Final Evaluation Report

Your Details	
Full Name	Aditya Pradhan
Project Title	Conserving and monitoring woodpeckers and other birds in the differently managed forests of Darjeeling, Eastern Himalaya, India
Application ID	38843-1
Date of this Report	25th January 2024

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
Information on the woodpecker communities in the differently managed forests of Darjeeling, Eastern Himalaya				Total sampling effort made during the project period was 2304-point counts in 12 transects (three in each of the forest management regimes) with four sampling repeats in each of the four seasons: winter (Dec-Feb), pre-monsoon (Mar-May), monsoon (Jun-Aug), post-monsoon (Sep-Nov). 953 individuals of woodpeckers representing 13 species were recorded in the differently managed forests of Darjeeling, Eastern Himalaya. Species richness (n=12) of woodpeckers is highest in territorial forest, while abundance was highest in tea garden forests across seasons. Low elevation forests (up to 900m) were identified as woodpecker hotspots in the study area.
Information on avian diversity in the differently managed forests of Darjeeling, Eastern Himalaya				297 species of birds were recorded during the project period. Species richness was highest during pre-monsoon season, followed by winter. Among the birds recorded, one vulnerable species - great hornbill *Buceros bicornis* was recorded, while four species endemic to the Eastern Himalaya were also recorded, namely white-naped Yuhina *Yuhina bakeri*, hoary-throated barwing *Actinodura nipalensis*, yellow-vented warbler *Phylloscopus cantator,* and broad-billed warbler *Tickellia hodgsoni.*
Testing woodpeckers as indicators of avian				Woodpeckers were found to be reliable indicators of bird diversity

diversity and forest management regimes				during non-breeding seasons (post-monsoon and winter). They may not accurately represent bird diversity during breeding seasons (pre-monsoon and monsoon). Clear associations between woodpecker species and management regimes were identified in four of the 13 species.
Identifying key woodpecker sites and linking bird-tourism and bird conservation as a means to incentivise communities for safeguarding them.				The initial study revealed that low-elevation forests host diverse woodpecker species, while high-elevation forests support unique ones not found elsewhere. Similarly, tea garden forests were identified to be crucial for the conservation of woodpeckers in Darjeeling. Thus, Makaibari Tea Estate (500-1000m), Rangbhang Valley (900-1600m), and Rimbick (>2000m) showcasing diverse habitats across elevation gradients were identified as key sites for woodpecker conservation. These sites were then targeted for promoting bird tourism through birding guide training initiatives.
Awareness and capacity-building workshops for local community members in Darjeeling				Three birding guide trainings were organised in the previously identified key sites - Rimbick, Makaibari Tea Estate, and Rangbhang Valley, which saw a participation of 87 (59 males and 28 females) local community members. Birding guide training in Rimbick between 29-30 April 2023 trained 19 local community members from five different villages adjoining the Singalila National Park. Birding guide training in Makaibari Tea Estate between 23-24 December 2023 trained 21 local community members from four different villages. Birding guide training in Rangbhang Valley between 27-28 December 2023 trained 14 local community members from three tea estates, and one forest village.

				Birding guide trainings were organised in collaboration and consultation with local nature guide associations, local homestay owners, tea garden management, and local village councils.
Perception of local community members towards woodpecker and other birds in Darjeeling				We interviewed 71 members of the local community. We found that local communities value many aspects of birds found in their neighbourhood, especially those related to aesthetics and birds' place in the ecosystem. Our preliminary results indicate that birds were generally well liked and negative perceptions towards them were minor. Similarly, woodpeckers as a group was liked for their vibrant colours, drumming behaviour, and how they can attract tourists. We plan to expand the reach of this study by interviewing more people from different localities in Darjeeling to get a better understanding.

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

a). Potential of the differently managed forests in woodpecker conservation explored.
Woodpeckers are keystone taxa of the forest ecosystem, and excellent ecological indicators. In India, limited studies on woodpeckers have been carried out, and these have been conducted exclusively in the western Himalaya or the Western Ghats. Globally, there is little or no information on woodpecker community structure outside protected areas, while the potential of tea garden forests and agroforests in woodpecker conservation has never been studied before. Darjeeling has a matrix of differently managed forests within the same landscape, and harbours 66% of the total woodpecker diversity in India.

Forests in the Darjeeling Himalaya that fall outside the protected area regimes are actively managed by the local communities, private companies, and government agencies. These forested areas are thus characterised by different management regimes. The study covered three different management regimes and one control site (Fig 1):

(1) Tea garden forests, that are managed by private companies who are responsible for the management and harvest of respective tea gardens.

(2) Agroforests, that are actively managed and modified by the local communities with whom the ownership of the land lies.

(3) Territorial forests, forest patches within reserve forests that are managed and modified by respective government agencies. These forests provide for subsistence needs, as well as occasional extraction of timber and other resources for commercial purposes.

(4) Control sites, adjoining forest patches within reserve forests that remain unmanaged. These forests are characterised by native and comparatively mature stands of trees.

