

**Distribution Modelling of Threatened Slipper Orchid
Species Under Current and Future Climate Scenarios and
Identification of Key Conservation Areas**

Progress Report I / May, 2024

Funded by:

Rufford Foundation

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1. BRIEF INFORMATION:

Project title: **Distribution Modelling of Threatened Slipper Orchid Species Under Current and Future Climate Scenarios and Identification of Key Conservation Areas.**

Project ID: 39730-1

Project type: 1st Rufford small grant

Reporting date: 14th May, 2024

Project leader: Namgay Rinchen

2. EXECUTIVE SUMMARY OF THE PROJECT:

The slipper orchid species (*P. fairrieanum* and *P. venustum*) are listed as critically endangered in the IUCN Red list. The species *P. fairrieanum* has been reported from more than nine districts which are all below 1400 meters above the sea level. *P. venustum* is rather rare compared to *P. fairrieanum* since the species was reported only from one district in Zhemgang, as of 2021. Recently, a new location was found with the presence of *P. venustum* in Mongar District, but the official report is yet to be published.

The current and most pressing issue for the two species is its rapid habitat destruction from various natural and mostly anthropogenic hazards like forest fires, commercial trading like floriculture business, human disturbance like deforestation, grazing from wild and domestic ungulates and climate change. In Bhutan, the most pertinent issue is with the construction of farm roads. Since, the particular species *P. fairrieanum* is mostly found along the old trails, the laying of farm roads along these trails have led to eradication of the whole population in these localities. One such notable example is in Sarjung site under Samdrup Jongkhar District. Around more than 200 individuals were eradicated by farm road construction. Thus, it has become critical for us to properly locate and conserve the habitat of these species.

Despite the intensive research surveys led by various researchers, proper distribution of these species is not well known. Further works are required to search for the potential habitats and distribution of these rare and threatened orchids. In order to carry out conservation activities on these orchids, a proper identification and habitat delineation is very crucial with the development of a proper distribution prediction model on these orchids.

Therefore, our study was aimed to model the spatial distribution range of the two terrestrial orchid species under currently suitable ecological niches, predict the effect of global warming on the distribution and coverage under future climatic scenarios and identify key conservation areas for these orchids.

3. FIELD VISITS AND SURVEY FOR OCCURRENCE POINTS

The study area includes a total of **Nine** districts: **Wangdue Phodrang** (Rukha), **Samtse** (Gomtu and Tading), **Samdrup Jongkhar** (Brongshing, Gomdar, Wangphu, Martshalla-Sarjung), **Mongar** (Labtsa-Nangri, Kengkhar-Mangola, Gongdu, Damkhar, Lingmethang FMU and Brongphu), **Zhemgang** (Ngala, Trong, Bali), **Pemagatshel** (Nanglam), **Sarpang** (Surelakha), **Dagana** (Lhamoizingkha-Pabji), and **Chhukha** (Kalikhola-Devitar). These **Nine** districts have the record of the species reported from some Gewogs under the districts (Table 1 & Figure 1). The report of the species from these localities were reported in few published

articles like (Gurung et al. 2019; Samdrup et al. 2020; Tshewang et al. 2022), except for **Tsirang** (Barshong) with the presence of *P. fairrieianum* and in **Mongar** (Lingmethang) with new records of *P. venustum*. But these are not published officially. These new reports on the species locations and locality were acquired from the foresters in the respective Parks and Range offices. Local people were also involved in finding and locating the species in their locality to create awareness on the importance of the species and its endangered status.

The various sites where the species presence was reported were visited personally to acquire proper and accurate GPS points and as part of ground truthing works. In addition, secondary data is not reliable when it comes to accuracy.

The visit to the sites took one to several days to travel and get the GPS points for modelling. At some sites, there were no accessible roads, which took half a day of walk to reach those sites along old trails and unpaved forests. One site in Rukha, under Jigme Singye Wangchuk National Park in Wangdue Phodrang, took us a whole day to reach at just one location. Likewise, most of the sites are located away from motorable roads and thus demands several hours of walking. The following **Table 1: List of the study sites visited till date.** Table 1 contains the visited localities in five districts and the route taken.

Table 1: List of the study sites visited till date.

