Final Evaluation Report

Your Details	
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Project Title	Standardized Biodiversity Monitoring to Assess the Impact of Climate Change in the Selva Maya
Application ID	33141-1
Date of this Report	03-01-2022

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
Take the first steps towards an integrated management plan in the Selva Maya through standardized collaborative monitoring				For the first time, governments, scientists, NGO workers, rangers and local guides from multiple reserves in the Selva Maya joined to exchange ideas for long-term collaborative monitoring in the Selva Maya.
Capacitate personnel from local environmental authorities and institutions across the Selva Maya (Mexico, Guatemala, Belize) in the survey methods used by Operation Wallacea for biological monitoring				Ten park wardens from Guatemala joined scientists and park wardens from Mexico at the first training programme in Calakmul. A large number of personnel from Belize, Guatemala and Mexico were present in the second session in Guatemala.
Provide training in how to make data collection and data handling more efficient, useful, and transparent by tapping into digital tools and technological resources already in use by Operation Wallacea for biological monitoring in CBR				Training in Epicollect data collection app in Calakmul and extensive work using both Epicollect and SMART data collection apps during the second session in Guatemala.
Run a series of discussion groups with other active players and institutions leading conservation effort in the Selva Maya to discuss future collaborative strategies for the biological monitoring across the Selva Maya				The first steps were made towards tri-national collaborative camera trap monitoring of felids and ungulates and strategies for local community involvements in biological monitoring.

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

a) This Rufford-funded project has laid the foundation for large-scale collaborative monitoring across the Selva Maya by creating a space for the Mexican, Guatemalan, and Belizean institutions operating in this biodiversity rich biome to interchange information on their biological monitoring methodologies, results and projects. The two Working Meetings for Biological Monitoring in the Selva Maya that we hosted (Calakmul - Mexico 2021, Tikal - Guatemala 2022) during this Rufford-funded project brought together the many voices across all levels operating in the Selva Maya (park wardens, reserve management personnel, conservation managers and biologists, national and international researchers) to the discussion table, thus setting the foundations for establishing new collaboration initiatives and plans for a standardised collaborative monitoring effort going forward. Both these meetings were highly productive, and particularly the 2022 one in Guatemala was of particular and somewhat historical importance as it was the first time institutions of all three countries were present at the same time in the same location to discuss conservation and biological monitoring in the Selva Maya.

b) A standardised shared methodology for long-term monitoring of waterbodies was established, incorporating the knowledge and experiences from already existing projects across the Selva Maya. The plan was to set the grounds for multiple collaborative efforts in the long-term and it was agreed to use waterbody monitoring as the pilot to figure out the framework. Going forward the idea is for each protected area to have their own (identical) version of this standardised monitoring method (e.g Aguada Monitoring Calakmul, Aguada Monitoring Tikal) in their digital data collection app and database of preference (Epicollect 5 or SMART). This collected information is the same across protected areas and then on a yearly basis the data is uploaded into a shared database of a similar structure (Aguada Monitoring Selva Maya). Given that we can promote these Working Meetings for Biological Monitoring in the Selva Maya each year, in the leading months to it we can digest and summarise all the shared information into a report and interactive map to present to everyone at the meeting. A standardised methodology being used to monitor multiple protected areas across the region in three different countries, coupled with the matching digital data collection systems feeding data into a centralised database is something outstanding, and, as far as we are aware, never achieved before anywhere else in the world.

c) Acoustic survey methodologies for monitoring birds, bats and frogs were investigated and trialled in Calakmul Biosphere Reserve during this project, and amongst other things included started putting together a species-specific call library to be used for acoustic monitoring across the Selva Maya the Selva Maya. At the time of writing this report our call libraries include recordings of 18 species of frogs, 28 species of bats and 143 species of birds. Acoustic monitoring methods for birds were trialled in Tikal in 2022 where calls were recorded using a directional microphone and Tascam recorder with identification of calls confirm using the Calakmul library, in conjunction with existing bird monitoring apps EBird and Merlin. Although all birds could only be identified with the assistance of trained local guides, inexperienced observers could reliably identify a sufficiently broad selection of bird species to permit development of standardised monitoring across reserves.