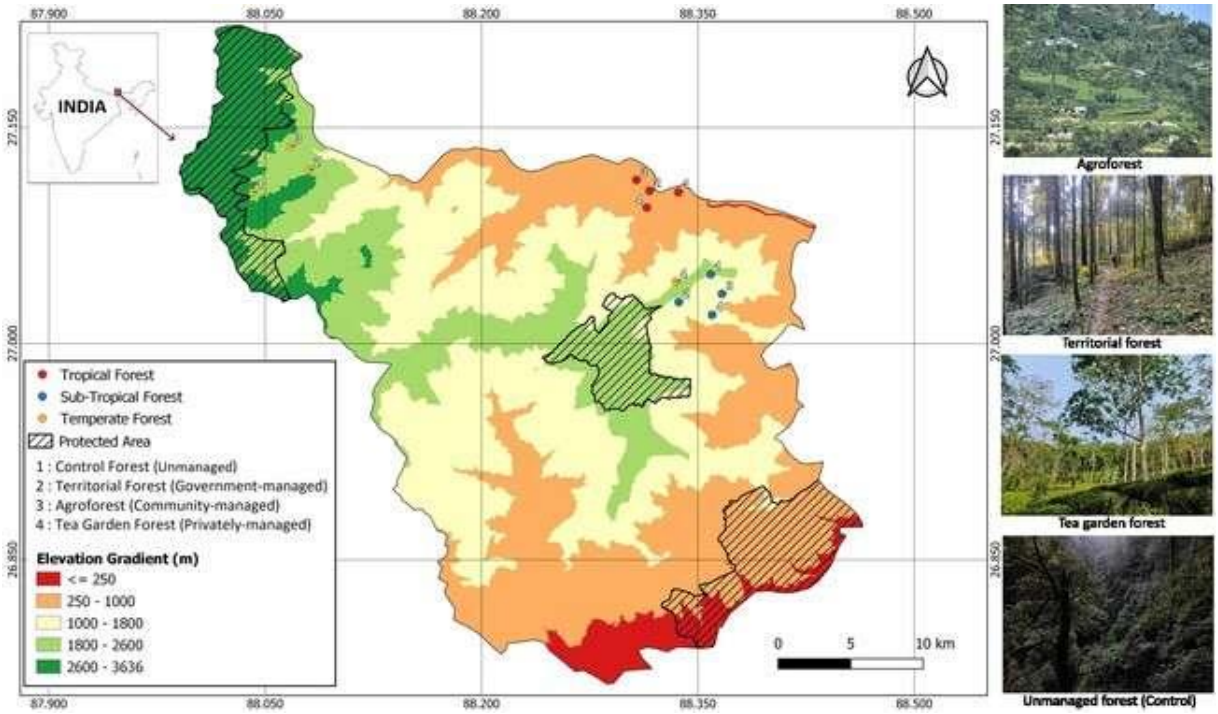

Fig 1. Map of the study area showing locations of all the 12 selected transects in Darjeeling, West Bengal, India along an elevation gradient, along with photographs of different forest management regimes sampled during the current study.

The current study recorded 13 species of woodpeckers in the differently-managed forests outside protected areas in Darjeeling, greater flameback *Chrysocolaptes guttacristatus*, greater yellownape *Chrysophlegma flavinucha*, lesser yellownape *Picus chlorolophus*, grey-headed woodpecker *Picus canus*, grey-capped pygmy woodpecker *Yungipicus canicapillus*, fulvous-breasted woodpecker *Dendrocopos macei*, crimson-breasted woodpecker *Dryobates cathpharius*, bay woodpecker *Blythipicus pyrrhotis*, rufous woodpecker *Micropternus brachyurus*, pale-headed woodpecker *Gecinulus grantia*, Darjeeling woodpecker *Dendrocopos darjellensis*, speckled piculet *Picumnus innominatus*, and white-browed piculet *Sasia ochracea*. Among these, seven species – greater yellownape (n=345), grey-headed woodpecker (n=176), bay woodpecker (n=112), grey-capped pygmy woodpecker (n=122), rufous woodpecker (n=56), greater flameback (n=52) and Darjeeling woodpecker (n=42) constituted 95% of the total woodpecker community.

Among the different forest management regimes studied, species richness was the highest (n=12) in territorial forests (forest patches that are actively managed by the

forest department), while the abundance was the highest in tea garden forests. Similarly, low-elevation forests (up to 900m) were identified as woodpecker hotspots as they harboured 11 of the 13 species of woodpeckers recorded in the current study, with woodpeckers like fulvous-breasted woodpecker, pale-headed woodpecker, speckled piculet and white-browed piculet being exclusively recorded from these tropical forests. Only crimson-breasted woodpeckers and Darjeeling woodpeckers (found above 2000m) were not recorded in low-elevation forests during the current study.

Results suggest that managed forests outside protected areas play a significant role in supporting woodpecker populations, while tea garden forests should be sustainably managed, as they support a higher diversity of woodpeckers even during the breeding season. Further, the presence of some woodpecker species exclusively at low or high elevations underlines the importance of considering elevation gradients for comprehensive conservation. Thus, habitat heterogeneity offered by different management systems managed forests should be promoted as they support different woodpecker species assemblages, thereby aiding in woodpecker conservation in the region.

Regrettably, the great slaty woodpecker *Mulleripicus pulverulentus*, a vulnerable woodpecker species previously reported from within the same landscape, was not observed during the present study. Further compounding this concern, eBird data from the region similarly lacks any recent reports of this particular bird, indicating a potential case of local extinction. This observation underscores the urgency of conservation efforts and underscores the importance of continued monitoring and intervention to address potential threats to the persistence of this vulnerable species within the studied ecosystem.

b). Woodpeckers as indicators of avian diversity and forest management regimes tested.

Woodpecker richness and abundance significantly positively correlated with the species richness and abundance of other birds during the non-breeding seasons but showed no significant correlation during the breeding seasons. Thus, woodpeckers are reliable indicators of bird diversity during non-breeding seasons but may not accurately represent bird diversity during breeding seasons. Woodpeckers are known to be territorial and are reported to forage closer to their nesting sites during breeding seasons, however during the non-breeding seasons, woodpeckers are often recorded in flocks with other birds. This may be one of the reasons behind this result.

When indicator value analysis was performed to identify individual species' preference for specific forest management regimes, it identified four of the 13 species to prefer particular forest management regimes. Three species, grey-headed woodpeckers, grey-capped pygmy woodpeckers, and pale-headed woodpeckers showed significant association with the tea garden forests, while Darjeeling woodpeckers appeared to prefer territorial forests and control (unmanaged forest patches within reserve forests). Thus, clear associations observed between some woodpecker species and specific forest management regimes indicate the importance of differently managed forests and again indicated the need to promote habitat heterogeneity in the landscape for woodpecker conservation.

