Template/Pro forma for Submission

NMHS-Himalayan Institutional Project Grant

NMHS-FINAL TECHNICAL REPORT (FTR)

Demand-Driven Action Research and Demonstrations

NMHS Grant Ref. No.:	GBPNI/NMHS-2017-18/SG-05	**Date of Submission:**	d	d	m	m	y	y	y	y
			0	**5**	**1**	**2**	**2**	**0**	**2**	**2**

"WILDLIFE AND NATURE BASED TOURISM AS A POTENTIAL LIVELIHOOD OPTION FOR LOCAL PEOPLE INHABITING AROUND THE PROTECTED AREAS IN EASTERN HIMALAYAS, ARUNACHAL PRADESH: A SUSTAINABLE APPROACH FOR BIODIVERSITY CONSERVATION"

Project Duration: from **26 February 2018 to 26th February 2021**

***Submitted to*:**
Er. Kireet Kumar
Scientist 'G' and Nodal Officer, NMHS-PMU
National Mission on Himalayan Studies, GBP NIHE HQs
Ministry of Environment, Forest & Climate Change (MoEF&CC), New Delhi
E-mail: nmhspmu2016@gmail.com; kireet@gbpihed.nic.in; kodali.rk@gov.in

***Submitted by*:**
Prof. Awadhesh Kumar
[*Department of Forestry, NERIST (Deemed to be University), Nirjuli-791109, Itanagar, Arunachal Pradesh*]
[*Contact No.:+91-9436055347.*]
[*E-mail: tpileatus@gmail.com*]

GENERAL INSTRUCTIONS:

1. The Final Technical Report (FTR) has to commence from the start date of the Project (as mentioned in the Sanction Order issued by NMHS-PMU) till completion of the project duration. Each detail has to comply with the NMHS Sanction Order.
2. The FTR should be neatly typed (in Arial with font size 11 with 1.5 spacing between the lines) with all details as per the enclosed format for direct reproduction by photo-offset printing. Colored Photographs (high resolution photographs), tables and graphs should be accommodated within the report or annexed with captions. Sketches and diagrammatic illustrations may also be given detailing about the step-by-step methodology adopted for technology development/ transfer and/ or dissemination. Any correction or rewriting should be avoided. Please provide all information under each head in serial order.
3. Any supporting materials like Training/ Capacity Building Manuals (with detailed contents about training programme, technical details and techniques involved) or any such display material related to project activities along with slides, charts, photographs should be brought at the venue of the Annual Monitoring & Evaluation (M&E) Workshop and submitted to the NMHS-PMU, GBP NIHE HQs, Kosi-Katarmal, Almora 263643, Uttarakhand. In all Knowledge Products, the Grant/ Fund support of the NMHS should be duly acknowledged.
4. The FTR Format is in sync with many other essential requirements and norms desired by the Govt. of India time-to-time, so each section of the NMHS-FTR needs to be duly filled by the proponent and verified by the Head of the Lead Implementing Organization/ Institution/ University.
5. Five (5) hard-bound copies of the Project Final Technical Report (FTR) and a soft copy of the same should be submitted to the **Nodal Officer, NMHS-PMU, GBP NIHE HQs, Kosi-Katarmal, Almora, Uttarakhand**.

The FTR is to be submitted into following two (02) parts:

Part A – Project Summary Report

Part B –Detailed Project Report

In addition, the Financial and other necessary documents/certificates need to be submitted along with the Final Technical Report (FTR) as follows:

Annexure I	**Consolidated and Audited Utilization Certificate (UC) & Statement of Expenditure (SE)**, including the interest earned for the last Fiscal year and the duly filled GFR-19A (with year-wise break-up).
Annexure II	**Consolidated Interest Earned Certificate**
Annexure III	**Consolidated Assets Certificate** showing the cost of the equipment in Foreign/ Indian currency, Date of Purchase, etc. (with break-up as per the NMHS Sanction Order and year wise).
Annexure IV	**List of all the equipment, assets and peripherals** purchased through the NMHS grant with current status of use, including location of deployment.
Annexure V	**Transfer of Equipment** through Letter of Head of Institution/Department confirming the final status of equipment purchased under the Project.
Annexure VI	**Details, Declaration and Refund of any Unspent Balance transferred through Real-Time Gross System (RTGS)/ PFMS in favor of NMHS GIA General**

NMHS-Final Technical Report (FTR) *template*

Demand-Driven Action Research Project

DSL: Date of Sanction Letter Completion

2	6	0	2	**2**	**0**	**1**	**8**
d	d	m	m	y	y	y	y

DPC: Date of Project

0	1	0	7	**2**	**0**	**2**	**1**
d	d	m	m	y	y	y	y

Part A: Project Summary Report

1. Project Description

i.	Project Grant Ref. No.:	GBPNI/NMHS-2017-18/SG-05						
ii.	Project Category:	**Small Grant**		~~Medium Grant~~		~~Large Grant~~		
iii.	Project Title:	Exploring Wildlife and Nature Based Tourism as a Potential Livelihood Option for Local People inhabiting in and around the Protected Areas in Eastern Himalayas, Arunachal Pradesh: A Sustainable approach for biodiversity conservation						
iv.	Project Sites (IHR States/ UTs covered) (*Location Maps attached*):	Pakke Wildlife Sanctuary, Arunachal Pradesh						
v.	Scale of Project Operation:	**Local**		~~Regional~~		~~Pan-Himalayan~~		
vi.	Total Budget:	Rs.45,00,295 (in Lakh)						
vii.	Lead Agency:	North Eastern Regional Institute of Science and Technology (Deemed to be University), Nirjuli-791109, Arunachal Pradesh						
	Lead PI/ Proponent:	Prof. Awadhesh Kumar						
	Co-PI/ Proponent:	1. Dr. Murali Krishna, Amity Institute of Forestry & Wildlife, Amity University, Noida, Delhi NCR – 201313 2. Dr. Ashalata Devi, Department of Environmental Science, Tezpur University, Tezpur, Assam 3. Mr. TanaTapi, DFO, Pakke Wildlife Sanctuary, Seijosa, Pakke Kessang district, Arunachal Pradesh 4. Mrs. Sarita Rayem, Green Lyfe Foundation –NGO, Seijosa, Pakke Kessang district, Arunachal Pradesh 5. Mr. Takum Nabum, The Ghora Abhe Society- NGO, Seijosa, Pakke Kessang district, Arunachal Pradesh						

viii.	Implementing Partners:	North Eastern Regional Institute of Science and Technology (Deemed to be University)
	Key Persons (Contact Details, Ph. No., E-mail):	Prof. Awadhesh Kumar Department of Forestry, NERIST (Deemed to be University), Nirjuli, 791109, Itanagar, Arunachal Pradesh Phone No. +91-9436055347/8258888273 Email: tpileatus@gmail.com, adk@nerist.ac.in

2. Project Outcomes

2.1. Abstract/ Summary (not more than 250-300 words)

***Background*:** Wildlife-based ecotourism is becoming a solution or conservation tool in today's biodiversity protection and management, and also livelihood options for local inhabitants of the protected area world wide. Pakke wildlife Sanctuary (PWLS) is a part of Eastern Himalaya biodiversity hotspot area and has the tremendous potential for developing and promoting sustainable wildlife based ecotouris activities, which could further assist to the livelihood of local people of the area. In view of the above background, the following objectives were proposed and approved to promote wildlife-based tourism in the PWLS.

Objectives/ Aim: **(i)** To evaluate the status of wildlife species and hotspot area with reference to flagship species targeting for wildlife-based tourism, **(ii)** To identify the major hotspot zones which have high potential for nature-based tourism within the selected study area, **(iii)** To investigate ways to promote wildlife and nature based tourism in Pakke Wildlife Sanctuary, Arunachal Pradesh, and **(iv)** Capacity building measure to forest department personals and local tribal people in relation to strengthen the ecotourism activities.

Methodology/Approach: The study was conducted in the PWLS located in Pakke Kessang district of Arunachal Pradesh. PWLS is naturally connected with Nameri National Park, Assam in one side and Sessa Orchid Sanctuary and Eaglenest WLS, A.P. through Tenga Reserve Forest otherside and coveres an area of 861.95 km^2. Direct observation by using total count and point methods, survey was conducted to explore the biological diversity of PWLS in view of wildlife based ecotourim activities. Through regular monitoring and recording of wildlife data, ecotourism zone/nature trails was identified. Questionnaire survey was conducted among selected stakeholders to assess the benefit gain through ecotourism activities.

***Results/ Outcomes*:** A total of 29 mammalian, 333 avian and more than 145 species of butterfies were recorded during the survey in the selected habitats. Maximum species diversity was recorded in forest area, followed by riverine habitat and bamboo dominating forest. More than 200 individuals of Wreathed Hornbill and 32 Oriental Pied Hornbill and around 20 Great hornbills were recorded from the tourism identified sites and a total of 62 individual of hornbill species were recorded frequently in sampling points laid in tourist trails. Four large roosting sites were recorded in and around the sanctuary. Two roosting sited are located nearby the home stay, in front of Tana Hola's homestay, Darlong village and named that place as "tea with hornbill". A total of 9 nature trails ranging from 3.5 km to 13 km. had been identified for wildlife-based tourism activities based on easy detection of species for regular visits of tourists. These nature trails can be assessed by foot or vehicle. Two training programmes were orgainised during the study period by taking the participation of 116 peoples and 5 nature guides were fully trained as tourist guide. Before the starting of present study only six homestay was operated with minmum facilities, but after our team involment and 5 more homestays were developed with the existing infrastructure facility.

Conclusions: A total of 29 mammalian, 333 avian and more than 145 species of butterfies were recorded during the survey in the selected habitats. Maximum species diversity was recorded in forest area, followed by riverine habitat and bamboo dominating forest. Hornbills and elephants are regarded as flagship species for the tourist based on their high sighting frequency. Four roosting sites and 23 nesting sites become one the best tourist attraction in the Pakke for hornbills' lovers. Five additional homestays were developed by using existing infrastructure facilities after the assist of our team to enhace their livelihood incomes. All together 116 people were benefited through capacity building and awareness programme conducted through project.

Recommendations/ Way Forward with Exit Strategy: Apart from the Seijosa range, Pakke Kessang and Rilloh range can be another site for the development of avitourism in PTR because of their mesmerizing landscape and unique bird species diversity (viz. Himalayan Cutia, Golden-throated Barbet, Brown dipper, Beautiful Sibia, etc.) for avitourist. Most of the tourists visiting Pakke are returning from the main gate of Pakke, asking about the kinds of souvenir availability. Therefore, it is recommended to open a few souvenirs shop near the entry gate of PTR in place of the far way like the Upper Seijosa to get local people benefits. Develop a small studio in Darlong village for tourists to watch hornbills roosting nearby the village by charging a nominal fee. Few trainings/workshops should be plan for better management of homestay, tour guide,

restaurants and souvenir shops as currently available facilities are not up to satisfaction of tourist.

2.2. Objective-wise Major Achievements

S#	Objectives		Major achievements (*in bullets points*)
1.	**To evaluate the status of wildlife species and hotspot area with reference to flagship species targeting for wildlife-based tourism.**	**:**	• A total of 29 mammalian, 333 avian and more than 145 species of butterfies were recorded during the survey in the selected habitats. Maximum species diversity was recorded in forest area, followed by riverine habitat and bamboo dominating forest. • Hornbills, Blyth's Kingfisher, and elephants are identified as flagship species and marked their roosting and continuous movement places for tourism point of view. • More than 200 individuals of Wreathed Hornbill and 32 Oriental Pied Hornbill and around 20 Great hornbills were recorded from the tourism identified sites and a total of 62 individual of hornbill species were recorded frequently in sampling points laid in tourist trails. • Four large roosting sites were recorded in and around the sanctuary. • The highest number (1698) of individuals was recorded of Black Bulbul (*Hypsipetes leucocephalus*). • Among recorded 333 bird species, six species were threatened under IUCN Red List. While 22 species were registered as Schedule I species under Wild Life (Protection) Act, 1972.

2.	**To identify the major hotspot zones which have high potential for nature-based tourism within the selected study area.**	**:**	• A total of 9 nature trails ranging from 3.5 km to 13 km. had been identified for avitourism based on easy detection of species for regular visits of tourists. • These nature trails can be assessed by foot or vehicle. • These nature trails are having altitudinal variation between 100 to 600 m above sea level and comprised of mostly with tropical semi-evergreen forest, riverine and bamboo habitat. • The highest number of species (104) was recorded from nature trail T4 and lowest (50 sp.) in nature trail T1 during the survey. • The species richness was found dominant in the forest habitat (169 species), followed by bamboo (123 species) and riverine (120), while 72 species shared all three habitats. • 23 Nos. of Hornbills nesting sites are located nearby the nature trails. • 4 Nos. of hornbills roosting site identified and selected as tourist zone.
3.	**To investigate ways to promote wildlife and nature based tourism in Pakke Wildlife Sanctuary, Arunachal Pradesh.**	**:**	• Three species of hornbills are recorded in the Pakke with adequate population viz. Wreathed hornbill, Oriental Pied hornbill and Great hornbill. • 04 nos. hornbills roosting sites were identified and selected for hornbill watch for tourists. • Based on the direct total count in four roosting sites, maximum individuals (79±46.7) of Wreathed hornbills were recorded at Darlong village (26.9401N & 92.9975E) followed by A2 Village (29.9908N & 93.0298E) 29.7±9 and Khari camp (26.9811N & 92.9208E) 20±5. • Only one roosting was recorded of Oriental Pied Hornbill at Langka camp (27.0204N &93.0465N) 21.8±9.4. • Due to lack of hotel facilities nearby Pakke, 11 nos. homestay are established and managed around the fringe area of PWLS. • 5 nos. of local youth were incoraged and trained as nature guides for tourism activities. • Six small restaurants and two souvenir shops are identified to support tourism activites in Pakke.

4.	**Capacity building measure to forest department personals and local tribal people in relation to strengthen the ecotourism activities.**	**:**	• Due to covid-19 restrictions during the study period, only two programmes were conducted • One training programme on management of homestay and encourage local youth as tourist guide has been conduct in Seijosa range, Pakke Wildlife Sanctuary by participating of 31 local people. • One awareness programme on marble cat was organized and stated that how can be indirect value (wildlife-based tourism) of wildlife could be used as option to earn livelihood by taking the participation of 80 young youth of schools were participated. • Five local youth were fully trained as “tourist guide” by developing their skill in identification of birds, mammals, butterflies, etc. • A brochure for home stay details has been prepared for marketing and promotion of home stays.(Attached) • Hoardings and Banners for publicity of tourism activities. • Local Handy crafts and food items are promoting in local festivals as well as Hornbill festival to encourage them for livelihood.

Note: Further details may be summarized in DPR Part-B, Section-5. Supporting materials may be enclosed as annexure/ appendix separately to the FTR.

2.3. Outputs in terms of Quantifiable Deliverables*

S#	Quantifiable Deliverables*	Monitoring Indicators*	Quantified Output/ Outcome achieved	Deviations, if any, & Remarks thereof:
1.	Maps showing hotspot zones for promoting wildlife and nature-based tourism and spot diurnal and nocturnal mammals.	No. of Baseline surveys performed;	10	
2.	Capacity building to 300 forest guards and local tribesmen.	No. of maps and templates generated for promoting tourism	• 03	Due to covid-19 restrictions, the the entire work was affected and it could not achieve as targeted.
3.	Blueprint on ways to promote wildlife and nature-based tourism.	No. of Capacity Building Programmes and No. of stakeholders benefitted;	• One capacity building progamme and 31 peoples were benefited. • One awareness programme and 80 peoples were benefited.	

4.	Tourist Map and templates for promoting tourism.	Blueprint/Policy draft(s) for assisting the decision-making in the identified area;	N.A.	
		Other Publications and knowledge products (Nos.).	• 04 papers published in Journals. • One Ph.D. thesis submitted. • One thesis work is going one. • Two papers are communicated.	

*As stated in the Sanction Letter issued by the NMHS-PMU.

2.4. Strategic Steps with respect to Outcomes (in bullets)

S#	Particulars	Number/ Brief Details	Remarks/ Attachment
1.	New Methodology/ Technology developed, *if any*:	N.A.	
2.	New Ground Models/ Process/ Strategy developed, *if any*:	• Nine nos. nature trails are identified along with wildlife species diversity for developing tourism program.	Table and Photo plates are attached.
3.	New Species identified, *if any*:	• The present study has added 110 bird species to the previous checklist of Pakke, which shows a vital contribution to the study.	Checklist of species Attached.
4.	New Database established, *if any:*	Yes	Checklist of species Attached.
5.	New Patent, *if any*:	No	
	I. Filed (Indian/ International)		
	II. Technology Transfer, *if any*:		
6.	Others, *if any*		

Note: Further details may be summarized in DPR Part-B, Section-5. Supporting materials may be enclosed as annexure/ appendix separately to the FTR.

3. New Data Generated over the Baseline Data

S#	New Data Details	Status of Existing Baseline	Addition and Utilisation New data
1.	A total 333 birds' species were recorded.	Previously 294 of birds were recorded.	It will be used management of protected as well as planning of wildlife-based ecotourism activities.

2.	18 Nos. threatened bird species.	07 Nos. species.	It will be helpful in managing the habitat in the Pakke as well as also suggest the area as a bird conservation site.
3.	9 nos. of nature trails	05 Nos.	Based on species diversity, 4 nature trails could be the preferred point for avitourism by avitourist.
4.	04 nos. of roosting sites identified.	03 Nos.	Among the 04 roosting sites, one is named as "**Tea with Hornbill**" due to direct sightings of species from the homestay point at morning and evening tea time.
5.	Blyth's Kingfisher and Ibis bill	Not available	Apart from hornbill species, avitourst can also enjoy the sighting of some other flagship species such as Blyth's Kingfisher and Ibis bill, which could also be a good option for avitourism development because of their limited population in India but wide distribution in the riverine habitat of Pakke.

Note: Further details may be summarized in DPR Part-B. Database files in the requisite formats (Excel) may be enclosed as annexure/ appendix separately to the soft copy of FTR.

4. Demonstrative Skill Development and Capacity Building/ Manpower Trained

S#	Type of Activities	Details with number	Activity Intended for	Participants/Trained			
				SC	**ST**	**Women**	**Total**
1.	Workshops	01			21	10	31
2.	On-Field Trainings	05 persons	Identification of birds in the field to develop skill as tourist guide	-	04	01	05
3.	Skill Development						
4.	Academic Supports	-	-	-	-	-	-
5.	Awarness programme	01	Lectures, video show, and competions were done.	-	60	20	80

Note: Further details may be summarized in DPR Part-B. Supporting materials may be enclosed as annexure/ appendix separately to the FTR.

5. Linkages with Regional & National Priorities (SDGs, INDC, etc.)/ Collaborations

S#	Linkages /collaborations	Detail of activities (No. of Events Held)*	No. of Beneficiaries

1.	Sustainable Development Goals (SDGs)/ Climate Change/INDC targets addressed	- The following goals of SDGs (**No poverty (01), Quality education (04), Climate change (13) and Life on land (15)** were covered during the project period by conducting one capacity building, one awareness programme and giving extensive field training to 11 youths.	(31+80+05) = 116 nos.
2.	Any other:	-	-

Note: Further details may be summarized in DPR Part-B, Section-6. Supporting materials may be enclosed as annexure/ appendix separately to the FTR.

6. Project Stakeholders/ Beneficiaries and Impacts

S#	Stakeholders	Support Activities	Impacts in terms of income generated/green skills built
1.	Line Agencies/ Gram Panchayats:	-	-
2.	Govt Departments (Agriculture/ Forest/ Water):	Bird's identification	Developed skill in bird's identification
3.	Villagers/ Farmers:	-	-
4.	SC Community:		
5.	ST Community:	-	Learned better management practices of homestay
6.	Women Group:	Management of homestay.	Learned better management practices of homestay
	Others, *if any*:	-	-

Note: Further details may be summarized in DPR Part-B, Section-6. Supporting materials may be enclosed as annexure/ appendix separately to the FTR.

7. Financial Summary (Cumulative)

Please attach the consolidated and audited Utilization Certificate (UC) and Year-wise Statement of Expenditure (SE) separately, *ref*. **Annexure I.**

8. Major Equipment/ Peripherals Procured under the Project** (*if any*)

S/N	Name of Equipment & Model no.	Quantity	Cost (INR)	Utilisation of the Equipment after project
1.	**Camera** (Nikon D7200 with 18-140mm lens)	01 no.	59,000/-	After completion of the project, all equipements are in working conditions, and regularly used in B.Sc., MSc. & Ph.D. students
2.	**Camera Lens** (Nikkor 200-500mm)	01 no.	75,000/-	

3.	**GPS** [Garmin GPS Etrex 30x]	02 nos.	29,000/-	research work as well as in teaching and practical works.
4.	**Portable Weather station** [Ambient Weather WM-4]	01 no.	30,000/-	
5.	**Binocular** [Nikon Prostaff 5 (8x42)]	4 nos.	38,600/-	
6.	**Night vision Binocular** [Bushnell LYNX]	01 no.	73,000/-	
7.	**Laptop** [HP 14-dh1026tx Pavilion x360 Laptop]	01 no.	1,15,000/-	
8.	**Desktop** [HP 24-f0043in 23.8-inch All-in-One Desktop (8th Gen Intel Core i5-8400T/ 4GB/TB/ Windows 10]	01 no.	69,000/-	
9.	**Projector** [ViewSonic M1-Portable Projector]	01 no.	56,000/-	
10.	**Printer** [Canon Pixma G3010]	01 no.	13,500/-	

Details should be provided in details **(*ref.* **Annexure III &IV).**

9. Quantification of Overall Project Progress

S. No.	Parameters	Total (Numeric)	Remarks/ Attachments/ Soft copies of documents
1.	IHR States/ UTs covered:	*Arunachal Pradesh*	
2.	Project Sites/ Field Stations Developed:	*9 nos. of nature trails are identified for tourism purposes*	
3.	Scientific Manpower Developed (PhD/M.Sc./JRF/SRF/ RA):	*02 Ph.D.*	*One submitted thesis and one is in writing stage*
4.	Livelihood Options promoted	*11 nos. of homestay services are promoted*	
5.	Technical/ Training Manuals prepared	*Not application*	*NA*
6.	Processing Units established, if any	.... (attach photos)	*NA*
7.	No. of Species Collected, if any	*Not application*	
8.	No. of New Species identified, if any	*Not application*	
9.	New Database generated (Types):	*Avian species checklist with population*	

10.	Others (if any)	-	

Note: Further details may be summarized in DPR Part-B. Supporting materials may be enclosed as annexure/ appendix separately to the FTR.

