2nd Annual Biodiversity Assessment

Neora Valley National Park

Gorumara Wildlife Division, West Bengal

30th September to 11th October 2018

Organized by:

Chief Conservator of Forests, Wildlife (North)

West Bengal

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Wildlife (North), West Bengal

Published by:

Principal Chief Conservator of Forests (Wildlife) &
Chief Wildlife Warden, **West Bengal**
Directorate of Forests,
Government of West Bengal

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2019

Photo courtesy:
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FOREWORD

Ravi Kant Sinha, IFS

Principal Chief Conservator of Forests, Wildlife
& Chief Wildlife Warden,
Government of West Bengal

In March 2018, we had conducted a rapid assessment of biodiversity of Neora Valley National Park, the first such attempt since 1982. The rich biodiversity discovered during the 2018 assessment encouraged us to conduct a more detailed survey, involving many more experts in their respective disciplines.

This compilation on biodiversity of Neora Valley National Park is limited by the Forest Departments' resources. However, it could serve as a basic document for all future development and management plans. With the rising awareness and India's commitments to conservation, all development projects have to consider basic information on biological diversity. The current laws also prescribe that each such project should include an analysis of its impact on biodiversity and the environment, and be a sustainable development plan.

This effort is only a beginning to enumerate biological diversity of a very important area of our State. An effort has been made to document the lesser classes of the animal world, especially the spiders, butterflies, orchids and small mammals. I hope this compilation will encourage further detailed studies on the species distribution, benefits that organisms can offer to mankind, and the ecological dynamics to allow co-existence with the fringe human population.

I also extend my deep appreciation to all experts, volunteers and forest department staff, who have worked tirelessly in the making of this report.

Kolkata, 13th August, 2019

Ravi Kant Sinha, IFS

ACKNOWLEDGEMENT

1st rapid biodiversity assessment of Neora Valley National Park (NVNP) conducted last year was a great success considering the magnitude and extent of different faunal and floral elements recorded scientifically. It is also felt essential to conduct such biodiversity assessment of pristine area like Neora Valley National Park (NVNP) on a regular interval for at least Five (05) years covering different seasons. Compilation of 2nd years assessment data revealed the richness of biodiversity of the National Park to a great extent. Floral and faunal species encountered during the survey carried out by Wildlife North Circle, Wildlife Wing, West Bengal has been updated in this 2nd edition.

This book would not have been possible without the support and encouragement from Sri Ravi Kant Sinha, IFS, Principal Chief Conservator of Forests, Wildlife and Chief Wildlife Warden, West Bengal and Sri Sandeep Sundriyal, IFS, Additional Principal Chief Conservator of Forests, Wildlife.

On behalf of Wildlife Wing, Government of West Bengal, I would like to acknowledge the significant contribution of the following institutions for providing resource persons and individuals of different fields viz. (i) Botanical Survey of India (ii) West Bengal Biodiversity Board (iii) Nature Mates-Nature Club, Kolkata (iv) Prakriti Sansad, Kolkata (v) Wildlife Conservation Society, India (vi) HNAF, Siliguri & (vii) ICIMOD, Nepal.

Our heartfelt thanks goes to Prof. Silanjan Bhattacharya, Head, Department of Zoology, West Bengal State University who was instrumental in planning, compiling and analyzing the raw data. His guidance and advise helped the resource persons and frontline staff immensely in data collection and compilation.

We also extend our sincere gratitude to Dr Nakul Chettri, Sr. Biodiversity Specialist of International Centre for Integrated Mountain Development (ICIMOD) & Programme Coordinator, Kangchenjunga Landscape Conservation and Development Initiative (KLCDI), Dr S N Ghosh, Sr. Research Officer, West Bengal Biodiversity Board for their active role in identifying and analysing the report.

We would also like to extend our humble and sincere gratitude to Dr Anant Kumar of Botanical Survey of India, Dr Rajendra Yonzone of Kalimpong and Sri D B Basnet, WBFS, DFO Darjeeling Social Forestry Division for their immense support and expertise provided in the respective fields.

Dr Sheela S of ZSI although not present during survey, was instrumental in identifying the collected specimen of Ants. We are sincerely expressing our thanks to her.

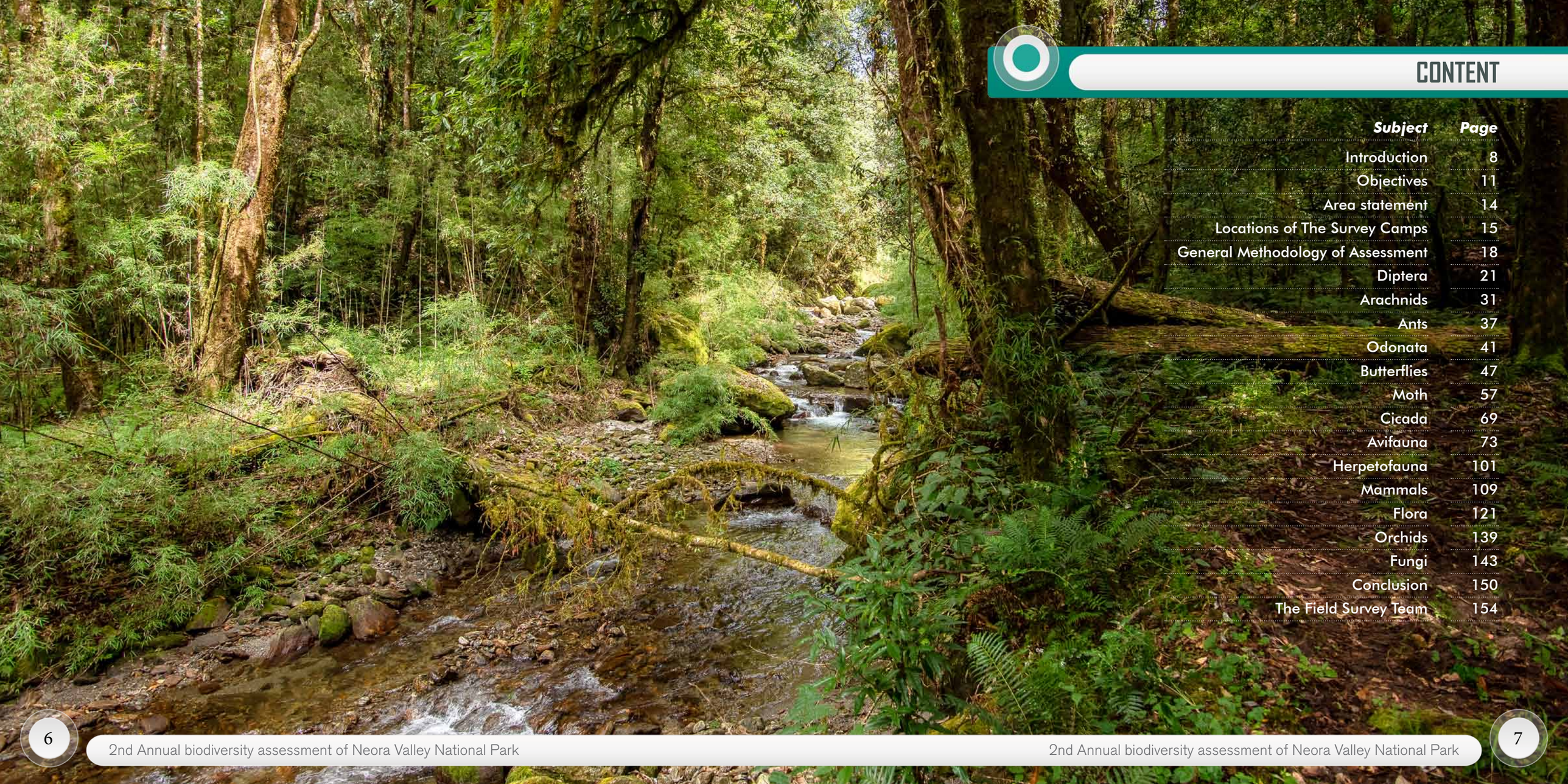
My special thanks to Dr Abesh Kumar Sanyal and Kamalika Bhattacharya in finding out time to identify the Moths from photographs. I also extend my gratitude to Dr Prakash Pradhan, Research Assistant, West Bengal Biodiversity Board in identifying the wild mushroom & fungi from the photographic evidence only.

We sincerely appreciate the members of Himalayan Nature & Adventure Foundation (HNAF), Siliguri for extending their help in setting up field camps in the remote and inaccessible areas.