Fig 2: Photographs of all the woodpeckers recorded during the study in Darjeeling, except the Pale-headed Woodpecker (could not be photographed). (Photos: Aditya Pradhan and Mingma Tamang).

c). Building capacity of potential birding guides from the local community

Darjeeling Himalaya is known to harbour about 50% of all birds found in India, even though the region only contributes to <0.0001% of the total area of India. This makes Darjeeling a hotspot of avian diversity, worthy of conservation attention. With a major part of the landscape being outside protected areas, local communities have an important role to play in the conservation of birds in Darjeeling. Being regarded as one of the most beautiful hill stations in India, Darjeeling is one of the leading tourist destinations in India. In recent years, numerous small, yet beautiful villages have emerged as popular tourist destinations. Bird tourism has flourished in a few local sites in Darjeeling, while this section of tourism is still unexplored in most areas. Since bird tourism generates birding interest among the local communities, promoting bird tourism in some key sites can be crucial to conserving birds in the everchanging human-dominated landscapes of Darjeeling Himalaya. Additionally, recent studies in the socio-ecological landscapes of Darjeeling-Sikkim Himalaya show that non-protected areas provide important habitats for several biodiversity components including birds.

With this outlook, the project successfully implemented three targeted birding guide trainings in Rimbick, Makaibari Tea Estate, and Rangbhang Valley, with the overarching objective of building the capacity of potential birding guides within the local communities of the Darjeeling region. A total of 87 participants, consisting of 59 males and 28 females, actively engaged in these training sessions (Annex-5,6,7).

Fig 3: Participants of Birding Guide Training in Makaibari T.E. looking for birds and taking notes during a field session.

The first training in Rimbick trained 19 local community members from five villages adjoining the Singalila National Park. The second training, conducted in Makaibari Tea Estate, involved the training of 21 participants from four different villages. The third and final training in Rangbhang Valley trained 14 local community members, including individuals from three tea estates and one forest village.

Each 2-day training programme encompassed a comprehensive curriculum, blending theoretical sessions with practical field experiences. Critical topics such as the significance of birds and their habitats in the distinctively managed forests of Darjeeling Himalaya were covered. The training methodology incorporated interactive PowerPoint presentations and hands-on group activities to ensure an effective learning environment.

Beyond the transfer of knowledge, the project achieved significant outcomes by empowering the local communities. The training sessions played a crucial role in disseminating awareness about the rich avian diversity, emphasising the ecological roles of birds, their contributions to agriculture and tourism, and the imminent threats they confront. Importantly, the initiative yielded tangible benefits by equipping 55 participants with practical skills in bird identification and guiding. The impact extended to the development of local expertise and economic empowerment of aspiring guides within the community. Furthermore, the engagement of participants in the field allowed for the sighting and identification of 20-50 species of birds during each training session, enhancing their practical understanding of birding and local biodiversity.

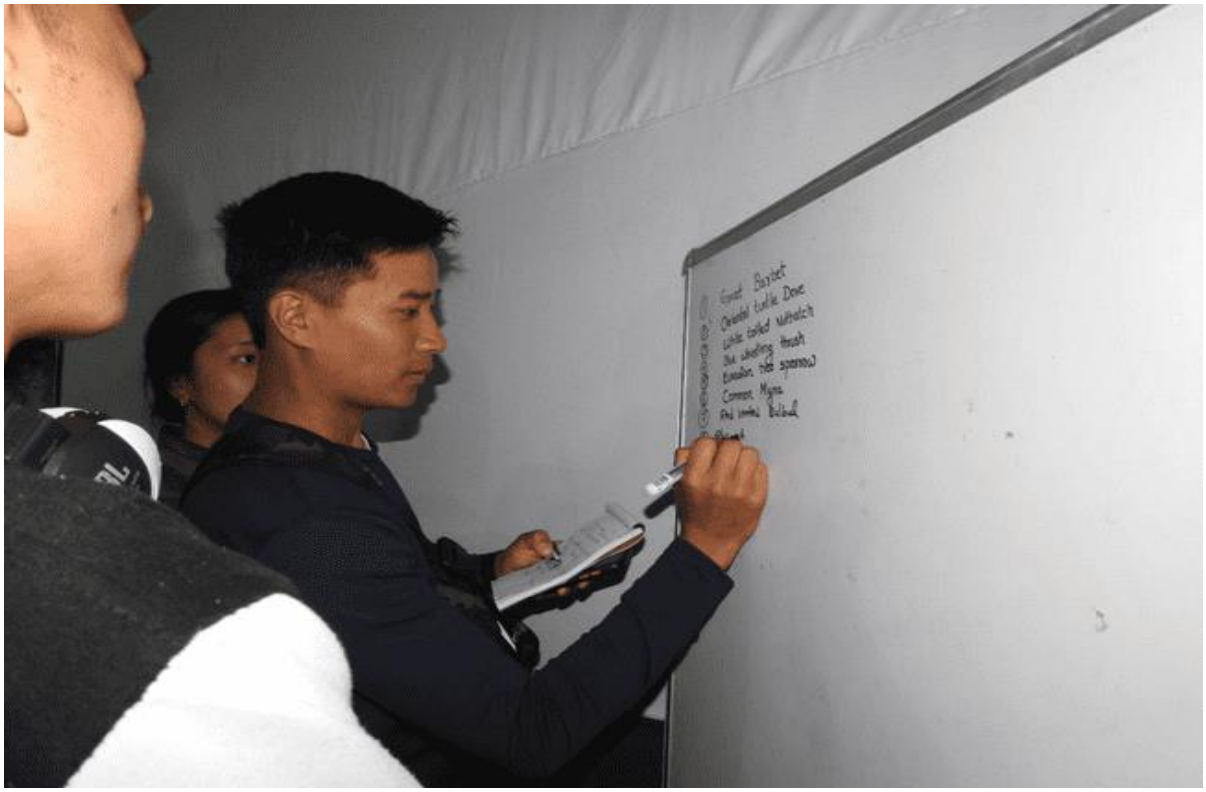

Fig 4: Participants preparing a checklist of birds after a field session during the Birding Guide Training in Rimbick, Darjeeling.