District	Gewog	Locality	Field survey status
Wangdue Phodrang	Athang	Rukha	Completed
		Paksam Omchu	Completed
		Dayu	Completed
		Lamgang	Completed
		Migtana Ringu	Completed
		Dolepchen Ringu	Completed
Samtse	Tading	Zhochaling/Sisney	Completed
Samdrup Jongkhar	Gomdar	Bainangwoong	Completed
		Leberi	Completed
		Sopoktor	Completed
		Gomdar Lhakhang	Completed
		Koyar Pangthang	Completed
		Brongshing	Completed
		Denchi top	Completed
		Khoyar	Completed
	Wangphu	Betsapoktor	Completed
		Lhakhang top	Completed
		Chongapa	Completed
		Chengapabrak	Completed
	Martsala	Khanarong Zortshalu (two sites)	Completed
		Dokalung Cliff	Completed
		Sesangzor Pangthang	Completed
		Saleng Zor	Completed
Sarjung		Completed	
Mongar	Kengkhar	Lingmethang	Completed
		Labtsa Nangri	Completed
		Kengkhar Mangola	Completed
		Brongphu	Completed
	Gongdue	Gongdue	Completed

		Damkhar	Completed
Zhemgang	Bjokha	Ngangla	Completed
		Pabji	Completed
		Kaktong	Completed
		Bjokha	Completed

Note: The GPS coordinates of the visited sites are not provided in the report due to the species being highly protected under Schedule I-FNCA, 2023 and its Critically Endangered Status globally. It has high risk of poaching and illegal collection.

STUDY AREA

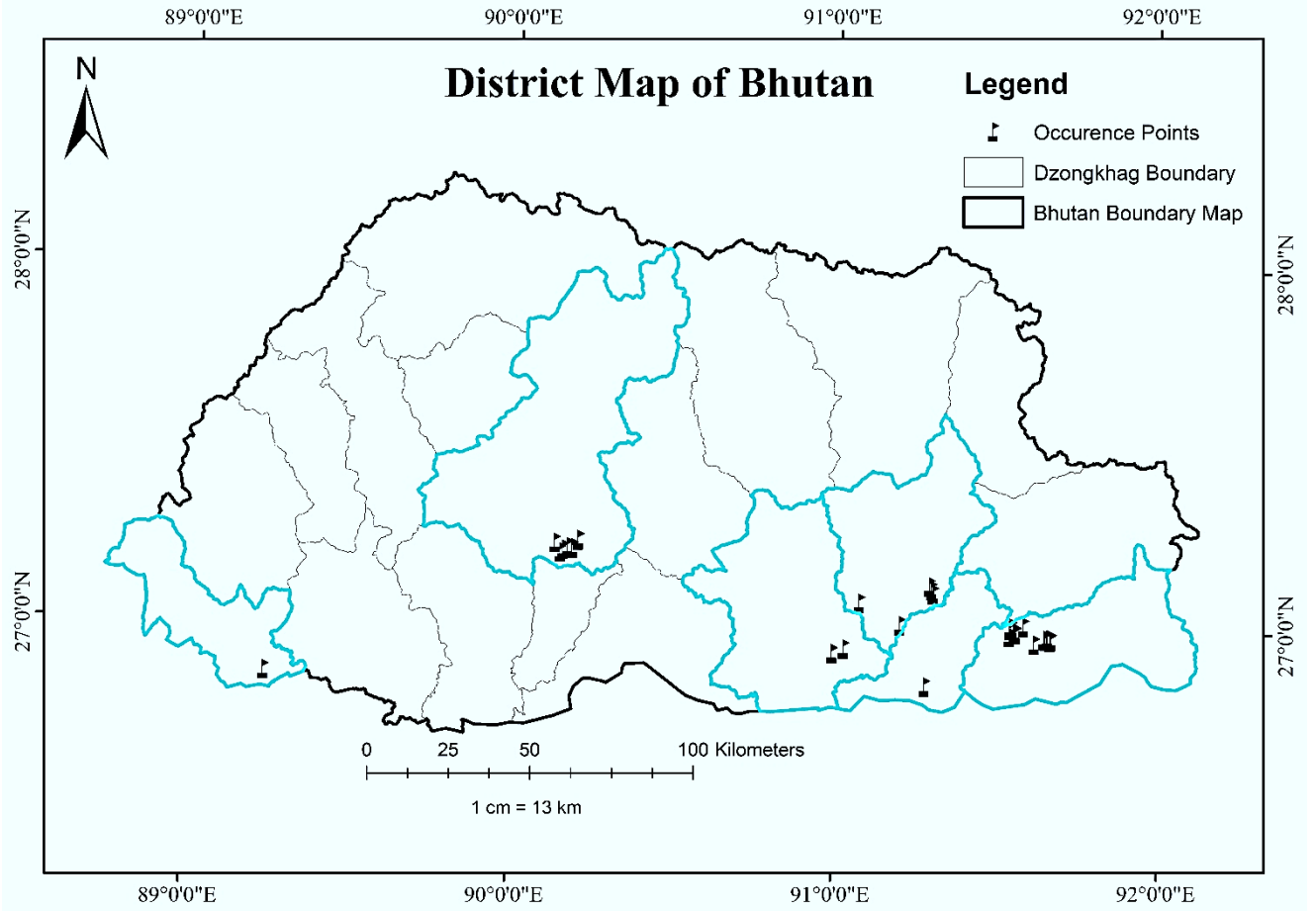


Figure 1: Map showing the study site in highlighted districts and sampling sites

First visit to Wangdue Phodrang District



Photo 1: First study site at Wangdue, Rukha Village and our local field guide Mr. Phurpa Dorji



Photo 2: Flowering observed even in late February, at Rukha Site.



