Final Evaluation Report

Your Details	
Full Name	Hugo Cardoso de Moura Costa
Project Title	White-lipped Peccary Conservation within and outside Amazonian Extractive Reserves
Application ID	24922-2
Date of this Report	30 June 2022

1. Indicate the level of achievement of the project's original objectives and include any relevant comments on factors affecting this.

Objective	Not achieved	Partially achieved	Fully achieved	Comments
Estimate white-lipped peccary occupancy within and outside Amazonian extractive reserves				See justification below
To evaluate how patch and landscape-scale habitat features affect WLP movements				
To develop a community-based game management protocol				See justification below

2. Describe the three most important outcomes of your project.

Objective: To evaluate how patch and landscape-scale habitat features affect WLP movements

New project Study Area– see justification in section 3

Study area

The study was carried out in Mato Grosso state between -58.359W, -14.617S and, -56.736W, -10.957S. This region encompasses areas of the Amazon forest and ecotonal forest of the Cerrado-Amazon transition (Marques et al. 2020). The region has two well-defined seasons, dry and rainy, with average temperatures ranging from 24 to 36 ° C and average annual rainfall of 1700 mm. The landscape is formed by forest fragment remnants inserted within both rain-fed croplands and exotic pastures for cattle ranching (Figure 1). Croplands are formed by double-cropped agriculture with soybean usually planted in rotation with maize. Soybean harvest season in Mato Grosso extends from September 15th to June 15th of the subsequent year, this period is annually defined as a management measure to prevent soybean rust, a disease caused by *Phakopsroa* spp. fungi. Therefore, during the non-harvest season it is prohibited to grow soybean, being crop fields completely inactive during this period of the year.

We captured and GPS tracked five WLP individuals each from independent herds which were identified accordingly to their sex and landholding municipality. Three adult females were captured in Tangará da Serra (TGAF1, TGAF2 and TGAF3), one adult male from Brasnorte (BRAM1) and another adult female from Tabaporã (TABF1). All animals we monitored for 367.4 (215 – 641) days on average and transmitted 6,404 (149 – 2747) GPS relocations. TGAF1 was captured on March 2nd of 2019 and was monitored for 641 days until 2020 December 4th when collar battery was over. We lost TGAF2 collar signal after 251 days since its capture on July 13rd of 2019 probably due to GPS antenna damage once the VHF signal is still active. We received mortality signal from TGAF3 and BRAM1 after 288 and 215 days respectively.