Fig 5: Photograph showing participants who have completed the Birding Guide Training along with resource persons in Rangbhang Valley, Darjeeling.

Thus, the project's paramount achievement lies in its successful capacity-building efforts, providing tangible skills and knowledge to local community members aspiring to become proficient birding guides. This initiative contributes not only to the conservation of avian diversity but also to the socio-economic development of the community through the cultivation of valuable guiding skills and heightened environmental awareness.

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

The project encountered no significant challenges; however, heavy rainfall and fog during the monsoon and post-monsoon seasons led to a brief postponement of fieldwork. Additionally, landslides along the road hindered the originally planned travel between field sites. Despite these obstacles, we successfully compensated for lost time by extending our field presence to meet project requirements.

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

Three birding guide trainings were conducted across three key woodpecker sites in Darjeeling, engaging 87 local community members, with 54 individuals completing the intensive 2-day training programme. The training curriculum had theory sessions along with practical field sessions, encompassing crucial topics on the significance of

birds and their habitats in the differently managed forests of Darjeeling Himalaya, utilising interactive PowerPoint presentations and hands-on group activities.

These workshops played a crucial role in disseminating knowledge about the local avian diversity, emphasising their ecological roles, the services they offer, and the threats they confront. Furthermore, the sessions shed light on the integral role of birds in both agriculture and tourism. The positive impacts of these initiatives extended beyond knowledge sharing, benefiting the local communities in several ways.

Income opportunities were generated for local self-help groups (SHGs), led by women from the local communities. These SHGs were enlisted to provide catering services for the participants, adding a practical economic dimension to the project. Simultaneously, local homestay owners hosted resource persons and project team members during the training sessions, contributing to the economic sustainability of these accommodations.

Crucially, the involvement of resource persons responsible for training the potential birding guides was sourced from the local community. This approach not only enhanced the credibility of the training but also fostered a sense of community ownership and expertise in the project.

To further strengthen community engagement, one of the trained participants was subsequently employed as a project field assistant. This individual played a key role in data collection throughout the project period, showcasing the project's commitment to fostering local talent and creating employment opportunities within the community.

In summary, these birding guide training initiatives not only enriched the local community with essential knowledge about avian diversity and conservation but also catalysed economic opportunities for women led SHGs, homestay owners, and a project field assistant from within the community. The multifaceted approach, combining education, economic empowerment, and community involvement, underscores the project's positive impact on both biodiversity conservation and the well-being of the local populace in Darjeeling.

5. Are there any plans to continue this work?

Yes, we plan to continue working on woodpeckers and other birds in the region, while continuing to encourage community involvement in all project-related activities. I am currently registered as a PhD candidate in the Department of Zoology, University of Calcutta and hence I will remain committed to studying avian diversity in the region for the next 1-2 years. We have identified some gaps and opportunities to work on (described in question no. 7 below).

Additionally, I have recently acquired an Oriental Bird Club small conservation grant for an upcoming project that aims to promote bird conservation through community engagement in the human-dominated landscapes of Darjeeling, eastern Himalaya. We will continue to leverage this support to secure additional funds for our ongoing work on bird communities in Darjeeling.

Hence, we plan to apply for the 2nd Rufford Small Grant to continue our ongoing research and involvement in the landscape.

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

Preliminary findings of the study have been already presented in different seminars, conferences, and on social media platforms (mentioned in question no. 8) (see Annex 2-4).

Further, we plan to communicate project results through a multi-faceted approach:

1. Individual reports for each training will be shared with local institutions.
2. Short articles about each training and other project finding will feature in our quarterly newsletter, *Eastern Himalaya*, with broad readership among scientists, academics, bird enthusiasts, and local NGOs.
3. Three research articles will be produced from the project findings. These are currently under preparation and can be expected to be published within the next 2 years. These will be prepared to target the scientific and academic communities.
4. Popular articles detailing project activities and findings will be published in local newspapers and social media channels, reaching the general public.
5. Outreach materials will be prepared and distributed across local communities, institutions, schools, and colleges to ensure broad dissemination.
6. Scientific posters and talks based on the project findings will be presented in appropriate forums.
7. Final report of the project will also be shared with the Directorate of Forests, Government of West Bengal.

Lastly, since the study is a part of my PhD research, the findings will be compiled in thesis, published as research articles in peer-reviewed journals, and The Rufford Foundation will be duly acknowledged in all the publications coming out of this project.

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

The project has helped us to understand how woodpeckers and other birds interact with different forest management regimes along an elevation gradient.

We have identified some gaps and opportunities to work on:

1. The project was limited to studying woodpeckers and other birds in the differently managed forests outside the protected area network up to 2300m, however our experience in the landscape suggests that there are a few species of woodpeckers and birds which are known to inhabit the old growth forests above 2600m. Given that Singalila National Park is the only protected area above 2600m, while Senchal Wildlife Sanctuary and Mahananda Wildlife Sanctuary are the only other protected areas in Darjeeling, studies here will

provide better insights into understanding the community ecology of woodpeckers and other birds in the region.

2. As part of the current project, we successfully provided training to 54 local community members across three identified sites within the project duration. However, given the escalating trend of bird tourism in the region and the rapid urbanisation unfolding in non-protected, human-dominated landscapes of Darjeeling, there arises a compelling necessity to extend training to additional local communities. There is a need to equip more community members with relevant skills but also to concurrently raise awareness about the imperative of bird conservation in these ever-changing landscapes.

3. Further, it becomes imperative to understand the perceptions of the local communities to garner public support. Human perception towards birds has not been studied from Darjeeling or the entire eastern Himalaya, understanding which, can be essential to identify potential threats stemming from negative perceptions, and promote effective conservation strategies that garner public support. Although through this project we managed to gather some information on this, we plan to expand the reach of this study by interacting with more members of the local community from different localities in Darjeeling.