Photo 3: Paphiopedilum fairrieanum at its last flowering stage in Rukha (in situ).



Photo 4: General habitat view at Rukha site.



Photo 5: P. fairrieianum at Lamgang site.



*Photo 6: Habitat view of *P. fairrieanum* at Rukha, and the research team with project leader Mr. Namgay Rinchen (Right), Mr. Rinchen Dorji (Middle), and Phurpa Dorji (Left), at Lamgang site.*



Photo 7: Habitat at Paksam Omchu, Rukha.

Second visit to Samtse District



Photo 8: Habitat of Paphiopedilum fairrieanum at Samtse, Tading.



Photo 9: Pictures of P. fairrieanum at the site. Field assistant Forester Tashi Dendup taking Photos of the orchids at site.

Third visit to Samdrup Jongkhar District



Photo 10: Healthy mature *P. fairrieanum* at Brongshing site.



Photo 11: A relocation conservation project to conserve *P. fairrieanum*, at Brongshing site, Gomdar Gewog under Samdrup Jongkhar District.



Photo 12: P. fairrieianum at Sarjung, Dokalung Cliff under Martsala, Samdrup Jongkhar.



Photo 13: P. fairrieanum at Brongshing site.



Photo 14: Forester Field Assistants searching for the presence of P. fairrieanum at Brongshing and Gomdar (Mr. Karma Dorji, Mr. Dendup Tshering and Mr. Singay).



Photo 15: Sarjung village at Martshalla, Samdrup Jongkhar.



*Photo 16: Local guide taking us to the site of *P. fairrieanum*, at Sarjung site, Martshala, Samdrup Jongkhar.*



Photo 17: Field Assistants Mr. Singay and Dendup Tshering at Sarjung site.



Photo 18: Healthy individuals of P. fairrieanum at Sarjung.

Field visit to Mongar District



Photo 19: Healthy population of P. fairrieanum observed at Labtsa Nangri. Mongar.



Photo 20: Abundant growth of P. fairrieanum at Labtsa Nangri, Mongar.



*Photo 21: Healthy population of *P. fairrieanum* at Labtsa Nangri.*



Photo 22: Field assistants Mr. Tashi Dendup and Mr. Lhadarla at Mongar, Kengkhar.



Photo 24: Habitat of *P. fairrieianum* at Kengkhar Mangola, Mongar.



Photo 23: Sharing information about the endangered status of the orchid species and exploring new locations of *P. fairrieianum*, with the residents of Labtsa Nangri, Kengkhar, Mongar.

Field visit to Zhemgang District



Photo 25: Habitat of P. farrieanum and P. vannustum in Kaktong, Zhemgang.



Photo 26: Abundant population of *P. fairrieanum* at Pepeling, Zhemgang



Photo 27: *P. fairrieanum* at Kaktong Zhemgang.

4. FURTHER PLAN

The team will collect the data from Tsirang District, Dagana District and Chhukha District in the May and June months of 2024.

After collecting the complete field data from all known locations, also known as realized niche, we will compile the data for the two species *P. venustum* and *P. fairrieianum*. The data required for current and future prediction models will be acquired from valid sources like WorldClim data base, Soil Grid, USGS, IPCC Climate Scenarios, and few others sources.

The spatial distribution range of the species will be predicted as current ensemble model and further explorations like ground truthing will be suggested as per the results. The most significant part of the research will be the future predictions, where we can understand the impact of climate change to the distribution range of the species in the future. We can compare the impact of changing climatic conditions like precipitation and temperature, with other anthropogenic influences.

The analysis of the results will be presented to Rufford Foundation as part of progress report.

One of the main outcomes of the study will be community engagement. Thus, the team will reach out to maximum community members starting from conservationists, local stakeholders, focal persons, NGOs, and Student bodies of relevant field. The main focus will be made on the local people residing in the habitat where the orchids are found. This will prove to be an effective solution for long term and immediate implementation of conservation plans.

After the completion of the project, presentations will be made to Conservation organizations with Department of Forest and Park Services as the main focus, to NGOs like Bhutan Ecological Society (BES), and to forestry students in College of Natural Resources. This will help in knowledge enhancement since the species are poorly understood by many and the study will serve as a reference to future conservation study and related works.