Last but not the least, I express my appreciation to the officers and frontline staff of Gorumara Wildlife Division under the leadership of Miss Nisha Goswami, IFS, DFO Gorumara Wildlife Division in organizing the camp consecutively for 2nd year in such an inaccessible landscape and executing the plan properly and effectively. I also extend my sincere appreciation to the senior officers of Forest Directorate for their participation in the camp

I may have forgotten to mention names of individuals and organizations who have provided support in bringing out this valuable publication. They all deserve due acknowledgement.

(**Sri Ujjal Ghosh**, IFS)
Chief Conservator of Forests
Wildlife North, West Bengal



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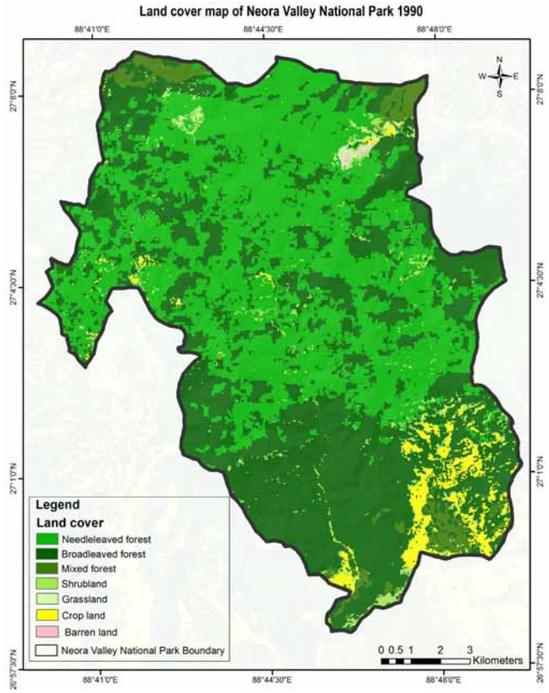
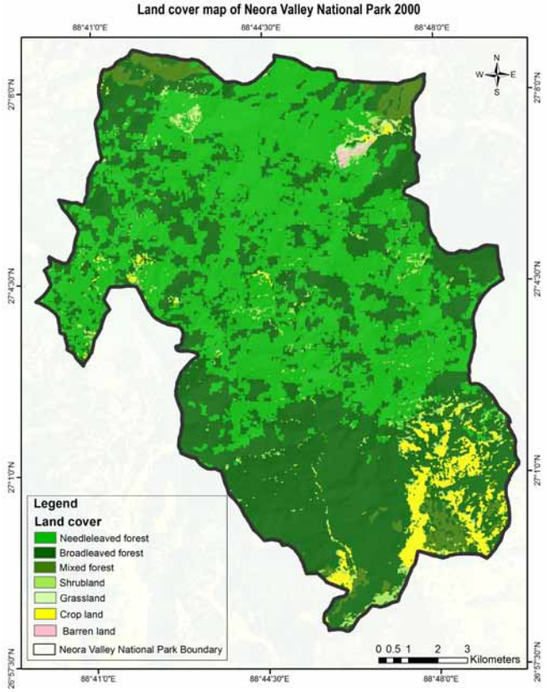
INTRODUCTION

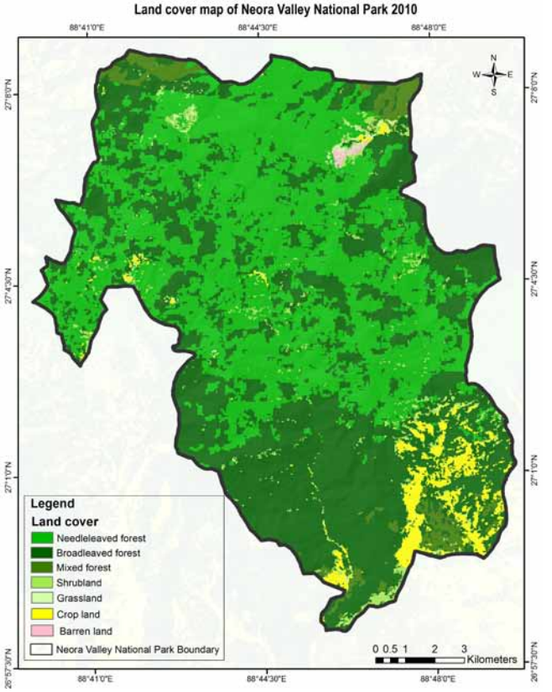
The Eastern Himalaya, transcend from the Kaligandaki Valley in central Nepal to northwest Yunnan in China – including the North Bengal hills in India – is an important biodiversity repository. This region has been in the spotlight for being biodiversity rich with high endemism as well as highly threatened ecosystems. Considered as the meeting place of three realms, namely, the Indo-Malayan, Paleoarctic, and Sino-Japanese and complex topography and extreme altitudinal gradients has created diverse bio-climatic zones (near tropical, subtropical, lower temperate, upper temperate, subalpine evergreen, alpine evergreen, and alpine shrubs and meadows) and 'island-like' conditions for many species and populations, making them reproductively isolated. This isolation has given rise to genetic differences among populations, thereby contributing to the exceptionally rich array of biodiversity.

Nestled in the Eastern Himalaya, the Neora Valley National Park (NVNP) is one of the key protected areas in North Bengal. It can be noted that the protected areas have been considered as an important measures for global biodiversity conservation and the corner stone for species survival. Considered as one of the most pristine ecosystems, the NVNP is important due to altitudinal variations, intact primary forest and also being part of the ecological trijunction with Sikkim and Bhutan. Established in 1881, it is one of the oldest reserve forests in India. The pristine primary and inaccessible forest kept it intact and unexplored till December 1982, when the Himalayan Club, along with Zoological Survey of India, Department of Botany, Calcutta University, West Bengal Forest Development Corporation and Indian army organized the first expedition to the then uncharted Neora Valley forest from Lava. The expedition recognized the value of its biodiversity and richness and was notified as a protected area of national importance in April 1986 and finally gazetted in December 1992.



The NVNP, initially established with 84 km^2, has been extended with an area of 159.78 km^2 in 2017. With a wide range of environment gradients (183 m – 3,200 m), the park has diverse ecosystems resulting to rich biodiversity. Considered as West Bengal's crowning glory, the NVNP is also important for species seeking refugia and explore better habitat and food from highly modified lowland areas. As a result, the protected ecosystems are providing an important





ecological corridor for movement of long-ranging animals to and from other contiguous protected areas in North Bengal (e.g., Gorumara National Park, and Chapramari Wildlife Sanctuaries), Sikkim (Pangolakha Wildlife Sanctuary) and Bhutan (Jigme Shinghe Strict Nature Reserve and Jigme Dorji National Park.

The diverse altitudinal range starting from 183m to the highest point in Rechila Danda peak at 3,170m bordering Sikkim, has protected a wide range of forests and vegetation types as reported by in the 1st Biodiversity Camp Report by the Directorate of Forest, Government of West Bengal (DoF, GoWB 2018). The lust and luxurious forest found in the NVNP is an important catchment for water supply to 50,000 people living in Kalimpong town within 23 wards. Collected through multiple sources with an age old supply system, the distance to source and supply of water is about 68 km and catering 50% of the daily requirement of people of Kalimpong. In addition, the water supply is also feeding numerous hamlets surrounding the NVNP for drinking as well as support for tourism enterprises. The significance of the NVNP has been recognized by the state Government and in May 2009, it was also been included in the tentative list of World Heritage sites (UNESCO World Heritage Centre, 2009).

The NVNP is also an important habitat for many charismatic species including Royal Bengal Tiger and Red Panda. Though with high significance in term of biodiversity and ecosystem services (e.g. water), the NVNP has not been researched and documented systematically. There are anecdotal studies on flora and fauna with more emphasis on higher taxa ignoring the lower invertebrates and plants. The periodic studies looking for seasonal and temporal changes on biodiversity is yet to be established – a crucial for management interventions of the park. Moreover, there increasing infestation by invasive species including Maling bamboo (*Yushania maling*), arresting regeneration of the climax species and possibly changing the ecosystem and biodiversity of the park. In addition, the frontline staff, responsible for conservation and management of biodiversity in day to day activities are not adequately skillful and well versed with the science behind the changes. This situation could be improved if opportunities are provided to the staff to work with professional and learn.

Considering these facts, and the mandate mentioned in the Draft National Forest Policy 2018, the Directorate of Forest, North Wing, Government of West Bengal has initiated first of its kind 'Biodiversity Camp' in the NVNP as a pioneering multidisciplinary research and documentation of its biodiversity. The 1st Annual Biodiversity Assessment Camp was scheduled for 3 to 13 March, 2018 strategized to cover the lower altitudinal belts of the NVNP and reported wide range of species checklist including birds (176 species), butterflies (75 species), spiders (90 species) and vascular plants (369 species) and orchid (53 species). The filed staff were also trained and encouraged for seasonal assessment and monitoring of species. Considering the success in organizing the 1st Annual Biodiversity Camp, the 2nd Annual Camp was organized during 30 September to 11 October 2018. Two camp sites were used for the purpose, namely - Gogune camp, lower Neora range (Altitude: 1232 mt) and Alubari camp, Upper Neora Range (Altitude: 2542 mt).

