Final Evaluation Report

Your Details	
Full Name	Felipe Ennes Silva
Project Title	Habitat suitability, geographic distribution and conservation of the bald uakaris (*Cacajao calvus* ssp.) in the Amazon Rainforest, Brazil
Application ID	23117-2
Grant Amount	£5,000
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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
To determine the geographic distribution of bald uakaris			■	We collected new information on the occurrence and distribution of each bald uakari subspecies in Brazil and reviewed the geographic distribution of bald uakaris in Peruvian forests according to new information from literature and unpublished reports.
To predict the habitat suitability of bald uakaris using Ecological Niche Modelling			■	We used the new information on the geographic distribution and bioclimatic variables to predict the habitat suitability of bald uakaris.
To assess the Conservation status of bald uakaris		■		Although we present here new data on the occurrence and distribution of bald uakaris and the predictions of how climate change and deforestation will affect their habitat, we suggest that for some taxa (for example, *C. c. novaesi*) hunting can have a significant impact on their populations and new information on population density is urgently required for the subspecies from the south, where the deforestation rate is higher. This data will be valuable for the assessment of the conservation status of bald uakaris

2. Please explain any unforeseen difficulties that arose during the project and how these were tackled.

In general, the field data collection occurred smoothly. My fieldwork was planned for January and February since these are the months when the water is starting to level up and facilitate the surveys using small canoes in the flooded forests – which is the best option to looking for uakaris. However, there were some situations when the water level was not yet appropriate to survey in canoes, but at the same time it was blocking the access to many parts of the forest to walk on trails. It caused some delays in data collection.

3. Briefly describe the three most important outcomes of your project.

1- We collected new data on the occurrence and distribution of each of the four subspecies of bald uakaris in Brazil and also considered the new information

published for the Peruvian bald uakari populations to estimate the extent of occurrence and the geographic distribution range for each one. Our data support the view that a disjunct distribution occurs in *C. c. calvus*, *C. c. rubicundus, and C. c. ucayalii. Cacajao c. novaesi* has the more restricted geographic distribution amongst bald uakaris, occurring only in the Tarauacá-Gregório interfluve, while *C. c. ucaylii* is widespread in the Peruvian forest but with some populations completely isolated in the southwest portion of its distribution.

2- We analysed the amount of habitat loss for each bald uakari subspecies based on the predicted deforestation by 2050 (Fig. 1, Table 1). This timeframe corresponds to three uakari generation, allowing us, therefore, to apply some of the IUCN criteria to assess their conservation status. *Cacajao c. rubicundus* and two of the three main populations of *C. c. calvus* inhabit a region with low rates of deforestation, in the middle Solimões River and lower Jutaí River. They have a large part of their range within protected areas. However, deforestation will probably impact the Peruvian populations of *C. c. ucayalii* from the southern portion of its distribution. *Cacajao c. novaesi*, under the governance scenario, will not have a significant reduction in their habitat. However, under the BAU scenario, 45% of their habitat will be lost by 2050, which qualifies the species as Vulnerable according to the IUCN criteria. In addition, the species is hunted and has the smaller extent of occurrence among bald uakaris, which are two essential variables to be considered in the assessment of its conservation status.
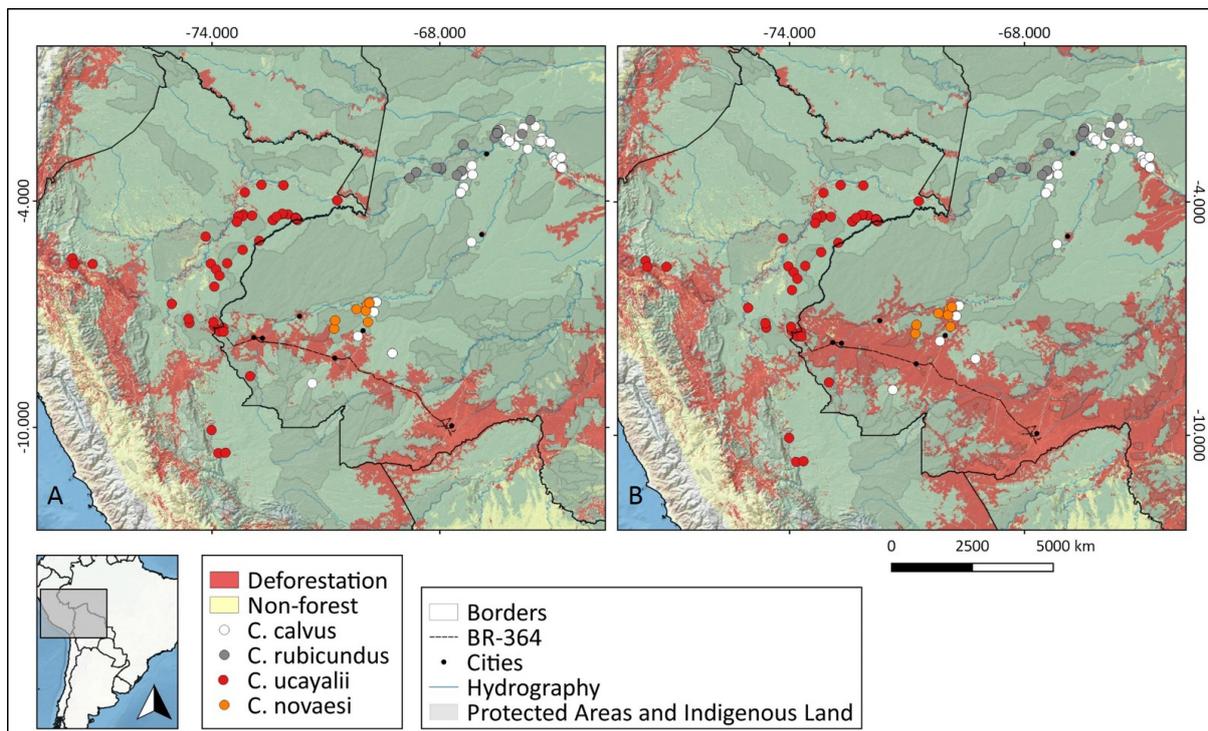

