

The Rufford Foundation

Final Report

Congratulations on the completion of your project that was supported by The Rufford Foundation.

We ask all grant recipients to complete a Final Report Form that helps us to gauge the success of our grant giving. The Final Report must be sent in **word format** and not PDF format or any other format. We understand that projects often do not follow the predicted course but knowledge of your experiences is valuable to us and others who may be undertaking similar work. Please be as honest as you can in answering the questions – remember that negative experiences are just as valuable as positive ones if they help others to learn from them.

Please complete the form in English and be as clear and concise as you can. Please note that the information may be edited for clarity. We will ask for further information if required. If you have any other materials produced by the project, particularly a few relevant photographs, please send these to us separately.

Please submit your final report to jane@rufford.org.

Thank you for your help.

Josh Cole, Grants Director

Grant Recipient Details	
Your name	Ricardo Canek Rivera Arroyo
Project title	Density estimation and distribution of the white-crowned parrot (<i>Pionus senilis</i>): a threatened species
RSG reference	23810-1
Reporting period	January 2018-January 2019
Amount of grant	£5,000
Your email address	circoaty@hotmail.com
Date of this report	

1. Please 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
Populations density				
Potential distribution				
Niche centroid				
Infer relative abundances in geographic spaces				There is no correlation between Mahalanobis density and distance data, so extrapolation cannot be done on a density map
Tissue harvest				The harvest effort was very intense, valuable samples were obtained despite the difficulty of detecting nests and their younglings.
Amplification of the mitochondrial				We started the amplification of the genes, but the sequencing of these is delayed due to budget issues.

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

During my field work, I faced three contingencies that forced reorientation of the search sites.

The first unforeseen event was the difficulty that was encountered in the non-invasive collection of wild specimens and tissue collection: a first aspect was that there was a great difficulty of detecting and locating active nests in order to collect specimens; this circumstance is the product of the constant looting of nests in many locations.

The second was to face a great insecurity that is present in various regions of Mexico, therefore, it was not possible to work in the National Park Lagunas de Montebello, Biosphere Reserve El Triunfo, Biosphere Reserve Montes Azules and The Conservation Area "Cycada "(Veracruz). By this situation, it was decided to visit other localities that had previously been established as viable options to elaborate the research, which included Totomoxtle and El Uxpanapa (Veracruz), Tecpatán, Naha and Catazajá (Chiapas), Tenosique and Huimanguillo (Tabasco), Candelaria (Campeche) and Tanchanaco (San Luis Potosí).

The third was a setback that occurred with the vehicle in which we were traveling; On the highway, in the mountain area, in the state of San Luis Potosí, the truck was stranded, so, to avoid delays in the programme we had, we chose to repair the

damage, that involved the use of part of my budget and 3 days of repair for the truck, which delayed the field activities.

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

A total of 32 records and 221 individuals of white-crowned parrot were obtained in 11 localities, in Palenque, Catazajá, Chavarrillo, Xilitla and Tamarindos no specimens of this species were recorded. The density values were very contrasting between locations (Table 1), for example, Tanchanaco had a density of 4.3 ind/ha, while in El Cielo a density of 110 ind/ha was detected and in El Naranjo 78.8 ind/ha. A total of 41 tissues of white-crowned parrot were collected in 15 localities of Mexico, these tissues will be used for the study of genetic structure and phylogeography.

Table 1. Density of the populations of the white-crowned parrot

Location	Density (ind / ha)
El Cielo	119.1
El Naranjo	78.8
Tanchanaco	4.3
Totomoxtle	14.7
Breña Torres Viejo	28.9
Chalchijapa	36.2
Armando Zebadúa	10.6
Tecpatan	13.6
Naha	49.3
Tenosique	36.5
Calakmul	28.7
Tenosique	36.5

The potential distribution model obtained presented predictions higher than those expected at random (test X², all models: $p < 0.01$, DF = 1). In addition, the potential distribution of the white-crowned parrot showed low levels of omission (i.e., the model was successful in predicting most of the data from the primary source), indicating a predictive power of more than 85%. The current potential distribution predicts that it is distributed in 585,034 km² (Fig. 2) from southern Tamaulipas to northern Panama. Mexico is the country with the largest distribution area for the species with 190,656 km², while Nicaragua has 103,798, while Honduras has 94,387 km², the rest is in Costa Rica (49,733 km²), Panama (30,240 km²), Belize (21,600) and El Salvador (10,900 km²). The potential distribution model was a little contrast with the distribution maps that are available for this species, unlike these not all the plain of the Gulf of Mexico presents conditions for the permanence of this parakeet; likewise, east of the Yucatan peninsula and El Salvador are included as places with suitable conditions for this species.