Sketch by: Dr S K Sinha

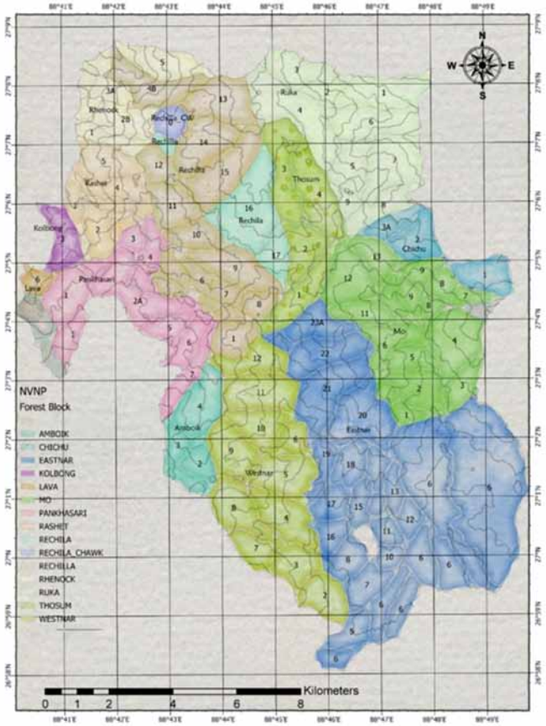
OBJECTIVES

The broad objective of the 2nd Camp was to contribute towards biodiversity assessment and documentation through multidisciplinary team at representatives altitudes. However, the specific objectives were:

- To explore, identify and document the floristic diversity of the newly added area of NVNP including orchids.
- To explore, identify and document the faunal diversity of the newly added area of NVNP including lesser known groups like herpetofauna (snakes and lizards), insects (spiders, butterfly, moths, dragonfly and damselfly) as well as mammals.
- To prepare and upgrade checklist of flora and fauna from the above mentioned explorations.
- To impart training to frontline staff in identifying and conserving biodiversity elements.

The National Park enjoys the distinction of being situated over one of the oldest Reserve Forest in India. The compact tract of forest is mostly virgin in nature because of its unique topography comprising of the hills which rise up abruptly from the piedmonts increasing northwards and having a mosaic of micro topographic units. The northern boundary of this National Park is contiguous with the forest of Sikkim and Bhutan and harbours a number of endemic species of flora and fauna. A number of animals like Red Panda, Royal Bengal Tiger, Golden Cat, Marbled Cat, Common Leopard, Clouded Leopard, Fishing Cat, Leopard Cat, Indian Wild Dog, Serow, Goral, Asiatic Black Bear, Flying Squirrels, Himalayan Palm Civet etc. have been found in this National Park. It contains angiosperms of at least 680 species, at least 23 species of Pteridophytes, more than 31 species of mammals, more than 200 species of birds, 276 species of insects, 38 species of other invertebrates. Total area of Neora Valley National Park is 159.89 Sq Km.

Neora Valley National Park




Forests of NVNP (2200mt)

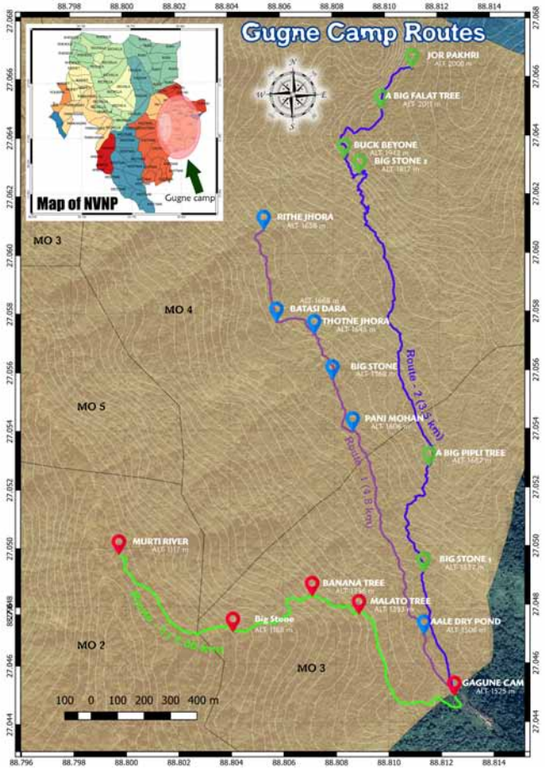
AREA STATEMENT

Sl	Block	Compartments	Area (Ha)
1	Rachila	Rachila1a,1b,1c,2a,2b,3,4,5,6,7,,8a,8b,9a,9b,10,11,12,13,14,15,16 & 17	2534.00
2	Thosum	Thosum 1,2a,2b,3 & 4	979.00
3	West Nar	West Nar 2,3,4,5,6,7,8,9,10,11&12	2043.00
4	East Nar	East Nar 14a,14b,17,18,19a,19b,20a,20b,21a,21b,22 & 23b	1551.00
5	Rhenock	Rhenok 1, 2b, 4b & 5	691.00
6	Rashet	Rashet 3b, 3c & 4	299.00
7	Strip on Eastern side (100 metre to 200 metre)		348.00
8	Strip on Western side (100 metre to 200 metre)		244.00
9	Rachila Chawk (Khasmahal area handed over to FD)		111.00
	Newly added Area		
10	Ruka	Ruka-1,2,3,4(P),5(P),6,7,8 (P) &9 (P)	1711.50
11	Chichu	Chichu 1,2,3a & 3b	492.00
12	East Nar	East Nar 15(P) & 23a (P)	266.15
13	Mou	Mou 1(P),2(P), 3,4,5,6(P),7,8,9,10,11(P),12(P) & 13	1958.50
14	Kolbung	Kolbung 3	165.00
15	Lava	Lava 7 & 8	221.00
16	Rashet	Rashet 1,2,3a & 5	421.00
17	Rhenock	Rhenock 2a, 3a, 3b, 4a	261.00
18	Pankhasari	Pankhasari 1,2a (P), 2b, 3 (P), 4 (P), 5(P), 6(P) & 7(P)	1259.77
19	Ambiok	Ambiok 1(P), 2(P), 3(P) & 4(P)	433.35
		Total :	**15989.27**

LOCATIONS OF THE SURVEY CAMPS

During 1st Annual Biodiversity assessment camp of NVNP, Three (03) camp locations were identified covering the lower, middle and upper hill forests. During 2nd assessment camp we have selected two camp locations, Gogune camp, Lower Neora Range (N 27^{0}02'58.6", E 88^{0}49'35.2", Alt-1525mt) for covering lower & middle hill forests and Alubari camp, Upper Neora Range (N 27^{0}7'29.00", E 88^{0}43'12.32", Alt 2540 mt) to cover upper hill forests. Forest types around Gogune camp, according to Champion and Seth (1935) are Lower Hill Forests comprising of (i) Eastern Himalaya Moist mixed deciduous forest (3C/C- 3b) and (ii) Sub Himalaya Secondary Wet mixed Forest (2B/2S-3) and Middle Hill Forest - Eastern Himalaya Sub-tropical Wet Hill forest of Northern Sub Tropical. Broad leaved Hill Sub group (8B/C 1). Plantation of coniferous species and Cinchona trees was raised along the southern boundary of the camp location early during 1970's. Interference of biotic factors like human presence, grazing of domestic animals, firewood collection etc. were noticed along the southern boundary. However the rest part of the forest was human disturbance free. The extension of this zone is very large, extending both north-south and east-west with considerable differences of temperature, soil and rainfall. The forests over a greater part of the area are mainly deciduous but often approaching to semi evergreen type, where rainfall exceeds 160 inch annually. The primary species is *Schima wallichi* mixed with *Bauhinia purpuria, Cedrela toona, Michelia champaca*, *Duabanga sonnertiodes, Acrocarpus fraxinifolius, Amoora wallichi*. The undergrowth in the middle hill forest is composed of herbaceous annual, shrubs, climbers ferns represented by *Lycopodium* sp., *Selaginella* sp., *Botrychium* sp., *Clerodenrum viseosum*, *Morinda eitrifolia*, *Eupatorium odoratum, Girardiana palmata, Rauwolfia serpentina, Vitis reppanda.*

The other camp location was at Alubari which is a 4 hrs treacherous uphill trek from Choudaferi camp under Upper



