

Final Evaluation Report

Your Details	
Full Name	Sheema Abdul Aziz
Project Title	Project Pteropus Phase 2: Understanding Bat-Plant Interactions to Protect Ecosystems in Peninsular Malaysia
Application ID	29639-B
Grant Amount	£9940
Email Address	sheema@rimbaresearch.org
Date of this Report	15 November 2021

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
<p>To help protect & manage critical refugia for flying foxes (<i>Pteropus</i> spp.) in Peninsular Malaysia</p>				<p>While we were able to visit 5 roost sites in 2020, due to the ongoing COVID-19 situation and the various interstate travel restrictions we were not able to carry out any further roost surveys in 2021. Due to the political Emergency imposed on the country, and Parliament being suspended, all legislative processes and meetings were postponed until further notice, so efforts to gazette the Rhu Island refugia as a State Park were not able to proceed as planned. However, we were still able to actively lobby for this online and through the phone, and we submitted an official proposal via email in July 2020 after which follow-up communication was maintained over email and phone. Now all these obstacles are over, the Terengganu State Parks Management Council has been able to reconvene. The Terengganu State Parks Department, Terengganu Department of Wildlife and National Parks, Marine Parks Department, Terengganu Forestry Department and other relevant government authorities welcomed this initiative and were extremely supportive of our proposal; as such there is now an agreement to pursue gazettment of Rhu Island as a Forest Reserve, a State Park, and possibly also a Marine Park. The official paperwork is now being prepared. Due to misleading media reports about COVID-19 that created negative public perceptions against bats, the local Department of Health in Terengganu</p>

			<p>advised all government departments to avoid visiting bat roost sites, even for bat species that have absolutely no link to the SARS-CoV-2 virus. Thus, we have not been able to organise proper site visits for state authorities to view the actual roost (although 1 boat visit to the surrounding waters was allowed in 2020). This misperception about bats and COVID-19 has seriously damaged our conservation efforts for flying foxes, and without wider support from the conservation and research community it will be exceedingly challenging to recover from such a serious blow. As the east coast is now experiencing the monsoon season, we can only continue to pursue this objective remotely before the end of the year and in person for the first 6 months of next year.</p>
<p>To conduct research on & highlight the critical pollination services provided by fruit bats to the durian industry</p>			<p>We were first able to successfully conduct 4 pilot tests at 4 farms across 4 states during January-March 2020. However, our activities were then completely disrupted and put on hold due to COVID-19, the subsequent national lockdown during March-June 2020, and interstate travel restrictions thereafter for the rest of the year. We were then able to successfully deploy 75 camera traps across 9 durian farms in 6 states during April-May 2021 for a more comprehensive study in conjunction with an MSc project, although this was also slightly compromised by another national lockdown and travel restrictions during May-September 2021. We were also able to conduct a pollination exclusion experiment at one durian farm. The data has been successfully retrieved and analysed by our MSc student, who is now in the process of writing this up for thesis submission in December. So far the statistical analyses</p>

			<p>confirm that fruit bats are necessary for durian fruit production, but further data collection and analyses are needed for next year before the research can be published.</p>
<p>3. To improve perceptions of fruit bats and the standard of information available to facilitate fruit bat conservation</p>			<p>We published 1 review paper on bats in Asia-Pacific cultures (https://doi.org/10.2993/0278-0771-41.1.18), and 1 review paper on bat-plant interactions spanning 36 years (https://doi.org/10.3389/fevo.2021.641411). We successfully collected data on durian farmers through face-to-face interviews during June 2020 to April 2021, but the subsequent spike in COVID-19 cases, the prolonged national lockdown, and interstate travel restrictions prevented us from continuing this into May 2021 as planned. However, this data collection will be completed this week, after which the results will be analysed and written up for publication. So far data has been collected and outreach conducted involving 42 farmers across 10 states in Peninsular Malaysia, and we were also able to conduct a Willingness-To-Pay study in 2021 via an online survey of durian consumers, which yielded 251 usable responses which are now being analysed and written up for publication.</p> <p>In 2020 we distributed outreach materials to 9 tourism operators across Perhentian Besar, Langkawi, and Rhu. We produced 2 information signboards for use on Tioman. We are now sending stakeholders additional outreach materials by post, which will be completed before the end of the month. Although the spike in COVID-19 cases and the subsequent lockdown restrictions prevented us from conducting in-person outreach events as planned, we were still able to pursue this work online, conducting social media campaigns and giveaways held in conjunction with Chinese New Year, Bat Appreciation Day, Eid, Mother's Day, Gawai, Pollinator Week, and Bat Week. This included launching 1 video on durian</p>