The distribution area of the species that is protected within a Natural Protected Area is 165,719 km². The white-crowned parrot is not adequately protected in Mexico, because only 32,973 km² (17%) of the potential distribution of the species is covered

by protected natural areas. Of the sites studied, four are located within a biosphere reserve (El Cielo, Usumacinta Canyon, Naha and El Ocote Forest), the observations in Calakmul were made outside the polygon of the reserve. The rest of the observations were made in areas where there is no natural protected area. In the other Central American countries, the proportion of distribution of the white-crowned parrot that is covered by ANPs is greater: Nicaragua has 45,892 km² (44.2%), Guatemala 31,546 km² (37.6%), Honduras 23,718 km² (25.1%), Costa Rica 12,516 km² (25.2%), Panama 9,523 km² (31.4%) and Belize 8,110 km² (37.5%).

The niche centroid modeling allows us to identify that the regions of the foothills of the Sierra Madre Oriental are the best conditions for the species, as well as the Maya Forest of Belize, Guatemala and Mexico, including the jungle Lacandona and the jungle of the south of the Yucatan Peninsula; in Honduras and Nicaragua there is another point where the environmental conditions locate the centroid for this species. The density relationship with the niche centroid was not adjusted to the premise that the populations of a species will be more abundant in the centroid of the niche, therefore, it was not possible to extrapolate the data to know the density in the geographic range of the species.

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

During field work, our strategy was to have interviews with local authorities in order to obtain their permission to enter communal and private lands, and to hire local guides. In addition, we offered always information about the endangered situation of parrot natural populations in Mexico due to habitat loss and extraction for the illegal pet trade. People reactions were usually of concern because they have noticed a decline in these species' presence. We also stressed the point that ecotourism and bird watching is an activity that they could benefit if they take more actions to protect these bird species and enhance their habitats.

5. Are there any plans to continue this work?

Yes, my plans to continue with this work include an effort to include samples from populations of one or two Central American countries, and to proceed with genetic analyses with the samples obtained to see if there is a genetic structure in the species, or more than one evolutionary significant unit. Also, with the genetic analysis we would like to see if there are genetic effects of isolation that we are founding among populations in Mexico that might affect the survival of these populations in the short run.

In a new period, I plan to continue with the genetic part, amplifying both mitochondrial and nuclear molecular markers to study the patterns of genetic structure and aspects of biogeography, and to understand the causes of the current configuration of populations of the species.

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

To share our results I plan to publish at least two scientific papers. The first will include the analysis of the current distribution and population densities of the species in Mexico including different maps of potential modeling of the species. The models will include historical scenarios that allow us to see previous habitat fragmentation that might have affected their distributions, and scenarios for climate change for the species. I will also upload the monitoring data of the species in the portal Global Biodiversity Information Facility (GBIF). A second paper will have the genetic analysis performed with samples included from Mexico and samples to obtain from Central America.

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

The subsidy was used mainly in the period of field work between March and May 2018. This applies within the range established for the fieldwork, since the cabinet analyses did not required funds.

8. Budget: Please 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.

Item	Budgeted Amount	Actual Amount	Difference	Comments
Field guides	300	450	+150	More field guides were needed mainly in the towns of the states of San Luis Potosi, Chiapas and Campeche
Accommodation	800	1,000	+200	
Meals	1,100	800	-300	
Tolls	500	650	+150	
Gas	2,300	1,670	-630	
Car repair		430	+430	The car suffered a breakdown on the highway and it was necessary to tow it, plus the repair cost
Total	5000	5000		

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

The main step to follow is to write a scientific article about the current population densities and conservation status of the white-crowned parrot, this action will allow me to publicise the information obtained in this study. It is very important to me to

use the valuable samples obtained in the field so I want to try continuing obtaining the genetic information of the species that will reveal the patterns of phylogeography and genetic structure of the species. This genetic information will help us to detect the potential of areas of illegal collection of specimens and if possible to reincorporate confiscated rehabilitated birds in locations assigned by genetic methods. This point requires additional funding.