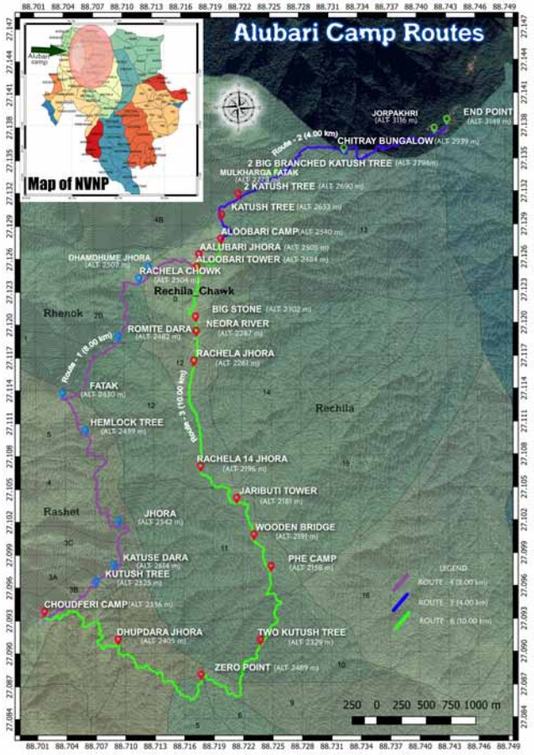
Neora Range. We have attempted to assess representative areas of upper hill forests from this camp location. The temperate zone ranges from an altitude of 1676 m. to 3169 m. The broad leave forest is restricted between 1676 m. - 2743 m. According to altitude vegetation types differ. In between

1676 - 2133 m. One can find *Machilus edulis - Alcimandra cathcartii*, between 2133 - 2438 m., *Quercus pachyphalla*, between 2438 - 2743 m. - *Quercus lamellosa* with *Acer* sp. *& Magnolia* sp. Other species in this region are *Alcimandra cathcartii, Nyssa javanica, Maclulus edilis, Engethardtia spicates, Cephalostachysm capitation, Arundinaria grititHion*.

Oak Forest : (2133 - 2438 m.) *Quercus lamellosa, Quercus lineata, Quercus spicata, Eleocarpus lanceaefolius, Echinocarpus, Acer campbeli* are found in this type of forests. Malling bamboo is found scattered all over with other species like *Rubus glaciate, Cardamine macrophylla, Ilex hookeri, Polygonum* sp., *Viburnum* sp., *Geranium nepalense*.

Rhododendron (Eastern Himalayan sub alpine -14/C-2) forest : Unlike other places of Eastern Himalayan the Rhododendron of the National Park don't exactly correspond to any of the Champion's climatic climax type and form pockets of pure patches, on the exposed hill tops with *Arundenaria pantlingii*. Common *species* are *Rhododendron arboruem, R. barbatum, R. falconeri, R. dalhousiae.* This community is perhaps a bio-edaphic climax peculiar to this area. It is found above 2743 m. Undergrowth on open patches includes. *Swertia chirata, Swertia bimaculata, Swertia nervosa, Swertia dilatata, Cardamine hersuta, Geranum nepalense, Capsella bursa-pastores, Drymaria villosa, Polygala arillata, Viburnum nervosum, Thalictrum foliolosum, Thalictrum jaranicum, Polygonum molle, Polygonum chinense*.

Himalayas Moist Temperate Forest - Montane Bamboo breaks (DS1 group-12) occur between 2,438 mt. - 3048 mt, particularly in areas exposed to heavy fire, adjoining the boundary of Sikkim state. Pockets of bamboo occur without any overwood in many places. *Arundinaeria panlingii, A. griffithiana, A. aristata, A. maling, A. falconeri, A. racemosa* are the main species. In damp area epiphytic moss on old bamboo is found. Grassland flora include - *Poa* sp., *Oplismenos, Imperata, Potentila, Cyperus* sp.



The survey team at Alubari Camp

GENERAL METHODOLOGY OF ASSESSMENT

The 2nd Camping for the survey of biodiversity in the NVNP was undertaken just at the end of monsoon in the months of Sept. 30th to 11th Oct. in three different locations of the park at two altitudes, namely around the Gogune camp (1300-1600 m.), Choudaferi and Alubari camps (2200-3127 m.).

The observations were mostly *ad libitum* and 'scan a block', i.e. intensive search in all the potential habitats for a target group of the fauna or flora in a patches of forests by the field experts for that group included in the survey team.

Encounter frequencies with different species during the surveys at different camp sites as experienced by the field team members were scaled from 0 to 3 in a hierarchical fashion to reflect the apparent abundance of each species in the surveyed locations, they are being **0 = not encountered, 1 = rarely encountered, 2 = common and 3 = highly abundant**.

Specimens were collected when it was absolutely necessary and as per the permissions from the Hon'bl CWLW, digital photography was also done freely to document the species and its variations as and when possible. This has allowed confirmation of the field identification of a species at leisure with identification resources back in Kolkata.

Govt. of West Bengal
Directorate of Forests
Office of the Principal Chief Conservator of Forests, Wildlife
& Chief Wildlife Warden, West Bengal
Bikash Bhawan, North Block, Third Floor, Saltlake City, Kolkata - 700091
Tel. No. 2334-6900/2358-3208, Fax. 91-033-23345946
Website – www.wildbengal.com e-mail – wbwildlife@gmail.com

No: C-28001/11/2019/XIII Dated : 03.04.2019

To,

Silanjan Bhattacharya,
Professor & Head,
Department of Zoology,
West Bengal State University,
Barasat, 24 Parganas (North),
West Bengal

Sub : Permission for collection of specimens from Singalila National Park during the Annual Biodiversity Assessment camp from 6th to 13th April 2019
Ref : Your letter through email, dated 15.03.2019

I am directed to convey the approval of Principal Chief Conservator of Forests, Wildlife & Chief Wildlife Warden, West Bengal, under Section 12 of Wildlife (Protection) Act 1972, for collection of specimens from Singalila National Park, West Bengal during the Annual Biodiversity Assessment camp from 6th to 13th April 2019 for preparing a database of faunal biodiversity of the National Park.

The terms and conditions are listed below,

1. Permission for collection of specimens is from Singalila National Park only and during the Annual Biodiversity Assessment camp from 6th to 13th April 2019 only.
2. The collection shall done strictly as a minimal number of sample specimens for lab examination to identify them on scientific parameters.
3. Collection of specimens shall be done only when absolutely necessary and following due scientific procedure.
4. For scientific purpose, minimal and essential collection of specimens is allowed only in case when their full taxonomic identity cannot be confirmed at the spot, for different animal groups, namely (a) Diptera, Insecta (b) Coleoptera, Insecta (c) Lepidptera, Insecta, (d) Odonata, Insecta (e) Hymenoptera, Insecta (f) Bugs (Hemiptera/Homoptera), Insecta (g) Mantis, stick/leaf insects (h) Arachnida, Arthropods (i) Amphibians (j) Reptiles. No mammals & birds are to be collected.
5. Specimens belonging to Schedule I of Wildlife Protection Act, 1972 for reptiles, amphibians and insects are not allowed to be collected.
6. Collection of specimens is permitted only between sunrise and sunset. Use of any lures of chemical / sound / light / mimicry and any trap is prohibited
7. There shall be no deviation from the locations and transit routes as scheduled in the Annual Biodiversity Assessment camp and collection of specimens shall be limited to it only.
8. The collected specimens shall be required to be initially primarily fixed initially at the field camps, listed and authorized by local Forest Officer and brought to Department of Zoology, West Bengal State University for final treatment and analysis. After due examination and identification, all collected specimens shall be deposited to repository at Zoological Survey of India, not later than 31st July 2019, under information to this office.
9. All scientific information related to above in detail, including data, photographic record, sample details and methodology adopted etc. shall be submitted to this office not later than 31st July 2019.
10. State Forest Department shall not be liable for any harm, injury or damage in course of working in forest area.
11. Dr. Silanjan Bhattacharya and his team shall be part of group as deputed by CCF, Wildlife (North) and DFO, Darjeeling Wildlife Division for Annual Biodiversity Assessment camp in Singalila National Park. Credentials and authentication of his team shall be done by Dr. Silanjan Bhattacharya to the local forest officials prior to commencement of camp.
12. The provisions of Wildlife (Protection) Act, 1972 and rules made thereunder are to be adhered to during the course of work in the Protected Area.

You are requested to contact Divisional Forest Officer, Darjeeling Wildlife Division in this regard prior to commencement of Annual Biodiversity Assessment Camp of Singalila National Park with all details.