Fig 6: Rufous-bellied Woodpecker *Dendrocopos hyperythrus,* photographed in Singalila National Park (~3500m asl). This species in the Darjeeling Himalaya is restricted above 2600m in the Temperate coniferous forests of Singalila National Park. (Photo: Mingma Tamang)

As mentioned earlier (in question no. 6), sharing the project findings is a crucial next step. We have planned to prepare and submit a few manuscripts based on the ecological data collected during the project. Since some aspects of our research were previously funded by Oriental Bird Club, we plan to compile the data collected through 2021 to 2023 and publish our findings in the form of peer-reviewed articles. As for the continued community involvement, we plan to organise and conduct more birding guide trainings in the landscape, while seeking potential collaboration from key stakeholders. Further, we will continue to look for more funding opportunities to carry forward our ongoing work in the landscape.

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:

1. Synopsis presentation delivered at the Department of Zoology, University of Calcutta in March 2023.
2. Talk entitled "Woodpecker communities in the differently managed forests of Darjeeling, Eastern Himalaya, India" delivered In ATREE Work Seminar (AWS), 2023, held in Ashoka Trust for Research in Ecology and the Environment, Bengaluru between 2-4 August 2023.
3. Poster entitled "Woodpecker communities in the differently managed forests of Darjeeling, Eastern Himalaya, India" presented in Student Conference on Conservation Science, Bengaluru (SCCS-BNG) 2023, held in Indian Institute of Science (IISc), Bengaluru, between 9-12 October 2023. SCCS-BNG is an international conference held annually in Bengaluru, India (Annex 2).
4. Banners and PowerPoint presentations used in all three Birding Guide Trainings in Darjeeling.

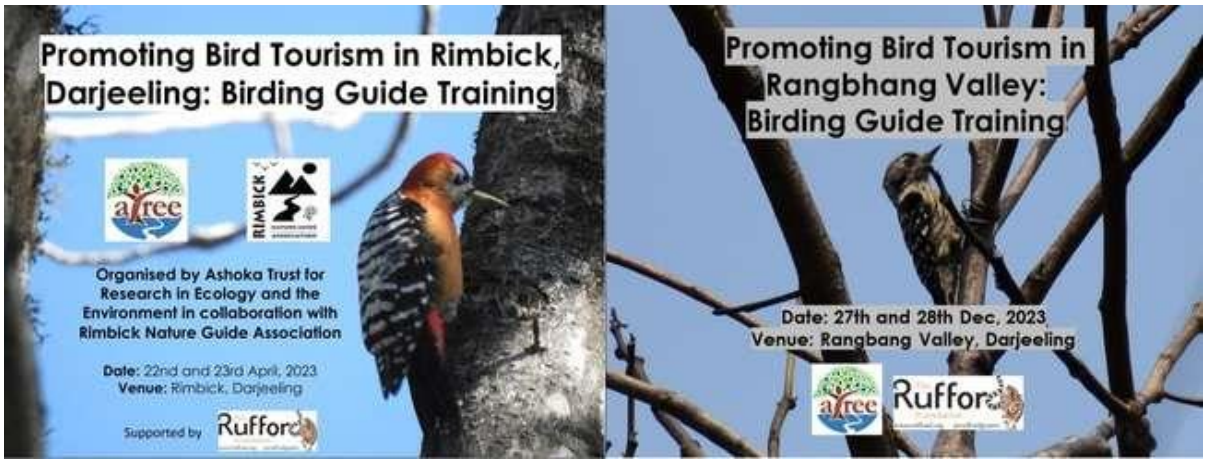

Fig 7: Banners used in the Birding Guide Trainings in Rimbick (Left) and Rangbhang Valley (Right) showing the use of The Rufford Foundation logo.

Birding Guide Trainings in Darjeeling got coverage from popular local news channels like *DTV* and *The Himal World*, both in television and other social media platforms like

Facebook and YouTube. Details of one these trainings were also published in a popular Nepali daily, *Himalaya Darpan*, with wide reach among the Nepali-speaking populace of the country (Annex 4).

In addition to the use of logo, The Rufford Foundation has been mentioned in our newsletter article that reported the details of Birding Guide Training in Rimbick. The article was published in our quarterly newsletter *Eastern Himalaya*, which has broad readership among scientists, academics, bird enthusiasts, and local NGOs (Annex 3). The Rufford Foundation will also be mentioned in our upcoming newsletter articles, popular articles and peer-reviewed articles.

As a result, The Rufford Foundation received good publicity among various young researchers not only in Darjeeling-Sikkim Himalaya, but across the country and abroad.

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

Aditya Pradhan: Project Leader and Researcher. He was involved in all project activities and was responsible for overall deliverables to Rufford.

Dr. Sarala Khaling: Project Advisor. She played a vital role in project supervision, offering essential feedback throughout its duration.

Mingma Tamang: Field Assistant. He assisted during data collection in temperate forests and also helped in organising trainings during the project period.

Benoy Thapa: Field Assistant. Trained during the Birding Guide Training in Rimbick. He assisted during data collection in tropical and sub-tropical forests and also helped in organising trainings during the project period.

Amir Ansari: Volunteered during data collection in tropical and sub-tropical forests. He works for the Darjeeling Forest Division, Directorate of Forests, Government of West Bengal, and was trained in bird identification in one of our earlier trainings in 2022.

Yumlam Benjamin Bida: Researcher working on White-bellied Herons in Arunachal Pradesh, India. He assisted through field-surveys in sub-tropical forests during monsoon.

Dr. Saibal Sengupta: Founder of St. Robert's School Nature Club, and recipient of Green Guru Award, 2023. He facilitated as a resource person for all the Birding Guide Trainings.

Sanjeeb Pradhan: Member of the Rimbick Nature Guide Association. He facilitated as a resource person for all the Birding Guide Trainings.