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

Yes. The Rufford Foundation received publicity in two places: at the Hotel Huasteca Secreta, Municipality of El Naranjo, and at the Hotel la Casa del Café, Municipality of Xilitla, both in San Luis Potosi, Mexico.

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

Ricardo Canek Rivera Arroyo: project manager, monitoring of specimens, photographer

Damian Aguilar Torres: chofér and assistant in the field.

Juan Carlos Orraca Corona: field assistant and monitoring of specimens.

Saúl Guillermo García Rivera: field assistant and photographer.

Luis Armando Ferman Cortez: field guide in Breña Torres Viejo and Los Chimalapas, Oaxaca.

Limberg Pérez Benavente: field guide and field assistant in Armando Zebadúa and Tecpatan, Chiapas.

Chankin Wiliam García: field guide in Naha, Chiapas.

Germán Hernández: field guide in Palenque and Catazajá, Chiapas

Lazaro Chavarrilla Mos: field guide in Tenosique, Tabasco.

Andry Hilario Acosta: field guide in Candelaria and Calakmul, Campeche.

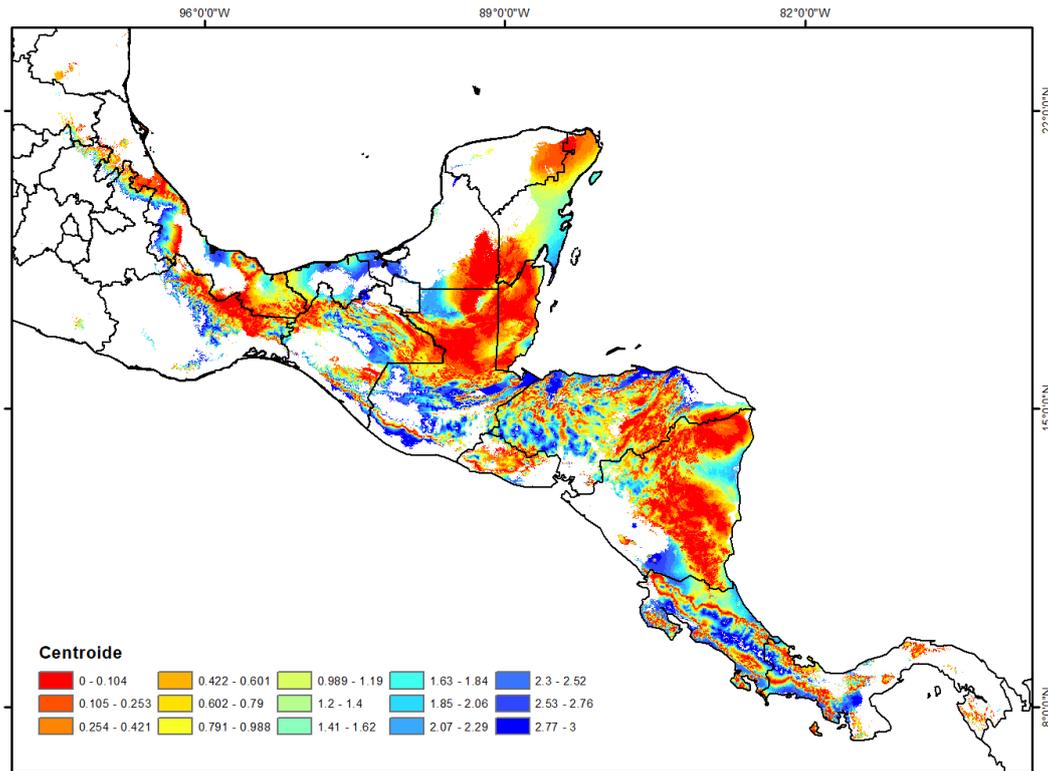
Roberto Lárraga Martínez: field guide in Tanchanaco and Tamarindos, San Luis Potosí

Mario Álvarez: field guide in El Cielo, Tamaulipas.

Esteban Berrones Benítez: field guide in El Cielo, Tamaulipas.

12. Any other comments?

Support offered by the Rufford Foundation was of great importance, because, I was able to go into the field to see and collect data about these populations and to speak with people that are in the same area where these parrots live.



Ecological Niche Modeling- *Pionus senilis*



Pinus-senilis-Tenosique-Tabasco