(Sandeep Sundriyal, IFS)
Additional PCCF, Wildlife
West Bengal
Dated : 03.04.2019

No: C-28001/11/2019/XIII

Copy forwarded for information and necessary action to -
a) CCF, Wildlife (North), West Bengal
b) DFO, Darjeeling Wildlife Division

Additional PCCF, Wildlife
West Bengal

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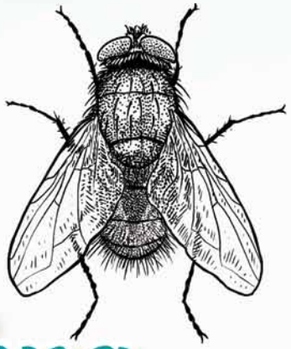
Tachina ursina Meigen, F-Tachinidae



Diptera

Neora valley National Park is one of the oldest National parks in India. It is mostly a compact patch of virgin forest covering an area of 159.89 sq km and is rich in biodiversity. Considering its richness, a survey and biodiversity assessment programme was organized in two successive seasons for documentation of one of the largest orders of insects in this National park.

There were many attempts for collecting Diptera specimens from the forest of different altitudes for beta diversity assessments.

Methods of collection:

1. Photographic documentation
2. Hand net sweeping and Malaise trapping

Results:

Dipteran Families documented at different altitudes of NVNP during 1st & 2nd Annual Biodiversity Assessment programme

SL	560-950 msl (Asalay)	950-1200 msl (Mouchuki and Gogune)	1950-2500 msl (Choudaferi and Doley)	2500-3127 msl (Alubari and adjoining areas)
1	Chironomidae			
2	Stratiomyidae			
3	Sciomyzidae			
4	Bombylidae			
5	Asilidae	Asilidae	Asilidae	Asilidae
6	Pipulinidae	Pipunculidae		
7	Syrphidae	Syrphidae	Syrphidae	Syrphidae
8	Micropezidae			
9	Sepsidae	Sepsidae	Sepsidae	
10	Anthomyiidae			
11	Calliphoridae	Calliphoridae	Calliphoridae	Calliphoridae
12	Muscidae	Muscidae	Muscidae	Muscidae
13	Sarcophagidae	Sarcophagidae	Sarcophagidae	Sarcophagidae
14	Tachinidae	Tachinidae	Tachinidae	Tachinidae
15		Bibionidae	Bibionidae	Bibionidae
16		Cecidomyidae		
17		Ceratopogonidae	Ceratopogonidae	
18		Culicidae		
19		Tipulidae	Tipulidae	Tipulidae
20		Phoridae	Phoridae	
21		Tephritidae		
22		Mycetophilidae	Mycetophilidae	
23		Hybotidae		
24		Dolichopodidae		
25		Tabanidae		
26			Lonchopteridae	
27			Diopsidae	
28			Drosophilidae	
29			Blepharoceridae	Blepharoceridae
30			Ptychopteridae	Ptychopteridae
31				Psychodidae
32				Ulididae
33				Lauxaniidae
	Total Family = 14	**Total Family = 19**	**Total Family =17**	**Total Family =13**

Asarkina africana

Chrysogaster sp

Dasysyrphus sp

Discussion:

14 families of Diptera were documented in altitude 560-1100m msl. This is lower hill forests with less flowering plant where no fly of family Syrphidae was found. Abundance of all the families was less but family Anthomyiidae, Muscidae and Calliphoridae were present in noticeable number.

At altitude 950-1200m msl where deciduous to evergreen forests dominate, a total of 19 fly families of Diptera was documented. This studied area was situated in border line of the National Park having extensive crop fields and lots of cardamom plantation found adjacent to the National park. This is why, abundant insect population was found with remarkable diversity. Flowering plants were diverse and pollinating Diptera was more. Abundance of family Syrphidae, Tachinidae, Tephritidae, Callphoridae and Muscidae was found in association with pollinating Hymenoptera.

In the upper hill forests at altitudes 1950-2500 mt., total 17 families was observed. Family Syrphidae showed great abundance and diversity with 14 different genera. In absence of bees (family Hymenoptera), extremely large number of bee-mimicking Syrphidae was reported in this altitude. Other families showed moderate number in abundance.

Altitude 2500 – 3127 mt of Himalayan sub-alpine and moist temperate forests represented 13 families; of which some are exclusive for this altitude like family Ulididae and Lauxaniidae. Diversity of hover flies (Syrphidae) remains same like upper hill forests.

Members of family Psychodidae was reported only in this range especially at altitude 2540 mt.

Eristalis sp

Eristalis tenax

Eristelinas taeniops

L picta

P heraclei

P siberita

Tachina ursina Meigen, 1824

T solivaga

Checklist of the recorded Dipterans during 2nd Annual Biodiversity Assessment programme of NVNP

SL	Genus	Species	Family	Subfamily
1	*Aldrichina*	*grahami* (Aldrich, 1930)	Calliphoridae	Calliphorinae
2	*Allarete*	*spatuliformis* Grover, 1979	Cecidomyiidae	Lestremiinae
3	*Anthomyia* Brunetti, 1907	Unknown	Anthomyiidae	Anthomyiinae
4	*Asarkina*	*africana* Bezzi, 1908	Syrphidae	Syrphinae
5	*Asarkina* Macquart, 1834	Unknown	Syrphidae	Syrphinae
6	*Atarba* Osten Sacken, 1869	Unknown	Tipulidae	Chioneinae
7	*Atherigona*	*orientalis* Schiner 1868	Muscidae	Atherigoninae
8	*Atherigona* Rondani, 1856	Unknown	Muscidae	Atherigoninae
9	*Atypophthalmus* Brunetti, 1911	Unknown	Tipulidae	Limoniinae
10	*Baccha*	*maculata* (Walker, 1852)	Syrphidae	Syrphinae
11	*Bercaea*	*cruentata* (Meigen, 1826)	Sarcophagidae	Sarcophaginae
12	*Betasyrphus* Matsumara, 1917	Unknown	Syrphidae	Syrphidae
13	*Blepharocera* Macquart, 1843	Unknown	Blephariceridae	Blepharicerinae
14	*Boettcherisca*	*nepalensis* Kano and Sugiyama, 1983	Sarcophagidae	Sarcophaginae
15	*Brontaea*	*ascendens* (Stein, 1915)	Muscidae	Mydaeinae
16	*Brontaea*	*distincta* (Stein, 1909)	Muscidae	Mydaeinae
17	*Brontaea*	*lasiopa* Emden, 1965	Muscidae	Mydaeinae
18	*Calliphora*	*vicina* Robineau-Desvoidy 1830	Calliphoridae	Calliphorinae
19	*Calliphora*	*pattoni* Aubertin, 1931	Calliphoridae	Calliphorinae
20	*Calliphora*	*vomitoria* (Linnaeaus, 1758)	Calliphoridae	Calliphorinae
21	*Camptomyia* Kieffer, 1894	Unknown	Cecidomyiidae	Porricondylinae
22	*Cheilosia* Meigen, 1838	Unknown	Syrphidae	Eristalinae
23	*Chrysogaster* Meigen, 1803	Unknown	Syrphidae	Eristalinae
24	*Chrysomya*	*pinguis* (Walker, 1858)	Calliphoridae	Chrysomyinae
25	*Chrysotoxum* Meigen, 1803	Unknown	Syrphidae	Syrphinae
26	*Citrogramma*	*citrinum* Brunetti, 1923	Syrphidae	Syrphinae
27	*Coenosia*	*plumiseta* (Stein, 1911)	Muscidae	Coenosiinae
28	*Coenosia* Meigen, 1826	Unknown	Muscidae	Coenosiinae

