Final Evaluation Report

Your Details	
Full Name	Ravinder Kaur
Project Title	The conservation of endangered hornbills in Malaysia
Application ID	42851-D
Date of this Report	30/06/25

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
Set up one artificial nest boxes in Peninsula Malaysia			/	We managed to set up one artificial nest in Janda Baik, Peninsula Malaysia with the Sabah team. We were surprised to see the targeted species visiting the box. Though they haven't used it, it is a positive sign. Photos below. The artificial nest box was monitored with camera traps for 3 months. We use drones but this is mainly to estimate height of tree, to check for hornets and briefly inspect the cavity. It's a wide angle lens, so its hard to really see the cavity closely. One must climb to inspect.
Engage local nest guardians to restore natural cavities of endangered hornbills			/	We have restored three natural cavities in the forest. These were monitored with camera traps for 3-6 months. Usually our restoration works are sufficient (because they are steps taken prescribed by Thailand hornbill project – 40 years of field experience) but we learnt that there are many species interested in the same cavity and this shows competition and the need for more nesting spaces. Too many visits can also mean they chase each other species off and no one ends up using it. So far the hornbills are only investigating the cavities. Out of the eight species found in Kinabatangan, the six species (as shown in the photos at the end of the report); Rhinoceros, White-crown, Wrinkled, Black and Oriental Pied, Bushy. This is quite fascinating because the two species never seen visiting are

				those that are rare (Wreathed hornbill – found mainly in mountain regions and critically endangered Helmeted hornbill that are usually found in better habitats rather than the degraded Kinabatangan forest)
Investigating the diet of hornbills through shotgun metagenomics			/	We have generated a list of food plants from our metagenomics analysis. We analysed 8 faecal samples of three species; Rhinoceros, Oriental Pied and Helmeted hornbill. We continue to pass nursery-grown plants to restoration NGOs and are also collecting "weeds" from the oil palm plantations – they are strangling fig plants that provide food for wildlife. If left growing on the oil palm tree, they strangle it to death.

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

a). A new artificial nest is set up in Janda Baik for the Great hornbills (vulnerable on IUCN red list) and was actually visited by the target species the very next day.

b). Three new tree cavities restored and hornbills are showing interest such as the Rhinoceros hornbill (vulnerable on IUCN red list)

c). The metagenomics work went well and revealed the diet of the hornbills. Here are the most accurate matches via metagenomics for critically endangered Helmeted hornbill. We have attached more details at the end of this report.

CRITICALLY ENDANGERED HELMETED HORNBILL
Plant Diet
Ficus altissima
Ficus tikuoa
Ficus microcarpa
Ficus carica
Ficus benjamina
Ficus pubilimba
Ficus sp. soltis
Morus notabilis

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

We had a longer rainy season in November 2024 until April 2025. It resulted in the flooding of the field area. This made things challenging, as the access was cut and the local community, we were working with had to endure floods. They also had trouble obtaining clean water. Field work resumed after the flooding subsided.

Metagenomics, though useful revealed a weakness. The gene bank needs to be improved, and this would mean we need to engage a botanist and take botanical samples to improve the gene bank. As it is now, the computer is struggling to find matches because of a poorly built gene bank on Malaysian fig species. It is an important next step, seeing that this is a keystone species and more effort needs to be carried out to build the gene bank on this plant species.

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

We employ three local people, Helson, Raihan and Firdaus as our full time staff. They are given a salary and also given training such as tree climbing. This useful skill is something they can use to work for hotels or resorts (tree pruning) besides conservation work. They are also taken from their village to experience other places and open up their minds. They were taken to Peninsula Malaysia to set up the nest box and this also boosts their self esteem, by leaving their remote village. It gives them confirmation of how important their roles are in hornbill conservation. At first, they are confused and hesitant about collecting fecal samples (makes them doubt us!) but gradually through exposure, they understand the importance of the work they do, and the birds.