11. Knowledge Products and Publications:

S#	Publication/ Knowledge Products	*Number*		*Total Impact Factor*	*Remarks/* Enclosures
		National	International		
1.	Journal – Research Articles/ Special Issue:	03	01	0.74,0.71, 0.18	Paper enclosed
2.	Book – Chapter(s)/ Monograph/ Contributed:	-	-	-	-
3.	Technical Reports:	-	-	-	-
4.	Training Manual (Skill Development/ Capacity Building):	-	-	-	-
5.	Papers presented in Conferences/Seminars:	02	02	-	-
6.	Policy Drafts/Papers:	-	-	-	-
7.	Others, if any:				

Note: Please append the list of KPs/ publications (with impact factor, DOI, and further details) with due Acknowledgement to NMHS. Supporting materials may be enclosed as annexure/ appendix separately to the FTR. **Inclosed as Appendix-2.**

12. Recommendation on Utility of Project Findings, Replicability and Exit Strategy

Particulars	Recommendations
Utility of the Project Findings:	• The project findings can be used for strengthening and promoting wildlife-based ecotourism in general and avitourism in particular in Pakke Wildlife Sanctuary. • Project finding can also be used for management of protected area and development of conservation action for threatened species.
Replicability of Project/ Way Forward:	• The activities of tourist in the area will be monitored to know the impact of current study in form of flow of the tourists and income generated by local stakeholder from tourists.

Exit Strategy:	• Please describe the Exit Strategy of the project, self-sustaining and benefitting the stakeholders and local community: • As nine nature trails are identified along with existing wildlife species diversity, particularly of avian species which could be easily sighted in the Pakke area, can be natural resource for self-sustaining the wildlife-based ecotourism. And tourism activities can benefit the local stakeholders whoever involved in providing services to tourists as a homestay, nature guide, foods, etc. that activities can self –sustain their life.

(**PROJECT PROPONENT/ COORDINATOR**)

(Signed and Stamped)

PRINCIPAL INVESTIGATOR
DEPARTMENT OF FORESTRY
NERIST (DEEMED UNIVERSITY)

(**HEAD OF THE INSTITUTION**)

(Signed and Stamped)

Place: NIRJULI
Date: 05/12/2022

PART B: DETAILED PROJECT REPORT

EXECUTIVE SUMMARY (not more than 2–3 pages)

The Indian subcontinent serves as an excellent ground for the growth and development of biodiversity. India is one of the 12 mega-biodiversity country recognized for its rich flora and fauna (Venkataraman, 2011). Among the biological diversity, mammals and birds are the charismatic, beautiful and has wide distribution in nature. They are easy to watch, capture, and record on camera in the wild as they show attractive posture during foraging, breeding and nesting, etc. Wildlife-based ecotourism is becoming a solution or conservation tool in today's biodiversity protection and management, and also livelihood options for local people living in the fringe of the protected area world wide. It is one of the fastest-growing outdoor activities worldwide and is gaining popularity in developing countries to improve livelihood of local people. Wildlife-based ecotourism or Avitourism provides a positive delight to the bird watchers and nature lovers as they connect themself with nature and natural resources during bird watching, which contributes to job creation including various livelihood options for local inhabitants. Several studies have been reported the avitourism activities have a vital source of income in UK, Poland, Costa Rica etc. (Molloy *et al.*, 2011). Pakke wildlife Sanctuary (PWLS) is a part of Eastern Himalaya biodiversity hotspot area and has the tremendous potential for developing and promoting sustainable wildlife and nature- based ecotourism, which could further assist to livelihood of local people of the area. In view of the above background, the presented was carried out in Pakke Wildlife Sanctuary (PWLS) the following objectives to promote wildlife and nature-based ecotourism: *(i)* To evaluate the status of wildlife species and hotspot area with reference to flagship species targeting for wildlife-based tourism, *(ii)* To identify the major hotspot zones which have high potential for nature-based tourism within the selected study area, *(iii)* To investigate ways to promote wildlife and nature based tourism in Pakke Wildlife Sanctuary, Arunachal Pradesh, and *(iv)* Capacity building measure to forest department personals and local tribal people in relation to strengthen the ecotourism activities.

The study was conducted in between 2018 and 2021 in the PWLS located in Pakke Kessang district of Arunachal Pradesh. PWLS is naturally connected with Nameri National Park, Assam in one side and Sessa Orchid Sanctuary and Eaglenest WLS, A.P. through Tenga Reserve Forest otherside and coveres an area of 861.95 km^2. Direct observation by using total count and point methods, surveys were conducted to explore the biological diversity (particularly mammals, birds and butterflies) of PWLS in view of wildlife based ecotourim activities. Through regular monitoring and recording data on wildlife species, ecotourism zones/nature trails were identified. Questionnaire survey was conducted among selected stakeholders to assess the benefit gain through ecotourism activities. As a out of the present study, total 333 birds, 321

butterflies and 32 mammals have been reported. More than 200 individuals of Wreathed Hornbill and 32 Oriental Pied Hornbill and around 20 Great hornbills were recorded from the tourism identified sites. Four large roosting sites were recorded in and around the sanctuary. Two roosting sited are located nearby the home stay, in front of Tana Hola's homestay, Darlong village and named that place as "tea with hornbill". A total of 9 nature trails (tourism sites) ranging from 3.5 km to 13 km. had been identified for wildlife-based tourism activities based on easy detection of species for regular visits of tourists. These nature trails can be assessed by foot or vehicle. Two training programmes were orgainised during the study period by taking the participation of 116 peoples and 5 nature guides were fully trained as tourist guide. Before the starting of present study only six homestay was operated with minmum facilities, but after our team involment and 5 more homestays were developed with the existing infrastructure facility. Apart from the Seijosa forest range, Pakke Kessang and Rilloh range can be developed as other sites for avitourism in Pakke because of their mesmerizing landscape and unique bird species diversity (viz. Himalayan Cutia, Golden-throated Barbet, Brown dipper, Beautiful Sibia, etc.) for avitourist. Most of the tourists visiting Pakke are returning from the main gate of Pakke, asking about the kinds of souvenir availability. Therefore, it is recommended to open a few souvenirs shop near the entry gate of PTR in place of the far way like the Upper Seijosa to get local people benefits. Develop a small studio in Darlong village for tourists to watch hornbills roosting nearby the village by charging a nominal fee. Few trainings/workshops should be plan for better management of homestay, tour guide, restaurants and souvenir shops as currently available facilities are not up to satisfaction of tourist.

[1] INTRODUCTION

1.1. Background

Ecotourism is an alternative form of tourism focusing on the need for a "clean" environment, an alternative form of holiday linked to nature which respects the local hosting community's needs (Fennell, 2008). It has also been embraced by many livelihood-generating options that can raise incomes for local people who inhabit the fringes of biodiversity-rich areas, such as protected areas while supporting *in-situ* conservation (Biggs *et al.,* 2011). Ecotourism is rapidly becoming a solution in today's biodiversity conservation battle by minimizing exploitative behaviours of the environment. People worldwide realize that pristine wilderness is worth much more in the long-term by preserving it and its beauty rather than converting it into short-term profits through deleterious processes like unsustainable developmental, forestry or agriculture practices. Ecotourists pay for a variety of services when travelling to wildlife and nature-based areas (national parks and wildlife sanctuaries), such as payments made to transportation (air, bus and taxi), hotels, lodges, homestay, restaurants, food suppliers, local guides, entry fee of national

parks or wildlife sanctuaries, elephant and jeep safari, riverboat rides, cultural activities. In addition, parks and communities also charge indirect fees by selling souvenirs to ecotourists such as t-shirts, postcards, books, and hand-made crafts like jewellery, woodwork, clothes, tapestries, and local food products. Local communities get profit from these goods made directly by them. Selling these local goods contribute to a significant portion of tourism revenues by local communities in many developing countries (Wunder & Sayer, 2000).

Since then, ecotourism has been expanding gradually at 20% – 34% a year, with some years seeing ecotourism rising nearly as 300% fast as the overall tourism industry (World Tourism Organization, 2004). Tourism made a new record in 2014 with over 1.1 billion international tourists travelling worldwide in one year, excluding the millions of people who travelled within their home country (domestic tourists) and contributed more than 9% to GDP globally. The Costa Rican Tourism Institute estimated that 41% of its $1-billion tourism revenues were gained from tourists who came primarily for bird watching in 1991. Similarly, stork nesting colonies established in villages of Poland indicated that bird-watching tourists spent an average of US $60 per visit (excluding travel costs) and the US $120 per visit (including travel costs) as a result of viewing the storks. Molloy et al. (2011) have reported that each tourist spends £4.92 on a day trip and £55.96 on a visit to bird watching in the UK.

Arunachal Pradesh is part of Eastern Himalaya and is one of the biodiversity hotspots in India which comprised of many charismatic fauna and flora to wildlife and nature-based tourim. The rich and unique bird diversity of state makes it an ideal destination for avitourism. Among the PAs of state, Pakke Wildlife Sanctuary (PWLS)/ Pakke Tiger Reserve (PTR) reported about 296 avifauna species and several flagship species tourism points of view (Management plan of PTR) including 4 species of hornbills, which serve as a potential bird watching landscape lies in the foothills of Eastern Himalaya. Hornbill is the main focused/flagship species of birds for conservation in Arunachal Pradesh (Datta, 1998). Thus, PTR has the tremendous potential for developing and promoting sustainable wildlife and nature-based tourism activities, which could further contribute to the livelihood of local people of the area.

1.2. Overview of the major issues addressed (max. 500 words)

The protected areas in India provide livelihood support to the local people, directly and indirectly (Berkmuller et al.1986, Ali and Pai 2001, Musavi et al. 2006). But the disproportionate biotic pressure on the protected areas has adverse impact on them in terms of habitat quality and the wildlife therein. Hunting and poachting of wildlife species by local peoples, particularly forest dependent people for bushmeat and utilization in their cultural ceremony and decoration of headgears, Dao and house, threatened the many charismatic fauna of the area. As majority of

local people living in the fringe of the PWLS are dependent on forest resources of sanctuary directly for their livelihood. As a results, in the past, many wildlife species populations have been declined, and thus, it needs a local people participation in conservation of threatened specie of the area like hornbills, elephants, capped langur, etc.

Wildlife and nature-based ecotourism is a sub-component of the field of sustainable tourism. Ecotourism's perceived potential as an effective tool for sustainable development is the main reason why developing countries are now embracing it and including it in their economic development and conservation strategies. Thus, if the problem of income source is addressed through proper livelihood options for local people inhabiting around the protected area, pressure on natural resources particularly on biodiversity can be protected and sustainably conserved for future generation and raise economic status of the people.

1.3. Baseline Data and Project Scope (max. 500 words)

Several studies have been conducted in protected areas of Arunchal Pradesh in terms of exploring biodiversity including flora and fauna. However, so far, no such study has been conducted in view of promoting and developing wildlife and nature-based ecotourism in the area to provide an alternative and sustainable resource of livelihood for local people inhabiting around the protected areas. Pakke wildlife sanctuary is one the favoural place for the researcher among the all-protected areas of state and that's why several studies are conducted in Pakke on primates' ecology and behaviour (Kumar, 2006), hornbill ecology and seed dispersal (Datta, 2004; Datta *et al.,* 2008), Pheasant species (Selvan *et al.,* 2013), Leopard cat (*Prionailurus bengalensis*) (Selvan *et al.,* 2014) and Bengal Slow Loris (*Nycticebus bengalensis*) (Das *et al.,* 2016).

From the past studies it is understood that there is tremendous potential for wildlife-based ecotourism promotion in the area. However, an immense research gap is prevailing for understanding overall wildlife species, particularly bird community characteristics and population ecology concerning various habitat structures and compositions to highlight its potential sites to improvise a plan for promoting and developing wildlife based ecotorism in the area while strengthening the livelihood of local people.

1.4. Project Objectives and Target Deliverables (as per the NMHS - Sanction Order)

Project Objectives	Quantifiable Deliverables
• To evaluate the status of wildlife species and hotspot area with reference to flagship species targeting for wildlife-based tourism in selected study areas. • To identify the major hotspot zones which	• Maps showing hotspot zones for promoting wildlife and nature-based tourism and spot diurnal and nocturnal mammals. • Capacity building to 300 forest guards and local tribesmen.

have high potential for nature-based tourism within the selected study area. • To investigate ways to promote wildlife and nature-based tourism in two major protected area of Arunachal Pradesh. • Capacity building measures to forest department personals and local tribal people in relation to strengthen the ecotourism activities.	• Blueprint on ways to promote wildlife and nature-based tourism. • Tourist Map and templates for promoting tourism.

[2] METHODOLOGIES/STARTEGY/ APPROACH

2.1. Study area: Pakke Wildlife Sanctuary/ Pakke Tiger Reserve

Pakke Wildlife Sanctuary and Tiger Reserve has great potential for ecotourism development because of their unique and rare wild animal and plant species. Pakke Wildlife Sanctuary and Tiger Reserve (here after PWLS or PTR) located in the East Kameng district, lies in the eastern Himalayan state of Arunachal Pradesh, India (26° 85' 49" N to 27° 81' 69" N; 92° 83' 69" E to 93° 80' 99" E) and covers an area of 861.95 km2. A result of its location at the Oriental and the Indo-Malayan realm and has been considered as one of hot-spots for biodiversity (Myers 1991). The area has subtropical climate with cold weather from November to March. It receives rainfall from both south-west (May-September) and north east monsoons (November-April). Temperature in the summer goes up to 30° C and goes down to 2° C in the winter. PWLS is bordered by the Bhareli River (or Kameng River) in the north and west, the Pakke River and the Nameri National Park in the east. The topography of the tiger reserve is undulating and hilly. The altitudinal variations start from 150 to 2040 m above mean sea level. Thus, the PTR is surrounded by contiguous forests, undulating terrain, and hills on most sides, with higher elevations in the northern part of the reserve. The vegetation of PTR is Assam Valley type (2B/C1); tropical semi-evergreen with a high density and diversity of trees, woody lianas and climbers (Champion & Seth 1968). Tropical, semi-evergreen forests dominate the lower plains and foothills, while subtropical, broadleaved, evergreen and dense forests occur at elevations of 900 to 1,800 m above sea level. The plant diversity of PTR is studied by Datta & Goyal, 1997 who reported 234 species of angiosperms with a high representation of species from the family Euphorbiaceae and Lauraceae in low-lying areas. Similarly, Tag *et al.* (2012) reported 215 species of higher plants. The forest of PTR has a typical multilayered structure with major emergent species are *Tetrameles nudiflora* and *Altingia excelsa* (Singh, 1991).

PWLS has a great diversity of avifauna and mammalian species. PWLS is famous for its hornbill species namely Wreathed Hornbill (*Rhyticeros undulatus*), Oriental Pied Hornbill (*Anthracoceros albirostris*), Great Hornbill (*Buceros bicornis*), and Rufous-necked Hornbill (*Aceros nipalensis*). Blyth's Kingfisher is a fascinating species found frequently in the santuary.

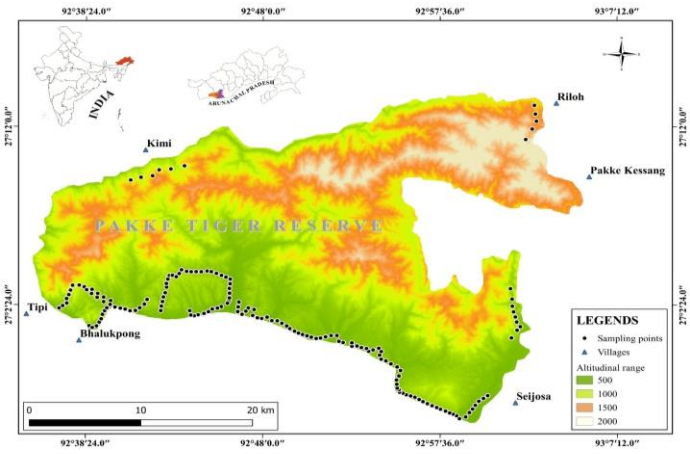


Figure 1. Map of study area with altitudinal variations and sampling points: Pakke Wildlife Sanctuary/Tiger Reserve, Arunachal Pradesh.

Sixty mammalian species have been reported from the PTR (Selvan, 2013). The major herbivores are elephant *Elephas maximus*, Gaur *Bos garus*, Sambar *Rusa unicolor*, barking deer *Muntiacus muntjak* and Wild boar *Sus scrofa*. Datta (1999) has reported seven species of small carnivores. Four species of primates are recorded in the sanctuary *viz.* capped langur, Assamese macaque, Rhesus macaque and slow loris (Kumar & Solanki, 2003).

The Nyishi are the most dominant tribal group in Arunachal Pradesh, with several clans which also dominate in the PTR area. About 16 villages are established in the eastern boundary of PTR with 791 households and 3902 individual human populations (Census 2011) (Table 1).

Table 1. Demographic profile of villages established around the Seijosa Forest Range of Pakke

S. N.	Villages	Administrative Division	Population	Total No. of Houses
1.	A - 1 Block	Seijosa	27	5
2.	A - 2 Block	Seijosa	78	16
3.	A - 3 Block	Seijosa	29	4
4.	Bali Basti	Seijosa	259	45
5.	Darlong	Seijosa	516	82
6.	Goloso	Seijosa	214	46
7.	Jolly	Seijosa	236	53
8.	Lanka	Seijosa	42	7
9.	Lower Seijosa	Seijosa	479	107
10.	Mobuso - II	Seijosa	30	7
11.	Mobuso -1	Seijosa	82	18
12.	Monai	Seijosa	43	14
13.	Morgaso	Seijosa	23	4
14.	Niti Darlong	Seijosa	461	63
15.	Taro Boso	Seijosa	24	3
16.	Upper Seijosa	Seijosa	1,359	317

2.2. Animals survey

The present study was carried out for two consecutive years from 2018 to 2021 on major seasonal bases: pre-monsoon (January to April) and post-monsoon season (September to December) when tourist activities are more feasible in northeast. The study area was divided into three major habitat types based on the availability of animals, particular bird species. A systematic field survey was carried out using the point count method (Bibby *et al.,* 1992) to estimate the species diversity and population attributes of avifauna found across different selected habitat types (Fig.2). The point count distance sampling method is widely used to estimate biological populations' diversity, density and abundance. This is the simplest method of counting birds, mammals and butterflies by an observer and recording all the animals seen and heard from a point count station for a set period. A total of 164 sampling points were laid in the entire landscape in selected habitat types (Forest; 109 points, Bamboo; 25 points, and Riverine; 30 points) (Fig.1). The number of sampling points varied in all three habitats due to detection and visibility of the targe wildlife species in the dense forest. Around 300 km^2 area was covered during the study wich ranged from 100 to 2000 m altitude.

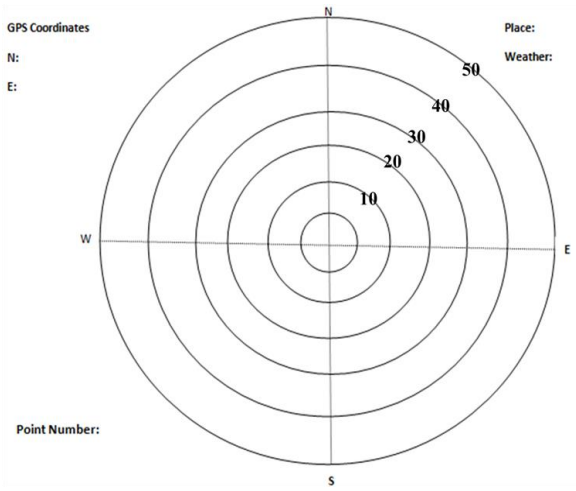


Figure 2. Circular plot for avifauna sampling at a point station (Bibby *et al.,* 1992**)**

Since the visibility or detectability of a species varies with time of year and time of day (Best, 1981; Robbins, 1981), therefore, a survey was conducted within a 50-meters radius in each point station (Fig.2) with two phases, such as early morning of the day between 06:00 hrs to 10:00 hrs and evening 14:00 to 16:00 hrs before sunset because of tourist visiting time. Time spent at each point was 15 minutes, followed by five minutes for settlement. All the point count stations were laid on exiting forest trails or trekking routes, and at least 500 m interval distance was maintained to minimize the overlapping of bird encounters (Hansen *et al.,* 1995). At the time of sighting of species, ecological data such as name of each species and its total individuals, perch height of individuals, and distance from the observer were recorded. In addition to birds,

other group of animals such as mammals and butterflies were also recorded and photographed for further indentification, if not. Beside the direct observation, indirect sign such pug and hoof mark, scats, dung, pellets, etc. were also collected and identified later on.

2.3. Identify the forest trails and potential habitats for promoting of wildlife-based ecotourism

The regular monitoring of wildlife, particularly birds were conducted in the assessable tourism area of WLS to identify the potential avitourism sites to promote avitourism (Amoah & Wiafe, 2012). Regular monitoring routes were viewed as transects with unfixed widths to collect information on wildlife species diversity and density. All the selected nature trails were given ID Trail-1 (T1), Trail-2 (T2), Trail-3 (T3), Trail-4 (T4), Trail-5 (T5), Trail-6 (T6), Trail-7 (T7), Trail-8 (T8) and Trail-9 (T9). During the monitoring activities, a standardized data sheet was used to keep records, such as (i) monitoring date and time, (ii) duration of monitoring, (iii) area or transects or tourism routes monitored, (iv) total distance covered, (v) numbers of avian species encountered along with their total individuals and locations. Monitoring was done from October to March due to the peak months of tourism activities in northeast India. Each selected site was monitored twice a month and took place in two phases, morning (07:00 to 11:00 hrs.) and afternoon (14:00 to 16:00 hrs), according to the visiting time of tourists. Various factors related to tourism activities were identified based on proximity factors such as available road network, lodging facility, and the approximate total time required to visit the area concerning the distribution, abundance, sighting probability and frequency of particular flagship and charismatic avian species (Hornbills and others) or their potential sites. A GIS-based map integrating the tourism routes for avitourism prepared

2.3. To study the potential economic benefits gained by the local community through wildlife-based tourism activities.

Understanding the distribution of economic benefits can assist protected area managers in making more informed and balanced decisions and adjusting tourism development and biodiversity conservation policies together. The method described by He *et al.* (2008) was used to collect data on the economic benefit of wildlife-based tourism in protected areas. Stakeholders like nature guides, restaurant and souvenir shops, and homestay, etc., were selected to evaluate their economic benefit gain through the tourism activities (Black, 2015). A pre-structured questionnaire survey was conducted among these people.