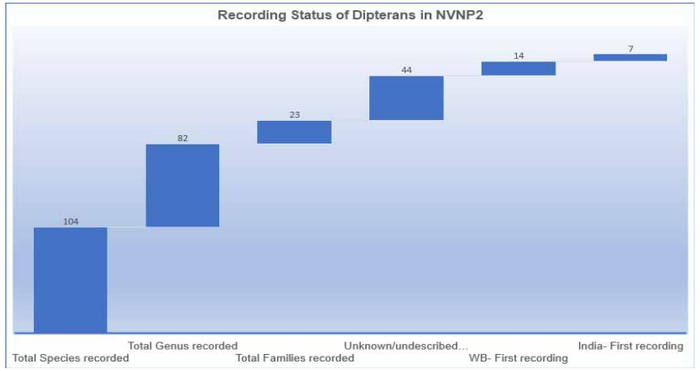
SL	Genus	Species	Family	Subfamily
29	*Culex* Linnaeus, 1758	Unknown	Culicidae	Culicinae
30	*Dasysyrphus* Enderlein, 1938	Unknown	Syrphidae	Syrphinae
31	*Delia*	*platura* (Meigen, 1826)	Anthomyiidae	Anthomyiinae
32	*Dexopollenia* Townsend, 1917	Unknown	Calliphoridae	Polleniini
33	*Dichaetomyia*	*nubiana* (Bigot, 1885)	Muscidae	Muscinae
34	*Dichaetomyia* Malloch, 1921	Unknown	Muscidae	Muscinae
35	*Dohrniphora*	*aequididtans* Brunetti, 1912	Phoridae	Phorinae
36	*Dolichopeza* Curtis, 1825	Unknown	Tipulidae	Dolichopezinae
37	*Dolichopus* Latreille, 1796	Unknown	Dolochopodidae	Dolichopodinae
38	*Episyrphus*	*balteatus* (De Geer, 1776)	Syrphidae	Syrphinae
39	*Episyrphus* Matsumara & Adachi, 1917	Unknown	Syrphidae	Syrphinae
40	*Eristalinus*	*taeniops* (Wiedemann, 1818)	Syrphidae	Eristalinae
41	*Eristalinus* Rondani, 1845	Unknown	Syrphidae	Eristalinae
42	*Eristalis*	*tenax* (Linnaeus, 1758)	Syrphidae	Eristalinae
43	*Geranomyia* Haliday, 1833	Unknown	Tipulidae	Limoniinae
44	*Graphomya*	*maculata* (Scopoli, 1763)	Muscidae	Mydaeinae
45	*Graphomya*	*rufitibia* Stein, 1918	Muscidae	Mydaeinae
46	*Hebecnema* Schnabl, 1889	Unknown	Muscidae	Mydaeinae
47	*Helina*	*iwasai* Shinonaga, 1992	Muscidae	Muscinae
48	*Helina*	*appendiculata* (Stein, 1910)	Muscidae	Muscinae
49	*Holorusia* Loew, 1863	Unknown	Tipulidae	Tipulinae
50	*Homoneura* Wulp, 1891	Unknown	Lauxaniidae	Homoneurinae
51	*Hybos*	*culiciformis* (Fabricius, 1775)	Hybotidae	Hybotinae
52	*Idiella*	*mandarina* (Wiedemann, 1830)	Calliphoridae	Rhiniinae
53	*Indotipula* Edwards, 1931	Unknown	Tipulidae	Tipulinae
54	*Isomyia* Walker, 1860	Unknown	Calliphoridae	Rhiniinae
55	*Limnophora*	*latiseta* Emden, 1965	Muscidae	Coenosiinae
56	*Limnophora*	*brunnescens* Emden, 1965	Muscidae	Coenosiinae
57	*Lispe*	*bengalensis* (Robineau-Desvoidy, 1830	Muscidae	Coenosiinae

SL	Genus	Species	Family	Subfamily
58	*Lispe* Latreille, 1796	Unknown	Muscidae	Coenosiinae
59	Lucilia	*illustris* (Meigen, 1826)	Calliphoridae	Luciliinae
60	*Maira*	*longirostrata* Bromley, 1935	Asilidae	Laphriinae
61	*Megaselia*	*pallicornis* (Brunetti, 1912)	Phoridae	Metopinini
62	*Melanostoma* Schiner, 1860	Unknown	Syrphidae	Syrphinae
63	*Melinda*	*scutellata* (Senior-White,1923)	Calliphoridae	Melanomyinae
64	*Morellia*	*nigrisquama* Malloch, 1928	Muscidae	Muscinae
65	*Morellia*	*pectinipes* Emden, 1965	Muscidae	Muscinae
66	*Morellia* Robineau-Desvoidy, 1830	Unknown	Muscidae	Muscinae
67	*Musca*	*tempestiva* Fallen, 1817	Muscidae	Muscinae
68	*Musca*	*hervei* Villeneuve, 1922	Muscidae	Muscinae
69	*Musca*	*convexifrons* Thomson, 1869	Muscidae	Muscinae
70	*Musca* Linnaeus, 1758	Unknown	Muscidae	Muscinae
71	*Myospila*	*bina* (Wiedemann, 1830)	Muscidae	Mydaeinae
72	*Myospila*	*tenax* (Stein, 1918)	Muscidae	Mydaeinae
73	*Neomyia*	*fletcheri* (Emden, 1965)	Muscidae	Muscinae
74	*Nusa*	*bengalensis* Joseph & Parui, 1990	Asilidae	Laphriinae
75	*Paragus*	*haemorrhous* Meigen, 1822	Syrphidae	Syrphinae
76	*Pegomya* Robineau-Desvoidy, 1830	Unknown	Anthomyiidae	Pegomyinae
77	*Penthetria*	*japonica* Wiedemann, 1830	Bibionidae	Pleciinae
78	*Phaonia*	*kambaitina* Emden, 1965	Muscidae	Muscinae
79	*Phaonia* Robineau-Desvoidy, 1830	Unknown	Muscidae	Muscinae
80	*Philoliche*	*longirostris* (Hardwick, 1823)	Tabanidae	Pangoniinae
81	*Plecia*(*Plecia*)	*assamensis* Hardy, 1949	Bibionidae	Pleciinae
82	*Polleniopsis*	*pilosa* (Townsend, 1917)	Calliphoridae	Polleniini
83	*Prosena* Lepeletier & Serville, 1828	Unknown	Tachinidae	Dexiinae

SL	Genus	Species	Family	Subfamily
84	*Pseudotephritis* Johnson, 1802	Unknown	Ulidiidae	Otitinae
85	*Ptychoptera* Meigen, 1803	Unknown	Ptychopteridae	Ptychopterinae
86	*Pyrellia*	*cadaverina* (Linnaeus, 1761)	Muscidae	Muscinae
87	*Ravinia*	*pernix* (Harris, 1780)	Sarcophagidae	Sarcophaginae
88	*Rhingia*	*binotata* Brunetti, 1908	Syrphidae	Eristalinae
89	*Rhinia*	*apicalis* (Wiedemann, 1820)	Calliphoridae	Rhiniinae
90	*Rhymosia* Curran, 1934	Unknown	Mycetophilidae	Mycetophilinae
91	*Robineauella* (*Jantiella*)	*kanoi* Nandi 1976	Sarcophagidae	Sarcophaginae
92	*sepsis* Falle'n, 1810	Unknown	Sepsidae	Sepsinae
93	*Silbomyia*	*asiatica* Crosskey, 1965	Calliphoridae	Ameniinae
94	*Sinonipponia*	*baruai* (Sugiyama, 1988)	Sarcophagidae	Sarcophaginae
95	*Sphegina* Meigen, 1822	Unknown	Syrphidae	Eristalinae
96	*Stomorhina* Rondani, 1861	Unknown	Calliphoridae	Rhiniinae
97	*Strongyloneura* Bigot, 1886	Unknown	Calliphoridae	Rhiniinae
98	*Tachina*	*asiatica* (Tothill, 1918)	Tachinidae	Tachininae
99	*Tachina* Meigen, 1803	Undescribed	Tachinidae	Tachininae
100	*Tachina* Meigen, 1803	Undescribed	Tachinidae	Tachininae
101	*Tachina* Meigen, 1803	Undescribed	Tachinidae	Tachininae
102	*Telmatoscopus*	*lacteitarsis* (Brunetti, 1908)	Psychodidae	Psychodinae
103	*Thelaira*	*solivaga* (Harris, 1780)	Tachinidae	Dexiinae
104	*Toxorhina* Loew, 1850	Unknown	Tipulidae	Limoniinae

The Status of records of Dipteran Biodiversity during 2nd Annual Biodiversity Assessment programme of NVNP

STATUS OF KNOWLEDGE	NUMBER
Total Species recorded	**104**
Total Genus recorded	**82**
Total Families recorded	**23**
Unknown/Un-described species	**44**
In WEST Bengal - First recorded	**14**
In India- First recorded	**7**



