado reserves, therefore being of international importance for conservation of these species.

Communication of results

Printed: peer reviewed scientific publications; books / book sections; reports, management plans or policies; fact sheets, brochures, leaflets, pamphlets, posters, academic dissertations, annual reports, proceedings of conferences or workshops; letters; newsletters.

Scientific Publications

- 1) Silveira, L.; Furtado, M. M.; Tôrres, N. M.; Sollmann, R.; Uhl, G.; Jácomo, A. T. A.; 2008. Maned Wolf Density in a Central Brazilian Grassland Reserve. *Journal of Wildlife Management*. *In press*.
- 2) Jácomo, A. T. A.; Kashivakura, C. K.; Ferro, C.; Furtado, M. M.; Astete, S. P.; Tôrres, N. M.; Sollmann, R.; Silveira, L. 2008. Maned wolf home-range and spatial organization in the Brazilian Grasslands. *Journal of Mammalogy*. *In press*.

- 3) Brait, C.; Furtado, M. M.; Roberto, N. 2008. Utilização de pêlos de animais silvestres para monitoramento ambiental de metais. Submitted to *Química Nova*. *In press*.
- 4) Silveira, L.; Jácomo, A. T. A.; Furtado, M. M.; Tôrres, N. M.; Sollmann, R.; Vynne, C. Ecology of the giant armadillo (*Prionomys maximus*) in the grasslands of central Brazil. *Edentata*. *In press*.
- 5) Maia, O. B.; Jácomo, A. T. A.; Bringel, B. A.; Kashivakura, C. K.; Oliveira, C. A.; Teodoro, L. O. F.; Silveira, L.; Teixeira da Costa, M. E. L.; Malta, M. C. C.; Furtado, M. M.; Torres, N. M.; Mattos, P. S. R.; Viau, P.; Lima, T. F. G.; Morato, R. G. Comparison of serum hormone levels of captive and free-living maned wolves *Chrysocyon brachyurus*. *Brazilian Journal of Medical and Biological Research*, 41 (2), p.176-179, 2008.
- 6) Furtado, M. M.; Kashivakura, C. K.; Jácomo, A. T. A.; Silveira, L.; Astete, S. E. P.; Lopes, F. M. Prevalence of crown trauma in free ranging maned wolves (*Chrysocyon brachyurus*) in Central Brazil. *Journal of Veterinary Dentistry*, December 2007.

Book sections

- 1) Oliveira, T. G.; Tortato, M. A.; Silveira, L.; Kasper, C. B.; Mazim, F. D.; Jácomo, A. T. A.; Lucherini, M.; Soares, J. B. G.; Marques, R. V.; Sunquist, M. Ocelot ecology and its effect on the small-felid guild in the lowland neotropics. *In press*.
- 2) Silveira, L.; Jácomo, A. T. A.; Furtado, M. M.; Torres, N. M. Predadores do Parque Nacional das Emas – GO e entorno. Manejo de Espécies Ameaçadas e de Espécies Invasoras da Fauna e da Flora, Fundo Nacional do Meio Ambiente. *In press*.

Proceedings of conferences

- 1) Furtado, M. M.; Kashivakura, C. K.; Ferreira Neto, J. S.; Jácomo, A. T. A.; Silveira, L. Jaguar Epidemiology Program in Brazil. *Felid Biology and Conservation – An International Conference*, Oxford - UK, September, 2007

Brochures

The institution, Jaguar Conservation Fund has a folder in Portuguese and English.

Digital: database; internet - websites, email group/ blog/forum; CD Rom, e-newsletter

Internet-website

The institution, Jaguar Conservation Fund has a website: www.jaguar.org.br

e-newsletters

The institution, Jaguar Conservation Fund has a monthly newsletter: **Jaguar News:**
http://e-commerce.cultura.com.br/shopping/lojas/1407/html/newsletter/16_mai08/newsletter16_mai08.htm

Meetings and conferences: presentations/ lectures; conferences; workshops; training sessions; discussions; local community meetings and events.

Presentations/ lectures

- 1) A Fauna do Parque Nacional das Emas - Quem Depende de Corredores? Presented by Rahel Sollmann at the Meeting for definition about biodiversities areas of high priority for Conservation of the Emas National Park region, November, 2007.
- 2) O papel do médico veterinário em ONGs conservacionistas. Presented by Mariana Furtado at the Week of Veterinary Medicine at the State University of São Paulo, August, 2007.