Figure 1. The predicted habitat loss within the geographic range of the four bald uakari species under the "Governance" (B) and "Business as Usual" (C) scenarios by 2050.

Table 1. The Extent of Occurrence (EOO) and the deforestation for each bald uakari species under two scenarios of deforestation for the Amazon Rainforest by 2050.

Species	EOO (Km^2)	Deforestation (Km2)		Deforestation (%)	
		Governance	BAU	Governance	BAU
C. calvus	151,777	9886	19976	0.07	0.13
C. rubicundus	15,864	314	728	0.02	0.05
C. ucayalii	300,650	45197	59616	0.15	0.20
C. novaesi	3,852	113	1732	0.03	0.45

3- When considering the effects of climate-changing on habitat suitability, the model provided a valuable insight into how impacted bald uakaris will be in near future scenarios. Areas with suitable habitat will be restricted to some spots in the western Amazonia, and probably in the north of Brazilian and in Colombian Amazonia, where the bald uakaris do not occur (Figure 2). It is quite unlikely they will be able to disperse to the north bank of Japurá and Negro rivers since these are two significant biogeographic barriers and black uakaris inhabit the forests of that region.

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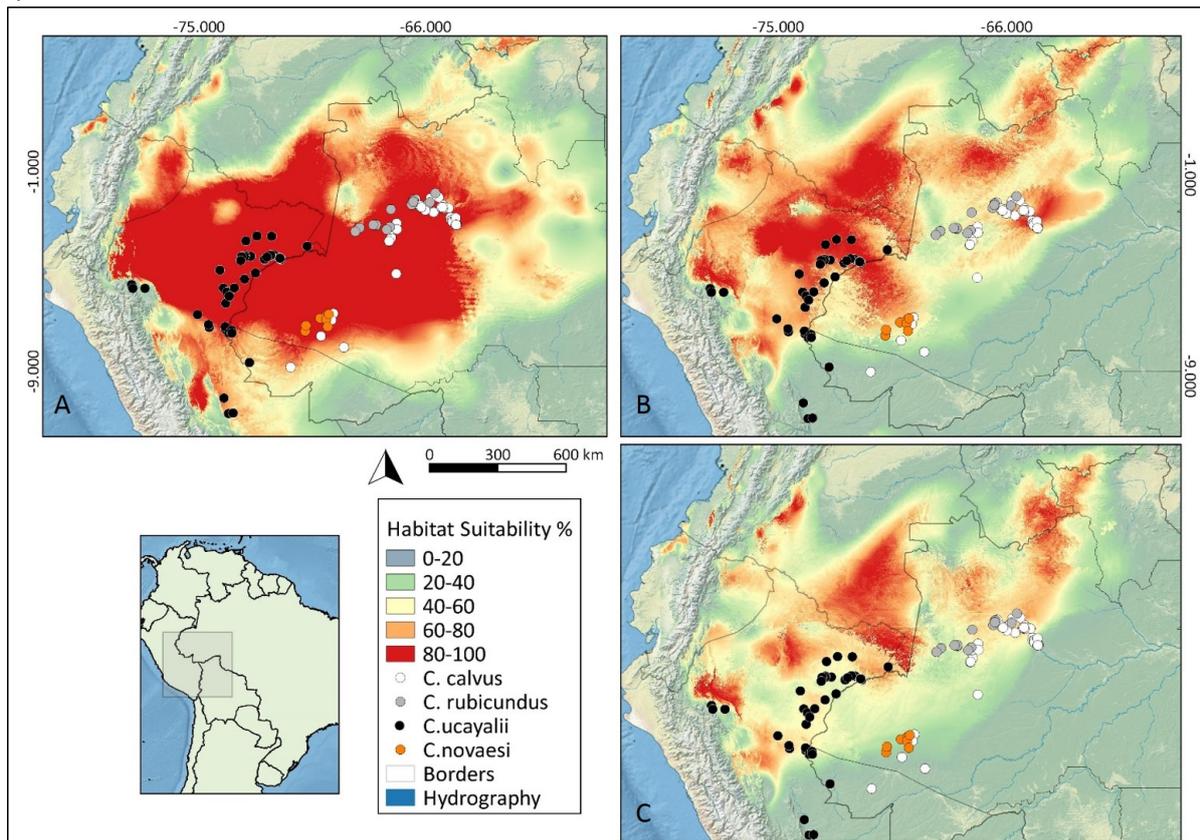
Figure 2. The Ensemble Modelling (Bioclim+Domain+MaxEnt) weighted by the AUC values for the current (A) and future scenarios (B – Mitigation; C – BAU).

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

The involvement with local communities during this stage of the project included local meetings to understanding the context and challenges considering the social and environmental scenario, and what would be the potential impacts to the primate populations in that regions. The scenario is particularly challenging in the Tarauacá river basin. The proximity of areas where we recorded bald uakaris to urban centres such as Eirunepé, Envira, Tarauacá, and Feijó seems to increase hunting pressure on primates. Beyond intensifying economic and cultural changes, these cities have roads that