Profile drawing of natural forest at Gogune camp site
Sketch by: Soumya Sarkar

Identification and Text by: Dr S K Sinha

Photographs by: Dr S K Sinha & Ujjal Ghosh, IFS

Neoscona sp

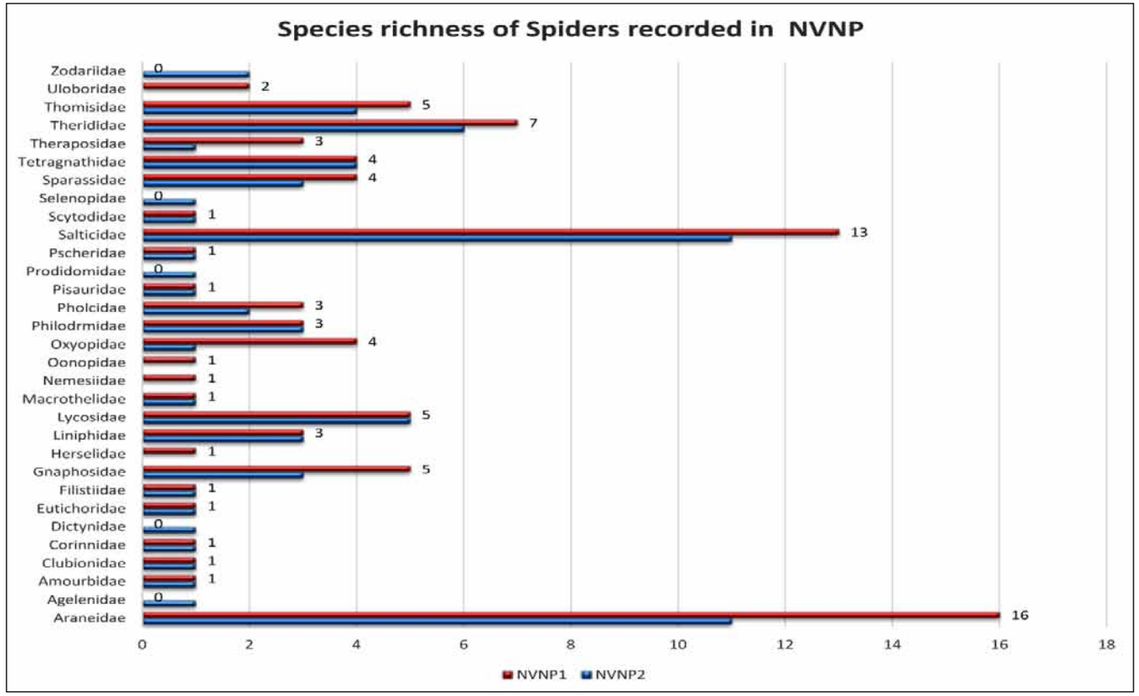
Arachnids

The Neora Valley National Park is part of one of the most important Biodiversity Hotspots on earth,- the Eastern Himalayas. The Valley has its unique distinction because of its dense primeval forest covers and its difficult terrains have kept scientists away from exploring it in depth. The pristine natural forests, dense bamboo breaks, Rhododendrons with brightly coloured flowers in full bloom, green valley, meandering rivers and streams altogether form the breathtaking vast picturesque landscape of Neora Valley National Park against the background of beautiful snow-capped Mount Kanchanjungha. We had surveyed a little portion of Neora Valley National Park for the first time in March, 2018. During this survey we recorded 90 genus of 27 families of Spiders that was much higher than previous survey report on of the whole district by ZSI (Majumder and Talukder 2013), spiders of 119 species of 23 families from entire Darjeeling district. Although, there are several published papers on the spiders of Darjeeling (Pocock, 1900 & 1901; Simon 1906; Gravely 1931; Sinha 1951; Tikader 1970; Tikader 1980 & 1982; Sethi & Tikader 1988; Majumder & Tikader 1991; Biswas & Biswas 1992), so far as the spider fauna of Neora Valley National Park is concerned, the published information indeed lack compilation and comparative descriptions to visualize the extraordinary richness of this fauna in the diverse mountain habitats of Darjeeling hills. After a grand success of the first camp in this season we got 5 family (eg. Agelenidae, Dictynidae, Prodidomidae, Selenopidae, Zodariidae) addition in the previous list. Four of the spider families (e.g. Herselidae, Nemesiidae, Oonopidae, Uloboridae) were not found during this survey, that was common in the last survey.

Number of Morpho-species documented

SL	Family	NVNP2	NVNP1
1	Araneidae	11	16
2	Agelenidae	1	0
3	Amourbidae	1	1
4	Clubionidae	1	1
5	Corinnidae	1	1
6	Dictynidae	1	0
7	Eutichoridae	1	1
8	Filistiidae	1	1
9	Gnaphosidae	3	5
10	Herselidae	0	1
11	Liniphidae	3	3
12	Lycosidae	5	5
13	Macrothelidae	1	1
14	Nemesiidae	0	1
15	Oonopidae	0	1
16	Oxyopidae	1	4

SL	Family	NVNP2	NVNP1
17	Philodrmidae	3	3
18	Pholcidae	2	3
19	Pisauridae	1	1
20	Prodidomidae	1	0
21	Pscheridae	1	1
22	Salticidae	11	13
23	Scytodidae	1	1
24	Selenopidae	1	0
25	Sparassidae	3	4
26	Tetragnathidae	4	4
27	Theraposidae	1	3
28	Theridiidae	6	7
29	Thomisidae	4	5
30	Uloboridae	0	2
31	Zodariidae	2	0
	Total	72	89



Exclusive Spider Diversity documented in NVNP1 and NVNP2

Documented Spiders	NVNP1	NVNP2
Total Number of Families	26	27
Total Number of morpho Species	89	72
Exclusively documented Families	4 (Herselidae, Nemesiidae, Oonopidae, Uloboridae)	5 (Agelenidae, Dictynidae, Prodidomidae, Selenopidae, Zodariidae)

Measures of Alfa-Diversity of two NVNP camp sites by Diversity Indices

Indices	NVNP2	SE	NVNP1	SE
Taxa Richness (S)	**27**	**1**	**26**	**1**
Individuals	**72**	**0**	**89**	**0**
Dominance_D	**0.06299**	**0.02191**	**0.0715**	**0.02362**
Simpson_1-D	**0.937**	**0.0219**	**0.9285**	**0.0238**
Shannon_H	**2.727**	**0.144**	**2.7**	**0.144**
Evenness_e^H/S	**0.566**	**0.0815**	**0.5724**	**0.0827**
Brillouin	**2.468**	**0.127**	**2.474**	**0.131**
Menhinick	**3.182**	**0.5**	**2.756**	**0.5**
Margalef	**6.08**	**0.5**	**5.57**	**0.5**
Equitability_J	**0.8273**	**0.0422**	**0.8288**	**0.0438**
Fisher_alpha	**15.69**	**0.54**	**12.35**	**0.4**
Berger-Parker	0.1528	0.06252	0.1798	0.0674
Chao-1	62	12.23	59	10.45

Diversity Indices of archnofauna of Neora Valley National Park, were calculated up to family level using centered unbiased bootstrapping (10000) to determine the possible error rate of estimation.

Microhabitats (All sites of NVNP2)	No/Sp
Flowers and leafs	1
Foliage and leaf dweller	2
Foliage dweller	6
Ground dweller	6
Ground dwelling specifically litter system	1
Jumper- on any dry surface	3
Leaf and flower undersurface	1
Leaf dweller	1
Leaf roll	2
Leaf undersurface	6
Leafs- curled uppersurface	1
Leafs of herb and shrub	1
Litter	2
Litter and foliage	1
Moss bed	1

Microhabitats (All sites of NVNP2)	No/Sp
Moss bed and rock walls	1
Rock underside	4
Rock undersides- make burrow in soil	1
Rock- undersurfaces and crevices	2
Rock wall	2
Rockwall corners	5
Webs- Funnel web in the ground	2
Webs in grassland	3
Webs of Nephila	1
Webs- Orb web between branch of herb	2
Webs- Orb web between branch of herb and tree	10
Webs- orb webs between branch of herb and shrub	1
Webs- Sheet and funnel webs on the ground	1
Webs- Tent web in bush	1