			<p>farmer testimonials (https://youtu.be/K3wEnVSF6d4), and 1 video compiling some of our camera-trap footage of bats pollinating durian flowers (https://youtu.be/TZIXIDepiio). Our project was also covered in a news report by CGTN, alongside one of our durian farmers partners (https://bit.ly/3nfpknx). We also launched a successful online fundraiser in conjunction with International Bat Night (https://fruitbatfundraiser.com/), which has provided us with further funds to cover fieldwork costs in 2022. This was given coverage in an interview with local radio station BFM 89.9 (https://www.bfm.my/podcast/the-bigger-picture/earth-matters/bats-for-malaysia).</p> <p>Finally, in response to the media-generated public backlash against bats due to the pandemic, we produced an FAQ sheet on 'Bats and COVID-19' in English, Malay and Chinese, which we made freely available via our website: (https://rimba.ngo/faq-on-bats-and-covid-19-in-malaysia/).</p>
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2. Please explain any unforeseen difficulties that arose during the project and how these were tackled.

All our activities were severely impacted by the COVID-19 situation in a very negative way. The implementation of all our research was affected by restrictions on travel, events, and face-to-face contact, and also the extremely rainy weather due to the La Niña effect, which affected durian flowering and fruiting. We could not conduct fieldwork during the March-June 2020 and May-October 2021 periods. As such, the data is not as robust or meaningful as we had hoped, and we plan to conduct one final round of data collection for our durian pollination research during January-June 2022. This will then also allow us to complete our final few field surveys to assess and quantify flying fox colonies and assist in developing steps to properly protect and manage refugia. Several of the individuals and organisations that were initially supposed to collaborate with us either did not provide us with official agreements or permission to proceed or failed to provide us with the right expertise and contributions necessary for our research. We were able to overcome this by scaling down on our research scope and collaborating with other partners instead.

Our outreach efforts were badly affected by the negative public backlash against bats caused by misleading media reports that sensationalised and misrepresented premature speculations about the tenuous, unproven link between bats and COVID-

19. We did not receive sufficient support from the conservation or research communities to overcome this major obstacle – i.e., rapid, authoritative and widespread public debunking of myths/misperceptions, and public dissemination of accurate information to overturn fake news about bats, did not happen at the right timing, rate or scale that was necessary, and there was insufficient amplification of the information, messages and content that our project produced for this purpose. Sufficient funding to do so was also scarce and hard to come by. As such, many damaging misperceptions about bats still persist currently. However, we were still able to overcome this to a certain extent by creating new materials and disseminating this as digital information online, via email, our website, and social media. We were also able to give online presentations via 2 webinars, and support 1 durian farmer in giving their own online presentation. Our efforts to promote positive images and perceptions of bats was well-received by members the Malaysian public who use social media, with no negative comments or backlash received. We were also able to work through a collaboration to produce a children's book on flying foxes, with an accompanying plushie set and activity kit (<https://fruitbatfundraiser.com/product/my-midnight-flora-bundle-shop/>), which we are still in the process of distributing to relevant stakeholders.

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

- Data, training and capacity-building provided for 1 MSc student, who now is sufficiently equipped to submit a thesis in December to fulfil university degree requirements.
- Maintenance of a flying fox colony in 1 island refugia, which is now in the process of being legally protected and managed.
- Providing new knowledge of pollination, seed dispersal, and ecotourism importance of fruit bats to durian farmers, tourism operators, government authorities, and the general Malaysian public.