2.4. Data collected and Equipments utilized:

For wildlife species (bird, mammals and butterfly) the existing nature trail was used for survey. Pakke Tiger Reserve is rich with many rare and threatened bird species so our main goal was to document the easily sighted species and their population around the existed nature trail and how visitors can use those nature trails for wildlife watching.

All the nature trail was marked with GPS track and prepared a trail map with the flagship and charismatic species so that tourist can easily select the nature trail with their choice of targeted species. Species was observed with the help of binocular and camera was used to photograph the species for further identification and documentation. Collected data was compiled and analyzed using laptop and desktop. Projector was used in conducting the capacity building and awareness workshops.

Apart from wildlife species documentation and estimated, we have also surveyed for hospitality in the surrounding of the sanctuary as no hotel, resorts and restaurant facilities were available within 30 km of the sanctuary. So, the homestays were located nearby villages was monitored reguraly.

2.5. Details of Field Survey conducted, if any:

The field survey was conducted inside Pakke wildlife sanctuary and their fringe villages (Darlong, Seijosa, Jolly, Lanka, Tipi, Bhalukpong, Kimi and Pakke Kessang). The existing nature trails and some new nature trails were selected for the wildlife documentation.

2.6. Strategic Planning for each activity with time frame:

S/N	ACTIVITIES	YEAR		
		FIRST	SECOND	THIRD
1.	Review of literature			
2.	Field data collection on wildlife diversity			
3.	Monitoring of Nature trails to identify the potential habitats for ecotourism			
4.	Interview among the local stakeholders for ecotourism			
5.	Workshop and awareness programme			
6.	Data Analysis and report writing			

[3] KEY FINDINGS AND RESULTS

3.1. Major Activities/ Findings (max. 500 words)

A total of 29 mammalian, 333 avian and more than 145 species of butterfies were recorded during the survey in the selected habitats. Maximum species diversity was recorded in forest area, followed by riverine habitat and bamboo dominating forest. Nature trail 2 was recorded to have highest and diversity of spcies and easily accessible for ecotourist. The present study

deeply focused on avian diversity as they are easily sighted and attractive to tourist. All together 9 nine nature tails covered a total distance of 64 km. Figure (3 & 4) represents the abudance of bird diversity and population during the study periods. In 2020, nature trail T4 was dominated by bird species with comprising of 98 species, followed by T8 (84 species), T2 (83 species), T3 (73 species), T9 (51 species), T5 (49 species), T1 (48 species), T7 (44 species) and T6 (33 species) (Fig.3). Similarly, the number of bird individual was recorded highest in T2 (6.63±2.25) n=1115, followed by T3 (4.36±2.09) n=759, T4 (3.76±0.87) n=658, T8 (3.63±1.03) n=614, T1 (2.89±1.15) n=491, T9 (1.35±0.34) n=227, T5 (1.34±0.35) 226, T7 (1.2±0.26) n=202 and T6 (1.04±0.53) n=175 (Fig.4). Similarly in 2021, nature trail T4 was again recorded the height number of bird species (104) followed by T2 (90 species), T8 (82 species), T3 (80 species), T5 (67 species), T7 (62 species), T9 (54 species), T1 (51 species), T6 (45 species) (Fig.3). And the bird individual was highest in nature trail T8 (4.36±1.47) n=813, followed by T4 (3.39±0.65) n=661, T2 (3.12±0.73) n=581, T3 (2.74±0.63) n= 509, T1 (1.77±0.6) n=329, T5 (1.54±0.39) n= 282, T7 (1.41±0.29) n= 263, T9 (1.37±0.29) n=258, and tT6 (0.64±0.14) n=123 (Fig.4).

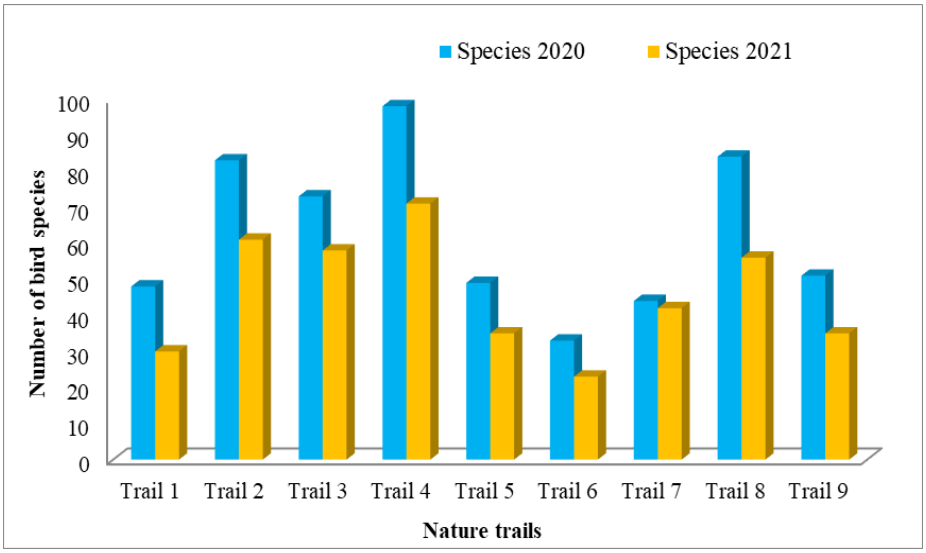


Figure 3. Bird species recorded in selected nature trail in the year 2020 and 2021.

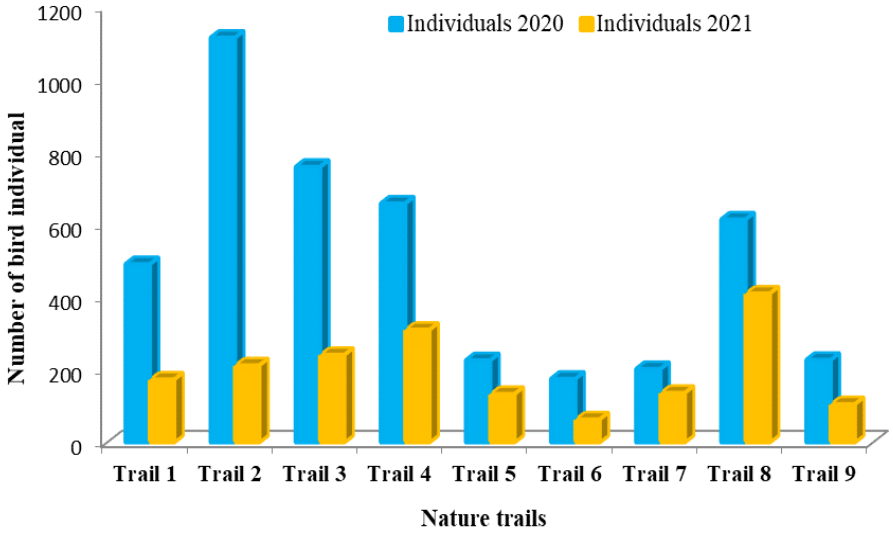


Figure 4. Iindividuals of the bird species in selected nature trail in the year 2020 and 2021.

Species richness was recorded highest (98) in T4 and lowest (33) in T6 (Table 4.17). Shannon diversity index was highest in T4 (3.68) and lowest in T6 (2.18) (Fig. 4.25), Simpson diversity index was highest in T7 (0.95) and lowest in T6 (0.73), Dominance was highest in T6 (0.27) and lowest in T7 (0.07) (Fig. 4.26), and species evenness was highest in T7 (0.61) and lowest in T3 (0.18) (Fig. 4.27).

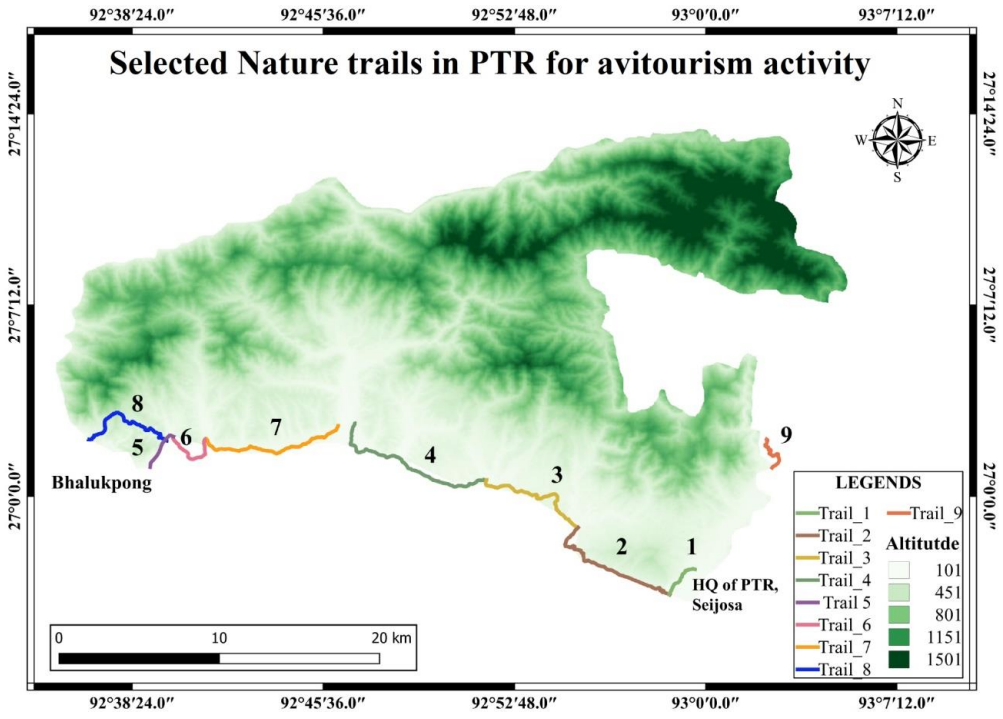


Figure 5. Selected nature trails for wildlife-based ecotourism activity in Pakke

Table 2. Diversity indices of bird species recorded selected nature trails.

Trail ID	Taxa	Individuals	Dominance	Simpson	Shannon	Evenness
T1	48	491	0.16	0.84	2.53	0.26
T2	83	1115	0.12	0.88	2.80	0.20
T3	73	759	0.22	0.78	2.57	0.18
T4	98	658	0.06	0.94	3.68	0.41
T5	49	226	0.07	0.93	3.24	0.52
T6	33	175	0.27	0.73	2.18	0.27
T7	44	202	0.05	0.95	3.30	0.61
T8	84	614	0.08	0.92	3.37	0.34
T9	51	227	0.07	0.93	3.25	0.51

Cluster analysis shows similarities between the nature trails. Nature trail T4 (13km), and T8 (9 km) illustrated more than 50% similarities. T7 (5km) and T9 (3.5km) were estimated to have 47% similarities between each other. T3 showed the 46% similarities with T4 and T8 (Fig. 6).

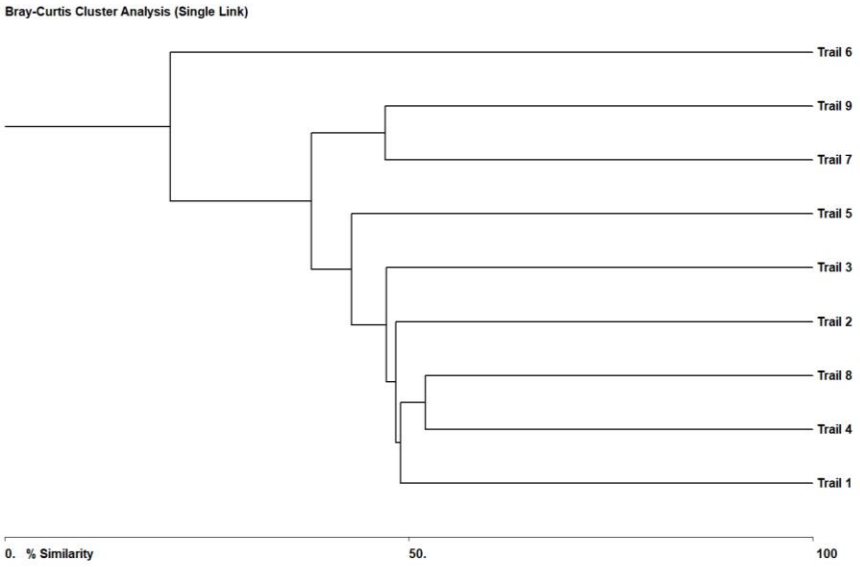


Figure 6. Dendrogram illustrating trail wise distribution patterns of birds between nature trails.

Population status of flagship species: Hornbills in roosting sites

Through intensive survey, four roosting sites were identified (two inside the forest and two outside the forest) and selected for hornbill watch for tourists. Based on the direct total count in four roosting sites, maximum individuals (79±46.7) of Wreathed hornbill was recorded at Darlong village (26.9401N & 92.9975E) followed by A2 Village (29.9908N & 93.0298E) 29.7±9 and Khari camp (26.9811N & 92.9208E) 20±5.Only one roosting was recorded of Oriental Pied Hornbill at Langka camp (27.0204N &93.0465N) 21.8±9.4 (Table 3). Based on survey results, the sanctuary is having a high potential for the sighting of hornbill species for the hornbill lovers. More than 50 individuals of

hornbills can be sighted easily in one flock in the morning and evening hours in roosting sites. Hornbills were estimated separately in the study site and all together the highest individual density 55.13±10.63/km^2 was calculated in the year 2020 and lowest 51.14±10.56/km^2 in the year 2021. Similarly group density of hornbills was recorded highest 4.64±0.89/km^2 and lowest 3.54±0.73/km^2 in the year 2021 (Table 4).

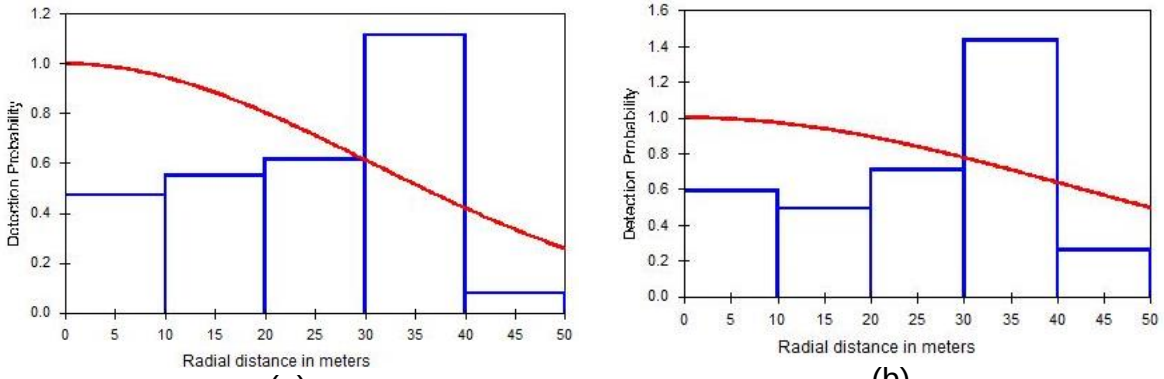
Table 3. Abundance of hornbill species in four different roosting sites

Species	Roosting site	Population (Mean±SD)	Distance from HQ (Km)	Best time to watch	Month	How to reach
Wreathed Hornbill	Darlong	79±46.7	2	5:00 to 6:00 hrs & 16:00 to 18:00 hrs	Whole year	By walk and vehicle
Wreathed Hornbill	A-2 Village	29.7±9	10	5:00 to 6:00 hrs & 16:00 to 18:00 hrs	January to March	By vehicle
Wreathed Hornbill	Khari camp	20±5	12	5:00 to 6:00 hrs & 16:00 to 18:00 hrs	January to March	By vehicle
Oriental pied Hornbill	Langka camp	21.8±9.4	14	5:00 to 6:00 hrs & 16:00 to 18:00 hrs	January to March	By vehicle

Table 4. Density estimation of all three hornbills inside Pakke Wildlife Sanctuary

Year	Mean cluster size	DP (%)	DS	D	EDR
2020	29.64±1.07	99.6	4.64±0.89	55.13±10.63	37.05±3.57
2021	31.66±1.09	99.5	3.54±0.73	51.14±10.56	42.40±4.37

DP= Detection probability, DS= Density of cluster (Number/km^2), D= Density of individual (Number/km^2), EDR= Effective density radius (m)



(a) (b)

Figure 7. Detection probability of hornbill speciesin the year: (a) 2020 and (b) 2021.

(a) Langka camp) Oriental Pied Hornbill roosting

(b) (Darlong village) Wreathed Hornbill roosting

(c) (Khari camp) Wreathed Hornbill roosting

(d) (A-2 Village) Wreathed Hornbill roosting

Photo plate 6. Roosting site of hornbills in the fringe villages and inside the PLWS.

Table 5. Density estimation of hornbill species in the year 2020 and 2021

Year	Hornbill Species	Mean cluster size	DP (%)	DS	D	EDR
2020	WH	29±1.55	99.8	4.92±1.31	58.27±15.56	35.97±4.80
	OPH	27.78±2.61	99	5.25±1.97	54.61±20.59	34.79±6.52
	GH	32.6±1.36	100	3.63±1.50	63.25±26.02	41.81±8.59
2021	WH	32.64±1.46	99.7	2.85±0.89	46.73±14.58	47.20±7.35
	OPH	29.29±2.72	98.8	4.66±1.66	55.89±19.93	36.91±6.54
	GH	32.46±1.23	100	3.97±1.70	66.25±28.41	40.04±8.59

WH - Wreathed hornbill, OPH- Oriental Pied hornbill, GH- Great hornbill, DP= Detection probability, DS= Density of cluster (Number/km^2), D= Density of individual (Number/km^2), EDR= Effective density radius (m)

Income generated by local people

(a) From primary resources: PWLS is surrounded with three major places e.g. Seijosa in eastern side; Bhalukpong in western side and Pakke Kessang in north-eastern boundary with district headquarter. Seijosa is headquarter of PWLS, located in its fringe area along with 14

small villages and also this place is easily accessible for tourism activity. A total of 32 local peoples were interviewed around the two ranges of PWLS which comprised of 62% (n=20) males and 38% (n=12) female respondent age-groups in between 20 and 60 years. Among the consulted respondents, maximum 56% (n=18) of respondent were self-employed followed by casual forest staff 22% (n=7), agriculture-based income 16% (n=5) and minimum respondent 6% (n=2) were in govt. job. The income generated from primary sources is range between Rs. 6000/month and >30000/month.

(b) Income generated from wildlife-nature based tourism activities: Apart from their primary occupation, these people were also engaged themselves in tourism related activities such as homestay management, nature guide, restaurant and souvenir business to earn some additional income for livelihood. Among the interviewed local people, maximum people 41% (n=13) were earning through homestay management (between Rs.<5000 to 20000/-per year), followed by nature guide (34%, n=11, between Rs. 5000 to 20000/- year), restaurant & souvenir shop business (25%, n=8, Rs. 5000 to 50000/- year). These earning data are collected immediate after the lifting of Covid-19 pendemic restriction. These earning can be more but due to Covid-19, entire tourism activity was affected.

3.2. Key Results (max. 500 words in bullets covering all activities)

- At total of 29 mammalian, 333 birds, 145 butterflies were recorded from the three selected habitats.
- The highest species diversity was recorded in the forest habitat, followed by bamboo dominated forest and riverine habitat.
- The recorded 333 bird species belonging to 75 families and 19 orders during the study period.
- Among 19 orders, Passeriformes dominated with 197 species constituting 59% of the total bird species.
- The bird species richness was found dominant in the forest habitat (169 species), followed by bamboo (123 species) and riverine (120), while 72 species shared all three habitats
- The highest number (1698) of individuals was recorded for Black Bulbul (*Hypsipetes leucocephalus*).
- Hornbills, Blyth's Kingfisher, and elephants are identified as flagship species and marked their roosting and continuous movement places for tourism point of view.
- Three species of hornbills are recorded in the Pakke with adequate population viz. Wreathed hornbill, Oriental Pied hornbill and Great hornbill.

- More than 200 individuals of Wreathed Hornbill and 32 Oriental Pied Hornbill and around 20 Great hornbills were recorded from the tourism identified sites and a total of 62 individual of hornbill species were recorded frequently in sampling points laid in tourist trails.
- 23 Nos. of Hornbills nesting sites are located nearby the nature trails.
- 4 Nos. of hornbills roosting sites (three roosting sites of Wreathed hornbills and one roosting of Oriental Pied hornbills) are located and selected as tourist attraction sites. Two roosting sited are located nearby the home stay in outside the forest, in front of Tana Hola's homestay, Darlong village and named that place as "**tea with hornbill**" and remaing two are inside the forest near the nature trails.
- Based on the direct total count in three roosting sites, maximum individuals (79±46.7) of Wreathed hornbills were recorded at Darlong village (26.9401N & 92.9975E) followed by A2 Village (29.9908N & 93.0298E) 29.7±9 and Khari camp (26.9811N & 92.9208E) 20±5. Only one roosting was recorded of Oriental Pied Hornbill at Langka camp (27.0204N &93.0465N) 21.8±9.4.
- A total of 9 nature trails ranging from 3.5 km to 13 km. had been identified for tourism based on easy detection of species for regular visits of tourists. These nature trails can be assessed by foot or vehicle. These nature trails are having altitudinal variation between 100 to 600 m above sea level and comprised of mostly with tropical semi-evergreen forest, riverine and bamboo habitat.
- The highest number of bird species (104) was recorded from nature trail T4 and lowest (50 sp.) in nature trail T1 during the survey.
- Due to lack of hotel facilities nearby Pakke, 11 nos. homestay are established and managed around the fringe area of PWLS. Among the 11 homestays, 5 homestay owners who had potential to developed homestay facilities with existing infrastures were contacted and techanically supported to developed homestay and other facilities for tourist as fishing in their own pond, birding with expert nature guides, bike safari and mammal watch.
- By engaging 5 Nos. of local unemployed youth (4 male +1 female) as local assistant during the study were trained as tourist guide by providing the knowledge about wildlife species identification.
- Due to covid-19 restrictions during the study period, only two programmes were conducted. One capacity buidling programme on management of homestay and encourage local youth as tourist guide has been conduct in Seijosa range, Pakke Wildlife Sanctuary by participating of 31 local people. Another was on awareness programme on marbel cat and other wildlife species, that how can be indirect value (wildlife based

tourism) of wildlife could be used as option to earn livelihood by taking the participation of 80 young youth of schools.