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

The main unforeseen difficulties that we faced during this project were related to the pandemic and extreme weather events which hindered the progress of the activities proposed in the original submitted project. However, we did not let this stop our enthusiasm and commitment to leading the effort on standardised collaborative monitoring across the Selva Maya as a way to boost conservation efforts in this biodiversity rich biome and so we kept pushing forward in the background despite not being able to travel the field activities in the original timeframe. The project became much bigger than originally planned with a broader selection of participating institutions from Mexico, Belize and Guatemala and a diverse selection of participants ranging from government reserve management teams, NGOs, academics, park wardens and local guides from multiple reserves in the Selva Maya. Consequently, we were able to achieve much more than we originally thought we would with the outcomes of this pilot project alone, so we are now much further ahead than just the first steps towards trinational, standardised monitoring projects and information exchanges between biological monitoring teams across the Selva Maya

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

Our project did not target local communities directly. However, we actively worked with park wardens and reserve management across all levels in the protected areas this project encompassed in both Mexico and Guatemala. That being said, local communities will benefit from the discussions and initiatives originated from this project in the long run, by amongst other things being more actively involved in the monitoring strategy for going forward.

5. Are there any plans to continue this work?

Yes. Despite the many postponements to project activities caused by the Covid-19 pandemic and extreme weather events in Guatemala, both us and collaborating parties are very excited to continue the work and collaborations established during both sessions organised by us to host discussion and collaborative planning on standardised biological monitoring in the long-term. As mentioned above, this Rufford-funded project has laid the foundation and walked the first steps towards large-scale collaborative monitoring across this biodiversity rich biome, in such a way that all involved parties agreed to make these Working Meetings for Biological Monitoring in the Selva Maya an annual event for amongst other things provide general update from everyone to everyone (i.e. how is the monitoring in each protected area / for each involved institution is going), revise current strategies for collaborative monitoring, discuss new strategies for further collaborative effort, tackle recurring or newly emerging problems and inclusion of relevant technological based approaches. These events will also serve as a common ground to reinforce current collaborations and forge new ones as new people / institutions get involved in this long-term strategy for large-scale conservation across the Selva Maya.

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

The results of our work project will be shared with local, regional, and international audiences. Science communication is increasingly becoming a powerful tool in the world of conservation, and so in addition to the continued publishing of the results from collaborative biological monitoring in the Selva Maya in international open access peer-reviewed journals, we are also targeting local journals of interest to the general public and conservationists operating in the Selva Maya, as well as regional journals divulging information to Mexican, Guatemalan and Belizean governmental sectors and NGOs, to spread around the message. Social media is also increasingly becoming a powerful tool in the world of conservation and so the most popular platforms (e.g., Facebook, Instagram, Twitter) will also be used to spread the message to the general public.

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

The main important thing is to maintain regular contact with everyone that has shown interest in taking this ambitious initiative further. The Selva Maya Conference format seems to have worked quite well in bringing people together and stimulate discussion and planning for collaborative effort regarding biological monitoring, so one of the important next steps is to keep the momentum going by doing our best to make them an annual event. The interchange of ideas and overall discussions and forging of new collaborations was something quite exciting to see during both sessions we organised during this project, and I personally want to do all within my reach to keep the ball rolling. Part of it is to seek additional funding to cover the costs of these events, which stand out from other conference like initiatives due to bringing together the many voices across all levels (park wardens, reserve management personnel, conservation managers and biologists, national and international researchers) and not just a select group of people within a certain level. In future editions we want to bring along even more different voices such as local tour guides, representatives and interested youth from local communities, local law and environmental enforcement authorities, so to expand of one of the branches of the envisioned collaborative biological monitoring via citizen and semi-citizen science projects.

Another important step linked to what was mentioned above is to make sure that the collaborative aguada monitoring pilot using standardised digital forms and shared databases keeps going. This can be achieved by virtually maintaining the contact and enthusiasm and sharing experiences of how things are going. The discussions on the overall structure of how this can be done during our sessions in Mexico and Guatemala were the first step to set the framework and preliminary technical details and now during the next year we can polish it with real life experience on the ground.

Another important step is to continue to expand and develop our call libraries for acoustic monitoring and secure the necessary funding to equip, further capacitate and support multiple reserve management teams. We were able during this project to advance a lot but ultimately further expertise and thinking (e.g., via PhD research) is required to full take this idea from the paper and make it operational and

sustainable in the long-term. We already have the overall concept on how to achieve this but need some extra resources (both human and financial) to take it a step further.

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?

Yes. The Rufford Foundation logo was used on all my presentations, training materials and certificates (See photos in Appendix II below) handed out to participants that joined both sessions of the Working Meeting for Biological Monitoring in the Selva Maya (Calakmul – Mexico 2021, Tikal – 2022). The financial contribution of The Rufford Foundation was also always properly acknowledged throughout the project activities to all collaborating institutions in this project.