5. Are there any plans to continue this work?

Yes, we will continue this work because we have a committed team that is passionate and keen to work with hornbills. Soo Teik Yuan is in the middle of his PhD, second year and will require funding to continue collecting and analysing data with our team. With continued funding from Rufford, we can continue to provide him with the field support, the field guides to walk with him in the forest, accommodation in the village and the boats to get to the locations. It is a costly initiative but an important one. At the end, we will have a graduate with a PhD in hornbill ecology in Malaysia, the second one after Ravinder.

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

We share our work on social media via Xploregaia on insta and facebook. The plant list generated have been provided to reforestation teams such as HUTAN NGO and APE Malaysia.

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

It is important to keep creating nesting opportunities for hornbills and even other cavity nesting animals. We also would like to test another design of the nest box, because not all species are attracted to it, such as the Wrinkled hornbills. It would be good to go back to the drawing board with new partners (e.g. engineers) to try can develop another prototype. To better our understanding of artificial nests, we are relying on Soo Teik Yuan to run an experiment, to find out what are the cavity preferences among

the eight species of hornbills in Borneo. We also need to continue the metagenomics work, as we discover new nest sites.

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, we used the logo in all our presentation slides.

9. Provide a full list of all the members of your team and their role in the project.
Helson Hassan – Field assistant
Ravinder Kaur – Hornbill expert
Sanjitpaal Singh - Photographer
Soo Teik Yuan – 1st year PhD student

10. Any other comments?

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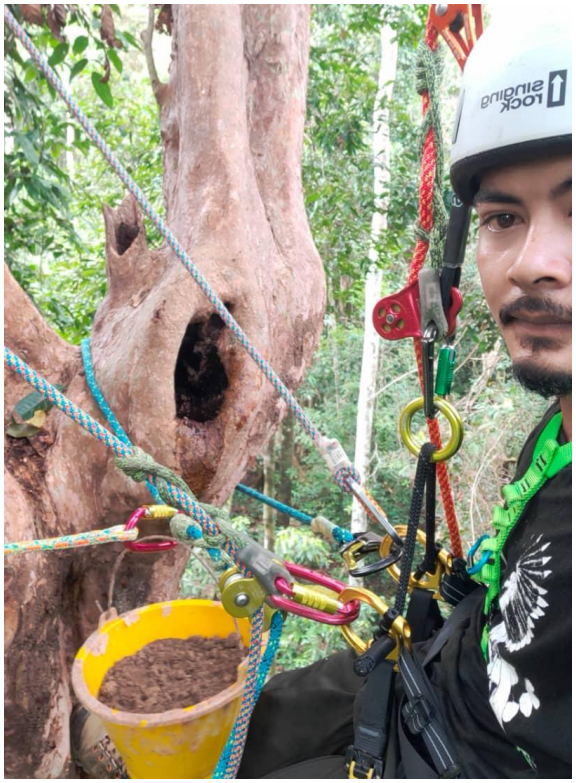
ANNEX – Financial Report

[Intentionally deleted]

SUPPORTING DOCUMENTS

Local community member Helson Hassan working on tree restoration works. This cavity needed soil added to increase the height of the floor and a perch added for ease of perching.



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Date: 22/08/2024

Site: Tandu batu area

Cavity 01 restored and monitored using camera traps

Pictures:


29.71 inHg
27C
07/02/2024 11:22AM CAMERA8

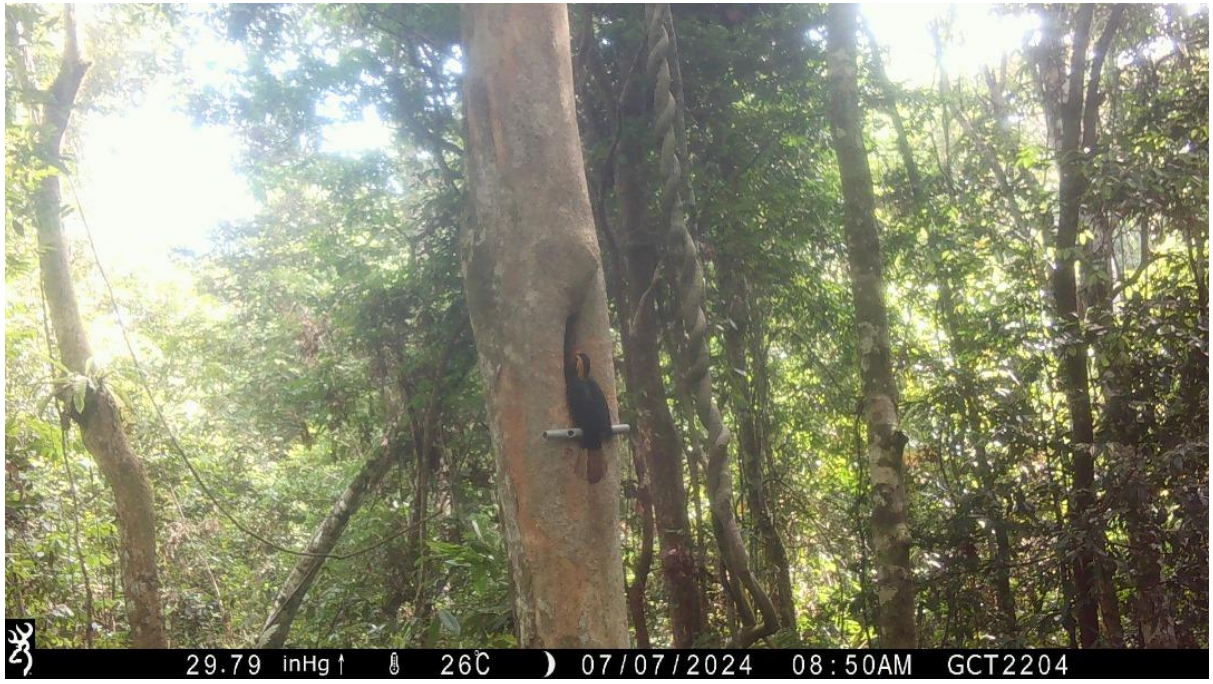

29.70 inHg - 31℃ 06/10/2024 05:03PM CAMERA8

Images in order; IUCN red list vulnerable Black hornbill, vulnerable Rhinoceros hornbill, least concern Oriental Pied hornbill and endangered Wrinkled hornbill interested in the restored cavity.

Site: Tandu batu area – cavity 2 restored and monitored using camera traps

Pictures:


29.80 inHg - 32C 06/05/2024 12:37PM GCT2204



Images in order; IUCN red list near threatened Bushy crested hornbill, endangered White crowned hornbill, and endangered Wrinkled hornbill interested in the restored cavity.

Site: Danau cavity restoration (Cavity 3)

Pictures:

The picture shows something blocking the entrance.

The picture after we restored the inside.

The addition of a perch to encourage hornbills to perch comfortably and use it.

Artificial nest box set up in Janda Baik, Pahang

The nest box was visited by the target species the very next day of installation! Though it was not used yet, this is an encouraging sign, especially the courtship behaviour presented next to the box.

Details on metagenomics

Some of the results from shotgun metagenomics with graphs will be illustrated below. 8 samples have been sequenced (fecal samples from Helmeted hornbills from Terengganu [HHBT1&2], Oriental Pied hornbills from Langkawi [OPHBL1&2] and Taiping [OPHBT1&2], and Rhinoceros hornbills from Taiping [RHBT1&2]).