- A brochure for home stay details has been prepared for marketing and promotion of home stays. Hoardings and Banners for publicity of tourism activities prepared.

3.4. Conclusion of the study (max. 500 words in bullets)

i. The present study concludes that Pakke Wildlife Sanctuary has the best capability to develop avitourism because the avifauna found in this landscape are rich enough in diversity (333 sp.) distribution (Forest habitat- 169, Riverine- 123 Bamboo- 120) with endemism and rarity.
ii. The present study has added 110 bird species to the previous checklist of Pakke, which shows a vital contribution to the study, and it will also be helpful for the future management plan of PTR.
iii. In the present study, some new area was explored, such as Kimi, Rilloh and Pakke Kessang, which was not explored before for bird documentation and population status.
iv. Pakke Kessang range was not explored before, and the present study revealed a unique habitat with a high altitudinal range (1000-2000m asl) and rich diversity of avifauna species.
v. Out of the 333 recorded bird species, Black Bulbul, Scarlet Minivet, Common Hill Myna, Silver-eared Mesia, Blue-winged Minla, Oriental white eye, Pin-tailed Green Pigeon, Asian fairy Bluebird, Blue-throated Barbet, Red-breasted Parakeet found as dominating species, and 21 species was recorded only once for example Asian Emerald Cuckoo, Crested Goshawk, Himalayan Cutia and White-browed Shortwing.
vi. The findings of 18 threatened bird species will be helpful in managing the habitat in the Pakke Wildlife Sanctuary as well as also suggest the area as a bird conservation site.
vii. The habitat selected for birds (Forest, riverine and Bamboo) in Pakke Wildlife Sanctuary revealed a total of 67 tree species belonging to 34 families and high species diversity represented under the family Malvaceae. Mostly birds were distributed in forest habitats, and as a result, it is proven that PTR has a healthy forest habitat.
viii. Habitat parameters like crown cover, number of tree species, number of tree individual, GBH and tree height has played a significant impact on bird species richness in the present study as it has shown the strong positive correlation between no. of tree individuals and crown cover with bird species richness, but tree GBH and tree height is shown the negative correlation with the number of bird species richness.
ix. The present study has identified 9 nos. of nature trails based on bird species richness, abundance and density. Nature Trail-04 has recorded maximum bird species richness, which could be the preferred point for avitourism by avitourist.

x. Out of three hornbill species recorded in Pakke Wildlife Sanctuary, Wreathed hornbills were recorded with the highest population and density in roosting sites. Detection probability was recorded 98 to 100% in all seasons, which shows that Hornbills are easily encountered species in all the nature trails.

xi. Four roosting sites were recorded along the nature tail and in the nearby fringe villages of PTR. Among them, one is named as "**Tea with Hornbill**" due to direct sightings of species from the homestay point at morning and evening tea time.

xii. Apart from hornbill species, avitourst can also enjoy the sighting of some other flagship species such as Blyth's Kingfisher and Ibis bill, which could also be a good option for avitourism development because of their limited population in India but wide distribution in the riverine habitat of PTR.

xiii. The local community has shown a positive attitude towards the conservation of avian species in general and hornbill in particular as they are gaining livelihood from avitourism activities such as nature/bird guide, homestay business, restaurants, handicrafts, jeep safari etc.

xiv. Finally, from the above study, it is concluded that Pakke Wildlife Sanctuary has vital potential and is a destination for avitourism along with enhancing the livelihood of the local inhabitant.

[4] OVERALL ACHIEVEMENTS

4.1. Achievement on Project Objectives/ Target Deliverables (max. 500 words)]

The overall deliverables of the approved objectives are not achieved due to Covid-19 pendemic. Though, the present study has generated the quality data-sets, which could be used in the formulation and development of wildlife-based ecotourism action plan for the Pakke Wildlife Sanctuary, Arunachal Pradesh, such as highlight the nature trails or tourist zone for visiting tourist, kinds of species available in the nature trails, distance of nature trails and time needed for trekking, roosting and nesting sites of hornbills, visiting time, homestay and other facilities available for tourist, connectivity, etc. Recording of 23 species mammals, 333 species of birds,145 species of butterflies as well as more than 200 individuals, 4 numbers of roosting and 23 numbers of nesting sites of hornills highlight the potential of the PWLS for the wildlife-based tourism in general and avitourism in particular. Involvement of local stakeholders in tourism related activities like homestay management, tour guide, jeep & bike safari, restaurant, saviour shop, etc. and getting direct benefits from them has encouraged the local people.

4.2. Interventions (max. 500 words)

Covid-19 Pandemic was the major intervention during study period, and because of this the present study was not achieved their goal as planned. More than year entry inside the sanctuary was restricted for both researchers and tourists and data collection was hampered.

Because of the Covid-19 restriction, we could not organize more nos. of capacity building programme for local people and forest department personals.

4.3. On-field Demonstration and Value-addition of Products, if any:

By engaging 5 Nos. of local unemployed youth (4 male +1 female) as local assistant during the study they were given on-field training by providing the knowledge about wildlife species identification to become as a tourist guide and further employ self as a tourist guide.

4.4. Green Skills developed in State/ UT (max. 500 words): Not Applicable

4.5. Addressing Cross-cutting Issues (max. 200 words)

Before our project only six homestays were operated nearby the sanctuary but after our project implementation, we identified the local people, who had adequate existing infrastructure and can be converted as homestay, were encouraged and technical support regarding the management of homestay was provided. In this way, five more homestays have been established. We provided a register to all 11 homestays to maintain tourist database like contact details, days of stays, purpose of visit and number of days spent with them and income gain from tourist by providing various services. These data can be use by the forest department and researchers so that their livelihood income generation can be measured. Forest department has key role on tourism activity. PWLS has poor tourism history accroding to secondary data collected from forest department. After our project initiation we have exposed Pakke continuously by social media plateform and publishing papers, and artices more visitors are coming to Pakke for birding, specially to watch Hornbills and Blyth's Kingfisher which are flagship for this region. Based on survey results, the sanctuary is having a high potential for the sighting of hornbill species for the hornbill lovers. More than 50 individuals of hornbills can be sighted easily in one flock in the morning and evening hours in roosting sites.

[5] PROJECT'S IMPACTS IN IHR

5.1. Socio-Economic impact (max. 500 words)

It is deliberated from the present study that people have gain little economic benefits from the wildlife-based tourism related activities like homestay, tour guide, jeep & bike safari, restaurant, saviour shop, etc. but due to covide-19 pendemic restrictions, they were suffered a lot in the initial stage of development of their business. Fringe area of Pakke Wildlife Sanctuary is mostly inhabited by tribal population whose livelihood is mostly depend upon the natural resource extracted from the buffer area of the sanctuary or nearby researve forest areas. Local people of the area are very cooperative and actively participating in the wildlife conservation programme. Hornbills nesting and roosting site adoption programme are the examples of people participation

in the area. Adoption or used of artificial products in place of products made by wild animal's body parts are other examples of local people's cooperation in wildlife conservation in the area as well as entire Arunachal Pradesh. As artificial beak of hornbill (mady by wood or synthetic fibre glass) woolen decorated *Dao* (Big Knife) covers demand are raising now days and these products locally manufactured and become part of cottage industry in the state.

5.2. Impact on of Natural Resources/ Environment (max. 500 words)

Pakke is established in between foothill and lower Himalayan region. It comprises many threatened and rare wildlife species. The species recorded in the eastern Himalaya are not found in mainland India. Most of the people living around the Pakke are the tribal people who are using the forest resources from the childhood for their sustainability. Therefore, to reduce their dependency on forest resources, an alternative livelihood sustainable option is needed and wildlife resources could be one of the options, if preserve and protected with sufficient in numbers. As Kaziranga National Park is one the best example in India to sustain many human populations with a healthy life-style due to protection of wildlife in general and rhino in particular. So, in near future if tourism activity will increase and it won't manage on sustainable way, then definitely it might be impact negatively to the animal species movement. But presently there are not any threats or impact on natural resources by tourism activities. However, if the local people income is not increase in coming years, then definitely there will be huge impact on natural resources,

5.3. Conservation of Biodiversity/ Land Rehabilitation in IHR (max. 500 words)

As Pakke wildlife sanctuary is very rich in terms of biodiversity due to its geographical location and highly secured from natural boundary like rivers and continuous forest area and well managed by local community people. Only 20-30% landscape of Pakke is exposed to tourism activities so there are no regular threats to biodiversity of the sanctuary.

5.4. Developing Mountain Infrastructures (max. 200 words)

There is very less development around the Pakke wildlife sanctuary. Presently few developments like construction of road are going on to connect Seijosa from Pakke Kessang, the district headquarter. Pakke well connect through road network from Assam. New lodging facilities are now available in Pakke Kessang (Tourist lodge and home stay) and regular bus and taxi facilities are also there direct from Itanagar.

5.5. Strengthening Networking in State/UT (max. 200 words)

[6] EXIT STRATEGY AND SUSTAINABILITY – *supporting documents to be attached.*

6.6. Utility of project findings (max. 500 words)

Project was initiated with the main goal to encourage local community for livelihood income generation from ecotourism and that was achieved with this project. One workshop on homestay management was conduct in the PTR head quarter and local was interestingly participated. People are now engaged with various tourism activities such as homestay and nature guides business. We prepared a baseline data of wildlife species which may help for future monitoring by forest department and also it will be helpful for the other stakeholders such as local NGOs, researchers, scientist etc. Homestay information data was also prepared so when the tourist will visit, they can select their choice of Homestay. The Hornbill were selected as Flagship species and department can take major initiative for the conservation of Hornbills and other wildlife species. The finding of project may help to develop of blueprint or policy draft for development of tourism programme in the area.

6.2. Other Gap Areas (max. 200 words)

Pakke wildlife sanctuary is not yet explored fully and still only 60-70% of area is explored. Northern part of PTR is still untouched due to undulating terrain and lack of infrastructure facilities like trekking routs, road, accommodation, etc. In our study we tried to explore some new area such as Kimi, Tipi and Pakke Kessang.

6.3. Major Recommendations/ Way Forward (max. 200 words)

Based on objectives and conclusions, the following recommendations have been generated for the promotion of avitourism in the Pakke area.

- ✓ Apart from the Seijosa range, Pakke Kessang and Rilloh range can be another site for the development of avitourism in Pakke because of their mesmerizing landscape and unique bird species diversity (viz. Himalayan Cutia, Golden-throated Barbet, Brown dipper, Beautiful Sibia, etc.) for avitourist.
- ✓ A few species, like White-winged wood duck (*Asarcornis scutulata*) and Rufous necked hornbill (*Aceros nipalensis*), were available previously in good numbers, but in the present study, only a few individuals of White-winged wood duck are recorded. Both being flagship species, their reintroduction plan could be initiated to maintain the area's unique diversity.
- ✓ Most of the tourists visiting Pakke are returning from the main gate of Pakke, asking about the kinds of souvenir availability. Therefore, it is recommended to open a few souvenirs

shop near the entry gate of Pakke in place of the far way like the Upper Seijosa to get local people benefits.

- ✓ Develop a small studio in Darlong village for tourists to watch hornbills roosting nearby the village by charging a nominal fee.
- ✓ Apart from hornbill, Blyth's Kingfisher can also be a good option for avitourism development because of their limited population in India but wide distribution in the riverine habitat of Pakke.
- ✓ To manage and improve the hornbills roosting and feeding habitat in the forest by planting suitable tree species such as for nesting trees viz. *Bombax ceiba, Albizia procera*, for roosting viz. *Ailanthus grandis, Tetrameles nudiflora* and *Altingia excels* for feeding viz. *Prunus Ceylanica, Aglaia spectabilis, Dysoxylum gotadhora, Polyalthia simiarum* and *Horsfieldia kingii* as these tree species have low density in the habitat.
- ✓ A proper record should be maintained to the bird populations in the Pakke and used for subsequent monitoring of their population's status.
- ✓ While artificial nesting structures cannot replace natural nesting habitats, they can increase the number of nesting sites available in an area. Artificial bird nests are created to increase wild bird populations, study bird reproduction and behaviour, and exterminate pests.
- ✓ Few trainings/workshops should be plan for better management of homestay, tour guide, restaurants and souvenir shops as currently available facilities are not up to satisfaction of tourist.

6.4. Replication/ Upscaling/ Post-Project Sustainability of interventions (max. 500 words)

A similar kinds work will be conducted after three years of gap to evaluate the impact of present study on livelihood of the local stakeholders involved in the tourism related activities such as homestay, nature guide, foods, etc. as well as tourism impact on wildlife. We are in contact with local stakeholders and also trying to get funds for orgnzing one week capacity building programme for homestay owners to learn the effective management technique of homestay.

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APPENDICES

Appendix 1 – Details of Technical Activities

Appendix 1A. Mammalian species recorded during the survey in Pakke WLS

S.N.	Common name	*Scientific name*	IUCN status	Sighted in Nature Trail
1.	Assam macaque	*Macaca assamensis*	NT	T2,T3,T4,T6,T7,T8
2.	Capped Langur	*Trachypithecus pileatus*	VU	T1,T2,T3,5,T8,T9
3.	Rhesus Macaque	*Macaca mulatta*	LC	T1,T2,T3,,T6,T6,T8
4.	Bengal slow loris	*Nycticebus bengalensis*	VU	T1,T2,T3,,T6,T6,T8
5.	Barking deer	*Muntiacus muntjak*	LC	T1,T2,T3,T5,T9
6.	Sambhar deer	*Cervus unicolor*	VU	T1,T2,T3,,T6,T6,T8
7.	Wild Boar	*Sus scrofa*	LC	T1,T2,T3,T4,T5,T6,T7,T8,T9
8.	Indian Bison	*Bos gaurus*	VU	T2, T3,T4
9.	Hoary-bellied Squirrel	*Callosciurus pygerythrus*	LC	T2,T3,
10.	Indian crested porcupine	*Hystrix indica*	LC	T2,T3
11.	Himalayan Giant Squirrel	*Ratufa bicolor*	NT	T2,T3
12.	Himalayan Serow	*Capricornus sumatraensis*	VU	T3,T4
13.	India Elephant	*Elephas maximus*	EN	T1,T2,T3,T4,T5,T6,T7,T8,T9
14.	Common Leopard	*Panthera pardus*	VU	T2,T4
15.	Leopard cat	*Prionailurus bengalensis*	LC	T2,T3
16.	Tiger	*Panthera tigris*	EN	T1,T2,T3,T4,T7
17	Clouded Leopard	*Neofelis nebulosa*	VU	T2, T3
18.	Marbled cat	*Pardofelis marmorata*	NT	T2,T3,T4
19.	Binturong	*Arctictis binturong*	VU	T2,T9
20.	Masked Palm Civet	*Paguma larvata*	LC	T2,T3,T4
21.	Common Palm Civet	*Paradoxurus hermaphroditus*	LC	T2,T3,T4,T7
22.	Small Indian Civet	*Viverricula indica*	LC	T2,T3,T4,T7,T8
23.	Large Indian Civet	*Viverra zibetha*	LC	T1,T2,T3,T5,T8
24.	Small-toothed Palm Civet	*Arctogalidia trivirgata*	LC	T2,T3,T4,5
25.	Yellow-throated Marten	*Martes flavigula*	LC	T2,T3
26.	Small Asian Mongoose	*Herpestes javanicus*	LC	T2
27.	Wild dog	*Cuon alpinus*	EN	T2
28.	Indian Flying Fox	*Pteropus giganteus*	LC	T2
29.	Asiatic Black Bear	*Ursus thibetanus*	EN	T1T2,T3,T7

Appendix 1B. Detail description of selected nature trails within PTR for avitourism.

Trail ID	Trail Name	Trail length	Altitude (m)	No. of species recorded	Attraction of wildlife species	Major habitat type	Mode of travel
T1.	West Bank to Majo Nallah	3.28 km	100-200	50	Red headed Trogon, Wreathed Hornbill, Oriental Pied Hornbill	Forest	By walk
T2.	West bank to Khari	12 km	100-400	97	Wreathed Hornbill, Great Hornbill, White crested Laughing thrush, Common Hill Myna, Warbler and babbler species, Grey Peacock Pheasant	Forest, bamboo and riverine	By walk and Jeep safari
T3.	Khari to Dekaroi	9.5 km	100-300	94	Vernal hanging Parrot, Pied Falconate, Wreathed Hornbill, Striated Heron, Common Hill Myna, Asian fairy Bluebird, Chestnut-headed Tesia, Grey Peacock Pheasant	Forest and riverine	By Jeep safari
T4.	Dekaroi to Panchali	13 km	100-200	104	Raptor species, Hornbills, Red-headed Trogon, Grey-peacock Pheasant, etc.	Forest	By Jeep safari
T5.	Bhalukpong Ghat to Denai	4.0 km	100-300	70	Black eagle, Oriental pied Hornbill, Wreathed Hornbill, Babbler species, Great Hornbill, Black stork, Khalij pheasant, Griffon Vulture.	Forest and riverine	By Jeep safari
T6.	Denai to Diji	4.0 km	100-300	51	Black stork, Striated Heron, Ruddy Shelduck, Common Merganser	Riverine and forest	By Jeep Safari
T7.	Diji to Nameri West	10 km	100-200	69	Great Hornbill, Wreathed Hornbill, Black stork, Owl, and Owlet species,	Riverine and forest	By Jeep Safari
T8.	Tipi ghat to Denai	9.0 km	100-500	91	Blyth's Kingfisher, Forktail species, Great Hornbill, Black eagle.	Riverine and forest	By walk
T9	Langka	3.45 km	200-600	55	Blyth's Kingfisher, Long tailed Broadbill, Oriental Pied Hornbill, Great Hornbill, Raptor and Owl species, Frogmouth, Griffon Vulture	Forest and riverine	By walk

Appendix 1C. Dominant bird species recorded in different seasons

S/N	Species	PrM 2020	PoM 2020	PrM 2021	PoM 2021	Total
1.	Black bulbul	492	441	502	263	1698
2.	Scarlet Minivet	447	247	341	189	1224
3.	Common Hill Myna	201	131	163	72	567
4.	Silver-eared Mesia	55	131	132	129	447
5.	Blue-winged Minla	80	122	108	98	408
6.	Oriental White-eye	148	68	0	86	302
7.	Pin-tailed Pigeon	137	44	65	53	299
8.	Asian fairy Bluebird	110	55	78	44	287
9.	Blue-throated Barbet	61	48	69	56	234
10.	Red-breasted Parakeet	39	109	46	36	230
11.	Black-Crested bulbul	86	0	67	57	210
12.	Mountain Imperial Pigeon	78	12	58	20	168
13.	Mountain Bulbul	21	61	14	70	166
14.	Wreathed Hornbill	37	39	50	38	164
15.	Grey-headed Canary flycatcher	31	48	30	46	155
16.	Bronzed Drongo	42	35	45	31	153
17.	Blue-whistling Thrush	9	4	9	98	120
18.	Red-vented Bulbul	37	28	25	26	116
19.	Jungle myna	31	12	46	18	107
20.	White-crested Laughingthrush	28	16	39	24	107
21.	Red-whiskered Bulbul	17	30	7	50	104
22.	Wedge-tailed Pigeon	27	50	1	25	103

Appendix 1D. Checklist of birds of Pakke Wildlife Sanctuary with their conservation status

S. No.	Order	Family	English Name	Scientific Name	Authority	IUCN Category	WPA Schedule
1	Anseriformes	Anatidae	Lesser Whistling Duck*	*Dendrocygna javanica*	Horsfield, 1821	LC	Schedule-IV
2			Common Merganser	*Mergus merganser*	Linnaeus, 1758	LC	Schedule-IV
3			Ruddy Shelduck	*Tadorna ferruginea*	Pallas, 1764	LC	Schedule-IV
4			White-winged Wood Duck	*Asarcornis scutulata*	S. Müller, 1842	**EN**	**Schedule-I**
5			Indian Spot-billed Duck*	*Anas poecilorhyncha*	J.R. Forster, 1781	LC	Schedule-IV
6	Galliformes	Phasianidae	Rufous-throated Hill Partridge*	*Arborophila rufogularis*	Blyth, 1849	LC	Schedule-IV
7			White-cheeked Hill Partridge	*Arborophila atrogularis*	Blyth, 1849	**NT**	Schedule-IV
8			Grey Peacock Pheasant	*Polyplectron bicalcaratum*	Linnaeus, 1758	LC	**Schedule-I**
9			Red Junglefowl	*Gallus gallus*	Linnaeus, 1758	LC	Schedule-IV
10			Kalij Pheasant	*Lophura leucomelanos*	Latham, 1790	LC	**Schedule-I**
11	Columbiformes	Columbidae	Rock Pigeon*	*Columba livia*	J.F. Gmelin, 1789	LC	Schedule-IV
12			Oriental Turtle Dove	*Streptopelia orientalis*	Latham, 1790	LC	Schedule-IV
13			Spotted Dove	*Streptopelia chinensis*	Scopoli, 1786	LC	Schedule-IV
14			Laughing Dove*	*Streptopelia senegalensis*	Linnaeus, 1766	LC	Schedule-IV
15			Barred Cuckoo Dove	*Macropygia unchall*	Wagler, 1827	LC	Schedule-IV
16			Orange-breasted Green Pigeon	*Treron bicinctus*	Jerdon, 1840	LC	Schedule-IV
17			Ashy-headed Green Pigeon*	*Treron phayrei*	Blyth, 1862	**NT**	Schedule-IV
18			Thick-billed Green Pigeon	*Treron curvirostra*	J.F. Gmelin, 1789	LC	Schedule-IV
19			Yellow-legged Green Pigeon*	*Treron phoenicopterus*	Latham, 1790	LC	Schedule-IV
20			Pin-tailed Green Pigeon	*Treron apicauda*	Blyth, 1846	LC	Schedule-IV
21			Wedge-tailed Green Pigeon	*Treron sphenurus*	Vigors, 1832	LC	Schedule-IV
22			Asian Emerald Dove	*Chalcophaps indica*	Linnaeus, 1758	LC	Schedule-IV
23			Green Imperial Pigeon	*Ducula aenea*	Linnaeus, 1766	LC	Schedule-IV
24			Mountain Imperial Pigeon	*Ducula badia*	Raffles, 1822	LC	Schedule-IV
25	Caprimulgiformes	Podargidae	Hodgson's Frogmouth*	*Batrachostomus hodgsoni*	G.R. Gray, 1859	LC	**Schedule-I**
26		Caprimulgidae	Large-tailed Nightjar	*Caprimulgus macrurus*	Horsfield, 1821	LC	Schedule-IV

