

Final Evaluation Report

Your Details	
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Project Title	Conservation in Underestimated Area: Diversity of Herpetofauna in Bromo Tengger Semeru National Park, East Java, Indonesia
Application ID	36547-1
Date of this Report	2 July 2023

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
Inventory and identification of herpetofauna species				We have identified 47 species, 20 amphibian and 27 reptile species, from 1116 individuals encountered to the comprehensive TNBTS checklist of herpetofauna. We also identified potential endemic, rare, and new records of herpetofauna species.
Documenting major threat to herpetofauna community				In the TNBTS and adjacent buffer zones, we have documented the main threats to the herpetofauna community, including habitat degradation, increased agricultural area, intensive tourism, and forest fires.
Determining an important conservation site based on herpetofauna diversity				Resort Ranu Darungan has the highest species diversity out of the 20 survey sites (four buffer zone and 16 TNBTS sites), but other sites are also significant because they are habitat to endemic and rare species.
To make recommendations while also improving attitudes and awareness toward conservation				Forum group discussions involving numerous stakeholders agreed to improve the herpetofauna conservation through the specimens and genetic collections, as well as long-term monitoring. This is in addition to training for the related parties and raising awareness through educational activities.

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

a) Comprehensive inventory of herpetofauna species for future targeted conservation project

This project fills the gap of knowledge in the herpetofaunal diversity in the underestimated area of Bromo Tengger Semeru National Park. We have listed 47 species, 20 amphibian and 27 reptile species, from 1116 individuals encountered (Fig. 1). We listed the main threats to the overall herpetofauna community, e.g., habitat degradation, increased agricultural area, intensive tourism, and forest fires. We also identified potential endemic, rare, and new record of herpetofauna of conservation importance, i.e., Java forest skink

(*Sphenomorphus sanctus tenggeranus*), pearly tree frog (*Nyctixalus margaritifer*), and Fruhstorfer's mountain snake (*Tetralepis fruhstorferi*). This provides up a wide range of opportunities for future research, including on biodiversity, taxonomy, ecology, and biological conservation.