- 3) Jaguar Research and Conservation in Brazil. Presented by Leandro Silveira at the Forest Service-US, Washington – DC, May, 2007.
- 4) Jaguar Research and Conservation in Brazil. Presented by Leandro Silveira at State Secretary – US Government, Washington – DC, May, 2007.
- 5) Jaguar Research and Conservation in Brazil. Presented by Leandro Silveira at Defenders of Wildlife, Washington – DC, May, 2007.
- 6) Jaguar Research and Conservation in Brazil. Presented by Leandro Silveira at USFWS, Washington – DC, May, 2007.
- 7) Jaguar Research and Conservation in Brazil. Presented by Leandro Silveira at Wildlife Trust, New York, May 2007.

Educational Opportunities

Does your project directly or indirectly involve the following groups in your research topic?

- Local communities - Yes
- Students - Yes
- Early career scientists - Yes
- Other groups - No

How does your research help these groups better understand and act towards the conservation of a sustainable environment? (Please provide specific examples of any activities you are aware of.)

- Local communities: We help local farmers understand the value of biodiversity and the role of their properties in conserving local carnivore species that often use surrounding farms as an extension of their home ranges.
- Students: We accept Brazilian and international students as interns in our project. Interns participate in field activities for carnivore research and conservation. These hands-on experiences with wildlife often make a long lasting impression, encouraging the formation of new professionals in the field of conservation biology.
- Early career scientists: The project has been supporting a large number of masters and PhD thesis. See below.

Has your project contributed to the completion of Masters' or PhD theses or degrees, or other educational research findings?

Two master's dissertations and four PhD dissertations are already concluded, and five PhD dissertations are currently running studying carnivores and peccaries at Emas National Park:

- 1) Sollmann, R. "Jaguar Ecology and Conservation in the Cerrado. PhD thesis at Institute for Zoo and Wildlife Research, Berlin-Deutschland. Ongoing.
- 2) Furtado, M. M. "Jaguar Epidemiology Program in Four Brazilian Biomes: Cerrado, Pantanal, Amazon and Caatinga. PhD thesis at University of São Paulo, Brazil Ongoing.
- 3) Brait, C. "Heavy Metal Analyzes in fur samples of wild animals". PhD thesis at Federal University of Goias, Brazil. Ongoing.
- 4) Haag, T. "Jaguar Conservation Genetics". PhD thesis at PUC-RS, Brazil. Ongoing.
- 5) Vynne, C. Land Matrix Composition Affects Distribution of Maned Wolf, Puma, and Jaguar in a Cerrado Ecosystem. PhD thesis at University of Washington, USA. Ongoing.

- 6) Rodrigues, F. M. Genetic Relation and Spatial Organization of a maned Wolf population in Emas National Park, State University of Goias, 2005.
- 7) Jácomo, A. T. A. 2004. "White-Lipped-Peccary Ecology, Management and Conservation in the Grassland", PhD thesis at University of Brasília, Brazil. Concluded.
- 8) Silveira, L. 2004. "Jaguar and Puma Ecology and Conservation in the Cerrado and Pantanal". PhD thesis at University of Brasília, Brazil. Concluded.
- 9) Jácomo, A. T. A. 1999. Maned Wolf Food Niche in Emas National Park – GO. Mester dissertation at Federal University of Goias. Concluded.
- 10) Silveira, L. 1999. Carnivore Ecology in Emas National Park – GO. Mester dissertation at Federal University of Goias. Concluded.
- 11) Bestemeyer, S. 1998. Solitary, Reproductive, and Parental Behaviour of Maned Wolves (*Chrysocyon brachyurus*), PhD thesis at Colorado State University, USA. Concluded.

Acknowledgements

Thanks to Earthwatch Institute, IBAMA and Memphis Zoo. Thanks to the partner farms in the surroundings of Emas National Park. A special thanks to the Earthwatch volunteers and the Brazilian undergraduate volunteers who helped us with the activities of the project and the data collection.



Figure 13. Veterinarian (PI) and volunteers collecting samples of a maned wolf.



Figure 14. Veterinarian (PI) and volunteers collecting samples of a jaguarondi.



Figure 15. Veterinarian (PI) and volunteer taking physiologic parameters of a hoary fox.



Figure 16. Maned wolves' scats – dietary analysis.