27			Indian Nightjar*	*Caprimulgus asiaticus*	Latham, 1790	LC	Schedule-IV
28			Savanna Nightjar*	*Caprimulgus affinis*	Horsfield, 1821	LC	Schedule-IV
29		Apodidae	Asian Palm Swift	*Cypsiurus balasiensis*	J.E. Gray, 1829	LC	Schedule-IV
30	Cuculiformes	Cuculidae	Greater Coucal	*Centropus sinensis*	Stephens, 1815	LC	Schedule-IV
31			Green-billed Malkoha	*Phaenicophaeus tristis*	Lesson, 1830	LC	Schedule-IV
32			Asian Koel*	*Eudynamys scolopaceus*	Linnaeus, 1758	LC	Schedule-IV
33			Asian Emerald Cuckoo*	*Chrysococcyx maculatus*	J.F. Gmelin, 1788	LC	Schedule-IV
34			Violet Cuckoo*	*Chrysococcyx xanthorhynchus*	Horsfield, 1821	LC	Schedule-IV
35			Banded Bay Cuckoo	*Cacomantis sonneratii*	Latham, 1790	LC	Schedule-IV
36			Plaintive Cuckoo	*Cacomantis merulinus*	Scopoli, 1786	LC	Schedule-IV
37			Square-tailed Drongo Cuckoo	*Surniculus lugubris*	(Horsfield, 1821)	LC	Schedule-IV
38			Large Hawk Cuckoo*	*Hierococcyx sparverioides*	Vigors, 1832	LC	Schedule-IV
39			Common Hawk Cuckoo*	*Hierococcyx varius*	Vahl, 1797	LC	Schedule-IV
40			Indian Cuckoo	*Cuculus micropterus*	Gould, 1838	LC	Schedule-IV
41	Gruiformes	Rallidae	Brown Crake*	*Zapornia akool*	Sykes, 1832	LC	Schedule-IV
42			Black-tailed Crake	Zapornia bicolor	(Walden, 1872)	LC	Schedule-IV
43			White-breasted Waterhen	*Amaurornis phoenicurus*	Pennant, 1769	LC	Schedule-IV
44	Ciconiiformes	Ciconiidae	Lesser Adjutant	*Leptoptilos javanicus*	Horsfield, 1821	VU	Schedule-IV
45			Asian Openbill*	*Anastomus oscitans*	Boddaert, 1783	LC	Schedule-IV
46			Black Stork	*Ciconia nigra*	Linnaeus, 1758	LC	Schedule-IV
47			Black-necked Stork*	*Ephippiorhynchus asiaticus*	Latham, 1790	NT	Schedule-IV
48	Pelecaniformes	Ardeidae	Yellow Bittern*	*Ixobrychus sinensis*	J.F. Gmelin, 1789	LC	Schedule-IV
49			Cinnamon Bittern*	*Ixobrychus cinnamomeus*	J.F. Gmelin, 1789	LC	Schedule-IV
50			Striated Heron	*Butorides striata*	Linnaeus, 1758	LC	Schedule-IV
51			Indian Pond Heron	*Ardeola grayii*	Sykes, 1832	LC	Schedule-IV
52			Cattle Egret	*Bubulcus ibis*	Linnaeus, 1758	LC	Schedule-IV
53			Grey Heron*	*Ardea cinerea*	Linnaeus, 1758	LC	Schedule-IV
54			Purple Heron*	*Ardea purpurea*	Linnaeus, 1766	LC	Schedule-IV
55			Great Egret*	*Ardea alba*	Linnaeus, 1758	LC	Schedule-IV
56			Little Egret	*Egretta garzetta*	Linnaeus, 1766	LC	Schedule-IV

57		Threskiornithidae	Indian Black Ibis	*Pseudibis papillosa*	Temminck, 1824	LC	Schedule-IV
58	Suliformes	Phalacrocoracidae	Little Cormorant	*Microcarbo niger*	Vieillot, 1817	LC	Schedule-IV
59			Great Cormorant	*Phalacrocorax carbo*	Linnaeus, 1758	LC	Schedule-IV
60			Indian Cormorant*	*Phalacrocorax fuscicollis*	Stephens, 1826	LC	Schedule-IV
61		Anhingidae	Oriental Darter	*Anhinga melanogaster*	Pennant, 1769	**NT**	Schedule-IV
62	Charadriiformes	Burhinidae	Great Thick-knee*	*Esacus recurvirostris*	Cuvier, 1829	**NT**	Schedule-IV
63		Ibidorhynchidae	Ibisbill	*Ibidorhyncha struthersii*	Vigors, 1832	LC	Schedule-IV
64		Charadriidae	Long-billed Plover*	*Charadrius placidus*	J.E. & G.R. Gray, 1863	LC	Schedule-IV
65			Little Ringed Plover	*Charadrius dubius*	Scopoli, 1786	LC	Schedule-IV
66			River Lapwing	*Vanellus duvaucelii*	Lesson, 1826	**NT**	Schedule-IV
67			Red-wattled Lapwing	*Vanellus indicus*	Boddaert, 1783	LC	Schedule-IV
68		Scolopacidae	Common Sandpiper	*Actitis hypoleucos*	Linnaeus, 1758	LC	Schedule-IV
69			Green Sandpiper	*Tringa ochropus*	Linnaeus, 1758	LC	Schedule-IV
70			Common Greenshank	*Tringa nebularia*	Gunnerus, 1767	LC	Schedule-IV
71			Wood Sandpiper*	*Tringa glareola*	Linnaeus, 1758	LC	Schedule-IV
72			Marsh Sandpiper*	*Tringa stagnatilis*	Bechstein, 1803	LC	Schedule-IV
73		Glareolidae	Little Pratincole	*Glareola lactea*	Temminck, 1820	LC	Schedule-IV
74		Laridae	River Tern	*Sterna aurantia*	J.E. Gray, 1831	**NT**	Schedule-IV
75	Accipitriformes	Pandionidae	Osprey	*Pandion haliaetus*	Linnaeus, 1758	LC	**Schedule-I**
76		Accipitridae	Oriental Honey Buzzard	*Pernis ptilorhynchus*	Temminck, 1821	LC	**Schedule-I**
77			Crested Serpent Eagle	*Spilornis cheela*	Latham, 1790	LC	**Schedule-I**
78			Griffon Vulture*	*Gyps fulvus*	Hablizl, 1783	LC	Schedule-IV
79			Changeable Hawk Eagle	*Nisaetus cirrhatus*	J.F. Gmelin, 1788	LC	**Schedule-I**
80			Rufous-bellied Eagle*	*Lophotriorchis kienerii*	de Sparre, 1835	**NT**	**Schedule-I**
81			Black Eagle	*Ictinaetus malaiensis*	Temminck, 1822	LC	**Schedule-I**
82			Indian Spotted Eagle*	*Clanga hastata*	Lesson, 1831	**VU**	**Schedule-I**
83			Black Kite	*Milvus migrans*	Boddaert, 1783	LC	**Schedule-I**
84			Bonelli's Eagle*	*Aquila fasciata*	Vieillot, 1822	LC	**Schedule-I**
85			Eastern Marsh Harrier*	*Circus spilonotus*	Kaup, 1847	LC	**Schedule-I**

86			Crested Goshawk*	*Accipiter trivirgatus*	Temminck, 1824	LC	**Schedule-I**
87			Shikra	*Accipiter badius*	J.F. Gmelin, 1788	LC	**Schedule-I**
88			Eurasian Sparrowhawk	*Accipiter nisus*	Linnaeus, 1758	LC	**Schedule-I**
89	Strigiformes	Strigidae	Collared Owlet	*Glaucidium brodiei*	E. Burton, 1836	LC	Schedule-IV
90			Asian Barred Owlet	*Glaucidium cuculoides*	Vigors, 1831	LC	Schedule-IV
91			Spotted Owlet	*Athene brama*	Temminck, 1821	LC	Schedule-IV
92			Mountain Scops Owl	*Otus spilocephalus*	Blyth, 1846	LC	Schedule-IV
93			Oriental Scops Owl	*Otus sunia*	Hodgson, 1836	LC	Schedule-IV
94			Brown Wood Owl*	*Strix leptogrammica*	Temminck, 1832	LC	Schedule-IV
95			Spot-bellied Eagle Owl	*Bubo nipalensis*	Hodgson, 1836	LC	Schedule-IV
96	Trogoniformes	Trogonidae	Red-headed Trogon	*Harpactes erythrocephalus*	Gould, 1834	LC	Schedule-IV
97	Bucerotiformes	Bucerotidae	Great Hornbill	*Buceros bicornis*	Linnaeus, 1758	**VU**	**Schedule-I**
98			Oriental Pied Hornbill	*Anthracoceros albirostris*	Shaw, 1808	LC	**Schedule-I**
99			Wreathed Hornbill	*Rhyticeros undulatus*	Shaw, 1811	**VU**	**Schedule-I**
100		Upupidae	Common Hoopoe	*Upupa epops*	Linnaeus, 1758	LC	Schedule-IV
101	Piciformes	Picidae	White-browed Piculet	*Sasia ochracea*	Hodgson, 1837	LC	Schedule-IV
102			Speckled Piculet	*Picumnus innominatus*	E. Burton, 1836	LC	Schedule-IV
103			Lesser Yellow-naped Woodpecker	*Picus chlorolophus*	Vieillot, 1818	LC	Schedule-IV
104			Streak-throated Woodpecker*	*Picus xanthopygaeus*	J.E. & G.R. Gray, 1846	LC	Schedule-IV
105			Grey-headed Woodpecker	*Picus canus*	J.F. Gmelin, 1788	LC	Schedule-IV
106			Great Slaty Woodpecker	*Mulleripicus pulverulentus*	Temminck, 1826	**VU**	Schedule-IV
107			Greater Golden-backed Woodpecker	*Chrysocolaptes guttacristatus*	Tickell, 1833	LC	Schedule-IV
108			Grey-capped Pygmy Woodpecker*	*Dendrocopos canicapillus*	Blyth, 1845	LC	Schedule-IV
109			Rufous-bellied Woodpecker*	*Dendrocopos hyperythrus*	Vigors, 1831	LC	Schedule-IV
110		Megalaimidae	Great Barbet	*Psilopogon virens*	Boddaert, 1783	LC	Schedule-IV
111			Brown-headed Barbet*	*Psilopogon zeylanicus*	J.F. Gmelin, 1788	LC	Schedule-IV
112			Lineated Barbet	*Psilopogon lineatus*	Vieillot, 1816	LC	Schedule-IV

113			Golden-throated Barbet	*Psilopogon franklinii*	Blyth, 1842	LC	Schedule-IV
114			Blue-throated Barbet	*Psilopogon asiaticus*	Latham, 1790	LC	Schedule-IV
115			Blue-eared Barbet	*Psilopogon duvaucelii*	Lesson, 1830	LC	Schedule-IV
116			Coppersmith Barbet	*Psilopogon haemacephalus*	Statius Muller, 1776	LC	Schedule-IV
117	Coraciiformes	Meropidae	Blue-bearded Bee-eater	*Nyctyornis athertoni*	Jardine & Selby, 1828	LC	Schedule-IV
118			Green Bee-eater	*Merops orientalis*	Latham, 1801	LC	Schedule-IV
119			Chestnut-headed Bee-eater	*Merops leschenaulti*	Vieillot, 1817	LC	Schedule-IV
120		Coraciidae	Indian Roller	*Coracias benghalensis*	Linnaeus, 1758	LC	Schedule-IV
121			Asian dollarbird	*Eurystomus orientalis*	Linnaeus, 1766	LC	Schedule-IV
122		Alcedinidae	Blue-eared Kingfisher	*Alcedo meninting*	Horsfield, 1821	LC	Schedule-IV
123			Blyth's Kingfisher*	*Alcedo hercules*	Laubmann, 1917	**NT**	Schedule-IV
124			Common Kingfisher	*Alcedo atthis*	Linnaeus, 1758	LC	Schedule-IV
125			Crested Kingfisher	*Megaceryle lugubris*	Temminck, 1834	LC	Schedule-IV
126			Pied Kingfisher	*Ceryle rudis*	Linnaeus, 1758	LC	Schedule-IV
127			Stork-billed Kingfisher*	*Pelargopsis capensis*	Linnaeus, 1766	LC	Schedule-IV
128			Ruddy Kingfisher	*Halcyon coromanda*	Latham, 1790	LC	Schedule-IV
129			White-throated Kingfisher	*Halcyon smyrnensis*	Linnaeus, 1758	LC	Schedule-IV
130	Falconiformes	Falconidae	Pied Falconet	*Microhierax melanoleucos*	Blyth, 1843	LC	Schedule-IV
131			Common Kestrel	*Falco tinnunculus*	Linnaeus, 1758	LC	Schedule-IV
132			Peregrine Falcon*	*Falco peregrinus*	Tunstall, 1771	LC	**Schedule-I**
133	Psittaciformes	Psittaculidae	Grey-headed Parakeet*	*Psittacula finschii*	Hume, 1874	**NT**	Schedule-IV
134			Red-breasted Parakeet	*Psittacula alexandri*	Linnaeus, 1758	**NT**	Schedule-IV
135			Rose-ringed Parakeet	*Psittacula krameri*	Scopoli, 1769	LC	Schedule-IV
136			Vernal Hanging Parrot	*Loriculus vernalis*	Sparrman, 1787	LC	Schedule-IV
137	Passeriformes	Pittidae	Blue Pitta	*Hydrornis cyaneus*	Blyth, 1843	LC	Schedule-IV
138		Eurylaimidae	Long-tailed Broadbill	*Psarisomus dalhousiae*	Jameson, 1835	LC	Schedule-IV
139			Silver-breasted Broadbill	*Serilophus lunatus*	Gould, 1834	LC	Schedule-IV
140		Campephagidae	Small Minivet*	*Pericrocotus cinnamomeus*	Linnaeus, 1766	LC	Schedule-IV
141			Short-billed Minivet	*Pericrocotus brevirostris*	Vigors, 1831	LC	Schedule-IV

142			Long-tailed Minivet	*Pericrocotus ethologus*	Bangs & J.C. Phillips, 1914	LC	Schedule-IV
143			Scarlet Minivet	*Pericrocotus flammeus*	J.R. Forster, 1781	LC	Schedule-IV
144			Large Cuckooshrike	*Coracina javensis*	Horsfield, 1821	LC	Schedule-IV
145			Black-winged Cuckooshrike	*Lalage melaschistos*	Hodgson, 1836	LC	Schedule-IV
146		Vireonidae	Blyth's Shrike-babbler*	*Pteruthius aeralatus*	Blyth, 1855	LC	Schedule-IV
147		Oriolidae	Maroon Oriole	*Oriolus traillii*	Vigors, 1832	LC	Schedule-IV
148			Black-hooded Oriole	*Oriolus xanthornus*	Linnaeus, 1758	LC	Schedule-IV
149			Indian Golden Oriole*	*Oriolus kundoo*	Sykes, 1832	LC	Schedule-IV
150		Artamidae	White-breasted Woodswallow*	*Artamus leucoryn*	Linnaeus, 1771	LC	Schedule-IV
151			Ashy Woodswallow	*Artamus fuscus*	Vieillot, 1817	LC	Schedule-IV
152		Vangidae	Bar-winged Flycatcher-shrike*	*Hemipus picatus*	Sykes, 1832	LC	Schedule-IV
153			Large Woodshrike	*Tephrodornis virgatus*	Temminck, 1824	LC	Schedule-IV
154		Aegithinidae	Common Iora	*Aegithina tiphia*	Linnaeus, 1758	LC	Schedule-IV
155		Dicruridae	Black Drongo	*Dicrurus macrocercus*	Vieillot, 1817	LC	Schedule-IV
156			Ashy Drongo	*Dicrurus leucophaeus*	Vieillot, 1817	LC	Schedule-IV
157			White-bellied Drongo	*Dicrurus caerulescens*	Linnaeus, 1758	LC	Schedule-IV
158			Bronzed Drongo	*Dicrurus aeneus*	Vieillot, 1817	LC	Schedule-IV
159			Lesser Racket-tailed Drongo	*Dicrurus remifer*	Temminck, 1823	LC	Schedule-IV
160			Hair-crested Drongo*	*Dicrurus hottentottus*	Linnaeus, 1766	LC	Schedule-IV
161			Greater Racket-tailed Drongo	*Dicrurus paradiseus*	Linnaeus, 1766	LC	Schedule-IV
162		Rhipiduridae	White-throated Fantail	*Rhipidura albicollis*	Vieillot, 1818	LC	Schedule-IV
163		Laniidae	Brown Shrike	*Lanius cristatus*	Linnaeus, 1758	LC	Schedule-IV
164			Bay-backed Shrike*	*Lanius vittatus*	Valenciennes, 1826	LC	Schedule-IV
165			Long-tailed Shrike	*Lanius schach*	Linnaeus, 1758	LC	Schedule-IV
166			Grey-backed Shrike	*Lanius tephronotus*	Vigors, 1831	LC	Schedule-IV
167		Corvidae	Rufous Treepie	*Dendrocitta vagabunda*	Latham, 1790	LC	Schedule-IV
168			Grey Treepie	*Dendrocitta formosae*	Swinhoe, 1863	LC	Schedule-IV
169			Common Green Magpie	*Cissa chinensis*	Boddaert, 1783	LC	Schedule-IV
170			House Crow	*Corvus splendens*	Vieillot, 1817	LC	Schedule-V

171			Large-billed Crow	*Corvus macrorhynchos*	Wagler, 1827	LC	Schedule-IV
172		Monarchidae	Indian Paradise-flycatcher	Terpsiphone paradisi	(Linnaeus, 1758)	LC	Schedule-IV
173			Black-naped Monarch	*Hypothymis azurea*	Boddaert, 1783	LC	Schedule-IV
174		Dicaeidae	Yellow-vented Flowerpecker	*Dicaeum chrysorrheum*	Temminck, 1829	LC	Schedule-IV
175			Thick-billed Flowerpecker*	*Dicaeum agile*	Tickell, 1833	LC	Schedule-IV
176			Pale-billed Flowerpecker*	*Dicaeum erythrorhynchos*	Latham, 1790	LC	Schedule-IV
177			Plain Flowerpecker	*Dicaeum minullum*	Swinhoe, 1870	LC	Schedule-IV
178		Nectariniidae	Little Spiderhunter	*Arachnothera longirostra*	Latham, 1790	LC	Schedule-IV
179			Streaked Spiderhunter	*Arachnothera magna*	Hodgson, 1836	LC	Schedule-IV
180			Purple-rumped Sunbird*	*Leptocoma zeylonica*	Linnaeus, 1766	LC	Schedule-IV
181			Purple Sunbird*	*Cinnyris asiaticus*	Latham, 1790	LC	Schedule-IV
182			Fire-tailed Sunbird*	*Aethopyga ignicauda*	Hodgson, 1836	LC	Schedule-IV
183			Black-throated Sunbird	*Aethopyga saturata*	Hodgson, 1836	LC	Schedule-IV
184			Crimson Sunbird	*Aethopyga siparaja*	Raffles, 1822	LC	Schedule-IV
185		Irenidae	Asian Fairy-bluebird	*Irena puella*	Latham, 1790	LC	Schedule-IV
186		Chloropseidae	Golden-fronted Leafbird	*Chloropsis aurifrons*	Temminck, 1829	LC	Schedule-IV
187			Orange-bellied Leafbird	*Chloropsis hardwickii*	Jardine & Selby, 1830	LC	Schedule-IV
188		Estrildidae	White-rumped Munia	*Lonchura striata*	Linnaeus, 1766	LC	Schedule-IV
189			Scaly-breasted Munia	*Lonchura punctulata*	Linnaeus, 1758	LC	Schedule-IV
190			Tricoloured Munia*	*Lonchura malacca*	Linnaeus, 1766	LC	Schedule-IV
191			Chestnut Munia*	*Lonchura atricapilla*	Vieillot, 1807	LC	Schedule-IV
192		Passeridae	House Sparrow	*Passer domesticus*	Linnaeus, 1758	LC	Schedule-IV
193			Eurasian Tree Sparrow	*Passer montanus*	Linnaeus, 1758	LC	Schedule-IV
194		Motacillidae	Tree Pipit*	*Anthus trivialis*	Linnaeus, 1758	LC	Schedule-IV
195			Olive-backed Pipit	*Anthus hodgsoni*	Richmond, 1907	LC	Schedule-IV
196			Rosy Pipit*	*Anthus roseatus*	Blyth, 1847	LC	Schedule-IV
197			Paddyfield Pipit	*Anthus rufulus*	Vieillot, 1818	LC	Schedule-IV
198			Grey Wagtail	*Motacilla cinerea*	Tunstall, 1771	LC	Schedule-IV
199			Citrine Wagtail*	*Motacilla citreola*	Pallas, 1776	LC	Schedule-IV