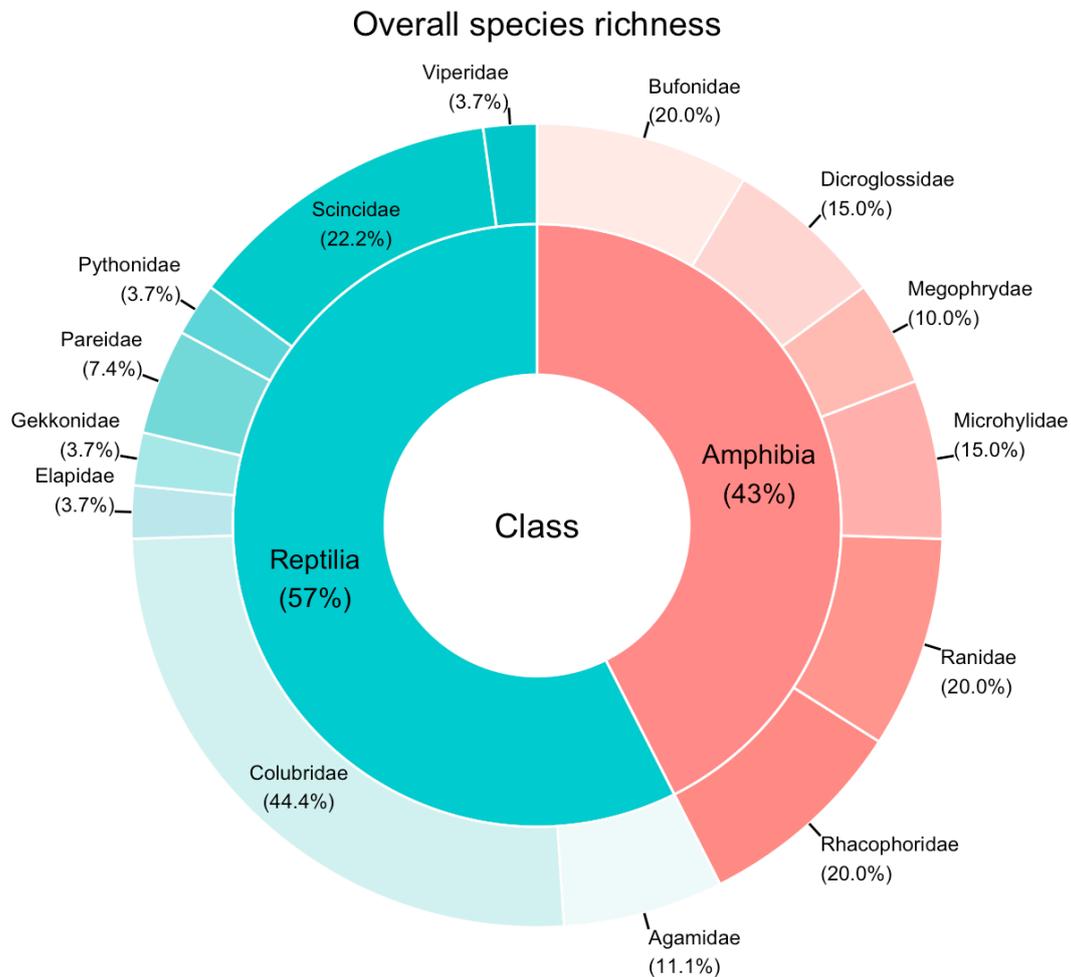


Figure 1. Overall herpetofauna species richness in TNBTS (in percentage)

Some of our findings (rediscovery on Fruhstorfer's mountain snake) have been accepted in Russian Journal of Herpetology, and others are in review (new record on Pearly tree frog), and writing (redescription and conservation status of Fruhstorfer's mountain snake; herpetofaunal diversity of Bromo Tengger Semeru National Park). In addition, the checklist of distributional range of the species is already submitted to the TNBTS's SITROOM biodiversity portal database. As a result, decision-making and knowledge on conservation, hopefully, will be improved.

- b) Stakeholder's capacity to conserve the herpetofauna relatively improved, the understanding and targeted audience for campaign awareness has been identified.**

Selected volunteers, TNBTS staff, and locals may have been better able to conduct surveys as a result of our prior workshop and training, which helped us gather and compile data from the field more rapidly. They voluntarily record and confirm their earlier encounters, some of which involve species that are of conservation importance (discussed above). This demonstrates how our initiatives and educational media (species identification card) could potentially increase people's knowledge of and capacity.

Our questionnaire surveys (23 questions), which were administered to visitors and local residents ($n=84$) in order to acquire an overview of their perception toward herpetofauna conservation, indicated a diverse attitude and perception (Fig. 2). It showed that the locals' understanding has to be strengthened, whereas visitors have a good understanding of herpetofauna conservation (Fig. 3). This reveals information about the understanding that needed to be enhanced, who was the ideal audience for the outreach, the underlying reason, and how it would affect future conservation efforts.



Figure 2. Questionnaire surveys administered to visitor and local residents.