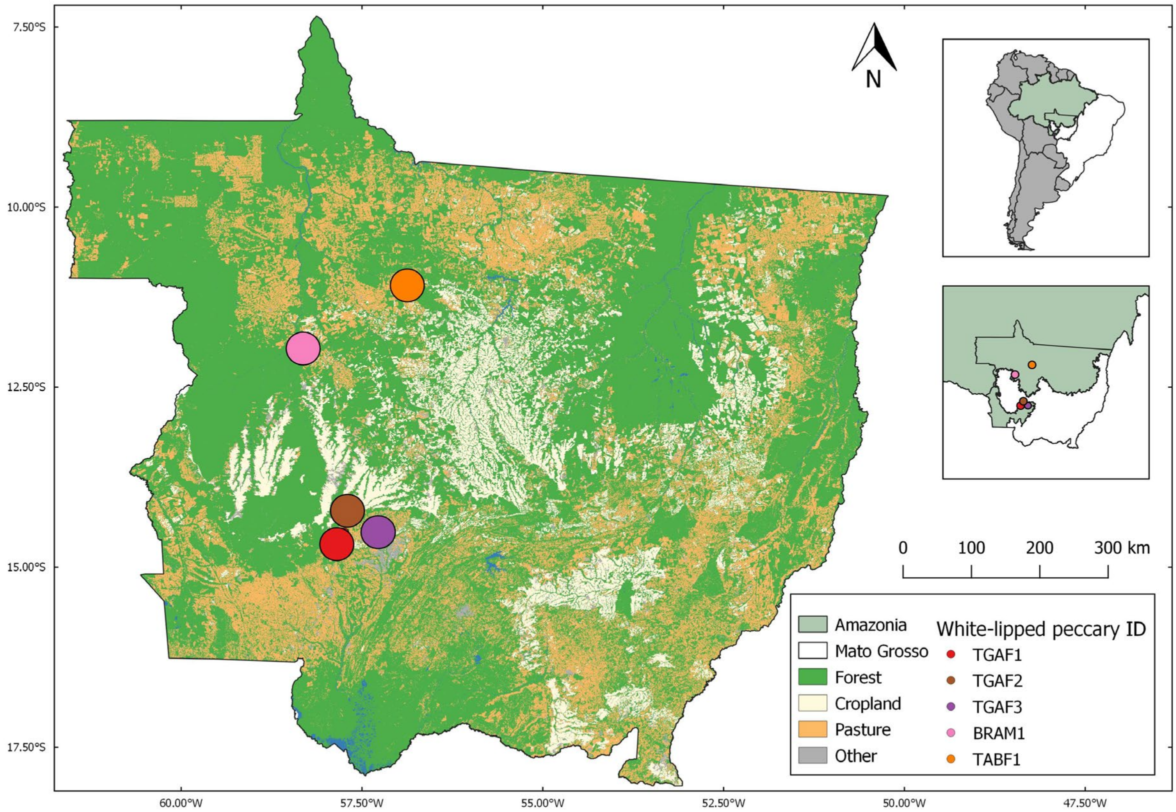

Figure 1. Location of five white lipped peccaries (*Tayassu pecari*) equipped with GPS collars within large-scale mechanized agricultural landscapes in Mato Grosso, southern Brazilian Amazonia.

We were unable to identify mortality causes due to advanced stage of body decomposition when we recovered the collars in the field. Finally, the collar of TABF1 is still transmitting data after 442 days since 18th November of 2019 when it was captured.

Overall and seasonal home range sizes

We were able to estimate overall and seasonal home rage sizes for all WLP except for BRAM1 which was only monitored during the crop season. Variograms of all individuals displayed an asymptote suggesting that they are home range residents. We observed the same pattern when subsetting the data for both crop and non-crop season. The best model that fitted the data was the Ornstein–Uhlenbeck Foraging (OUF) revealing overall and seasonally autocorrelation in position and velocity. The largest overall home range was from TABF1 which span 125.16 (85.42 – 172.37) km² (Table 1), followed by the 62.66 (51.13 – 75.34) km² home range of TGAF2, and the 43.14 (34.23 – 53.07) km² of TGAF1. TGAF3 presented the smallest overall home range size within all the monitored females with 30.91 (21.88 – 41.47) km², whereas the unique male BRAM1 presented the smallest overall home range size within all tracked WLP with 26.59 (19.47 – 34.81) km² (Figure 2). TGAF1 increased its home range by 26% from crop to non-crop season (Figure 3A, Table 1). We observed a marked reduction in home range size from crop to non-crop season for all other individuals, TGAF2 (Figure 3 B) reduced its home range only by 0.09% whereas TGAF3 (Figure 3C) possessed a home range 73% smaller during the non-crop season. The highest shrinkage was from TABF1 (Figure 3D, E) which home range during the crop season is 93% larger than during the non-crop season.

Table 1. White lipped peccaries (*Tayassu pecari*) home range sizes (km²) at agricultural landscapes in southern Brazilian Amazonia. Minimum convex polygon (MCP), kernel density estimates (KDE) and autocorrelated kernel density estimates (AKDE) were calculated using 95% of GPS collar relocations. Values in brackets represents 50% isopleths for MCP and KDE in km² whereas 95% confidence interval for AKDE estimates.