200			Eastern Yellow Wagtail*	*Motacilla tschutschensis*	J.F. Gmelin, 1789	LC	Schedule-IV
201			White-browed Wagtail	*Motacilla maderaspatensis*	J.F. Gmelin, 1789	LC	Schedule-IV
202			White Wagtail	*Motacilla alba*	Linnaeus, 1758	LC	Schedule-IV
203		Fringillidae	Common Rosefinch*	*Carpodacus erythrinus*	Pallas, 1770	LC	Schedule-IV
204		Emberizidae	Crested Bunting	*Emberiza lathami*	J.E. Gray, 1831	LC	Schedule-IV
205			Black-faced Bunting*	*Emberiza spodocephala*	Pallas, 1776	LC	Schedule-IV
206		Stenostiridae	Yellow-bellied Fairy-fantail	*Chelidorhynx hypoxanthus*	Blyth, 1843	LC	Schedule-IV
207			Grey-headed Canary-flycatcher	*Culicicapa ceylonensis*	Swainson, 1820	LC	Schedule-IV
208		Paridae	Sultan Tit	*Melanochlora sultanea*	Hodgson, 1837	LC	Schedule-IV
209			Cinereous Tit	*Parus cinereus*	Vieillot, 1818	LC	Schedule-IV
210			Green-backed Tit	Parus monticolus	Vigors, 1831	LC	Schedule-IV
211			Black-lored Tit	*Machlolophus xanthogenys*	Vigors, 1831	LC	Schedule-IV
212		Alaudidae	Bengal Bushlark	*Mirafra assamica*	Horsfield, 1840	LC	Schedule-IV
213			Indian Bushlark*	*Mirafra erythroptera*	Blyth, 1845	LC	Schedule-IV
214			Greater Short-toed Lark*	*Calandrella brachydactyla*	Leisler, 1814	LC	Schedule-IV
215		Cisticolidae	Grey-breasted Prinia*	*Prinia hodgsonii*	Blyth, 1844	LC	Schedule-IV
216			Ashy Prinia*	*Prinia socialis*	Sykes, 1832	LC	Schedule-IV
217			Plain Prinia*	*Prinia inornata*	Sykes, 1832	LC	Schedule-IV
218			Common Tailorbird	*Orthotomus sutorius*	Pennant, 1769	LC	Schedule-IV
219			Dark-necked Tailorbird*	*Orthotomus atrogularis*	Temminck, 1836	LC	Schedule-IV
220		Locustellidae	Striated Grassbird*	*Megalurus palustris*	Horsfield, 1821	LC	Schedule-IV
221		Acrocephalidae	Blyth's Reed Warbler*	*Acrocephalus dumetorum*	Blyth, 1849	LC	Schedule-IV
222		Hirundinidae	Red-rumped Swallow*	*Cecropis daurica*	Laxmann, 1769	LC	Schedule-IV
223			Wire-tailed Swallow*	*Hirundo smithii*	Leach, 1818	LC	Schedule-IV
224			Barn Swallow	*Hirundo rustica*	Linnaeus, 1758	LC	Schedule-IV
225			Sand Martin	Riparia riparia	(Linnaeus, 1758)	LC	Schedule-IV
226		Pycnonotidae	White-throated Bulbul	*Alophoixus flaveolus*	Gould, 1836	LC	Schedule-IV
227			Ashy Bulbul	*Hemixos flavala*	Blyth, 1845	LC	Schedule-IV
228			Mountain Bulbul	*Ixos mcclellandii*	Horsfield, 1840	LC	Schedule-IV

229			Black Bulbul	*Hypsipetes leucocephalus*	J.F. Gmelin, 1789	LC	Schedule-IV
230			Striated Bulbul	*Pycnonotus striatus*	Blyth, 1842	LC	Schedule-IV
231			Black-crested Bulbul	*Pycnonotus flaviventris*	Tickell, 1833	LC	Schedule-IV
232			Red-whiskered Bulbul	*Pycnonotus jocosus*	Linnaeus, 1758	LC	Schedule-IV
233			Red-vented Bulbul	*Pycnonotus cafer*	Linnaeus, 1766	LC	Schedule-IV
234		Phylloscopidae	Ashy-throated Warbler*	*Phylloscopus maculipennis*	Blyth, 1867	LC	Schedule-IV
235			Sulphur-bellied Warbler*	*Phylloscopus griseolus*	Blyth, 1847	LC	Schedule-IV
236			Tickell's Leaf Warbler	*Phylloscopus affinis*	Tickell, 1833	LC	Schedule-IV
237			White-spectacled Warbler	*Phylloscopus intermedius*	La Touche, 1898	LC	Schedule-IV
238			Whistler's Warbler*	*Phylloscopus whistleri*	Ticehurst, 1925	LC	Schedule-IV
239			Chestnut-crowned Warbler	*Phylloscopus castaniceps*	Hodgson, 1845	LC	Schedule-IV
240			Greenish Leaf Warbler	*Phylloscopus trochiloides*	Sundevall, 1837	LC	Schedule-IV
241			Blyth's Leaf Warbler	*Phylloscopus reguloides*	Blyth, 1842	LC	Schedule-IV
242		Scotocercidae	Slaty-bellied Tesia	*Tesia olivea*	McClelland, 1840	LC	Schedule-IV
243			Grey-bellied Tesia*	*Tesia cyaniventer*	Hodgson, 1837	LC	Schedule-IV
244			Mountain Tailorbird*	*Phyllergates cucullatus*	Temminck, 1836	LC	Schedule-IV
245		Aegithalidae	Black-throated Tit*	*Aegithalos concinnus*	Gould, 1855	LC	Schedule-IV
246		Sylviidae	Yellow-eyed Babbler*	*Chrysomma sinense*	J.F. Gmelin, 1789	LC	Schedule-IV
247			Grey-headed Parrotbill	*Psittiparus gularis*	G.R. Gray, 1845	LC	Schedule-IV
248		Zosteropidae	Striated Yuhina*	*Yuhina castaniceps*	F. Moore, 1854	LC	Schedule-IV
249			Black-chinned Yuhina	*Yuhina nigrimenta*	Blyth, 1845	LC	Schedule-IV
250			Whiskered Yuhina	*Yuhina flavicollis*	Hodgson, 1836	LC	Schedule-IV
251			White-naped Yuhina	*Yuhina bakeri*	Rothschild, 1926	LC	Schedule-IV
252			Oriental White-eye	*Zosterops palpebrosus*	Temminck, 1824	LC	Schedule-IV
253		Timaliidae	Slender-billed Scimitar Babbler*	*Pomatorhinus superciliaris*	Blyth, 1842	LC	Schedule-IV
254			White-browed Scimitar Babbler	*Pomatorhinus schisticeps*	Hodgson, 1836	LC	Schedule-IV
255			Pin-striped Tit Babbler	*Mixornis gularis*	Horsfield, 1822	LC	Schedule-IV
256		Pellorneidae	Rufous-throated Fulvetta*	*Schoeniparus rufogularis*	Mandelli, 1873	LC	Schedule-IV
257			Puff-throated Babbler	*Pellorneum ruficeps*	Swainson, 1832	LC	Schedule-IV

258		Leiothrichidae	Nepal Tit Babbler	*Alcippe nipalensis*	Hodgson, 1837	LC	Schedule-IV
259			Himalayan Cutia*	*Cutia nipalensis*	Hodgson, 1837	LC	Schedule-IV
260			Jungle Babbler*	*Turdoides striata*	Dumont, 1823	LC	Schedule-IV
261			Lesser Necklaced Laughingthrush	*Garrulax monileger*	Hodgson, 1836	LC	Schedule-IV
262			White-crested Laughingthrush	*Garrulax leucolophus*	Hardwicke, 1816	LC	Schedule-IV
263			Greater Necklaced Laughingthrush	*Garrulax pectoralis*	Gould, 1836	LC	Schedule-IV
264			Rufous-vented Laughingthrush*	*Garrulax gularis*	McClelland, 1840	LC	Schedule-IV
265			Scaly Laughingthrush*	*Trochalopteron subunicolor*	Blyth, 1843	LC	Schedule-IV
266			Long-tailed Sibia	*Heterophasia picaoides*	Hodgson, 1839	LC	Schedule-IV
267			Beautiful Sibia*	*Heterophasia pulchella*	Godwin-Austen, 1874	LC	Schedule-IV
268			Silver-eared Mesia	*Leiothrix argentauris*	Hodgson, 1837	LC	Schedule-IV
269			Red-billed Leiothrix*	*Leiothrix lutea*	Scopoli, 1786	LC	Schedule-IV
270			Red-tailed Minla	*Minla ignotincta*	Hodgson, 1837	LC	Schedule-IV
271			Chestnut-tailed Minla*	*Chrysominla strigula*	(Hodgson, 1837)	LC	Schedule-IV
272			Blue-winged Minla	*Siva cyanouroptera*	Hodgson, 1837	LC	Schedule-IV
273			Rusty-fronted Barwing	*Actinodura egertoni*	Gould, 1836	LC	Schedule-IV
274		Sittidae	Indian Nuthatch*	*Sitta castanea*	Lesson, 1830	LC	Schedule-IV
275			Chestnut-bellied Nuthatch	*Sitta cinnamoventris*	Blyth, 1842	LC	Schedule-IV
276			Velvet-fronted Nuthatch	*Sitta frontalis*	Swainson, 1820	LC	Schedule-IV
277			Wallcreeper*	*Tichodroma muraria*	Linnaeus, 1766	LC	Schedule-IV
278		Sturnidae	Asian Pied Starling	*Gracupica contra*	Linnaeus, 1758	LC	Schedule-IV
279			Brahminy Starling*	*Sturnia pagodarum*	J.F. Gmelin, 1789	LC	Schedule-IV
280			Chestnut-tailed Starling	*Sturnia malabarica*	J.F. Gmelin, 1789	LC	Schedule-IV
281			Common Myna	*Acridotheres tristis*	Linnaeus, 1766	LC	Schedule-IV
282			Jungle Myna	*Acridotheres fuscus*	Wagler, 1827	LC	Schedule-IV
283			Great Myna*	*Acridotheres grandis*	F. Moore, 1858	LC	Schedule-IV
284			Spot-winged Starling*	*Saroglossa spilopterus*	Vigors, 1831	LC	Schedule-IV

285			Common Hill Myna	*Gracula religiosa*	Linnaeus, 1758	LC	**Schedule-I**
286		Cinclidae	Brown Dipper	*Cinclus pallasii*	Temminck, 1820	LC	Schedule-IV
287		Muscicapidae	Indian Robin*	*Saxicoloides fulicatus*	Linnaeus, 1766	LC	Schedule-IV
288			Oriental Magpie Robin	*Copsychus saularis*	Linnaeus, 1758	LC	Schedule-IV
289			White-rumped Shama	*Kittacincla malabarica*	Scopoli, 1786	LC	Schedule-IV
290			Dark-sided Flycatcher*	*Muscicapa sibirica*	J.F. Gmelin, 1789	LC	Schedule-IV
291			Asian Brown Flycatcher	*Muscicapa dauurica*	Pallas, 1811	LC	Schedule-IV
292			Hill Blue Flycatcher*	*Cyornis banyumas*	Horsfield, 1821	LC	Schedule-IV
293			Tickell's Blue Flycatcher	*Cyornis tickelliae*	Blyth, 1843	LC	Schedule-IV
294			Pale-chinned Flycatcher	Cyornis poliogenys	W.E. Brooks, 1880	LC	Schedule-IV
295			White-tailed Blue Flycatcher*	*Cyornis concretus*	S. Müller, 1836	LC	Schedule-IV
296			Rufous-bellied Niltava	*Niltava sundara*	Hodgson, 1837	LC	Schedule-IV
297			Large Niltava	*Niltava grandis*	Blyth, 1842	LC	Schedule-IV
298			Small Niltava	*Niltava macgrigoriae*	E. Burton, 1836	LC	Schedule-IV
299			Verditer Flycatcher	*Eumyias thalassinus*	Swainson, 1838	LC	Schedule-IV
300			Rusty-bellied Shortwing*	*Brachypteryx hyperythra*	Blyth, 1861	**NT**	Schedule-IV
301			Bluethroat*	*Luscinia svecica*	Linnaeus, 1758	LC	Schedule-IV
302			Little Forktail	*Enicurus scouleri*	Vigors, 1832	LC	Schedule-IV
303			Black-backed Forktail	*Enicurus immaculatus*	Hodgson, 1836	LC	Schedule-IV
304			Slaty-backed Forktail	*Enicurus schistaceus*	Hodgson, 1836	LC	Schedule-IV
305			Spotted Forktail*	Enicurus maculatus	Vigors, 1831	LC	Schedule-IV
306			White-crowned Forktail	*Enicurus leschenaulti*	Vieillot, 1818	LC	Schedule-IV
307			Blue Whistling Thrush	*Myophonus caeruleus*	Scopoli, 1786	LC	Schedule-IV
308			Siberian Rubythroat	*Calliope calliope*	Pallas, 1776	LC	Schedule-IV
309			White-tailed Robin	*Myiomela leucura*	Hodgson, 1845	LC	Schedule-IV
310			Red-breasted Flycatcher	*Ficedula parva*	Bechstein, 1792	LC	Schedule-IV
311			Taiga Flycatcher*	*Ficedula albicilla*	Pallas, 1811	LC	Schedule-IV
312			Ultramarine Flycatcher*	*Ficedula superciliaris*	Jerdon, 1840	LC	Schedule-IV
313			Little Pied Flycatcher	*Ficedula westermanni*	Sharpe, 1888	LC	Schedule-IV
314			Ferruginous Flycatcher	Muscicapa ferruginea	(Hodgson, 1845)	LC	Schedule-IV

315			Rufous-gorgeted Flycatcher	Ficedula strophiata	(Hodgson, 1837)	LC	Schedule-IV
316			White-capped Water Redstart	*Phoenicurus leucocephalus*	Vigors, 1831	LC	Schedule-IV
317			Plumbeous Water Redstart	*Phoenicurus fuliginosus*	Vigors, 1831	LC	Schedule-IV
318			Black Redstart	*Phoenicurus ochruros*	S.G. Gmelin, 1774	LC	Schedule-IV
319			Blue-fronted Redstart	Phoenicurus frontalis	Vigors, 1831	LC	Schedule-IV
320			Common Redstart*	*Phoenicurus phoenicurus*	Linnaeus, 1758	LC	Schedule-IV
321			Daurian Redstart	*Phoenicurus auroreus*	Pallas, 1776	LC	Schedule-IV
322			Hodgson's Redstart	*Phoenicurus hodgsoni*	F. Moore, 1854	LC	Schedule-IV
323			Blue-capped Rock Thrush*	*Monticola cinclorhyncha*	Vigors, 1831	LC	Schedule-IV
324			Chestnut-bellied Rock Thrush*	*Monticola rufiventris*	Jardine & Selby, 1833	LC	Schedule-IV
325			Blue Rock Thrush	*Monticola solitarius*	Linnaeus, 1758	LC	Schedule-IV
326			Siberian Stonechat	*Saxicola maurus*	Pallas, 1773	LC	Schedule-IV
327			Grey Bushchat	Saxicola ferreus	J.E. & G.R. Gray, 1847	LC	Schedule-IV
328		Turdidae	Himalayan Forest Thrush*	*Zoothera salimalii*	Alström *et al.*, 2016	LC	Schedule-IV
329			Scaly Thrush*	*Zoothera dauma*	Latham, 1790	LC	Schedule-IV
330			Green Cochoa	*Cochoa viridis*	Hodgson, 1836	LC	Schedule-IV
331			Grey-winged Blackbird	*Turdus boulboul*	Latham, 1790	LC	Schedule-IV
332			Indian Blackbird*	*Turdus simillimus*	Jerdon, 1839	LC	Schedule-IV
333			Red-throated Thrush*	*Turdus ruficollis*	Pallas, 1776	LC	Schedule-IV

Appendix 1E. Yearly income earned through tourism related business in Pakke

Gender	Age-group	Tribe	Stakeholder	Village	Occupation	Tourism activity	Income from tourism (yearly)	Did Covid-19 effected your income (%)
M	40-50	Nyshi	Local villager	Darlong	Agriculture	Homestay	5000-10000	70-80%
F	40-50	Nyshi	Local villager	Niti Darlong	Govt. servent	Homestay	10000-20000	70-80%
M	30-40	Nyshi	Local villager	Darlong	Casual forest staff	Homestay	10000-20000	60-70%
F	30-40	Nyshi	Local villager	Darlong	Self employed	Homestay	5000	70-80%
M	40-50	Nyshi	Local villager	Niti Darlong	Self employed	Homestay	20000	50-60%
F	40-50	Nyshi	Local villager	Mabuso II	Agriculture	Homestay	20000	80-90%
F	30-40	Nyshi	Local villager	Upper Seijosa	Govt. servent	Homestay	5000-10000	80-90%
F	40-50	Nyshi	Local villager	Upper Seijosa	Self employed	Homestay	5000	90-100%
F	30-40	Nyshi	Local villager	Niti Darlong	Self employed	Homestay	5000	90-100%
M	40-50	Nyshi	Local villager	Niti Darlong	Self employed	Homestay	0	90-100%
F	40-50	Monpa	Local villager	Bhalukpong	Self employed	Homestay	20000	50-60%
M	40-50	Nyshi	Local villager	Bhalukpong	Self employed	Homestay	20000	50-60%
M	50-60	Nyshi	Local villager	A-2	Self employed	Homestay	20000	70-80%
M	30-40	Nyshi	Local villager	Bali	Casual forest staff	Nature guide	20000	50-60%
M	20-30	Nyshi	Local villager	A-2	Agriculture	Nature guide	10000-20000	90-100%
M	20-30	Nyshi	Local villager	Bali	Agriculture	Nature guide	10000-20000	90-100%
M	30-40	Nyshi	Forest personal	Bhalukpong	Casual forest staff	Nature guide	5000	90-100%
M	30-40	Nyshi	Forest personal	Darlong	Casual forest staff	Nature guide	5000	90-100%
M	20-30	Nyshi	Forest personal	Bhalukpong	Casual forest staff	Nature guide	5000	90-100%

M	50-60	Aaka	Forest personal	Bhalukpong	Casual forest staff	Nature guide	5000-10000	90-100%
M	30-40	Nyshi	Local villager	Darlong	Self employed	Nature guide	5000-10000	90-100%
F	20-30	Nyshi	Local villager	Darlong	Self employed	Nature guide	5000	90-100%
M	20-30	Nyshi	Forest personal	Darlong	Casual forest staff	Nature guide	5000	90-100%
M	30-40	Nyshi	Local villager	Juli	Agriculture	Nature guide	5000-10000	90-100%
M	30-40	Bodo	Local villager	Darlong	Self employed	Restaurant	50000	60-70%
F	30-40	Nepali	Local villager	Darlong	Self employed	Restaurant	50000	40-50%
F	30-40	Nyshi	Local villager	Darlong	Self employed	Restaurant	50000	50-60%
M	20-30	Assamese	Local villager	Darlong	Self employed	Restaurant	50000	60-70%
F	20-30	Assamese	Local villager	Darlong	Self employed	Restaurant	50000	20-30%
M	30-40	Nyshi	Local villager	Darlong	Self employed	Restaurant	50000	60-70%
M	40-50	Assamese	Local villager	Upper Seijosa	Self employed	Souvenir	10000-20000	80-90%
F	40-50	Nyshi	Local villager	Upper Seijosa	Self employed	Souvenir	5000-10000	80-90%

Appendix 1F[1]. Community structure of tree species recorded in Forest habitats of Pakke Wildlife Sanctuary, A.P.

S.N. Tree species	No. of individual	Frequency	Density	D/ha	Abundance	RF	RD	RA	IVI
1. *Aglaia spectabilis*	20	17.43	0.18	18.35	1.05	5.43	4.69	1.69	11.81
2. *Ailanthus grandis*	14	11.01	0.13	12.84	1.17	3.43	3.28	1.87	8.58
3. *Albizia procera*	9	8.26	0.08	8.26	1.00	2.57	2.11	1.60	6.29
4. *Altingia excelsa*	18	12.84	0.17	16.51	1.29	4.00	4.22	2.06	10.29
5. *Artocarpus chaplasha*	6	5.50	0.06	5.50	1.00	1.71	1.41	1.60	4.73
6. *Baccaurea ramiflora*	3	2.75	0.03	2.75	1.00	0.86	0.70	1.60	3.17
7. *Bauhinia purpurea*	4	3.67	0.04	3.67	**1.00**	1.14	0.94	1.60	3.69
8. *Bauhinia racemosa*	4	1.83	0.04	3.67	2.00	0.57	0.94	**3.21**	4.72
9. *Bauhinia variegata*	10	8.26	0.09	9.17	1.11	2.57	2.35	1.78	6.70
10. *Beilschmiedia assamica*	3	2.75	0.03	2.75	1.00	0.86	0.70	1.60	3.17
11. *Bombax Ceiba*	8	5.50	0.07	7.34	1.33	1.71	1.88	2.14	5.73
12. *Brassaiopsis glomerulata*	4	2.75	0.04	3.67	1.33	0.86	0.94	2.14	3.93
13. *Bridelia retusa*	2	0.92	0.02	1.83	2.00	**0.29**	0.47	3.21	3.96
14. *Canarium resiniferum*	33	22.02	0.30	30.28	1.38	6.86	7.74	2.21	16.81
15. *Canarium strictum*	1	**0.92**	0.01	0.92	1.00	0.29	**0.23**	1.60	**2.12**
16. *Chionanthus macrophyllus*	1	0.92	0.01	0.92	1.00	0.29	**0.23**	1.60	**2.12**
17. *Chukrasia tabularis*	3	2.75	0.03	2.75	1.00	0.86	0.70	1.60	3.17
18. *Dillenia indica*	30	18.35	0.28	27.52	1.50	5.71	7.04	2.41	15.16
19. *Duabanga grandiflora*	10	9.17	0.09	9.17	1.00	2.86	2.35	1.60	6.81
20. *Dysolxylum gotadhora*	26	17.43	0.24	23.85	1.37	5.43	6.10	2.20	13.72
21. *Dysolxylum hamiltonii*	5	4.59	0.05	4.59	1.00	1.43	1.17	1.60	4.21
22. *Ehretia acuminata*	1	0.92	0.01	0.92	1.00	0.29	0.23	1.60	2.12
23. *Elaeocarpus aristatus*	3	1.83	0.03	2.75	1.50	0.57	0.70	2.41	3.68
24. *Elaeocarpus obtusifolius*	14	11.01	0.13	12.84	1.17	3.43	3.28	1.87	8.58
25. *Elaeocarpus assamica*	1	0.92	0.01	0.92	1.00	0.29	0.23	1.60	2.12
26. *Ficus Bengalensis*	2	1.83	0.02	1.83	1.00	0.57	0.47	1.60	2.64

27. *Ficus religiosa*	4	2.75	0.04	3.67	1.33	0.86	0.94	2.14	3.93
28. *Ficus sp*	3	1.83	0.03	2.75	1.50	0.57	0.70	2.41	3.68
29. *Garuga pinnata*	4	1.83	0.04	3.67	**2.00**	0.57	0.94	3.21	4.72
30. *Gmelina arborea*	9	7.34	0.08	8.26	1.13	2.29	2.11	1.80	6.20
31. *Horsfieldia kingii*	2	1.83	0.02	1.83	1.00	0.57	0.47	1.60	2.64
32. *Lagerstroemia parviflora*	7	5.50	0.06	6.42	1.17	1.71	1.64	1.87	5.23
33. *Laportea crenulata*	1	0.92	0.01	0.92	1.00	0.29	0.23	1.60	2.12
34. *Litsea glutinosa*	1	0.92	0.01	0.92	1.00	0.29	0.23	1.60	2.12
35. *Livistona jenkinsiana*	4	2.75	0.04	3.67	1.33	0.86	0.94	2.14	3.93
36. *Macaranga denticulata*	4	3.67	0.04	3.67	1.00	1.14	0.94	1.60	3.69
37. *Magnolia champaca*	1	0.92	0.01	**0.92**	1.00	0.29	0.23	1.60	2.12
38. *Magnolia hodgsonii*	31	22.02	0.28	28.44	1.29	6.86	7.27	2.07	16.20
39. *Meliosma pinnata*	5	3.67	0.05	4.59	1.25	1.14	1.17	2.01	4.32
40. *Mesua ferrea*	3	2.75	0.03	2.75	1.00	0.86	0.70	**1.60**	3.17
41. *Micromelum integerrimum*	1	0.92	**0.01**	0.92	1.00	0.29	0.23	**1.60**	2.12
42. *Phoebe attenuata*	6	5.50	0.06	5.50	1.00	1.71	1.41	**1.60**	4.73
43. *Phoebe cooperiana*	1	0.92	0.01	0.92	1.00	0.29	0.23	**1.60**	2.12
44. *Polyalthia simiarum*	2	1.83	0.02	1.83	1.00	0.57	0.47	**1.60**	2.64
45. *Pterospermum acerifolium*	25	19.27	0.23	22.94	1.19	6.00	5.87	1.91	13.78
46. *Sterculia (Pterygota) alata*	11	10.09	0.10	10.09	1.00	3.14	2.58	**1.60**	7.33
47. *Sterculia hamiltonii*	2	1.83	0.02	1.83	1.00	0.57	0.47	**1.60**	2.64
48. *Sterculia villosa*	1	0.92	0.01	0.92	1.00	0.29	0.23	**1.60**	2.12
49. *Stereospermum chelonoides*	6	5.50	0.06	5.50	1.00	1.71	1.41	**1.60**	4.73
50. *Syzygium spp.*	4	2.75	0.04	3.67	1.33	0.86	0.94	2.14	3.93
51. *Terminalia myriocarpa*	13	10.09	0.12	11.93	1.18	3.14	3.05	1.90	8.09
52. *Tetrameles nudiflora*	36	**22.94**	**0.33**	**33.03**	1.44	**7.14**	**8.45**	2.31	**17.90**
53. *Talauma hodgsonii*	4	3.67	0.04	3.67	1.00	1.14	0.94	1.60	3.69
	426	**321.10**	**3.91**	**390.83**	**62.339**	**100**	**99.96**	**100**	**299.95**

*Note= D- density, RF- Relative frequency, RD- Relative density, RA- Relative abundance, IVI-Important value indices

Appendix 1F[2]. Community structure of trees recorded in the Riverine habitats of Pakke Wildlife Sanctuary, A.P.