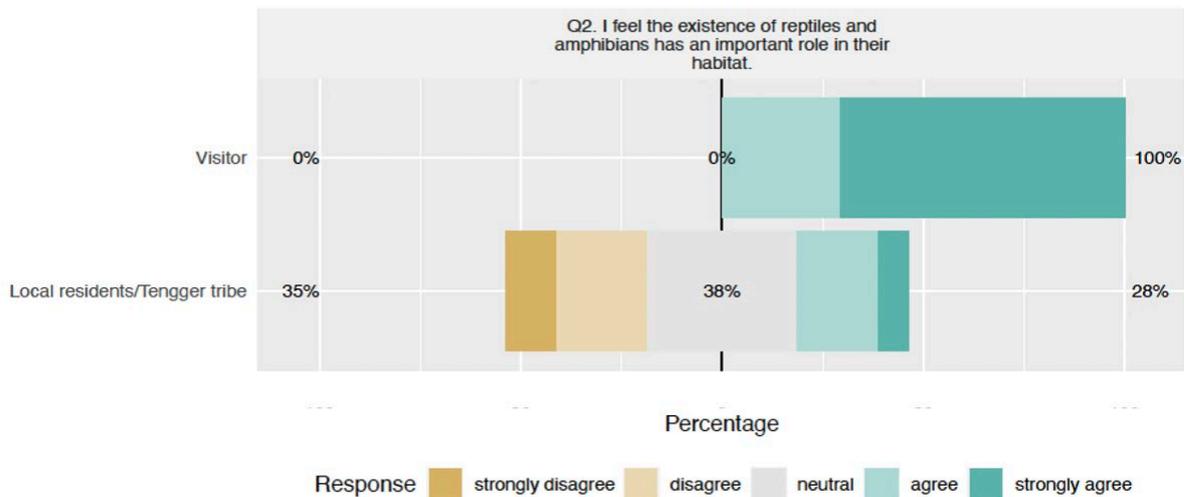


Figure 3. Response (1 out of 23 question) showing the differences attitude between visitor and local resident.

c) Improve herpetofauna protection through long-term monitoring, specimens and genetic collections

Resort Ranu Darungan has the highest herpetofauna species richness, which suggests potential areas for future sanctuary sites (Fig. 4). It is also noteworthy that other sites with low richness (e.g., Jemplang, Ranu Regulo, Wonokitri) are also significant because they are home to endemic and rare species (Fruhstorfer's mountain snake). The level of diversity that was previously unknown was made clear by this information, which also led in the direction of the optimum conservation practices, e.g., long-term monitoring, protecting the conservation-importance species, etc.

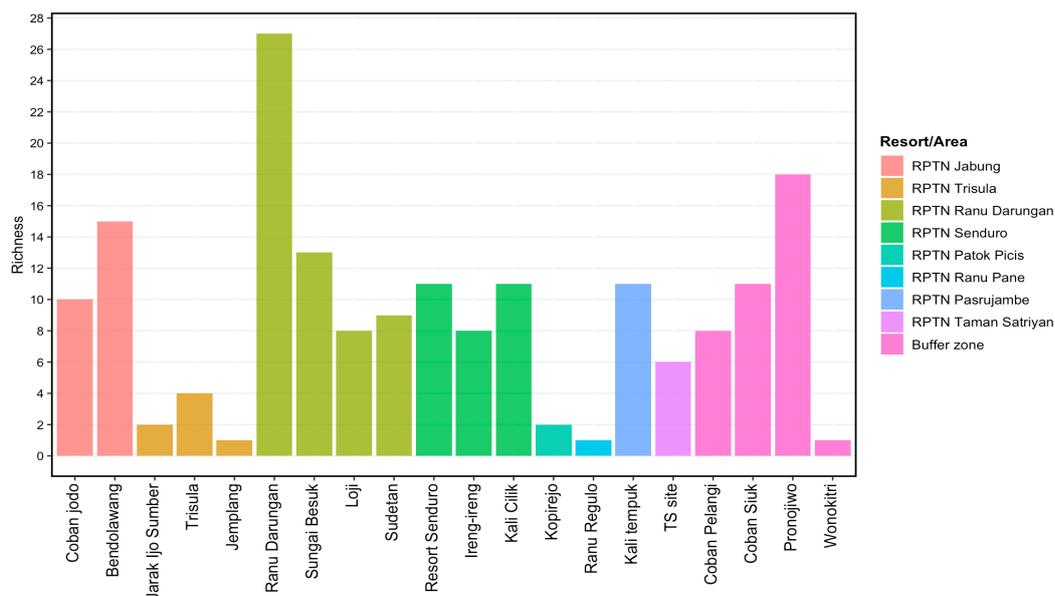


Figure 4. Herpetofauna species richness per surveyed sites in TNBTS and surroundings.

Through research exposure and forum-group discussions with numerous stakeholders, including BBTNBS, local universities (Universitas Brawijaya, UIN Maulana Malik Ibrahim Malang), NGO (Sahabat Alam Indonesia), KKHSG, and UPT KSDAE throughout Indonesia, we also shared our efforts and preliminary findings (Fig. 5). We determined at this meeting to work together to increase the herpetofauna's conservation through specimen and genetic collections, long-term monitoring, and collaborative approach.



Figure 5. Through online meeting (>25 participant) and offline meeting (>80 participant), various stakeholders, i.e., BBTNBS, local universities, non-profit

organizations, and other UPT KSDAE around Indonesia participated in research exposure and forum-group discussions.