interconnect them, which may provide hunters with access to inner portions of the forest, resulting in the overexploitation of source areas of wildlife. For instance, hunting events of *C. c. novaesi* were reported by locals on the border of BR-364 highway, near Feijó city. At Igarapé Preto and lower Tarauacá River, we did not record atelids, the largest Neotropical primates usually consumed by local communities. These primates were reported by local people to have their abundance decreased in recent decades because of hunting. According to locals from these same areas, medium-bodied primates such as *Cebus* and *Cacajao* became an important protein source, possibly a mechanism to compensate their foraging returns under the context of the absence of large-sized overhunted terrestrial mammals. For example, locals reported hunting events of about 15 individuals of *C. c. novaesi*, a strategy commonly adopted to hunt large herds of peccaries (*Tayassu pecari*). In the management plan of the Rio Gregório Extractive Reserve, *Cacajao c. novaesi* was also listed as the third most hunted primate in the region. Although providing valuable information on these species threats, these reports and records are not enough to assess how this primate population is affected by hunting. Therefore, the evaluation of hunting pressure on bald uakari populations in this region is urgently needed.

5. Are there any plans to continue this work?

Yes. We are planning to collect data on bald uakari populations, especially for *C. c. novaesi* since this is the taxon with the more restricted geographic distribution range and we found some preliminary evidence that the species is hunted. Therefore, population parameters for *C. c. novaesi* are essential to understand their conservation status. Also, as part of my collaboration with the Primate Whole-Genome Sequencing initiative, we will integrate genomics with ecological niche modelling to investigate the adaptive potential of uakaris to climate change using a unique dataset that includes all *Cacajao* taxa.