4. What do you consider to be the most significant achievement of this work?

All our work and activities are done in full partnership with stakeholders (e.g., durian farmers, tourism operators, government authorities) who are all fully local, and we ourselves are local to Malaysia. Thus, this contributes towards enhancing local livelihoods and meeting local conservation priorities. Our stakeholders and partners have received our outreach materials and content for free, and they are now able to display physical copies at their business establishments for customers to see, while sharing digital copies via their social media networks for customers and professional contacts. Tourism operators (many who are native to the islands) are now able to highlight resident flying fox colonies as an attraction to tourists, and local durian farmers are now able to promote fruit bat conservation as an important component of their industry's sustainability.

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

Yes, we will continue this work for an additional 6 months at the start of 2022, but we no longer have long-term funding to cover our operational costs such as salaries and office rental, and as such we will close down after that.

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

Our research will be published in international scientific journals, which we hope to make open access if we can afford to. We will also distribute more outreach materials, including making digital copies available online for free download on our website (<https://rimba.ngo/fruit-bat-outreach-materials/>). Lastly, we will also conduct presentations (either online or in person) for any stakeholders that request these.

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

This grant was supposed to terminate at the end of February 2021 but was extended another 8 months to October 2021.

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
Tree climbing fees	900	795	105	Slight reduction in fieldwork activities due to lockdown restrictions on travel
Lodging & food	1200	896	304	
Travel costs	1540	1479	61	
Reconyx camera traps	6300	5480	820	Additional camera traps were lent by The Datai resort on Langkawi Island
Crowdfunding webpage design, development and maintenance		1047	+1047	Surplus funds repurposed towards fundraising for additional work in 2022
TOTAL	9940	9747	243	Majority of grant still spent within required time period. Historical local exchange rate 1 MYR (Malaysian Ringgit RM) = 0.18 GBP (Pounds Sterling £) when the money was transferred to Rimba on 20 Feb 2020.

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

i) Follow through on the gazettement process of Rhu Island to ensure that the colony is reliably quantified, the entire island is holistically protected under the law, and then work with the authorities and local communities to develop a concrete plan for sustainable management.

ii) Complete all research and publish results.

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?

We used The Rufford Foundation logo in the outreach materials that we produced. Some images are included further below in this report, and digital copies can also be viewed and downloaded via our website (<https://rimba.ngo/fruit-bat-outreach-materials/>)

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

Dr. Sheema Abdul Aziz – Principal Investigator, overall project manager and supervisor

Ms. Mary-Ruth Low – Senior Conservation Scientist, lead person for socio-economic research

Ms. Hana Abdul Aziz – Communications Manager, lead person for outreach and sci-comm

Mr. Yong Joon Yee – MSc student (Research Associate), lead person for durian pollination ecology research

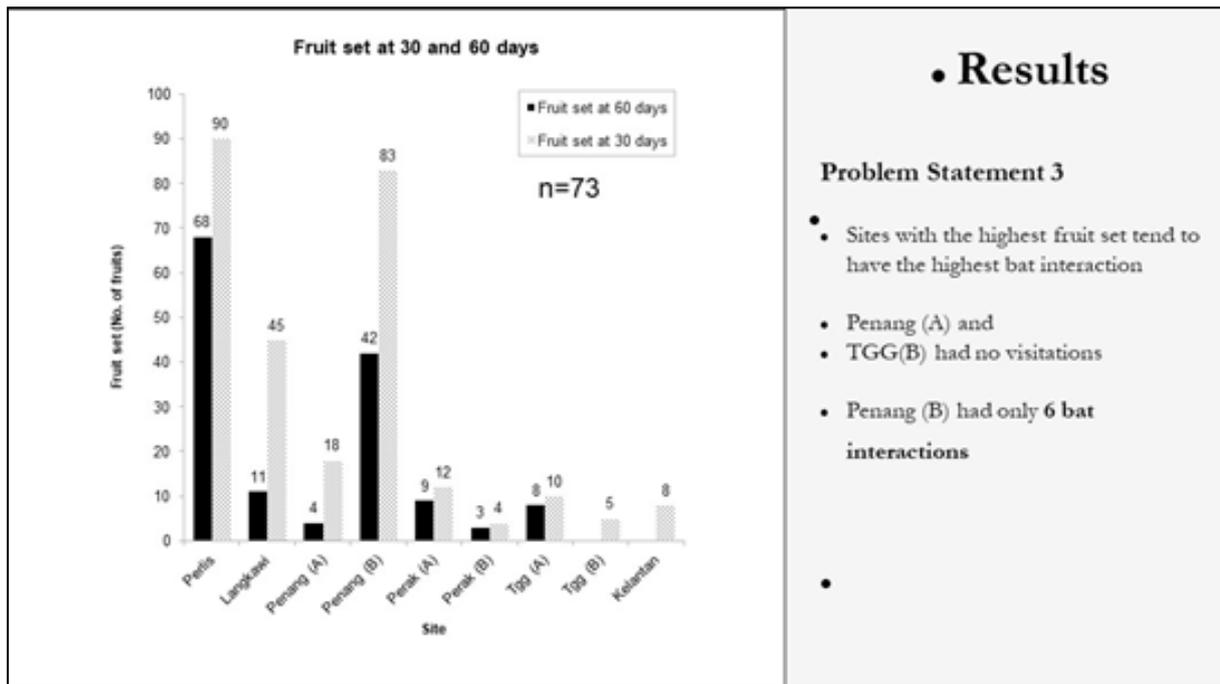
12. Any other comments?

