Final Evaluation Report

Your Details				
Full Name	Mirella Baldacconi Gondeck			
Project Title	Distribution patterns of frugivorous butterflies (Papilionoidea: Nymphalidae) metacommunities in Atlantic Forest fragments on the Santa Catarina Island – SC, BR			
Application ID	40781-1			
Date of this Report	January 2025			

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
Research sites selection in partnership with the Municipal Environmental Foundation - FLORAM				Sampled sites were indicated and selected in partnership aiming to contribute with the protected areas' management action plans.
Equipment acquisition				All equipment planned in the initial budget were purchased and good price deals allowed us to replan the budget including other necessary materials.
Complete 100 field working days				Fieldwork was initially planned to take place from Oct/2023 to Feb/2024. As we depended on the grant to buy traps, it started in Jan/2024 and lasted until May/2024, completing 90 days.
Fieldwork for environmental and geographical variables collecting				
Species identification				
Data analysis, preparation for publication and report				A first assessment of butterfly diversity data has been elaborated and presented at the Federal University of Santa Catarina's "Postgraduate Programme Ecology and Conservation Week" event (Sep/2024) and report sent to the Protected Areas' Department at FLORAM (Jan/2025).
Evaluation of the effects of habitat quality and				All butterfly, temperature and geographical data has been collected; vegetation to be

fragmentation of the Atlantic Forest remnants on the fruit- feeding butterflies' diversity	completed by February, followed by the start of the analysis and evaluation.
Elaboration of the Santa Catarina Island's fruit- feeding butterflies guide with distribution on the surveyed P.As.	We have the species list and their distribution, plus a first layout suggestion. Once collected species are mounted, we will photograph them and use both set specimens and field images to create the guide.

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

a). We have registered a total of 643 specimens belonging to 46 species of butterflies from the Nymphalidae and Hesperiidae (represented by 1 specimen) families. From the Nymphalidae, Satyrinae was the most representative subfamily (21 species, 143 specimens), followed by Biblidinae (9 species, 150 specimens), Danainae (6 species, 277 specimens), Charaxinae (5 species, 27 specimens) and Nymphalinae (4 species, 45 specimens). Alfa diversity indexes measured on each of the twelve Sampling Stations (SS) varied between 3,0 to 12,3 (Shannon) and from 2,2 to 10,0 (Simpson). Beta diversity between SS varied from 52% to 93%, where two SS in the centre region of the island indicated the highest dissimilarity among the group.

We produced baseline data on the occurrence and distribution of fruit-feeding butterflies on the Santa Catarina Island which previously presented a knowledge gap, except for one published inventory on a specific location on the island's south region. With our work, we have collected data on five protected areas, from north to south regions on twelve areas never sampled before, including newly stablished P.A.s. These data will enhance knowledge of species occurrence on the island and expand the Atlantic Forest species distribution maps in south Brazil. It will also serve as tool for future evaluation and conservation actions.

b). From the above-mentioned species nine singletons were registered, from which we have already identified species of conservation interest and possible new records for the localities. We highlight here three genus which are possibly vulnerable due to habitat fidelity and isolation:

- Dasyophthalma rusina and D. creusa

The genus is endemic to the Atlantic Forest, with three out of five described species of conservation interest, included in the national Red List for Species Conservation. Additionally, since they are large dayflying butterflies, they have a large appeal to be used in citizen science through photographic records (ROSA AHB *et al*, 2023).

- Narope cyllene

They are exclusively neotropical forest dwellers with crepuscular habits, therefore rarely collected with very few representatives in entomological collections. With insufficient spatial distribution data, a reference study (CASAGRANDE, 2002) states the need for collecting expedition in forested areas in order to enhance this knowledge gap - our record is possibly the first for its locality. There are two Narope species (*N. cyllarus* and *N. guilhermei*) on the Santa Catarina state list of endangered fauna and one (*N. guilhermei*) listed on the National Action Plan for the Conservation of Lepidoptera Endangered Species. The latter has its geographical distribution on two specific localities on the Santa Catarina and Rio Grande do Sul states, none in Protected Ares.

- Taygetis acuta

According to a species immature stage study (FREITAS AVL, 2017), they are endemic to the Atlantic Forest, ranging from Santa Catarina state to Espirito Santo. They are locally rare, crepuscular and usually found in montane coastal forests in well preserved areas.

c). Entomological collection expansion

The grant allowed us not only to collect new specimens and species for the the Mítia Heusi Silveira Entomological Collection (Santa Catarina State University), but also to enhance and expand it physically through the purchase of a high quality standard entomological cabinet. And because we will build up a team to work on the new species mounting and curation, we have gain notoriety and have been forwarded a long-term butterfly collection previously cared by a university professor which will enrich our regional reference collection. We are very excited to star working on the organization of the specimens, drawers and database to make sure it is ready and available for future research and reference studies.