Animal ID	**95 % MCP**	**95% KDE**	**95 % AKDE**		
				Crop season	**Non– crop season**
TGAF1	34.29 (7.08)	32.60 (7.75)	43.14 (34.23 – 53.07)	43.09 (32.48 - 55.18)	58.24 (36.31 – 85.26)
TGAF2	39.53 (21.98)	49.97 (10.46)	62.66 (51.13 – 75.34)	69.21 (54.19 - 86.05)	62.46 (41.27 – 87.98)
TGAF3	21.53 (8.73)	28.254 (7.00)	30.91 (21.88 – 41.47)	32.94 (22.74 - 44.99)	8.63 (5.03 – 13.19)
BRAM1	18.33 (4.68)	28.01 (6.58)	26.59 (19.47 – 34.81)	N/A	N/A
TABF1	70.03 (9.74)	77.49 (17.25)	125.16 (85.42 – 172.37)	162.40 (104.59 - 232.74)	10.11 (7.9 – 12.59)

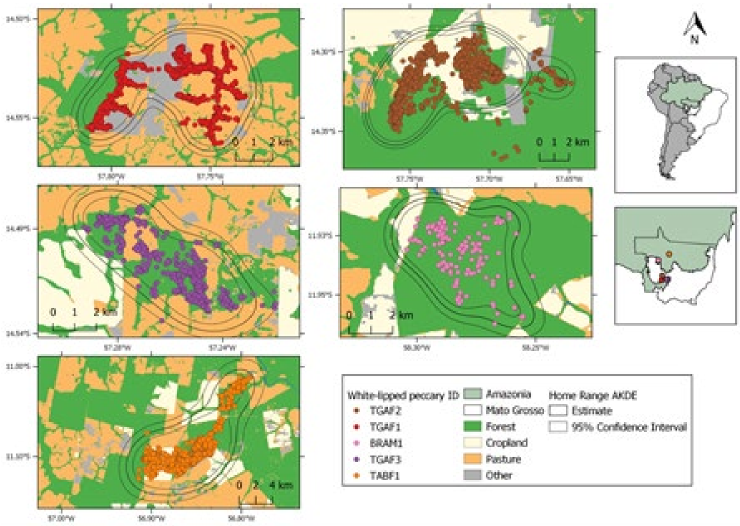

Figure 2. Auto Correlated Kernel Density Estimates of home range sizes of five individuals of white-lipped peccary (*Tayssu pecari*) within large-scale mechanised agricultural landscapes in Mato Grosso, southern Brazilian Amazonia. Continuous lines represent the estimated home range size whereas dotted lines represent the 95% confidence interval.

Resource selection

Model coefficients did not change much when models were fitted using 10 available points for each visited location for both seasons and hypotheses tested (quadratic x linear relationships). However, we present the results using 100 pseudo-absences for each presence location. For both seasons the models containing a quadratic relationship with forest patch area and forest distance and a linear relationship with hydrography distance were better supported than the models that only contained linear relationships (Table 2).

The models performed well, with fixed effects explaining considerable variation, R^2 conditional = 0.283 (R^2 marginal = 0.262) for crop season model and R^2 conditional = 0.414 (R^2 marginal = 0.257) for non-crop season model. WLP selects forest more than croplands, pastures and other land use class regardless of season (Figure 4A, Table 3). However, we observed a marked increase of selection strength for croplands and class "other" during the crop season. Large forest patches were preferred than small ones (Figure 4B) with relative selection strength peaking in fragments larger than 10,000 ha during both crop ($\beta = -0.035$, $p = 0$) and non-crop season ($\beta = -0.063$, $p = 0$). Locations distant from permanent water bodies were often not selected by WLP, however, during the crop season, the selection strength for areas faraway from water are higher ($\beta = -0.487$, $p = 0$) during crop than during non-crop season ($\beta = -0.396$, $p = 0$; Figure 4C). Although WLP strongly uses forest more than any of the other land use classes and selects large forest fragments, the selection strength for forest distance presented a downward parabola for both crop (β = -0.168, p = 0) and non-crop season (β = -0.137, p = 0) that peaked at locations nearby forest edge (Figure 4D) with reduced selection for locations distant more than 1,000 m away from forest and > 3,000 m inside forest fragments. WLP demonstrated a greater amplitude of forest distance values during the crop season when compared to non-crop season.