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

- **Risk of extreme weather and disaster.** The planned survey sites have experienced flooding, landslides, and the continuing eruption of the Bromo and Semeru volcanoes (up till now). We therefore believe that extending the surveys (beyond the planned timeframe) and conducting the fieldwork while waiting for better weather was more feasible and safer for the field team.
- **Reorganisation of the national park.** The authority where the project is designated (BBTNBTS) goes through an organisational substitution during our project, which also affects coordination and our stakeholder discussions. At this time, we focused more on the educational activities.
- **Locals are reluctant to participate in the field surveys.** The cultural norm is to avoid going into the forest at night. We respected this cultural belief and spoke with the head of the community that we are entering the forest with good intentions.
- **Not every site that is planned has been surveyed.** Due to the aforementioned reason, we were only able to survey 20 of the 23 planned survey sites; regrettably, the core zone (i.e., Ranu Tompe, Ranu Kuning, and Jokoniti) was not surveyed. Nonetheless, the herpetofauna species of conservation importance, i.e., Java Forest skink (*Sphenomorphus sanctus tenggeranus*), pearly tree frog (*Nyctixalus margaritifer*), and Fruhstorfer's mountain snake (*Tetralepis fruhstorferi*), were found due to efforts to maximise the surveys on the remaining 20 locations. Furthermore, our species accumulation curves demonstrated that surveys are relatively sufficient to reflect overall diversity (Fig. 6).

Species accumulation curve

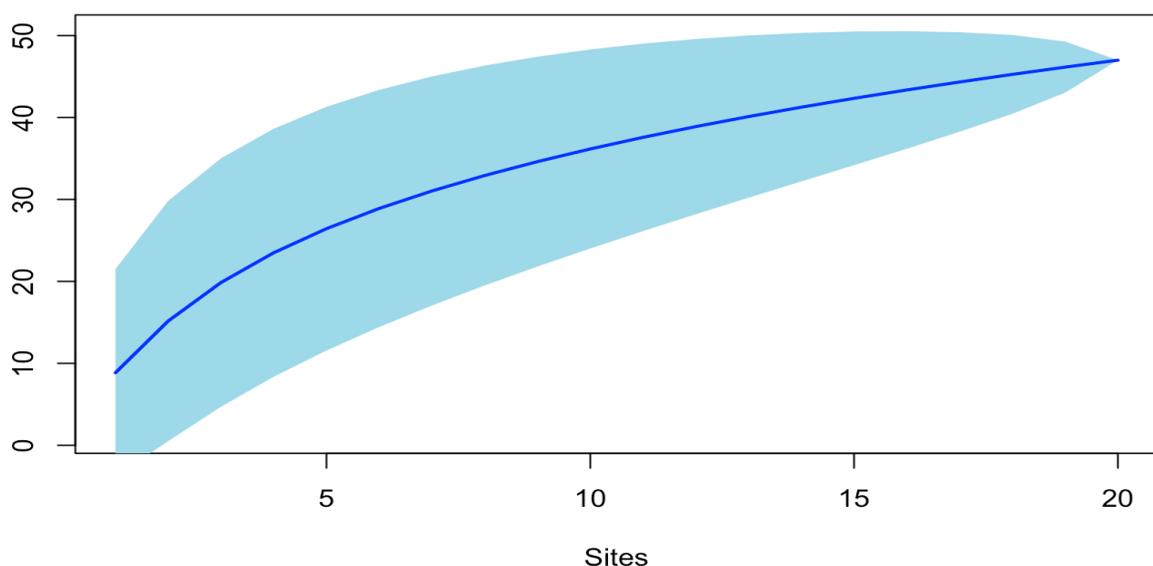


Figure 6. Species accumulation curve showing the linear pattern (dark blue) and credible interval (light blue), indicating sufficient surveys.

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

Our project has involved a number of parties, including TNBTS staff, selected volunteers from different universities (Universitas Jember, UIN Maulana Malik Ibrahim Malang), and residents during surveys on buffer zone sites. They now know more about the variety of herpetofauna, their habitats, importance of them, and how to look for them.