S.N.	Tree species	No. of individual	frequency	density	D/ha	abun	RF	RD	RA	IVI
1.	*Aglaia spectabilis*	4	10.00	0.13	13.33	1.33	2.78	3.10	3.28	9.28
2.	*Ailanthus grandis*	2	6.67	0.07	6.67	1.00	1.85	1.55	2.46	2.66
3.	*Albizia procera*	2	6.67	0.07	6.67	1.00	1.85	1.55	2.46	**2.66**
4.	*Altingia excelsa*	5	16.67	0.17	16.67	1.00	4.63	3.88	2.46	8.00
5.	*Amoora wallichi*	1	3.33	0.03	**3.33**	**1.00**	**0.93**	**0.78**	**2.46**	3.86
6.	*Bauhinia variegata*	3	10.00	0.10	10.00	1.00	2.78	2.33	2.46	4.94
7.	*Canarium resiniferum*	2	6.67	0.07	6.67	1.00	1.85	1.55	2.46	2.66
8.	*Chukrasia tabularis*	4	10.00	0.13	13.33	1.33	2.78	3.10	3.28	9.28
9.	*Dillenia indica*	9	26.67	0.30	30.00	1.13	7.41	6.98	2.77	16.57
10.	*Dipterocapus retusus*	4	10.00	0.13	13.33	1.33	2.78	3.10	3.28	9.28
11.	*Duabanga grandiflora*	13	**33.33**	**0.43**	**43.33**	1.30	**9.26**	**10.08**	3.20	**19.65**
12.	*Dysolxylum gotadhora*	3	10.00	0.10	10.00	1.00	2.78	2.33	2.46	7.02
13.	*Elaeocarpus aristatus*	3	10.00	0.10	10.00	1.00	2.78	2.33	2.46	7.02
14.	*Elaeocarpus obtusifolius*	2	6.67	0.07	6.67	1.00	1.85	1.55	2.46	5.56
15.	*Elaeocarpus robustus*	2	6.67	0.07	6.67	1.00	1.85	1.55	2.46	5.56
16.	*Ficus auriculata*	1	**3.33**	**0.03**	3.33	1.00	0.93	0.78	2.46	3.86
17.	*Ficus sp*	3	6.67	0.10	10.00	1.50	1.85	2.33	3.69	8.22
18.	*Garuga floribunda*	4	10.00	0.13	13.33	1.33	2.78	3.10	3.28	9.28
19.	*Gynocardia odorata*	4	10.00	0.13	13.33	1.33	2.78	3.10	3.28	4.77
20.	*Horsfieldia kingii*	2	6.67	0.07	6.67	1.00	1.85	1.55	2.46	5.56
21.	*Lagerstroemia parviflora*	4	6.67	0.13	13.33	**2.00**	1.85	3.10	**4.92**	10.89
22.	*Livistona jenkinsiana*	2	6.67	0.07	6.67	1.00	1.85	1.55	2.46	5.56
23.	*Macaranga denticulata*	3	10.00	0.10	10.00	1.00	2.78	2.33	2.46	7.02
24.	*Magnolia hodgsonii*	3	10.00	0.10	10.00	1.00	2.78	2.33	2.46	4.77
25.	*Michelia oblonga*	4	10.00	0.13	13.33	1.33	2.78	3.10	3.28	9.28

26.	*Pterospermum acerifolium*	1	3.33	0.03	3.33	1.00	0.93	0.78	2.46	3.86
27.	*Saurauia roxburghii*	1	3.33	0.03	3.33	1.00	0.93	0.78	2.46	3.86
28.	*Sloanea sterculiacea*	1	3.33	0.03	3.33	1.00	0.93	0.78	2.46	3.86
29.	*Sterculia (Pterygota) alata*	3	10.00	0.10	10.00	1.00	2.78	2.33	2.46	7.02
30.	*Sterculia lanceolata*	4	10.00	0.13	13.33	1.33	2.78	3.10	3.28	9.28
31.	*Stereospermum chelonoides*	4	10.00	0.13	13.33	1.33	2.78	3.10	3.28	9.28
32.	*Syzygium spp.*	9	26.67	0.30	30.00	1.13	7.41	6.98	2.77	12.80
33.	*Terminalia myriocarpa*	11	23.33	0.37	36.67	1.57	6.48	8.53	3.87	18.75
34.	*Tetrameles nudiflora*	4	10.00	0.13	13.33	1.33	2.78	3.10	3.28	9.28
35.	Talauma hodgsonii	2	6.67	0.07	6.67	1.00	1.85	1.55	2.46	5.56
		117	**360.00**	**4.30**	**430.00**	**40.62**	**100**	**100**	**100**	**300**

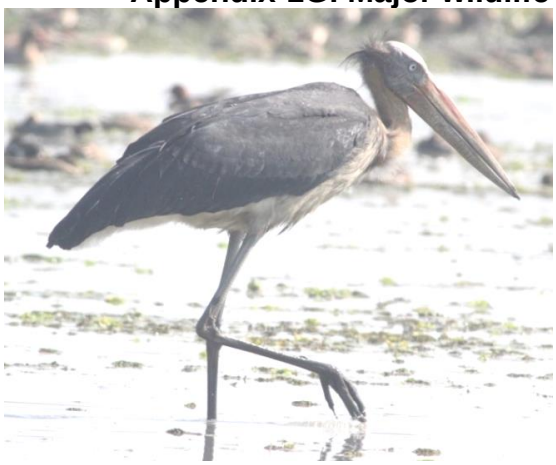
*Note= D- density, RF- Relative frequency, RD- Relative density, RA- Relative abundance, IVI-Important value indices

Appendix 1 F[3]. Community structure of trees in Bamboo habitat of Pakke Wildlife Sanctuary, A.P.

S.N.	Tree species	No. of individual	freq	density	D/ha	Abun	RF	RD	RA	IVI
1.	*Altingia excelsa*	6	20	0.24	24	1.2	10.20	9.231	9.09	28.53
2.	*Albizia procera*	8	20	0.32	32	**1.6**	10.20	12.308	**12.12**	34.63
3.	*Dillenia indica*	6	20	0.24	24	1.2	10.20	9.231	9.09	28.53
4.	*Duabanga grandiflora*	11	**36**	**0.44**	**44**	1.222	**18.37**	**16.923**	9.26	**44.55**
5.	*Dysolxylum gotadhora*	2	**8**	0.08	**8**	**1**	**4.08**	**3.077**	**7.58**	**14.73**
6.	*Elaeocarpus obtusifolius*	5	16	**0.2**	20	1.25	8.16	7.692	9.47	25.33
7.	*Pterospermum acerifolium*	6	16	0.24	24	1.5	8.16	9.231	11.36	28.76
8.	*Syzygium spp.*	8	24	0.32	32	1.333	12.24	12.308	10.10	34.65
9.	*Terminalia myriocarpa*	6	16	0.24	24	1.5	8.16	9.231	11.36	28.76
10.	*Tetrameles nudiflora*	7	20	0.28	28	1.4	10.20	10.769	10.61	31.58
		65	**196**	**2.6**		**13.2**	**100**	**100**	**100**	**300**

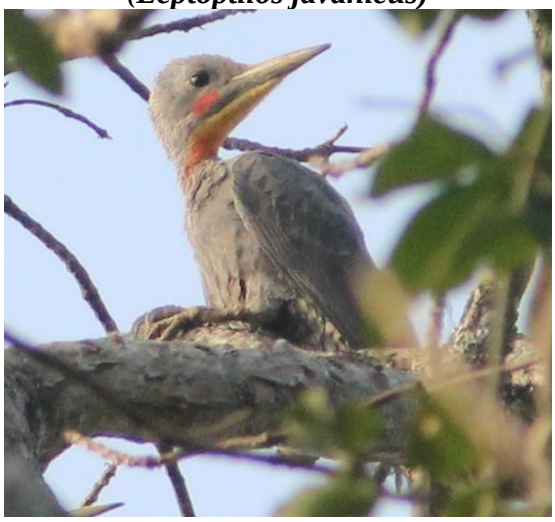
*Note= D- density, RF- Relative frequency, RD- Relative density, RA- Relative abundance, IVI-Important value indices

Appendix-1G. Major wildlife species as attraction of tourist



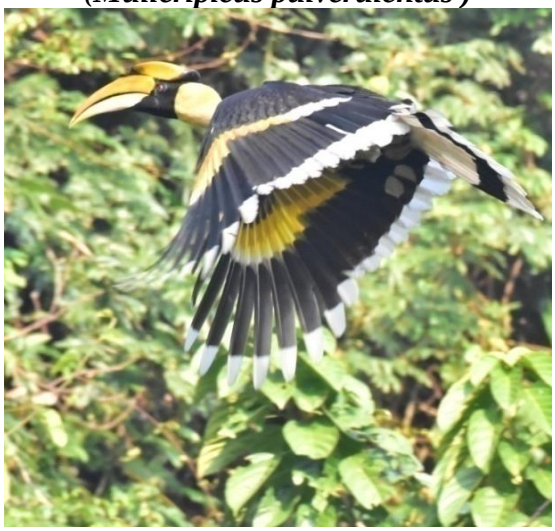
Lesser Adjutant
(Leptoptilos javanicus)

Indian Spotted Eagle
(Clanga hastate)

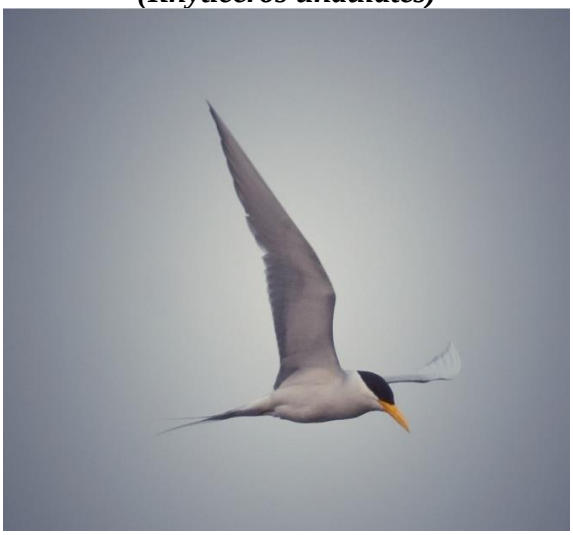


Great Slaty Woodpecker
(Mulleripicus pulverulentus)

Wreathed Hornbill
(Rhyticeros undulates)



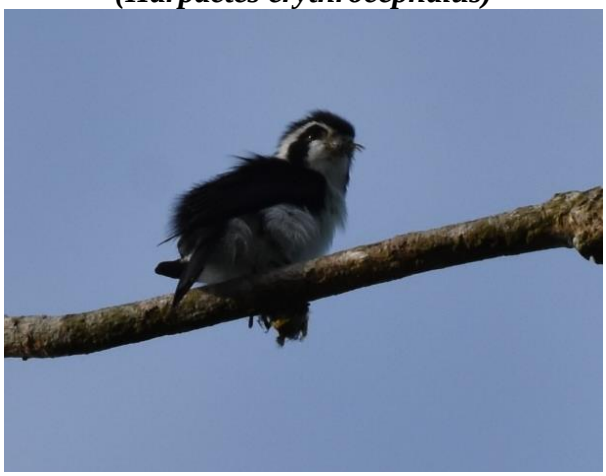
Great Hornbill
(Buceros bicornis)



River Tern
(Sterna aurantia)

Red-headed Trogon
(Harpactes erythrocephalus)

Striated Heron
(Butorides striata)



Pied Falconet
(Microhierax melanoleucos)

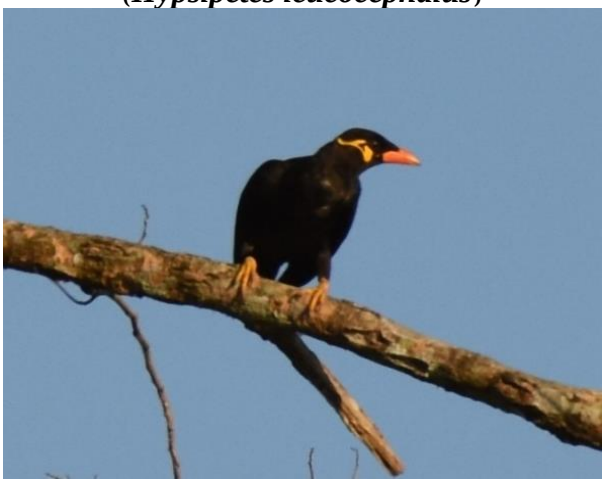
Golden-throated Barbet
(Psilopogon franklinii)

Long-tailed Broadbill
(Psarisomus dalhousiae)

Yellow-bellied Fairy-fantail
(Chelidorhynx hypoxanthus)

Black Bulbul
(***Hypsipetes leucocephalus***)

Scarlet Minivet
(***Pericrocotus flammeus***

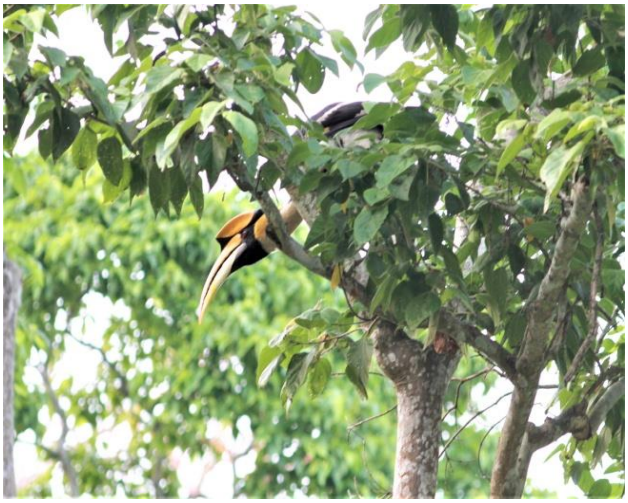


Scarlet Minivet
(***Pericrocotus flammeus***

Silver-eared Mesia
(***Leiothrix argentauris***)

Blue-winged Minla
(***Siva cyanouroptera***)

Oriental white eye
(***Zosterops palpebrosus***)



Roosting sites of honbills in Pakke Wildlife Sanctuary, Arunachal Pradesh

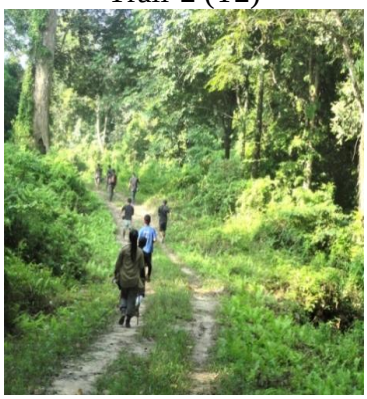
Appendix 1H. Different nature trail selected for exploring wildlife based ecotourism

Trail-1 (T1)

Trail-2 (T2)

Trail-3 (T3)

Trail-4 (T4)



Trail-5 (T5)

Trail-6 (T6)

Trail-7 (T7)

Trail-8 (T8)

Trail-9 (T9)

Appendix 1I. Accommodation facilities nearby Pakke Wildlife Sanctuary, A.P.

(a) Traditional Nyshi style homestay

(b) Concrete luxury homestay

(c) Eco-Jungle camp, GHA

(d) Mubosa village Homestay

(e) Melung Bagang Homestay

(f) Shampa Nabam Homestay

(g) Basang Waghe Homestay

(h) Hola Tana Homestay

(i) Jyoti Tabum Homestay

(j) Langka Forest IB

(k) Upper Decroi, Forest IB

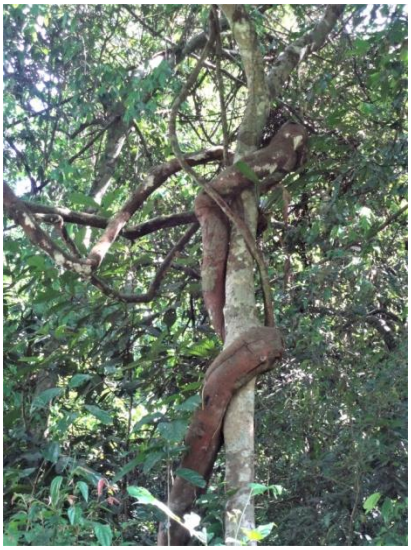
(l) West bank, Forest IB

(m) West bank, VIP Forest IB

(n) West bank, Dormitory IB

(o) Khari beat IB

Annexure-1J. Some of the unique nature based places inside the sanctuary





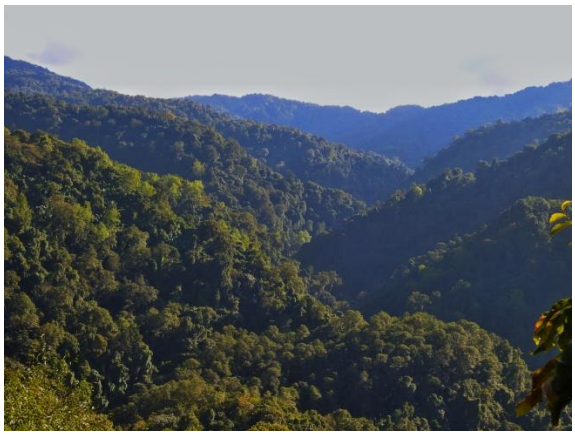






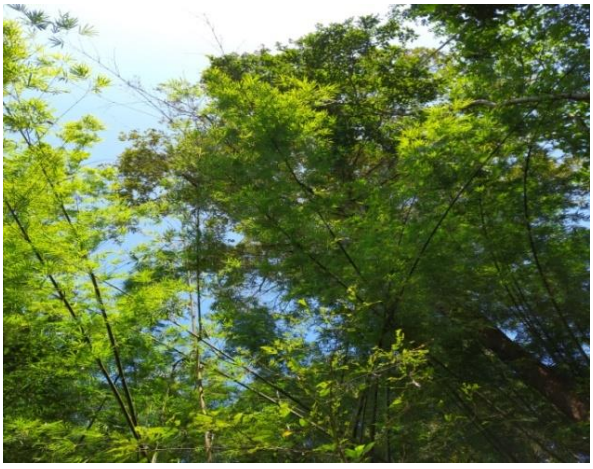
Appendix 1K. Selected habitat types for estimating wildlife speices and their population.