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

Our project ran smoothly overall. We could plan ahead and select relevant sites with safe access to the surveyed areas, thanks to our partnership with FLORAM. Also, we were lucky to count on more participants during fieldwork than initially planned, since the project arose interest on the directly involved community.

At first, we set a different timescale for the butterfly sampling, starting in October 2023 and ending in February 2024. However, as we had unexpected issues with the first indicated organisation to receive the grant, our funding was released in February 2023 and our time was running out for the optimum butterfly season. For this reason, we had to adapt our plans and start the first campaign with a borrowed car and material. All went well, and with initial 24 borrowed butterfly traps we started our first campaign on the 22nd of January and by the end of February we were finishing our second campaign, making it possible to meet our five campaigns goal by the end of May. In order to achieve this, the team had to work almost continuously throughout the fifteen weeks, from Monday to Saturday!

Another challenge we faced in the beginning was that eight out of the fifty entomological traps newly purchased with the grant presented a fault on the lace handle used to attach them to the trees. It was ripping apart, so at first, we had to sew and adapt a new solution in the field, in order to carry on the collecting as planned. Then we contacted the company responsible for the sales and arranged the exchange for new ones. They promptly replied, very interested in our feedback regarding the material and trying to understand what has caused it to rip. They not only exchanged our traps for new ones, but also sent extra five and these had a new type of reinforced lace made with a stronger material.

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

This project had the collaboration of a team of twenty participants, including researches, undergraduate students, technicians from FLORAM and general public.

Before we started fieldwork, we put an advert on the University's main website calling Biological Sciences Undergraduate students to take part either voluntarily for a day or more, or to commit as a paid field assistant. We had 42 subscriptions in total, from which four paid assistants were selected and seven were volunteers. It was a valuable opportunity for them to experience field ecology and conservation, exchange information, practice research methods and learn more about the butterflies' life cycle and ecological indicators' role in nature. Also, many were excited to know it is possible to receive grants from international institutions when the time comes for them to write their own postgraduation projects.

From March 2025, some of the project's undergraduate participants and volunteers at the Terrestrial Animals Ecology Lab will take part of a team that will start curating and mounting the collected specimens. Additionally, the lab has just received butterfly specimens from a former University's professor which we will be working to amalgamate to our collections to the highest standards.

Researchers from the Environmental State Institute (IMA) and the Chico Mendes Biodiversity Conservation Federal Institute (ICMBio) accompany some of our fieldwork as well, and this was a great opportunity to exchange knowledge and build future partnerships. Our sampling design followed the ICMBio's fruit-feeding butterflies biodiversity monitoring criteria, and they were very excited to know we were applying it on municipal Protected Areas. Our work has inspired them to start a new butterfly sampling project on a site never surveyed for this group before, at a Federal P.A. called Carijós' Ecological Station on the Santa Catarina Island.

One of our paid field assistants started her undergraduate project using the same methodology at an Urban Park in the centre of the island, under our supervision. Our project helped her to choose her study theme and learn the methodology so that it could be applied at a different site. Her project will evaluate the fruit-feeding butterflies' seasonal diversity and importance of urban parks. Her monthly sampling will complete a year in March (2025) and is happening at the Córrego Grande Municipal Park, where we hold the Environmental and Conservation Education Project on insect diversity. As a result, we will help her create a poster that will be donated to the park, with information regarding the fruit-feeding butterfly species found in the area and their hostplants.

We also collected *Caligo beltrao* specimens and donated to the above-mentioned insect diversity project, led by our lab coordinator. The butterflies were kept at the Córrego Grande Municipal Park's butterfly house and Insectarium, where they were cared for and reared. Eggs, caterpillars and adults were displayed for visitors from general public and local schools and were later released in their natural habitats.

At last, two institutions ran by local communities and housed nearby the Protected Areas we surveyed gave us support by allowing us to park our car and use their facilities during fieldwork. They are the Çarakura Institute (Instagram: @instituto_carakura) and the Sítio Vale Encantado (@sitiovaleencantado). Both receive visitors and students, working with environmental education and related themes. So, in exchange for their kind support and the wonderful work they develop, we will be preparing a didatic material showcasing the butterflies recorded around their areas, their ecology, conservation relevance and related foodplants, so it can be used for local educational activities.

5. Are there any plans to continue this work?

As this is a PhD project, we divide it in four main phases:

- 1) fruit-feeding butterflies' sampling;
- 2) environmental and geographical variables collecting;
- 3) species mounting for collection organisation, data analysis and publication writing;
- 4) results publicity, knowledge dissemination, educational material production (illustrated fruit-feeding local distribution guides).

At present we are finishing the second phase and soon will have the butterflies' final alfa and beta diversity analysis ready, being able to identify possible isolation among communities. We are half way through collecting environmental data that, together with geographical variables, will help identify factors that influence on the communities' composition and diversity. Then, we will identify vulnerable species, aiming to contribute with species conservation and environmental management policies. For the next one year and a half we will be writing reports and submitting the three planned papers for publication, giving publicity to the results in different ways and for different kinds of public.