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

Two manuscripts are being produced. The first is to update the geographic distribution of each bald uakari taxon. In the second manuscript, we will share the results of the ecological niche modelling analysis and the effects of climate change on the habitat suitability of bald uakaris. I am also working on a website where I will share the behind the scenes aspects of this research.

7. Timescale: Over what period was the grant used? How does this compare to the anticipated or actual length of the project?

Pre-Fieldwork – Before the field data collection, from November to January, I contacted local collaborators from the Brazilian environmental agency (ICMBio) and Universidade Federal do Acre (UFAC) to organise the logistic support. In February 2018, we surveyed for uakaris in two areas: in the Tarauacá River and the Serra do Divisor National Park. I used the RSG to collect data that were integrated into my PhD, which included a molecular phylogenetic analysis and a taxonomic revision of bald uakaris. Therefore, I spent more time than I was expecting to get the taxonomic arrangement resolved and integrated into the geographic distribution data. In total, I took a year analysing these data, which implied about a year and a half of delay in the report preparation.

8. Budget: Provide a breakdown of budgeted versus actual expenditure and the reasons for any differences. All figures should be in £ sterling, indicating the local exchange rate used. It is important that you retain the management accounts and all paid invoices relating to the project for at least 2 years as these may be required for inspection at our discretion.

Item	Budgeted Amount	Actual Amount	Difference	Comments
Foods and Consumables	1843	1520	-323	We spent a little less because we could include external funds in this budget line
Fuel	860	1450	+590	We spent more than expected on fuel due to the short trips from the field site to the nearest cities
Field Assistant	1421	1560	+139	A slightly higher cost here was required because we opted to hire an extra field assistant for a longer period
Canoe Rental	876	470	-406	Some field assistant already had small canoes and include this cost in the daily cost for field assistant
TOTAL	**5000**	**5000**		

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

One possible approach for bald uakari conservation is to start from the knowledge about the following threats: selective logging, deforestation, climate change, habitat loss, and hunting. These threats will potentially imply a reduction of the extent of occurrence, in a smaller area of habitat suitability, and a reduction of the population size. Therefore, this information is essential for all populations of bald uakaris to integrate different lines of evidence to assess the conservation status of each species.

Selective logging can also imply lower availability of key food resources for bald uakaris. Therefore, studies on the feeding ecology of bald uakaris are urgently

needed for all populations, especially because these studies will enable a comparative analysis across field sites. Data on the impact of bushmeat consumption in primate communities are essential in most of the areas where bald uakaris occur. The relevance of hunting and timber extraction for bald uakaris populations will vary depending on the local context of each field site, and this information is missing for most of them. For example, while we got reports of hunting of *C. novaesi* and *C. ucayalii*, Pereira et al. (2019) did not get any register for *C. calvus* at Mamirauá SDR after 11 years of monitoring. I consider, therefore, that the following data are priorities for bald uakaris:

1- To collect population data using the distance sampling method in a similar approach as presented in Silva et al. (2020).
2- To verify the importance of uakaris in bushmeat consumption in different field sites.
3- To investigate the effects of climate change and deforestation in the habitat reduction for each bald uakari.
4- To investigate how paleoclimatic changes may have influenced the demographic history and genetic diversity of uakaris.
5- To monitor the selective logging in different field sites to understand the potential impacts of this activity for bald uakaris.