5. Are there any plans to continue this work?

We have not yet achieved the ideal long-term goals, and the first of the five steps for range-wide conservation priority has only just begun, i.e. (Valencia & Fonte 2021), i) produce baseline knowledge, ii) ensure viable populations in natural habitats, iii) maintain and manage captive survival-assurance colonies, iv) increase visibility of species, and v) create mechanisms for multi-stakeholder collaboration and participation. We had to finish all the publications that were scheduled and finish the reporting to the TNBTS in the meantime.

Since our baseline data open up new possibilities for more specific study, we intended to work on the targeted conservation project for species of conservation importance, such as evolution, biogeography, and a conservation action plan for Fruhstorfer's mountain snake, true identity of Java Forest skink, etc. Given the rich cultural heritage of the Tengger tribe, we also aimed to develop initiatives to enhance the conservation of herpetofauna using a socio-cultural approach.

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

In addition to the technical report and planned academic publications (mentioned above), we intend to share our results with undergraduate students through guest lectures, guidebook to TNBTS visitors, and local media coverage in order to raise awareness among the general public.

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

Monitoring the herpetofauna population is a crucial next step. Additionally, we still have a task to survey the TNBTS's core area. Since the data (genetic and specimens) from TNBTS are lacking, it is thus necessary to determine the endemic's process as well as its disputed taxonomic identity. With all of this knowledge at hand, decisions about the conservation of the herpetofauna will be based on solid evidence.

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?

For the overall activities and products (campaign awareness, research expose and forum group discussions, books, etc.), we utilised the Rufford Foundation logo on posters, oral presentation materials, educational materials (species identification

cards), and t-shirts. Curious about what The Rufford Foundation supports, some lecturers and students have asked us to help with their forthcoming submissions. The government institutions acknowledge the support and react positively with the aid of The Rufford Foundation.

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

Nia Kurniawan (Supervisor)—expert in herpetology, vertebrate diversity, and biological conservation; currently a lecturer and senior researcher at Universitas Brawijaya.

Berry F Hanifa (Supervisor)—lecturer from Universitas Islam Negeri Maulana Malik Ibrahim Malang with a passion for herpetology, ecology, and biodiversity.

C. Hendro Widjanarko (Supervisor)—head of Balai Besar Taman Nasional Bromo Tengger Semeru, supporting and supervising this project.

Luhur Septiadi (Project Leader)—with a focus on herpetology, natural history, and wildlife biology, researcher from the Wildlife Conservation Society-Indonesia Program is in charge of designing and directing this project.

M. Rahmadana (TNBTS coordinator)—forest ecosystem specialist from Balai Besar Taman Nasional Bromo Tengger Semeru, assists and coordinates with resort field staff to conduct the fieldwork for this project.

M. Fathoni (Field Coordinator)—researcher from Universitas Brawijaya, with an interest in biodiversity, ecology, and biological monitoring, responsible for overseeing the field surveys and working with the field staff.

Miftah Farid (Field Assistant)—undergraduate student from Universitas Brawijaya, whose primary duties include managing the administrative and financial requirements and assisting the field coordinator.

Agus Nurrofik (Field Assistant)—graduate student from Universitas Brawijaya, primary responsibilities include aiding the Field Coordinator by maintaining logistics and equipment during the fieldwork.

M. Syahroni (Field Assistant)—graduate student from Universitas Brawijaya, primary responsibilities include aiding the Field Coordinator by maintaining logistics and equipment during the fieldwork.

M. Asyraf Rijalullah (Education Coordinator)—Universitas Brawijaya graduate student who was responsible for designing the awareness-raising program and carrying out educational activities.

M. Afthoni (Education Designer)—Institut Teknologi Sepuluh November's alumni, responsible for creating media assets for campaigns raising awareness.

Andik Syaifudin (NGO partner)—grassroots environmentalist from Sahabat Alam, Indonesia, with great experience in community empowerment to improve protection of the environment.

10. Any other comments?

We really appreciate The Rufford Foundation's support of our East Java efforts. In addition to revealing the hidden diversity of herpetofauna in an underestimated area, our project has significantly expanded the networking and collaboration, which led to a positive means toward the herpetofauna conservation. We are looking forward for the possibilities of upcoming supported future projects.



Discovery of Pearly tree frog in Bromo Tengger Semeru National Park.