We would love to continue this work and can foresee opportunities such as setting an ongoing monitoring scheme, to build a more robust database involving general public, environmental and educational institutions. This could be an integrated plan among the islands' P.As and could count on Citizen Science as well, in partnership with environmental authorities. We also plan to build a new butterfly house where we can receive visitors and rear local species, with focus on raising awareness amongst and involving visitors on environmental education and nature conservation topics.

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

Our results will be first shared through three scientific publications on peer-viewed journals and the elaboration of the "Santa Catarina Island's fruit-feeding butterflies guide", which will be published in partnership with FLORAM, showing their occurrence on the local P.As surveyed.

We have been sharing ongoing posts on both the lab's and the project's social media accounts. We aim to share results also via conference attendance and events participation, possibly presenting posters and short talks.

Lastly, we can organize meetings with the public and private institutions involved in order to return the results to the society, preparing a customized PowerPoint presentation to make sure every public is directed to in a correct manner.

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

The Atlantic Forest is among the world's five hotspots' priorities for conservation, housing an expressive number of endemic species. It is well known that habitat protection is the first step for species conservation. Therefore, once our results are consolidated and ready to be shared, it is essential to work in collaboration with the Protected Areas' management team so that they can apply our results when evaluating connectivity between habitat patches, creating or retaining buffer zones or validating priority areas for conservation. We can also elaborate future monitoring actions as an evaluation follow-up.

Moreover, it is important to further on the occurrence of the identified species of conservation interest and work on other ten species that need id confirmation. They can possibly indicate areas that need improving habitat condition or connectivity or enhancing species conservation status and information.

Apart from that, sharing knowledge and working with the local communities is the key for the above-mentioned actions. Since the Santa Catarina Island has a strong touristic appeal, it is equally important to work on environmental education communication so that visitors to the P.As get to know the importance of conservation actions and contribute towards them.

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 logo was used in all reports and presentations exposed to the University and to FLORAM. All members of the team, local community and volunteers that contributed to the project received an onboarding short training were the Foundation was mentioned as project sponsor. All project material posted on the University's website and lab social media received either a reference to the Foundation or the logo. Mirella also shared the Rufford Foundation's project webpage on her professional social media profile. All graphic material that will still be produced, such as the butterfly guide and the posters donated to the local community institution will have the Foundation's logo, such as all scientific publications that will result from the PhD thesis will mention The Rufford Small Grant and Foundation in the Acknowledgement session.

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

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	Carol Neves Ananias	Paia fiela assistant
2	Felipe Medina Vianna	Paid field assistant
3	Luana Boeno dos Santos da Silva	Paid field assistant
4	Liridiane Batista Pillar	Paid field assistant
5	André Luis Klein	Volunteer researcher
6	Idelmara de Alencar Tinoco	Volunteer researcher

7	Larissa Nascimento	Volunteer researcher
8	Santos Gonçalves Magagnin	Biology undergraduate volunteer
9	Sofia Gabriel Marafon Bacca	Biology undergraduate volunteer
10	Clara Flor Nogueira	Biology undergraduate volunteer
11	Lara Gomes Ghizoni	Biology undergraduate volunteer
12	Amanda Leal Freitas	Biology undergraduate volunteer
13	Camila Borges	Biology undergraduate volunteer
14	Matheus Guizi	Biology undergraduate volunteer
15	Leonardo de Oliveira	General public
16	Malva Isabel Medina Hernández	Project Supervisor
17	Ronaldo Bastos Francini	Project Co-supervisor
18	Mariana Coutinho Hennemann	Head of the Protected Areas'
		Department (FLORAM)
19	Cid Neto	Technician at the Protected
		Areas' Department (FLORAM)
20	Henrique	Trainee technician (FLORAM)

10. Any other comments?

The evaluation methods selected for monitoring the project's success are based on the PRISM methodology and will be applied once we have completed data analysis, writing and results' sharing. Representants from each of the different backgrounds involved in the project (University, public sector, local communities, general public, project's team and researchers) will be invited to participate and contribute with answers to tools such as Knowledge Gaps Scorecard and Key Informant Interviews.

On behalf of all the team I would like to highlight the dimension of the importance of receiving this grant. Fieldwork, study and the enlargement of our butterfly collection was only possible thanks to your support. We honour the confidence you have in our work and hope to be able to count with The Rufford Foundation for future projects! As a PhD researcher I feel grateful for having the chance to receive this grant. It made it possible for me to start a new research line with fruit-feeding butterflies that has not been developed with this magnitude before at the Santa Catarina Federal University. It meant a lot, regarding credibility, to have such an international institution backing up our project! And thanks to this I now can see the opportunity of not only continuing but expanding in this research field and, hopefully, being a regional reference.