10. Any other comments?

The current project is a part of a larger study on the woodpecker communities in the differently managed forests of Darjeeling, eastern Himalaya. This is the first study working on woodpeckers in the entire eastern Himalaya.

I would like to express my sincere gratitude to The Rufford Foundation for their invaluable support during a challenging phase of my PhD journey. I extend my heartfelt thanks to Dr. Sarala Khaling and the entire team at ATREE Regional Office Eastern Himalaya – Northeast India for their unwavering support and words of encouragement throughout the course of this project. I would like to acknowledge with deep appreciation the guidance and support provided by my PhD supervisor, Prof. Goutam Kumar Saha.

I express my profound thanks to Prof. Bhoj Kumar Acharya and Prof. Joydeep Bhattacharjee for graciously agreeing to provide the reference letters essential for the further processing of the project proposal. Their support has been instrumental in advancing this research.

My gratitude also extends to the Directorate of Forests, Government of West Bengal, for granting us the necessary permit [Memo No.: 1559/WL/4R-23(Pt-II)/2022] to conduct our work in the forests of Darjeeling. This permission has been crucial to the successful execution of our project.

Lastly, I would also like to extend my heartfelt appreciation to the local communities of Darjeeling. Their support and cooperation have been indispensable to the successful implementation of our project. The willingness of community members to share their knowledge and experiences has enriched our project in many ways.

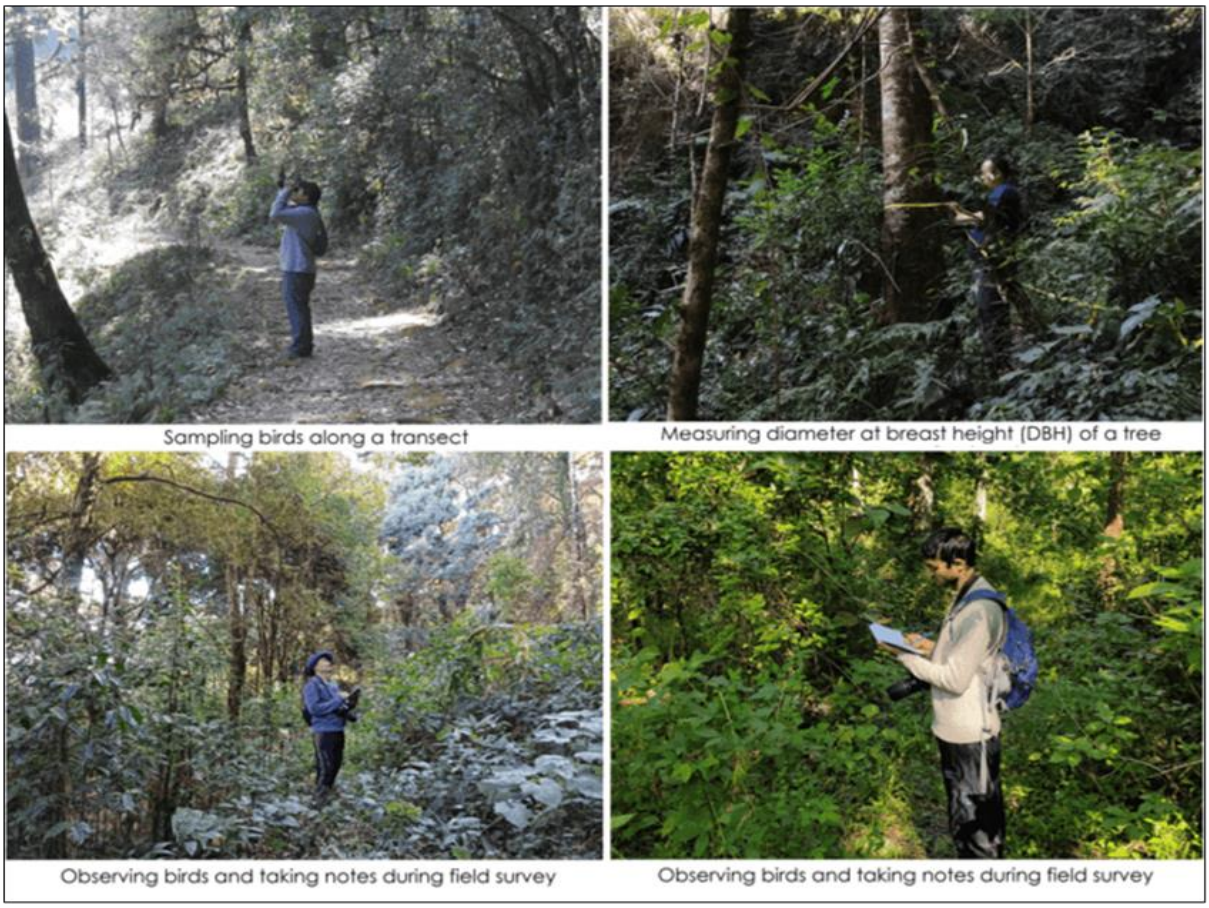

Fig 8: Photographs featuring project team members performing field activities during the current study in Darjeeling.

Poster presented in the Student Conference on Conservation Science (SCCS)-Bengaluru between 9-12 October 2023

Woodpecker communities in the differently-managed forests of Darjeeling, Eastern Himalaya, India

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I. Why Woodpeckers in Darjeeling?