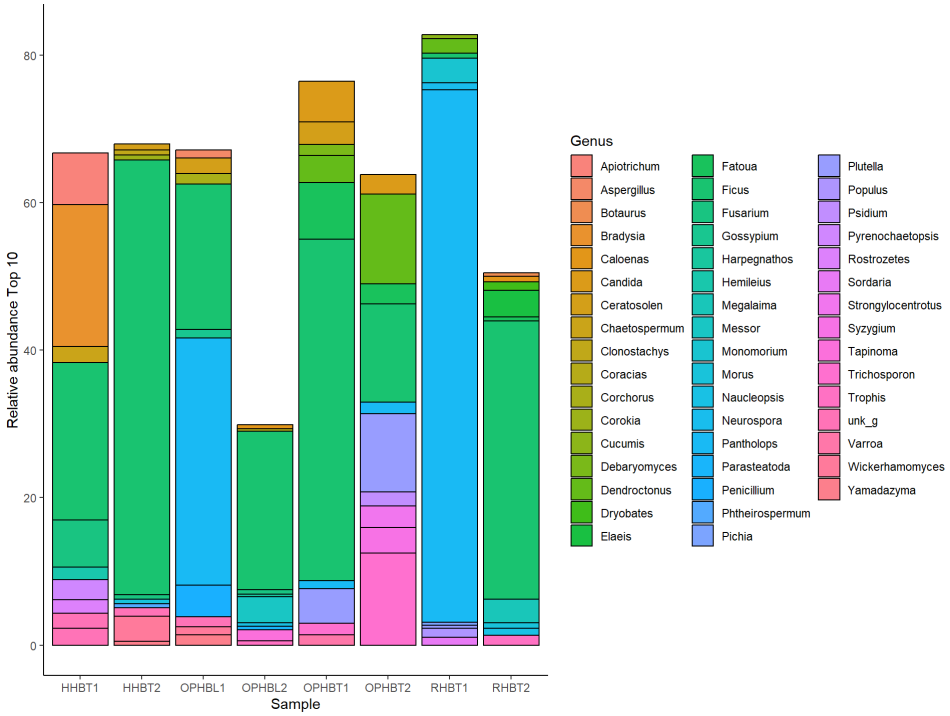


Figure 1. Relative abundance of diet-related gut composition at genus level. Genus Ficus has been found to be the most abundant for most samples.

Table 1. All Ficus species found in samples using shotgun metagenomics sequencing.

No	Species	Total Samples	Present in Species Oriental Pied (OPHB), Helmeted hornbill (HHB) and Rhinoceros Hornbill (RHB)
1	Ficus tikoua	8	OPHBL1, OPHBL2, OPHBT1, OPHBT2, RHBT1, RHBT2, HHBT1, HHBT2
2	Ficus sp. Soltis s.n.	5	OPHBL1, OPHBL2, RHBT2, HHBT1, HHBT2
3	Ficus cucurbitina	4	OPHBL1, OPHBL2, HHBT1, HHBT2
4	Ficus deltoidea	4	OPHBL1, OPHBT1, RHBT2, HHBT2
5	Ficus asperula	4	OPHBT1, OPHBT2, RHBT1, RHBT2
6	Ficus benjamina	3	OPHBL1, RHBT2, HHBT2
7	Ficus curtipes	3	OPHBL1, RHBT2, HHBT2
8	Ficus religiosa	3	OPHBL1, RHBT2, HHBT2
9	Ficus sp. Moore 315	3	OPHBL1, RHBT2, HHBT2
10	Ficus tinctoria	3	OPHBT1, OPHBT2, RHBT2
11	Ficus altissima	2	OPHBL1, HHBT2
12	Ficus pedunculosa	2	OPHBL1, HHBT2

13	Ficus pubilimba	2	OPHBL1, HHBT2
14	Ficus pumila	2	OPHBL1, HHBT2
15	Ficus binnendijkii	2	OPHBL1, RHBT2
16	Ficus crassiramea	2	OPHBL2, HHBT2
17	Ficus habrophylla	2	OPHBL2, RHBT2
18	Ficus benghalensis	2	RHBT2, HHBT2
19	Ficus macrophylla	2	RHBT2, HHBT2
20	Ficus superba	2	RHBT2, HHBT2
21	Ficus drupacea	1	HHBT1
22	Ficus hirta	1	HHBT2
23	Ficus insipida	1	HHBT2
24	Ficus annulata	1	OPHBL2
25	Ficus elastica	1	OPHBL2
26	Ficus coronata	1	OPHBT1
27	Ficus variegata Blume, 1825	1	RHBT1

28	Ficus aurea	1	RHBT2
29	Ficus calcicola	1	RHBT2
30	Ficus consociata	1	RHBT2
31	Ficus diversiformis	1	RHBT2
32	Ficus kochummeniana	1	RHBT2
33	Ficus prolixa	1	RHBT2
34	Ficus racemosa	1	RHBT2
35	Ficus rumphii	1	RHBT2
36	Ficus virens	1	RHBT2
37	Ficus xylophylla	1	RHBT2