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

Overall project conceptualization and coordination
José António L. Barão-Nóbrega (Operation Wallacea, rePLANET & CRMC)
Kathy Slater (Operation Wallacea & rePLANET)

Active project collaboration (Overall research & Biological Monitoring)
Mauricio González-Jáuregui (CEDESU-UAC & CRMC)
Anuar Hernández Saint Martin (Pronatura Peninsula Yucatan)
Fernando Contreras-Moreno (WWF – Mexico)

Active project collaboration (Acoustic Monitoring)
Ivan Samayoa (Operation Wallacea)
Ezequiel Cauich (Operation Wallacea)

Active project collaboration (Digital data collection & Database management)
Gabriel Olivares (FUNDAECO – Guatemala)

Passive collaboration (Institutional support)
Carlos Coutiño (CONANP Calakmul – Mexico)
Gaby Méndez Saint Martin (CONANP Calakmul – Mexico)
Arturo Balam & Omar Parrao (SEMABICCE – Mexico)
Rony Garcia (WCS – Guatemala)
Rafael Reyna (ECOSUR – Mexico)
Francisco Asturias (FUNDAECO – Guatemala)
Manolo Garcia & Carlos Gaitán (CECON USAC – Guatemala)
Ramón Pacheco (Programme for Belize)

10. Any other comments?

An additional outcome from the 2022 meeting in Guatemala was the agreement to investigate methods for further collaboration with camera trap monitoring of felids and ungulates. WCS Guatemala, FUNDAECO and CONAP have a large camera trapping grid covering 300 km^2 of the central area of the Selva Maya covering

Parque Nacional Mirador-Rio Azul and Biotopo Dos Lagunas, whilst WWF Mexico and CONANP have an adjacent camera trapping grid covering 100 km^2 to the north in Calakmul Biosphere Reserve. The participating organisations in these monitoring programmes have already established an exchange of photos for jaguar IDs. In 2023, both Operation Wallacea and CONANP will be developing community monitoring projects in the southeast buffer zone of Calakmul that will require camera trapping. This area of community owned land is the corridor of forest that connects Calakmul to Rio Bravo conservation area in Belize to the east and Biotopo Dos Lagunas in Guatemala to the south. Consequently, an agreement was made to investigate options for camera trap placement in the southeast buffer zone of Calakmul and redeployment of cameras in Rio Bravo conservation area in Belize to connect with the existing camera trapping grids in CBR, MNP-RA and Biotopo Dos Lagunas to create a continuous tri-national camera trapping grid for collaborative monitoring of felids and ungulates.

As this trinational camera trapping project will only be possible with reliable camera trap data from community lands, Operation Wallacea, WWF and CONANP have agreed to collaborate to promote community led biodiversity monitoring projects in Calakmul.

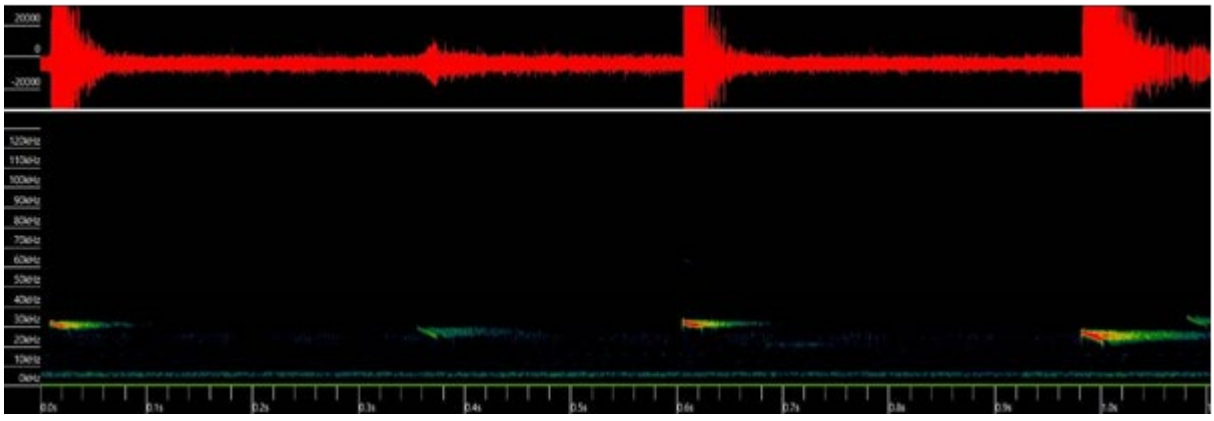
Figure 1. Group photos at the end of our Session I in Mexico and Session II in Guatemala. In these photos there are representatives (park-wardens, reserve management personnel, conservation managers and biologists, national and international researchers) of multiple institutions from Mexico (Pronatura Peninsula Yucatan, CEDESU-UAC, CRMC, WWF, CONANP, SEMABICCE, ECOSUR), Guatemala (FUNDAECO, WCS, CECON USAC, WWF), Belize (Programme for Belize, WWF) and the UK (Operation Wallacea, rePLANET) leading conservation efforts in the Selva Maya.