Table 2. Model selection table for white-lipped peccary resource selection in agricultural landscapes in southern Amazonia during both crop and non-crop season

Season	Fixed terms sturcture	AICc	Delta AICc	Weight
Crop	Patch area² + Forest distance² + Hydrography distance + Land class	130,765.100	0	1
	Patch area + Forest distance + Hydrography distance + Land class	130,940.600	175.420	0
Non-crop	Patch area² + Forest distance² + Hydrography distance + Land class	42,600.190	0	1
	Patch area + Forest distance+ Hydrography distance +			

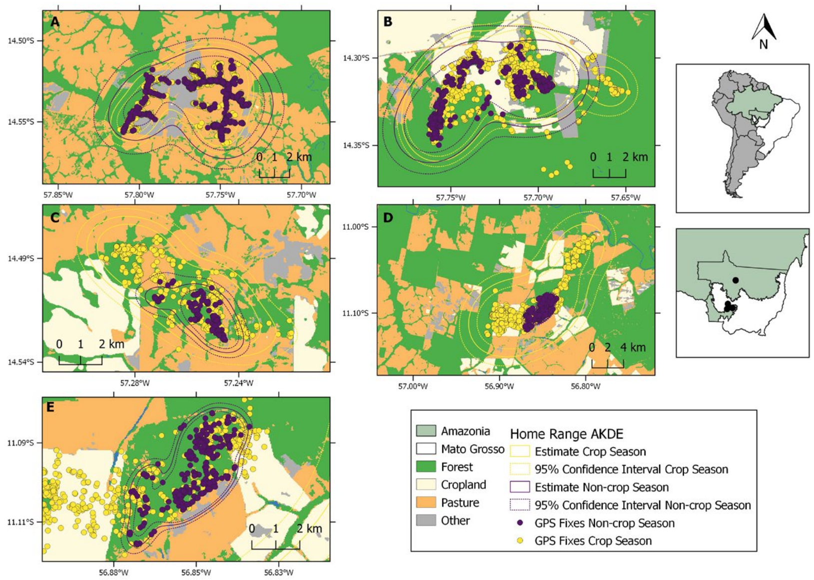

Figure 3. Auto Correlated Kernel Density Estimates of home range sizes of four individuals of white-lipped peccary (*Tayssu pecari*) during both the crop and non-crop season within large-scale mechanized agricultural landscapes in Mato Grosso, southern Brazilian Amazonia during the crop season during the non-crop season. A) TGAF1, B) TGAF2, C) TGAF3, D) TABF1 and E) TABF1. Yellow circles represent GPS relocations during the crop season whereas purple circles represent the non-crop

season in all figures. Continuous lines represent the estimated home range size whereas dotted lines represent the 95% confidence interval.