In addition, to get essential information to assess the conservation status of each bald uakari taxon; these data will enable us to take actions involving local government, managers of protected areas, schools, and local communities in a long-term conservation programme. These initiatives will result in the involvement of the stakeholders and the reduction of the impacts on bald uakari populations (Fig. 3). Similar initiatives are a reality in Brazil and Peru where the involvement of local communities has been essential for the conservation in protected areas where bald uakaris occur (Queiroz, 2011; Bowler et al., 2013).
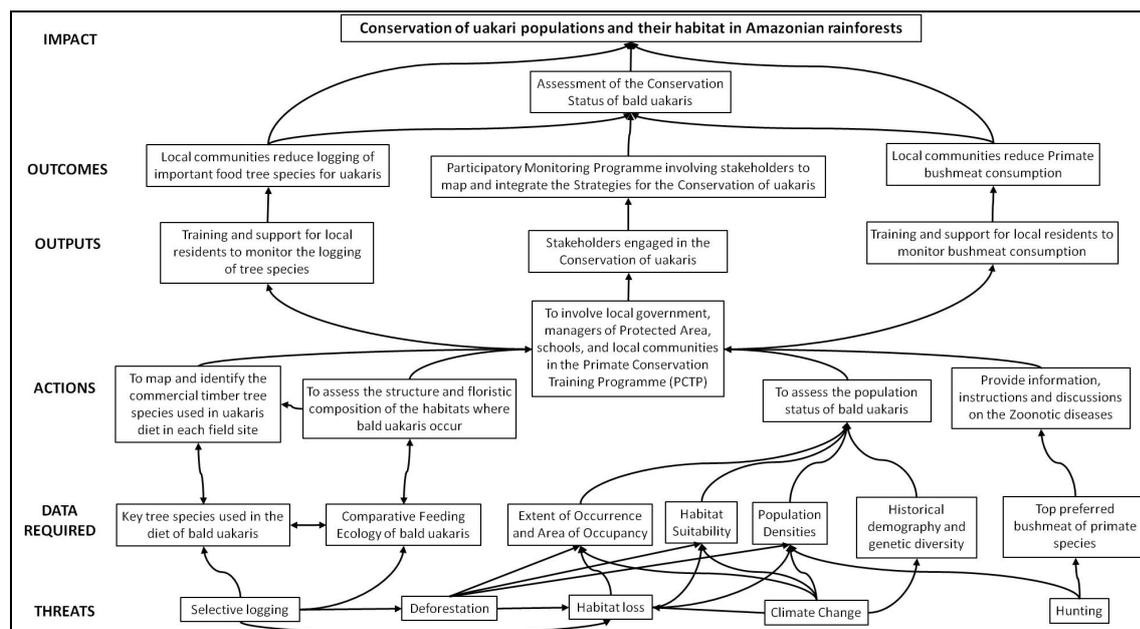
Figure 3. A hierarchical model to integrate data collection and analyses to the long-term conservation of bald uakaris.

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Pereira PM, Valsecchi J, Queiroz H (2019) Spatial patterns of primate hunting in riverine communities in Central Amazonia. Oryx 53:165–173. https://doi.org/10.1017/S0030605317000199
Silva FE, El Bizri HR, Gonçalves J da R, et al (2020) The Roosevelt–Rondon expedition marmoset *Mico marcai*: unveiling the conservation status of a Data Deficient species. Oryx 1–7. https://doi.org/10.1017/S0030605318000303

Queiroz HL (2011) Protected areas of sustainable use, involvement of social actors, and biodiversity conservation in the Várzea: The case of the Mamirauá Reserve-sharing conservation benefits in Central Amazonia, Brazil. In: The Amazon várzea: the decade past and the decade ahead. Springer Netherlands, pp 239–257

Bowler M, Valsecchi J, Queiroz HL, et al (2013) Communities and uacaris: conservation initiatives in Brazil and Peru. Evol Biol Conserv Titis, Sakis Uacaris 359–367. https://doi.org/10.1017/cbo9781139034210.043

10. 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?

Yes, I had two oral presentations during the International Primatological Society Congress, in Nairobi, Kenya, when I got an honourable mention for one of them. Also, I presented a poster during the Primate Society of Great Britain meeting and I used the Rufford Foundation in two presentations as a guest lecturer in the UK.

11. Please provide a full list of all the members of your team and briefly what was their role in the project.

Dr Jean P. Boubli, University of Salford – Dr Boubli was my PhD supervisor at the University of Salford and supported the project during the planning of field activities and to analyse the data.

Lisley Lemos, Mamiraua Institute – Lisley was responsible to investigate the effects of hunting on the primate populations and collected data in the Serra do Divisor National Park. She continues to collaborate in all manuscript productions.

12. Any other comments?

Two manuscripts are being produced and should be submitted soon. We are very thankful for the financial support provided by the RF. The results of this project were integrated into the last National (ICMBio) and Global (IUCN) assessment of the conservation status of bald uakaris. We continue to update this information together with these agencies.