Some relevant images are included further below.



Above: Printed metal signboard produced for Tioman Island. Below: Printed metal signboard at Mersing jetty for delivery to Tioman Island.





• Results

Problem Statement 3

- Sites with the highest fruit set tend to have the highest bat interaction
- Penang (A) and TGG(B) had no visitations
- Penang (B) had only 6 bat interactions

Results of camera-trap detections and durian fruit set quantification.

• Results

• Problem Statement 3

- Bat duration was the variable predicted by the model to most likely affect fruit set at 60 days
- Caution when interpreting these results

Model	k	LL	AIC _c	dAIC _c	wAIC _c	R ² _m
m1. F60 ~ BatDuration + (1 Farm) + (1 Tree.random.factor)	3	-168.98	347.08	0.00	0.35	0.02
m2. F60 ~ BatDuration + BatInteraction + (1 Farm) + (1 Tree.random.factor)	4	-167.95	347.62	0.54	0.27	0.02
m3. F60 ~ (1 Farm) + (1 Tree.random.factor)	2	-170.69	348.03	0.95	0.22	0.02

Term abbreviations are defined as follows: k = number of parameters, LL = maximum log-likelihood, dAIC_c = difference in AIC_c for each model from the most parsimonious model, wAIC_c = AIC_c weight, and R²_m = marginal R² according to Nakagawa & Schielzeth, 2013.

Preliminary results of regression analysis on factors affecting durian fruit set.