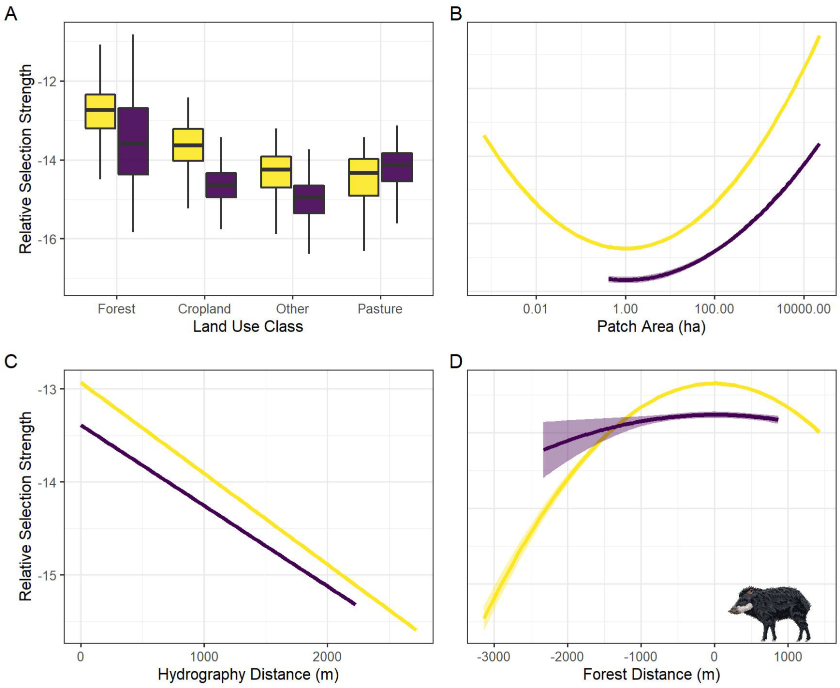

Figure 4. Resource selection, quantified as relative selection strength (RSS), by white-lipped peccary (*Tayassu pecari*) at large-scale mechanised agricultural landscapes in Mato Grosso, southern Brazilian Amazonia. A) RSS in relation to and use types; B) RSS for forest patch area C) RSS for hydrography distance and D) RSS relationship with forest distance. Crop season is represented in yellow whereas purple represents non-crop season in all figures.

3. Explain any unforeseen difficulties that arose during the project and how these were tackled.

During the project planning the whole team agreed that capturing WLPs to fit GPS collar would be the most difficult, and both time and budget demanding, although it could provide us unprecedented data about the species in the entire western Brazilian Amazonia. During our field expeditions into the forest, we camped, walked and canoed searching for WLPs herds following experienced hunters' information. Unfortunately, the wildlife veterinary was not able to dart any individual because of the lack of encounters with the species and the dense forest understory. After successive fails, we rethought our project and we decided to keep studying white-lipped peccaries due to its ecological and social importance, but we moved the project to another study area and as a consequence changed our project objectives. In this way, we delayed our activities to secure extra funds to fulfil our activities during the second and forthcoming years.

Populations of white-lipped peccaries have already been extirpated or drastically reduced in much of their historical range but are still relatively abundant in the state of Mato Grosso, southern Brazilian Amazonia, the country's largest maize and soy producer. However, this iconic ungulate species feed within maize plantations bordering forest fragments during the entire cultivation cycle and farmers in Mato Grosso vociferously protest the severe economic losses they cause. To protect their crops from damage, farmers slaughter white-lipped peccaries using firearms, traps and mass poisoning. New project objectives aim to better understand this crop-raiding conflict by collecting information about crop management directly from the farmers and by using GPS collars to uncover how white-lipped peccaries are using the landscape formed by large crop fields and forest fragments.

4. Describe the involvement of local communities and how they have benefitted from the project.

From February to July 2019, we have interviewed 83 landholders that reported crop raiding by WLPs. In 2019, the mean crop damage area in soybean and corn plantations among interviewed farmers was 30 ha which led to a U$ 27,000 mean loss (Figure 3). The farmers' most common response is to cull the species. Hunting is much practised by farm residents in Mato Grosso in the afternoon after their working shift, which is also when WLPs leave the plantations and return to forest fragments in search of shelter and water. A pair of hunters will ride a single motorbike and repeatedly circle the dirt roads that separate the forest fragments from the plantations, one acting as the driver whilst the other wields a shotgun. Electric fences, ditch, and even massive poisoning was reported as actions to prevent conflict between WLPs and crop fields. Brazilian agribusiness sector accounts for 21.6%of national Gross Domestic Product (GDP). The state of Mato Grosso, in the centre-west of the country, is the largest Brazilian soy producer. Soy plantations in the Cerrado and Amazon biogeographic biomes of Mato Grosso occupied 10.46 million ha during the 2017/2018 harvest. To our knowledge our project is the largest in terms of scale to address crop-raiding in the Neotropics. Furthermore, our GPS-collared WLPs are the first monitored in southern Amazonia, providing unprecedented data about the movement ecology. The crop-raiding conflict is widespread in Mato Grosso; however, this is the first study to quantify and map the conflict in large-scale. These results are essential to support policy makers to reconcile both biodiversity and the landholders.