Figure 2. Group photos during of our Session I in Mexico and Session II in Guatemala. In these photos JALBN and KS are leading field sessions on the use of digital methods of data collection and shared cloud-based databases as a basis for collaborative monitoring across the Selva Maya.

Figure 3. Photos from field activities undertaken during of our Session I in Mexico and Session II in Guatemala. In these photos MGJ, RR and AHSM lead field sessions on different methodologies for monitoring herpetofauna and mastofauna within and around waterbodies in the Selva Maya.

Figure 4. Photos from field activities undertaken during of our Session I in Mexico. In these photos SO and RF lead sessions on different methodologies for monitoring insects and birds.

Figure 5. Photos from field activities undertaken during of our Session I in Mexico and Session II in Guatemala. In these photos FM, EC and IS lead sessions on different methodologies for acoustic monitoring bats and birds.



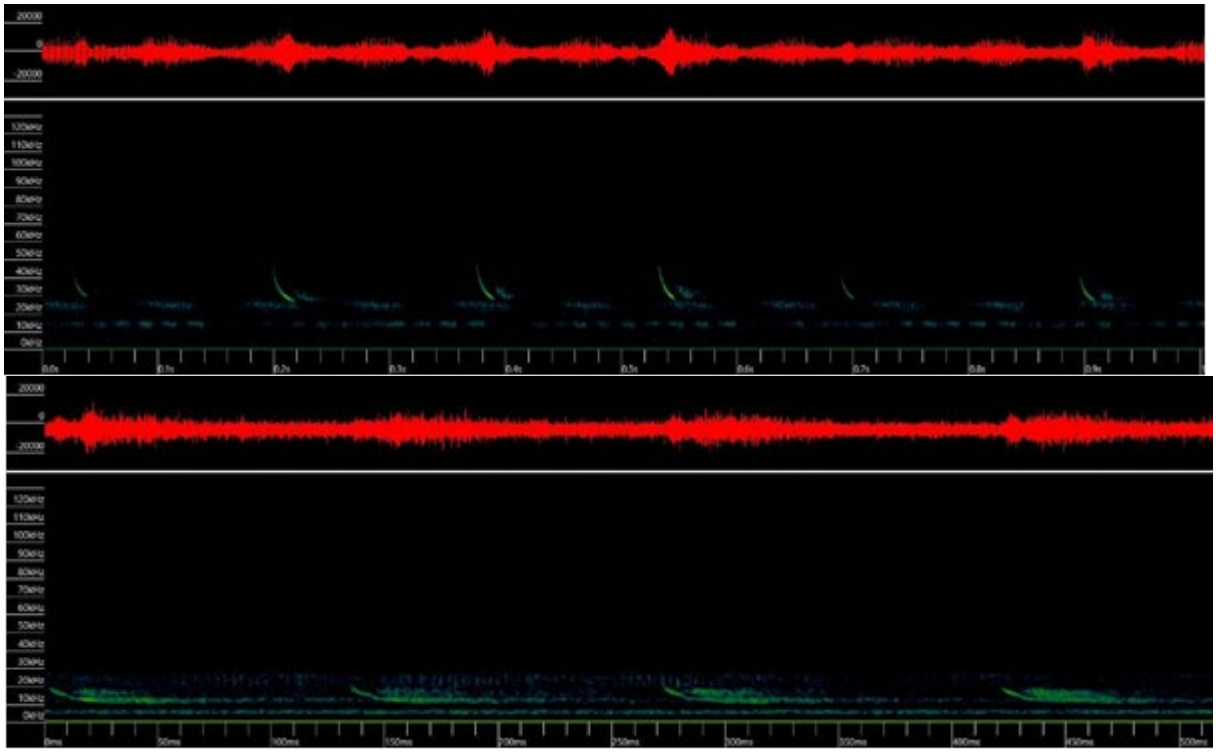


Figure 6. Spectrograms of some of the bats species (*Molossus nigricans*, *Lasiurus intermedius* and *Eumops auripendulus*) recorded during the field activities undertaken during of our Session I in Mexico and Session II in Guatemala. The processing of this sound recordings was made by IS.

Figure 7. Cover slides of the two complementary lectures during our Session II in Guatemala overviewing the possible methods and platforms to be adopted going forward for standardization of data collection, data storage and interchange of information across different institutions leading conservation efforts in the Selva Maya. These lectures and proposed approaches were put together and delivered by JALBN and GO.

Figure 7. Photos from the Aguada Restoration training activity undertaken during of our Session I in Mexico.