- Woodpeckers are keystone taxa of the forest ecosystem, and excellent ecological indicators
- In India, limited studies, exclusively in the Western Himalaya or the Western Ghats
- Globally, little or no information on woodpecker community structure outside protected areas
- Darjeeling has a matrix of differently-managed forests within the same landscape, and harbors 66% of total woodpecker diversity in India
- Ecological research on avifauna, particularly woodpeckers, deficient in the region

II. Objectives

- To understand the response of woodpecker communities to different forest management regimes
- To test the reliability of woodpeckers as indicators of bird diversity in differently-managed forests

III. Methods

- Sampling of both picid and non-picid birds were carried out following transect point-count method (Acharya et al. 2011)
- 12 transects (2 km long) were fixed covering tea garden forests, territorial forests, agroforests, and unmanaged forests (control) (Fig 1)
- Multiple sampling repeats (12 per transect) across non-breeding (Dec-Feb) and breeding (Mar-May) seasons between December 2021 and May 2023

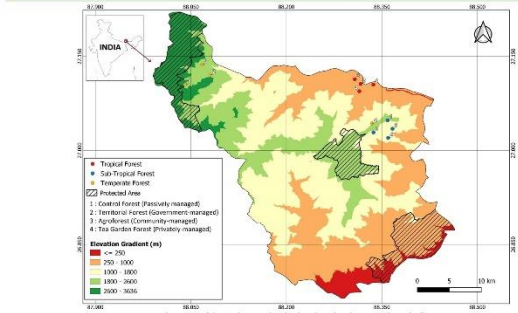

Fig 1: Map of the study area, showing location of each transect in Darjeeling

Agroforest | Territorial Forest | Tea Garden Forest | Unmanaged Forest (control)

IV. Results

- 1728 point-counts across 12 transects yielded 882 woodpecker detections (470 in non-breeding, 412 in breeding) belonging to 13 species
- Seven species – Greater Yellownape (n=333), Grey-headed Woodpecker (n=151), Bay Woodpecker (n=125), Grey-capped Pygmy Woodpecker (n=111), Rufous Woodpecker (n=51), Greater Flameback (n=45; <900m asl), Darjeeling Woodpecker (n=34; >2000m asl) constituted 95% of the total woodpecker community
- Differences in woodpecker diversity observed across different forest management regimes and seasons (Fig 2, Fig 3, Table 1)
- Clear association between different woodpecker species and management regimes were observed in four of the 13 species (Fig 4)
- Diversity of woodpeckers significantly correlated with that of other birds during non-breeding season (Fig 5)

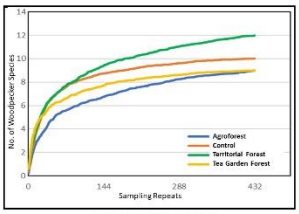

Fig 2. Species accumulation curve

	Agroforest	Territorial Forest	Tea Garden	Control forest
Species Richness	9	12	9	10
Encounter rate per km	2.21	3.02	3.97	3.04
Mean number of species per survey ± SE	2.17 ± 0.18	2.97 ± 0.26	3.11 ± 0.29	2.17 ± 0.24
Mean number of individuals per survey ± SE	4.42 ± 0.53	6.06 ± 0.73	7.94 ± 0.96	5.64 ± 0.94

Table 1. Woodpecker richness and abundance in differently-managed forests

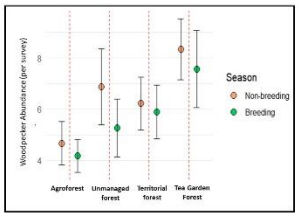

Fig 3. Abundance of woodpeckers across non-breeding and breeding seasons

Species	Managed forest type	Indicator value (IndVal)	P-value
Grey-capped Pygmy Woodpecker	Tea Garden Forest	0.265	0.001
Grey-headed Woodpecker	Tea Garden Forest	0.111	0.003
Pale-headed Woodpecker	Tea Garden Forest	0.083	0.048
Darjeeling Woodpecker	Territorial forest and Control forest	0.175	0.001

Fig 4. Woodpeckers as indicators of forest management regimes

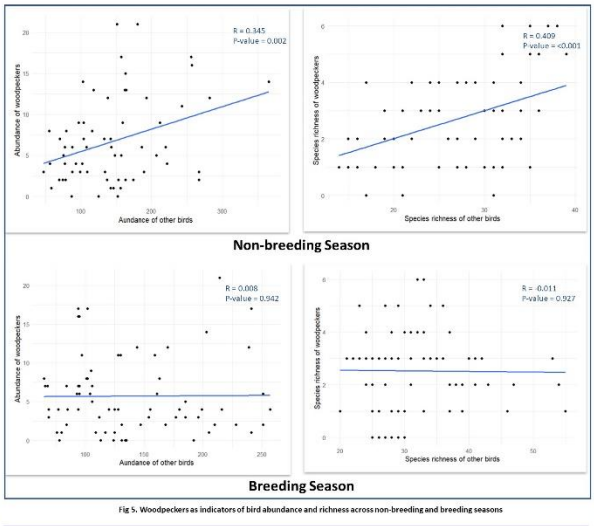

Fig 5. Woodpeckers as indicators of bird abundance and richness across non-breeding and breeding seasons

V. Conservation Implications

- Managed forests outside protected areas play a significant role in supporting woodpecker populations, particularly during non-breeding season
- Presence of some woodpecker species exclusively at low or high elevations underline the importance of considering elevation gradients for comprehensive conservation.
- Tea garden forests should be sustainably managed, as they support higher diversity of woodpeckers even during the breeding season
- Clear associations observed between some woodpecker species and specific management regimes indicate promotion of habitat heterogeneity in the landscape
- Woodpeckers are reliable indicators of bird diversity during non-breeding seasons but may not accurately represent bird diversity during breeding seasons

Acknowledgements

Oriental BIRD CLUB

Newsletter article published in *Eastern Himalaya* Vol 9 Issue 2.

April - June, 2023

EASTERN HIMALAYA

Quarterly newsletter of the ATREE Eastern Himalaya / Northeast Regional Office VOLUME 9, ISSUE 2

Promoting bird tourism in Rimbick, Darjeeling

Participants using Merlin Bird ID app to identify birds - Aditya Pradhan

Promoting bird tourism in key sites of the Darjeeling Himalaya can be crucial for conserving birds in human-dominated landscapes. Bird tourism generates interest and awareness among local communities, and provides economic incentives, creating livelihood opportunities and motivating locals to protect key habitats. Increased demand for birding sites leads to the implementation of conservation measures, including habitat restoration and sustainable land-use practices. Thus, creating a win-win situation, benefiting both communities and bird conservation in the face of changing landscapes.