5. Are there any plans to continue this work?

Project next steps include data analysis from our interviews to model crop raiding suitability to identify conflict hotspots within the whole Mato Grosso state. The results will be quite essential to prioritise mitigation measures to reduce white-lipped peccary culling by landholders. We seek to continue work in a close relationship with the farmers so find the best techniques to prevent crop raiding based on the empirical data collect by our team using the tracked animals and the interviews.

6. How do you plan to share the results of your work with others?

Results will be shared to the scientific community in the form of peer-reviewed publications from our home range and habitat selection results described above and the upcoming analysis of the crop raiding hotspots. Furthermore, we intent to communicate as many as possible landholders about our results and start our conflict resolution initiative.

7. Looking ahead, what do you feel are the important next steps?

We expect that after the dissemination of our results among landholders many of them could be engaged to use their farms as permanent field stations in which we can develop a long-term project. Key future objectives would be to estimate the population size of white-lipped peccaries and to experimentally evaluate the effectiveness of the main actions used to prevent crop raiding. The association of soybean producers in Mato Grosso provide funds to research projects yearly, as a strong local demand, our project possesses good chanced to be supported. Project collaborator Mato Grosso State University – UNEMAT, can contribute by undergrad and graduate students participating in project to produce their final courses, master or PhD thesis.

8. Did you use The Rufford Foundation logo in any materials produced in relation to this project? Did the Foundation receive any publicity during the course of your work?

We did not produce any printed material with the Rufford logo, but the foundation was properly cited as project supported in media reports about the project.

Full text:
http://portal.unemat.br/?pg=noticia/12782/Unemat%20estuda%20preju%EDzos%20causados%20por%20queixadas%20nas%20lavouras%20de%20milho%20e%20soja

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UNEMAT
Universidade do Estado de Mato Grosso
Carlos Alberto Reyes Maldonado

E-mail Esqueci minha senha

Mato Grosso, Sábado, 22 de Fevereiro de 2020 RSS

Início A Unemat Pró-reitorias Áreas Graduação Pós-Graduação Câmpus Serviços Vestibular Concurso Comunicação Social Transparência

« Voltar a página anterior

UNEMAT FAZ PESQUISA

Unemat estuda prejuízos causados por queixadas nas lavouras de milho e soja

31/10/2019 15:00:00
por Nataniel Zanferrari

Queixada (Tayssu pecari) recuperando-se da anestesia após ser equipado com colar com rastreamento via satélite

A Universidade do Estado de Mato Grosso (Unemat) em Tangará da Serra está desenvolvendo um projeto para quantificar e mapear os danos que a espécie *Tayassu pecari* causa nas lavouras de milho e soja em Mato Grosso.

Conhecido popularmente como queixada, o *Tayassu pecari* também é chamado de canela-ruiva, pecari, porco-do-mato, queixada-ruiva, queixo-ruivo, sabucu, tacuité, taguicati, taiaçu, tajaçu, tanhaçu, tanhocati e tiririca, e ocorre em todo o Brasil, além de toda a América do Sul, América Central e Cuba.

Para quantificar e mapear os danos, os pesquisadores da Unemat estão equipando alguns animais

2019

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20/02/2020
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19/02/2020
Pró-Reitoria de Assuntos Estudantis se reúne com autoridades acadêmicas de Cáceres

18/02/2020

9. Provide a full list of all the members of your team and their role in the project.

Dr. Carlos Peres – University of east Anglia: scientific supervisor

Dr. Danielle Storck-Tonon – Mato Grosso State University: project collaborator

10. Any other comments?

We leant from our mistakes! The initial project was an abituous task to be completed within a year. This allowed us to improve our colective sensus to retough, adapt restart our project. A long this journey we improved a lot our relationship skills. During project first year the main stakeholder were small rural commutties from a remote region of the Amazon and after project changes we were continouly meeting with large sclae landholders from the deforested southern Amazonia, this represent a huge monetary, social and cultural contrast to be in the interface between biodiversity conservation and agribusiness. Tecnically we improved our statistical and GIS skills to analyse all data collected up to now. Thecniques to visualize and analyse movement data from GPS collars will be learnt in a upcoming workshop. This is the greatet improvemnet once none of us worked with this kind of data before.