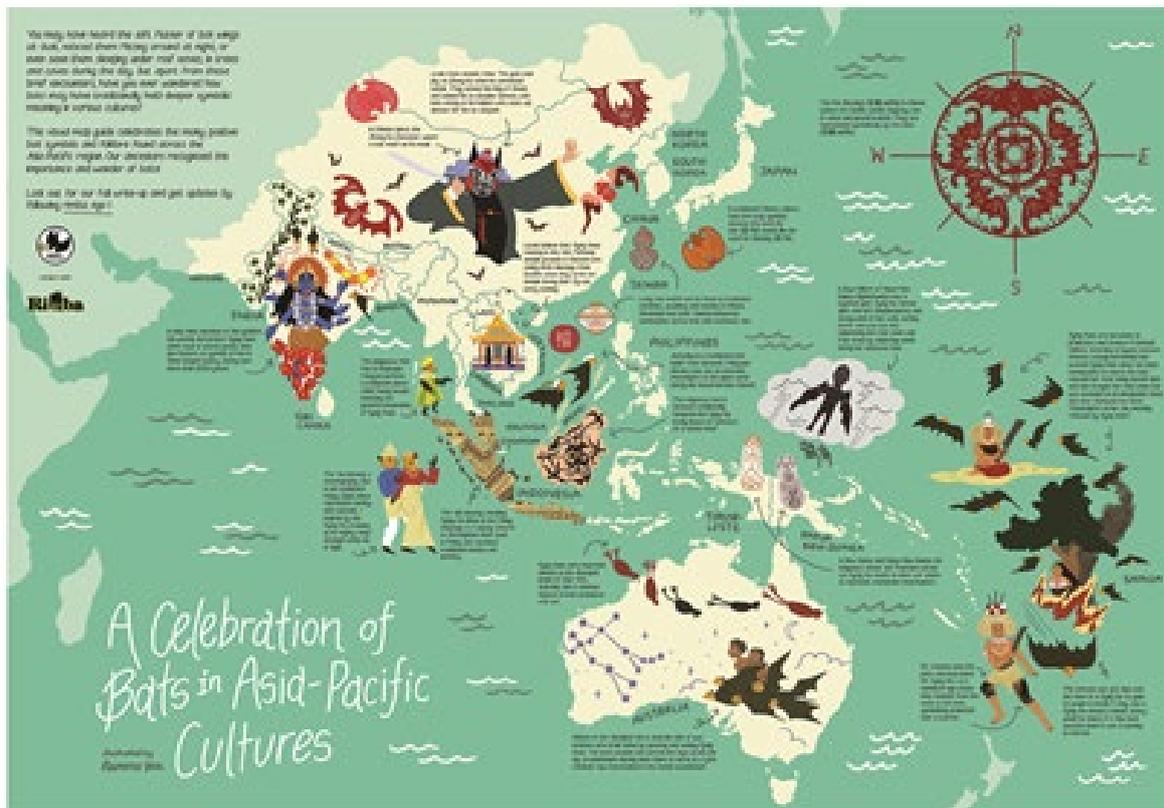
Results

Hydrogen Peroxide Test					
Cultivar and Location					
Time	Lan Cia Yuan, Penang	Ganja, Penang	Unknown, Perak	Unknown, TGG	Durian Kg, Perlis
13:00 hrs	++	++	++	++	++
15:00 hrs	++	++	++	++	++
17:00 hrs	++	++	++	++	+++
19:00 hrs	+++	+++	+++	+++	+++

Anthesis					
Cultivar and Location					
Time	Lan Cia Yuan, Penang	Ganja, Penang	Unknown, Perak	Unknown, TGG	Durian Kg, Perlis
13:00 hrs	Tightly shut				
15:00 hrs	Begins to open				
17:00 hrs	About to bloom	About to bloom	About to bloom	About to bloom	All flowers fully bloomed
19:00 hrs	All flowers fully bloomed				

Cultivar and Location	Time of Anther Dehiscence
Lan Cia Yuan, Penang	19:30 hrs
Ganja, Penang	19:35 hrs
Unknown, Perak	19:30 hrs
Unknown, TGG	19:30 hrs
Durian Kg, Perlis	19:30 hrs

Results of data collection on durian floral biology.



Poster map produced for outreach based on our preliminary research.



Above: Updated poster map accompaniment for our full scientific publication (no space for logos but donors listed in text along right border). Below: Durian Pollination infographic.



Pollinating Bats of Peninsular Malaysia

• and their food plants •

Durian
Durio zibethinus

Large Flying Fox
Pteropus vampyrus

Common Rousette
Rousettus amplexicaudatus

Hill Long-nosed Nectar Bat
Macroglossus minimus

Island Flying Fox
Pteropus hypomelanus

Hill Long-tongued Nectar Bat
Macroglossus sobrinus

Cave Nectar Bat
Eonycteris spelaea

Crabapple Mangrove
Sonneratia caseolaris

Cluster Fig
Ficus racemosa

Wild Banana
Musa acuminata

Kapok
Ceiba pentandra

Petal
Parkia speciosa

Did you know the Pteropodidae family of bats are vegetarian? They feed on plants, so they're known as fruit bats - but in fact they eat fruits, nectar, flowers, leaves, tree bark and even tree sap. They don't echolocate the way insectivorous bats do - they have large eyes and a strong sense of smell, which they use to find their food.

Some bat species in this family are important pollinators. When they feed on nectar from flowers, they help transfer pollen from one tree to another - and this helps the trees to produce fruits! When the bats feed on fruits, they carry and drop seeds far away, which helps to plant more trees (especially figs!).

Let's get to know Peninsular Malaysia's pollinating and seed-dispersing bats - our winged night-time gardeners!



'Pollinating Bats of Peninsular Malaysia' poster.