ATREE in collaboration with Rimbick Nature Guide Association, through the Rufford Small Grants project "*Conserving and monitoring woodpeckers and other birds in the differently-managed forests of Darjeeling, Eastern Himalaya, India*", organized a two-day Birding Guide Training in Darjeeling. The training was carried out in Smriti Bhawan, Rimbick Bazaar on 29th and 30th April, 2023. Aiming to promote bird tourism, 19 local guides were trained in bird identification and guiding skills. They were also introduced to regional flora and fauna through technical and field sessions. Notably, the participants identified 48 bird species, including the Greater Yellownape *Chrysophlegma flavinucha* and Bay Woodpecker *Blythipicus pyrrhotis*. This initiative is expected to empower the local community, foster conservation efforts, and encourage sustainable bird tourism in the differently-managed forests of Darjeeling.

Aditya Pradhan
(aditya.pradhan@atree.org)

News article covering our Birding Guide Training in Makaibari Tea Estate. Published on 26 December 2023 in a popular Nepali daily, *Himalaya Darpan*.

हिमालय दर्पण

मकैबारी चियाबारीमा बर्डिङ गाइड तालिम

खरसाङ, २५ दिसम्बर (निसं): दार्जीलिङ हिमालय क्षेत्रमा पाइने चरा-चुरुङ्गी संरक्षण, प्रवर्द्धन, बर्ड वचिङ पर्यटनलाई अघि बढ्राउने उद्देश्यले मकैबारी चिया बगानको कोदोबारी सार्वजनिक भवनमा एक पर्यटन तालिम सम्पन्न भयो। यस तालिममा स्थानीय समुदायका युवा तथा महत्वाकांक्षी गाइडहरूलाई चरा-चुरुङ्गीको प्रजाति चिन्न मार्गदर्शन गर्ने शीप तथा विभिन्न महत्त्वपूर्ण वनस्पति र जीव-जन्तुबारे जानकारी गराइएको थियो। विभिन्न प्रजातिका चराहरू, तीन प्रजातिका वुडपेकरहरू पाइएका थिए। सेन्ट रोबर्ट स्कूल नेचर क्लबका डा. सैबल सेनगुप्ता, रिम्बिक नेचर गाइड एसोसिएसनका सञ्जीव प्रधान तालिमका स्रोत व्यक्तिको रुपमा उपस्थित थिए। प्राप्त जानकारी अनुसार भारतको दार्जीलिङ हिमालय क्षेत्रमा भारतमा पाइने सबै चराहरूको लगभग ५० प्रतिशत प्रजातिका चराहरू बसोबास गर्ने स्थानको रूपमा परिचित छ, यद्यपि यस क्षेत्रले भारतको कुल क्षेत्रफलको केही अंश मात्र ओगटेको छ। यसले दार्जीलिङलाई एभियन अर्थात चरा चुरुङ्गी विविधताको केन्द्रविन्दु बनाउँछ अनि यो क्षेत्रको संरक्षणमा ध्यान दिन आवश्यक छ भन्ने जताएको छ। संरक्षित क्षेत्रभन्दा बाहिर भएको ठूलो क्षेत्र दार्जीलिङमा चराहरूको संरक्षणमा स्थानीय समुदायहरूको महत्त्वपूर्ण भूमिका छ। भारतको सबैभन्दा सुन्दर हिल स्टेशनहरू मध्ये एक मानिने दार्जीलिङ भारतको प्रमुख पर्यटक गन्तव्यहरू मध्ये एक हो। हालैका वर्षहरूमा असंख्य साना अनि सुन्दर गाउँहरू लोकप्रिय पर्यटक गन्तव्यको रूपमा देखा परेका छन्। विज्ञप्तिमा अझ भनिएको छ, दार्जीलिङका केही स्थानहरूमा चरा पर्यटन फस्टाएको छ, जबकि पर्यटनको यो

प्राविधिक र क्षेत्रीय स्रोतहरू मार्फत स्रोत व्यक्तिहरूद्वारा निर्देशित तालिममा सहभागीहरूले विभिन्न प्रजातिका चराहरू हेरेर पहिचान गरेका थिए। तालिमको क्रममा रेकर्ड गरिएका केही उल्लेखनीय र असामान्य

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सम्भावनालाई अझै घेरैजसो क्षेत्रमा खोजिएको छैन। बर्ड टुरिजमले स्थानीय समुदायमा चरा-चुरुङ्गीमा रुचि जगाउने भएकोले दार्जीलिङ हिमालयको मानव बाहुल क्षेत्रमा चराहरूको संरक्षण गर्न केही प्रमुख स्थानहरूमा चरा पर्यटन प्रवर्द्धन गर्नु महत्त्वपूर्ण रहेको छ। दार्जीलिङ-सिक्किम हिमालयको चिया परिदृश्यहरूमा हालैका अध्ययनहरूले देखाउँछन् कि यस व्यवस्थापन प्रणालीले चराहरू सहित धेरै जैविक विविधताको लागि महत्त्वपूर्ण बासस्थान प्रदान गर्दछ। यस दृष्टिकोणमा एउटा सानो सहयोग कोषमा सञ्चालित परियोजना दार्जीलिङ, पूर्वी हिमालय, भारतका विभिन्न व्यवस्थित वनहरूमा विशेष रुपले लौहचे प्रजाति र अन्य प्रजातिका चराहरूको संरक्षण गर्नको लागि एक हिस्साको रूपमा अशोका ट्रष्ट फर रिसर्च इन अकोलजी एण्ड द एनभाइरमेन्ट संस्थाले दुई दिने गहन बर्डिङ गाइड तालिमको आयोजना गरेको हो।