FOREST HABITAT



RIVERINE HABITAT

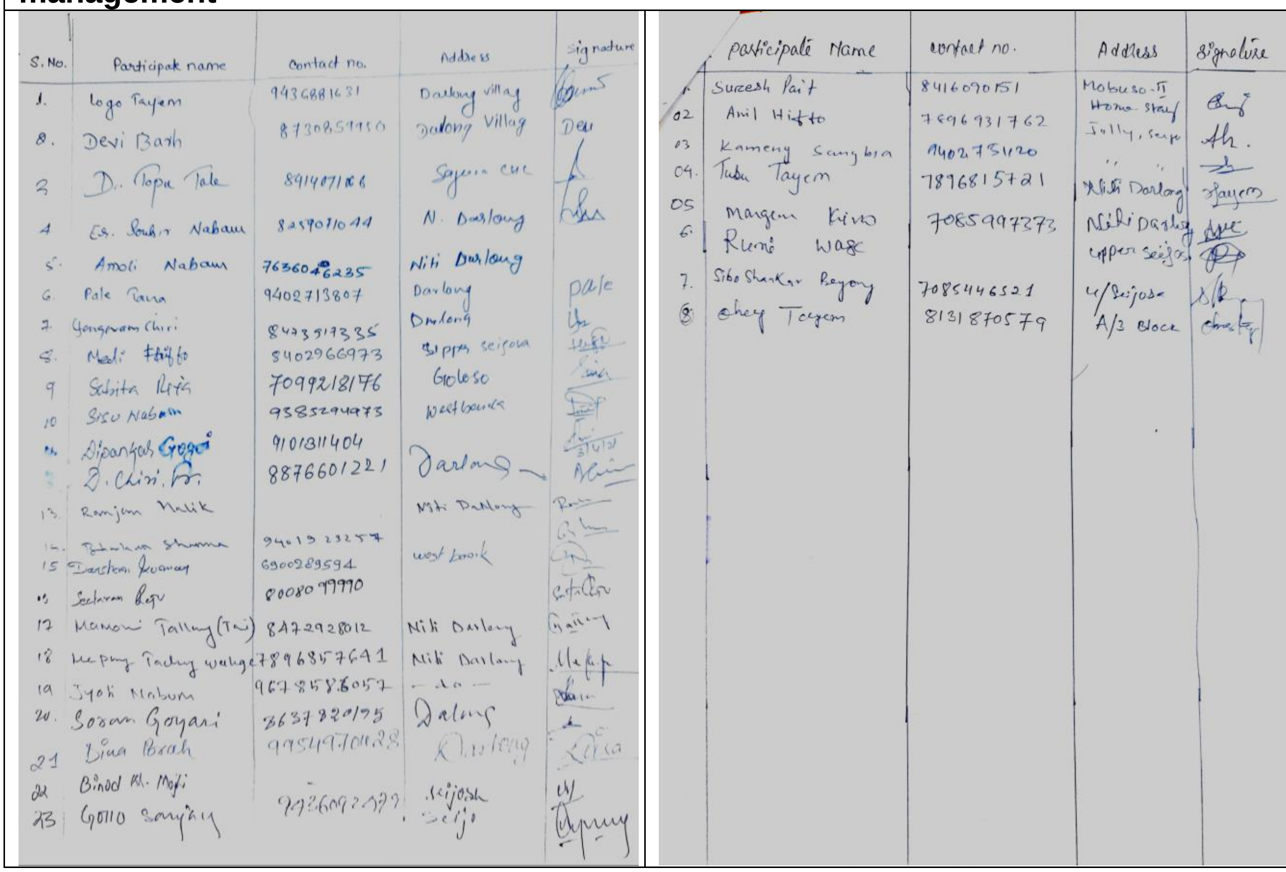
BAMBOO HABITAT



Appendix-1L. Local project available in the souvenir's shops at Pakke

Figure 4. Banner of workshop conducted in Seijosa, Pakke Tiger Reserve

List of persons participated in capacity building programme on homestay management



S.No.	Participant name	Contact no.	Address	Signature
1.	Logo Tayem	9436881631	Darlong villag	
2.	Devi Bath	8730859950	Darlong Villag	Deu
3	D. Popu Tale	8914071066	Sayum CHC	
4	Er. Soubir Nabam	8259071044	N. Darlong	
5.	Amoli Nabam	7636046235	Niti Darlong	
6.	Pale Tara	9402713807	Darlong	pale
7.	Gongram Chiri	8473917335	Darlong	
8.	Medi Hifto	8402966973	Sippa seijosa	
9	Sabita Rita	7099218176	Goloso	
10	Sisu Nabam	9385294973	West bank	
11	Dipankar Gogoi	9101811404		
12	D. Chiri	8876601221	Darlong	
13.	Ramjan Malik		Niti Darlong	
14.	Bhaskar Sharma	9401323257		
15	Darshan Kumar	6900289594	west bank	
16	Sectaram Rapu	8008099990		
17	Mamoni Talley (Tai)	8472928012	Niti Darlong	
18	Hepung Tachung wahge	7896857641	Niti Darlong	
19	Jyoti Nabum	9678586057	— do —	
20.	Sozam Goyari	8637820175	Darlong	
21	Dina Borah	9954970128	Darlong	
22	Binod Kr. Mofi		Seijosa	
23	Gollo Sanyang	9436092477	Seijo	

S.No.	Participate Name	Contact no.	Address	Signature
1	Suresh Pait	8416090151	Mobuso-II Home stay	
02	Anil Hifto	7896931762	Jolly, Seijo	Ah.
03	Kameng Sangbia	9402751120	" "	
04.	Tuba Tayem	7896815721	Niti Darlong	Tayem
05	Margem Kino	7085997373	Niti Darlong	
6.	Rumi Wage		Upper Seijosa	
7.	Sibo Shankar Bagang	7085446521	U/Seijosa	
8	Chey Tayem	8131870579	A/3 Block	

APPENDIX- 1M[2]. Photographs of the Capacity Building Workshop

Appendix- 1N. Photographs of the Awareness Workshop on Marbled Cat Conservation

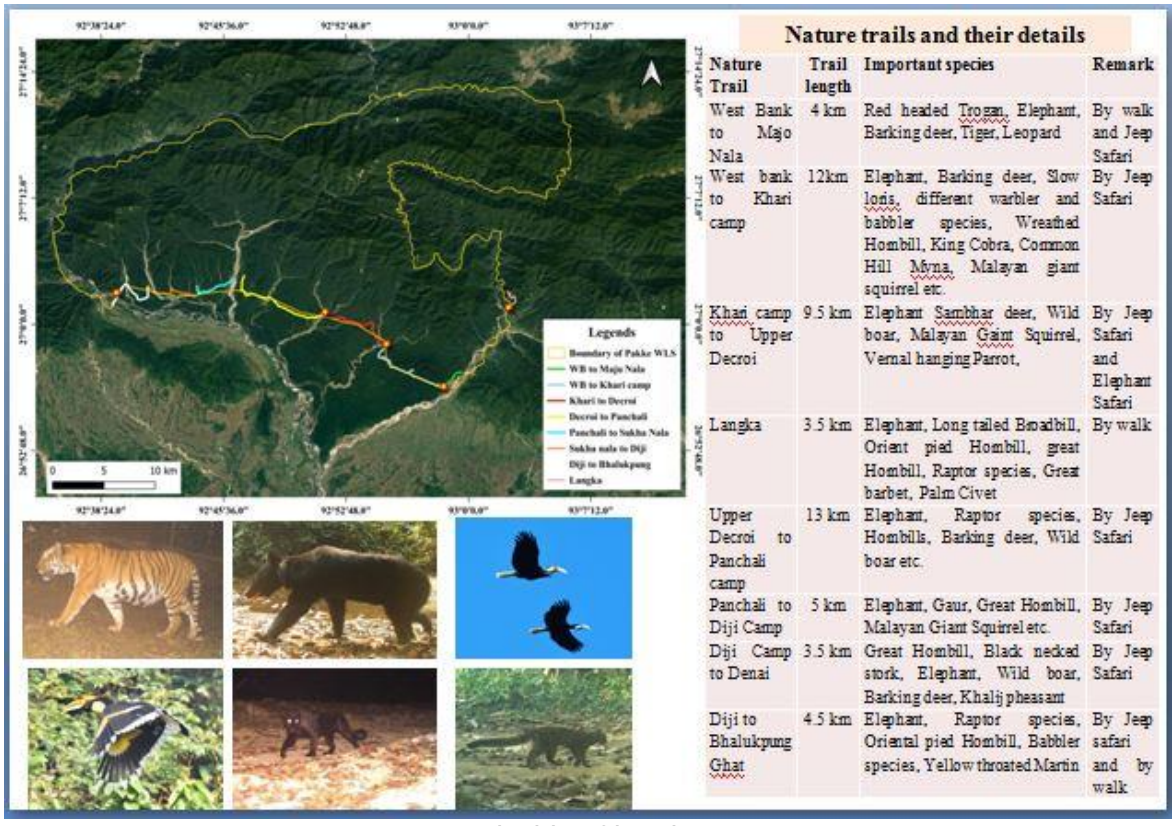

Awareness Programme on
MARBLED CAT CONSERVATION
PAKKE TIGER RESERVE SEIJOSA, ARUNACHAL PRADESH.
IN COLLABORATION WITH
PAKKE TIGER RESEVE, SEIJOSA, PAKKE KESSANG DISTRICT, ARUNACHAL PRADESH.
&
DEPARTMENT OF FORESTRY, NERIST, NIRJULI
ARUNACHAL PRADESH.
GBI NIHESD
Supported by
MBZ SPECIES CONSERVATION FUND
CLOUDED LEOPARD WORKING GROUP


Awareness Programme on
MARBLED CAT CONSERVATION
RESERVE SEIJOSA, ARUNACHAL PRADESH.
Supported by

Appendix- 1O. Brochure prepared for homestay information and wildlife species

S. No.	Owner	Contact no	Village	Distance from park (km)
1	Hola Tana	9402713807	Darlong	2
2	Basang Waghe	8011398486	Darlong	1.5
3	Mrs. Jyoti Tabum	9678586057	Niti Darlong	1.5
4	Shampa Nabam		Darlong	1.5
5	Metam Tahang	8416090151	Mabuno II	14
6	Yake Tachang	9402283099	Upper Seijosa	5
7	Tileswari Tayem	8135996934	Darlong	1
8	Melung Bagang	7085414164	Upper Seijosa	7
9	Rasham Brah	7002141732	Darlong	2
10	Atul Tai	9366516857	Niti Darlong	1.5
11	Logo Tayem	9436881631	Darlong	2

Front side of brochure



Nature trails and their details

Nature Trail	Trail length	Important species	Remark
West Bank to Majo Nala	4 km	Red headed Trogan, Elephant, Barking deer, Tiger, Leopard	By walk and Jeep Safari
West bank to Khari camp	12km	Elephant, Barking deer, Slow loris, different warbler and babbler species, Wreathed Hornbill, King Cobra, Common Hill Myna, Malayan giant squirrel etc.	By Jeep Safari
Khari camp to Upper Decroi	9.5 km	Elephant Sambhar deer, Wild boar, Malayan Gaint Squirrel, Vernal hanging Parrot,	By Jeep Safari and Elephant Safari
Langka	3.5 km	Elephant, Long tailed Broadbill, Orient pied Hornbill, great Hornbill, Raptor species, Great barbet, Palm Civet	By walk
Upper Decroi to Panchali camp	13 km	Elephant, Raptor species, Hornbills, Barking deer, Wild boar etc.	By Jeep Safari
Panchali to Diji Camp	5 km	Elephant, Gaur, Great Hornbill, Malayan Giant Squirrel etc.	By Jeep Safari
Diji Camp to Denai	3.5 km	Great Hornbill, Black necked stork, Elephant, Wild boar, Barking deer, Khalij pheasant	By Jeep Safari
Diji to Bhalukpung Ghat	4.5 km	Elephant, Raptor species, Oriental pied Hornbill, Babbler species, Yellow throated Martin	By Jeep safari and by walk

Back side of brochure

APPENDIX-2: Publications duly Acknowledging the Grant/ Fund Support of NMHS

LIST OF PUBLISHED PAPERS:

1. Vishwakarma, A., Kumar, A., Samte, M., Parbo, D., Krishna, C.M. (2020). Remnant Flowering Trees as Avifaunal Refuge in the Fringe Areas of Pakke Tiger Reserve, Arunachal Pradesh, India. *Proceedings of Zoological Society*. doi.org/10.1007/s12595-020-00337-3 (Impact Factor-0.71)

2. Vishwakarma, A., Kumar, A., & Maravi, D. K. (2022): Record of a possible hybrid of Australian Shoveler Spatula rhynchotis and Northern Shoveler Spatula clypeata from Assam, Northeast India. *Journal of Bombay Natural History Society*.Vol. 119. DOI: 10.17087/jbnhs/2022/v119/160005 (Impact factor-0.14)

3. Vishwakarma, A., Kumar, A., & Krishna, M. (2022). Hornbills: A Flagship Species in Pakke Tiger Reserve, Arunachal Pradesh, India. *International Journal of Ecology and Environmental Sciences:* 48(1). https://doi.org/10.55863/ijees.2022.0663 (Impact Factor-0.74)

4. Vishwakarma, A**.,** & Kumar, A. (2022). Community involvement: a big contribution for Hornbill conservation. *Saevus Wildlife* Vol. 10(3) 70-73pp.

5. Vishwakarma A.& A. Kumar (2021). Assessment and Conservational status of Hornbills: a flagship species for avitourism development in and around Pakke Wildlife Sanctuary, Arunachal Pradesh, India. *Online International Multidisciplinary Conference On Recent Trends in Environmental Science and Management* 6th and 7th August 2021.

6. Vishwakarma A.& A. Kumar (2022). The use of regular monitoring for bird species to identify the potential habitat in Forest trail for Avi-tourism expansion at Pakke Wildlife Sanctuary. *National Symposium-cum-Workshop Biodiversity and its Utilization and Conservation in Central India* (In Blended Mode) 21-22 February 2022.

Annexure- I

Consolidated and Audited Utilization Certificate (UC) and Statement of Expenditure (SE)

For the Period: …….

1.	Title of the project/Scheme/Programme:	Exploring Wildlife and Nature Based Tourism as a Potential Livelihood Option for Local People inhabiting in and around the Protected Areas in Eastern Himalayas, Arunachal Pradesh: A Sustainable approach for biodiversity conservation
2.	Name of the Principal Investigator & Organization:	Prof. Awadhesh Kumar North Eastern Regional Institute of Science & Technology (NERIST), Deemed to be University), Nirjuli-791109, Itanagar, Arunachal Pradesh
3.	NMHS-PMU, G.B. Pant National Institute of Himalayan Environment, Kosi-Katarmal, Almora, Uttarakhand Letter No. and Sanction Date of the Project:	GBPNI/NMHS-2017-18/SG-05 26/02/2018
4.	Amount brought forward from the previous financial year, quoting the NMHS-PSu, GBPNIHESD, Kosi, Katarmal, Almora letter No. and Date on which the authority to carry farward the said amount was given	2,60,964.00+76,027 (Bank interest) = 3,36,991.00
5.	Amount received from the NMHS-PSU, GBPNIHESD, Kosi, Katarmal, Almora during the financial year (2019-2021) with sanction order no.	14,06,853.00 GBPNI/NMHS-2017-18/SG-05/610/377/157, dated 28/10/2020
6.	Total amount that was available for expenditure (including commitments) incurred during the financial year (2020-2021) (Sl. No. 4+5)	14,82,880.00
7.	Actual expenditure (excluding the commitments) incurred during the financial year (2020-2021)	10,72,240.00
8.	Unspent balance amount refunded, if any: (Please give details of Cheque No. etc.)	Not applicable
9.	Balance amount available at the end of the financial year (2020-2021) or at the end of the project	4,10,640.00
10.	Balance Amount:	4,10,640.00
11.	Accrued bank Interest:	64283.00

Certified that the expenditure of **Rs. 10,72,240.00 (Rupees Ten lakh seventy two thousand two hundred forty only)** mentioned against Sr. No. 7 was actually incurred on the project/scheme for the purpose it was sanctioned.

Date:05/12/2022

(Signature of Principal Investigator)

PRINCIPAL INVESTIGATOR
DEPARTMENT OF FORESTRY
NERIST (DEEMED UNIVERSITY)

(Signature of Registrar/ Finance Officer of the Insitituion)

OUR REF. No.

ACCEPTED AND COUNTERSIGNED

Date:

COMPETENT AUTHORITY
NATIONAL MISSION ON HIMALAYAN STUDIES (GBP NIHE)

Statement of Consolidated Expenditure

[North Eastern Regional Institute of Science & Technology (Deemed to be University)]

Statement showing the expenditure of the period from
Sanction No. and Date : GBPNI/NMHS-2017-18/SG-05, 26/02/2018

1. Total outlay of the project : Rs. 45,00295/-

2. Date of Start of the Project : 1st July 2018

3. Duration : Three years

4. Date of Completion : 30/06/2021

5. Total amount sanctioned : Rs.45,00,295/-
a) Total amount received during the project period : Rs.3091388/- [1684535.00+14,06,853.00]
(Financial 2018-19 & 2019-20)

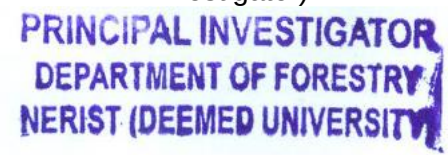
b) Total amount available for Expenditure : **Rs.**

S. No.	Budget head	Amount received	Expenditure	Amount Balance/ excess expenditure
1	Salaries			
2	Permanent Equipment Purchased (Item-wise)			
3	Salaries			
4	Travel			
5	Consumable			
6	Contigency			
7	Acitivity & other cost			
8	Institutional charges			
9	Accrued bank Interest			
10	**Total**			

Certified that the expenditure of **Rs.**_____ **(**
Rupees:_____**)** mentioned against Sr. No.12 was actually incurred on the project/ scheme for the purpose it was sanctioned.

Date:

(Signature of Principal Investigator)



(Signature of Registrar/ Finance Officer)

(Signature of Head of the Institution)

OUR REF. No.

ACCEPTED AND COUNTERSIGNED

Date:

COMPETENT AUTHORITY
NATIONAL MISSION ON HIMALYAN STUDIES (GBP NIHE)

Annexure-II

Consolidated Interest Earned Certificate

Please provide the detailed interest earned certificate on the letterhead of the grantee/ Institution and duly signed.

Annexure-III

Consolidated Assets Certificate

Assets Acquired Wholly/ Substantially out of Government Grants

(Register to be maintained by Grantee Institution)

Name of the Sanctioning Authority: National Mission on Himalayan Studies, GBP NIHE & Ministry of Environment, Forest & Climate Change (MoEF&CC)

1. Name of Grantee Institution: **NERIST (Deemed to be University)**
2. No. & Date of sanction order: **GBPNI/NMHS-2017-18/SG-05, 26th February, 2018**
3. Amount of the Sanctioned Grant: **Rs. 45,00295/-**
4. Brief Purpose of the Grant: **Exploring Wildlife and Nature Based Tourism as a Potential Livelihood Option for Local People inhabiting in and around the Protected Areas in Eastern Himalayas, Arunachal Pradesh: A Sustainable approach for biodiversity conservation.**
5. Whether any condition regarding the right of ownership of Govt. in the property or other assets acquired out of the grant was incorporated in the grant-in-aid Sanction Order: **No.**
6. Particulars of assets actually credited: **10 nos. of equipments**
7. Value of the assets as on: **Not assessed**.
8. Purpose for which utilised at present : **For the research work purpose.**
9. Encumbered or not : **Not**
10. Reasons, if encumbered : **N.A.**
11. Disposed of or not : **Not (in working condition and are regularly used in research work)**
12. Reasons and authority, if any, for disposal: **N.A.**
13. Amount realised on disposal : **N.A.**

(Prof. Awadhesh Kumar)
PROJECT INVESTIGATOR

PRINCIPAL INVESTIGATOR
DEPARTMENT OF FORESTRY
NERIST (DEEMED UNIVERSITY)

(FINANCE OFFICER)

(HEAD OF THE INSTITUTION)

Annexure-IV

List or Inventory of Assets/ Equipment/ Peripherals

S. No.	Name of Equipment	Image of product	Quantity	Sanctioned Cost	Actual Purchased Cost	Purchase Details
1.	**Camera** (Nikon D7200 with 18-140mm lens)		01 no.	621655/-	59,000/-	519500/- to expenditure on equipment purchase
2.	**Camera Lens** (Nikkor 200-500mm)		01 no.		75,000/-	All items are purchased through open tender.
3.	**GPS** [Garmin GPS Etrex 30x]		02 nos.		29,000/-	
4.	**Portable Weather station** [Ambient Weather WM-4]		01 no.		30,000/-	
5.	**Binocular** [Nikon Prostaff 5 (8x42)]		4 nos.		38,600/-	
6.	**Night vision Binocular** [Bushnell LYNX]		01 no.		73,000/-	
7.	**Laptop** [HP 14-dh1026tx Pavilion x360 Laptop]		01 no.		1,15,000/-	
8.	**Desktop** [HP 24-f0043in 23.8-inch All-in-One Desktop (8th Gen Intel Core i5-8400T/ 4GB/TB/ Windows 10]		01 no.		69,000/-	
9.	**Projector** [ViewSonic M1-Portable Projector]		01 no.		56,000/-	
10.	**Printer** [Canon Pixma G3010]		01 no.		13,500/-	

5. Equipment and Asset Information

Note: **Attach a Descriptive Annexure/ File separately.**

(PROJECT INVESTIGATOR) **(FINANCE OFFICER)**

(Signed and Stamped) **(Signed and Stamped)**

(HEAD OF THE INSTITUTION)

(Signed and Stamped)

Annexure-V

Letter of Head of Institution/Department confirming Transfer of Equipment Purchased under the Project to the Institution/Department

To,

The Convener, Mountain Division
Ministry of Environment, Forest & Climate Change (MoEF&CC)
Indira Paryavaran Bhawan
Jor Bagh, New Delhi-110003

Sub.: Transfer of Permanent Equipment purchased under Research Project titled "**"Wildlife and nature-based tourism as a potential livelihood option for local people inhabiting around the protected areas in Eastern Himalayas, Arunachal Pradesh: a sustainable approach for biodiversity conservation**" funded under the NMHS Scheme of MoEF&CC – reg.

Sir/ Madam,

This is hereby certified that the following permanent equipment purchased under the aforesaid project have been transferred to the Implementing Organization/ Nodal Institute after completion of the project:

1.	**Camera** [Nikon D7200 with 18-140mm lens]	01 no.
2.	**Camera Lens [**Nikkor 200-500mm]	01 no.
3.	**GPS** [Garmin GPS Etrex 30x]	02 nos.
4.	**Portable Weather station** [Ambient Weather WM-4]	01 no.
5.	**Binocular** [Nikon Prostaff 5 (8x42)]	04 nos.
6.	**Night vision Binocular** [Bushnell LYNX]	01 no.
7.	**Laptop** [HP 14-dh1026tx Pavilion x360 Laptop]	01 no.
8.	**Desktop** [HP 24-f0043in 23.8-inch All-in-One Desktop (8th Gen Intel Core i5-8400T/ 4GB/TB/ Windows 10]	01 no.
9.	**Projector** [ViewSonic M1-Portable Projector]	01 no.
10.	**Printer** [Canon Pixma G3010]	01 no.

Head of Implementing Department: Prof M.B. Sharma
Name of the Implementing Department & Organization:
Dept. of Forestry, NERIST (Deemed to be University)

Stamp/ Seal:…….

Date:……

Copy to:

1. The Nodal Officer, NMHS-PMU, National Mission on Himalayan Studies (NMHS), G.B. Pant National Institute of Himalayan Environment (NIHE), Kosi-Katarmal, Almora, Uttarakhand-263643

Annexure-VI

Details, Declaration and Refund of Any Unspent Balance

Please provide the details of refund of any unspent balance and transfer the balance amount through RTGS (Real-Time Gross System) in favor of **NMHS GIA General** and declaration on the official letterhead duly signed by the Head of the Institution.

Kindly note the further Bank A/c Details as follows:

Name of NMHS A/c:	NMHS GIA General
Bank Name & Branch:	Central Bank of India (CBI), Kosi Bazar, Almora, Uttarakhand 263643
IFSC Code:	CBIN0281528
Account No.:	3530505520 (Saving A/c)

In case of any queries/ clarifications, please contact the NMHS-PMU at e-mail: nmhspmu2016@gmail.com