Microhabitats / Niches used by the Spider community of NVNP2

Heteropoda sp

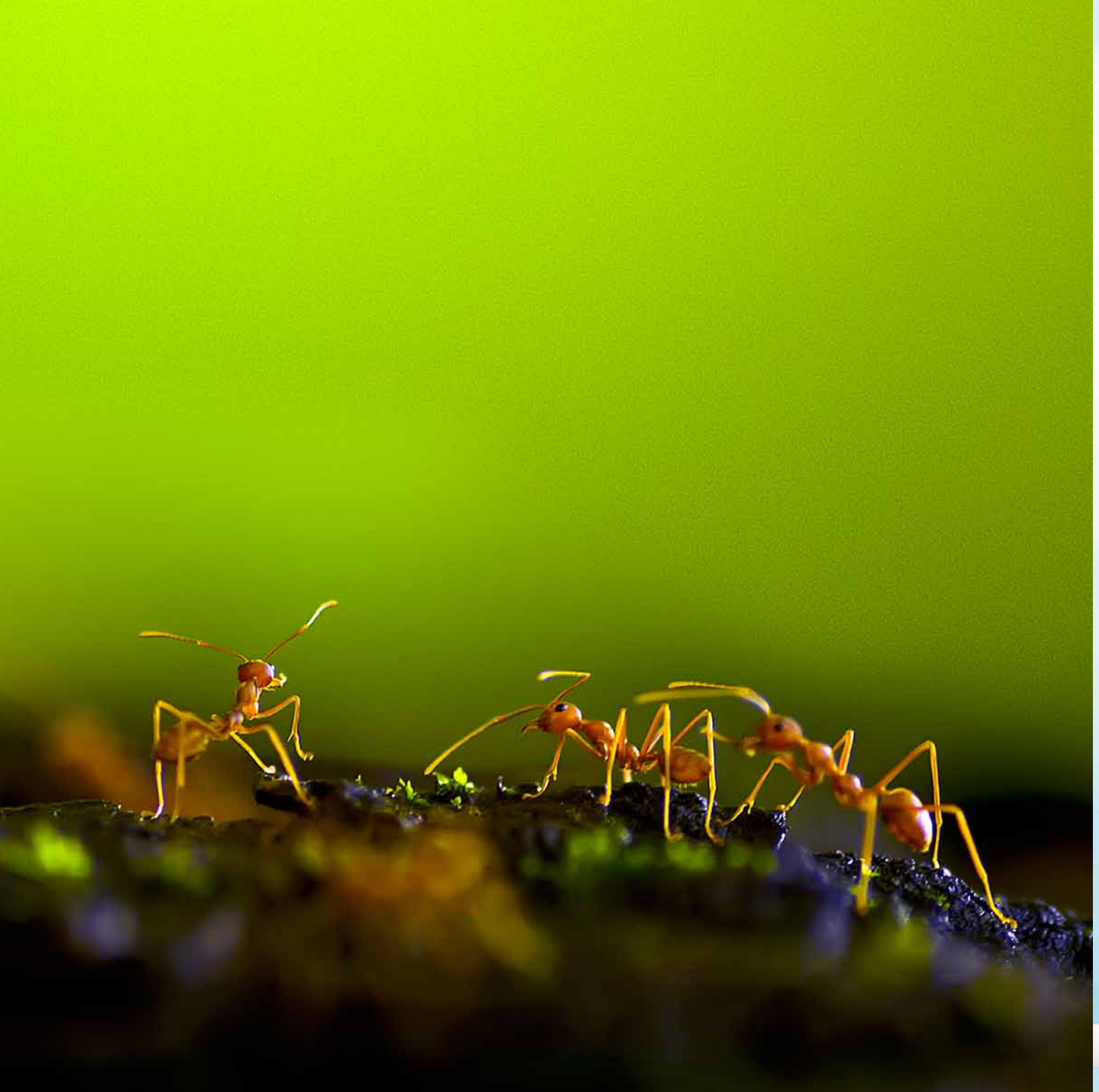
Arachnids other than Spiders encountered in NVNP2	
Species	Family
Scorpiops sp1	Euscorpidae
Scorpiops sp2	Euscorpidae
Velvet Mite	Trombidiidae
Opiliones	?
Mite Harvestman	Stylocellidae

Menemerus sp

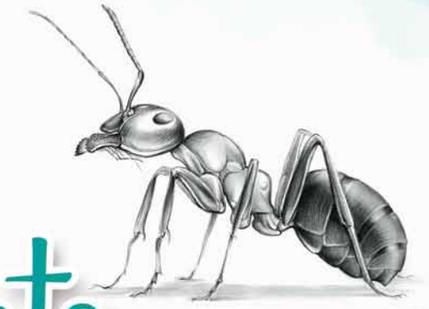
Field presentation at Alubari Camp

Identification and Text by: Ayan Mondal

Photographs by: Ujjal Ghosh, IFS



Ants



Ants, as a group share the larger biomass than any other animal group in tropical forest ecosystems. Ants also play important roles in the ecosystems being extensive soil diggers, predator, detrivores, protectors of plants against predators, their biomass and diversity thus, often indicate the health of an ecosystem.

Ants are searched *ad libitum* and by scanning all possible ant habitats and microhabitats. Once located, a specimen is picked up with the help of a soft paint brush soaked in alcohol. The specimen is stored in a vial of 70% alcohol marked with date, location and habitat of collection. Specimens were identified by experts from Zoological Survey of India.

The remote and inaccessible forested tracts of the Neora valley National Park have hardly been explored for ant diversity. The present survey was thus, very likely the first of its kind. Unfortunately, continuing heavy rains, chilled ambience, and occasional hailstorms during the camping days made the environment most unsuitable for ants to emerge from their nests hidden at deeper and drier places. Thus, the diversity recorded is very likely underrepresented. Yet, the 16 morpho-species recorded are quite unique, some are challenging to the present taxonomic knowledge on ants of the region with high chances of being of new species and new distribution range. For example**, a new species has been found of the genus *Kartidris* Bolton. This genus was erected in 1991 from India based on a species *K. nyos* from Meghalaya. And, it is the only species reported so far from India. The genus now includes 6 species, the other 5 being from China (4) and Thailand (1)**. (Sheela, S., *pers. comm*.)

SL	Ant Species recorded in NVNP2
1	*Myrmica rugosa* Mayr
2	*Myrmica rugosa* Mayr
3	*Ectomomyrmex astutus* (Smith, F.)
4	*Aenictus laeviceps* (Smith, F.)
5	*Aphaenogaster schurri* (Forel)
6	*Lasius himalayanus* Bingham
7	*Brachyponera luteipes* (Mayr)
8	*Tetramorium smithi* Mayr

SL	Ant Species recorded in NVNP2
9	*Tetramorium* sp.
10	*Pheidole* sp.1 worker minor
11	*Pheidole* sp.2 worker minor
12	*Pheidole* sp. 3 worker minor
13	*Dorylus orientalis* Westwood
14	*Crematogaster* sp.
15	*Kartidris* sp.
16	*Solenopsis* sp.

Identification and Text by: Dr Sheela S

Photographs by: Dr Sheela S & Sanjit Nandi

Aenictus laeviceps

Apheanogaster schurri

Lasius himalayanus

Myrmica rugosa

Black Emperor

Odonata

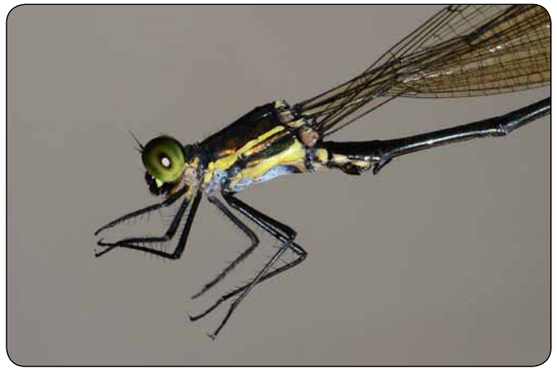
Rainy, cold days of early October, are not much of a good season for locating flying Odonates in the high altitudes of Neora Valley forests. Despite of being in a wrong place in wrong time we encountered adult insects of three species from three genera and two different families. Neora Valley National Park represents the Darjeeling Himalayas in all sorts of Faunal compositions, and Odonata fauna is no exception. The faunal composition of this region consists of elements form both the Oriental and Indo-Malayan Ecoregion and has an special composition of species.

Being the summer capital of British India, Darjeeling was well explored by the British Explorers in all sorts of science including taxonomy and biodiversity. Thus, we can expect most species that we might encounter from Neora Valley landscape to be earlier recorded from the Greater Darjeeling of British India. Over the last two round of survey in varying altitudes of NVNP we surveyed a range of streams, waterbodies and forests in two different seasons. Among the seasons surveyed, post-monsoon was found to be most productive in the sense of species availability. Survey during post-monsoon (Sept- Oct) resulted in a checklist of 13 species from the highest part of NVNP (2200–3100 mt) where pre-monsoon only counted 4 commoner species from lower altitudes. Among the 13 species recorded in the last survey represents at least 6 families which include rare families like Chlorogomphidae or Corduliidae.

The species *Megalestes ghalsey* was earlier known only from the type locality in Bhutan. This time our expedition added new location for the species along with another record from Arunachal Pradesh by a team of researchers from ZSI, Kolkata. The larva of the Giant Spreadwing and the larval habitat is also described for the first time (Payra et al. in press).

One more species *Somatochlora daviesi* Lieftinck, 1877 was recorded for the first time from West Bengal and an interesting breeding habitat was found which differs from the other observational records of *S. daeviesi* from other parts of the country.

At the altitude of 3100 mt in a perennial lake (Jorpokhri, Aloobari) we found enormous number of Aeshnidae larvae which were found to be the top predator in the fishless pond



Megalestes ghalsey Gyeltshen, Kalkman and Orr, 2017

Somatochlora daviesi Lieftinck, 1877

Aeshna petalura Martin, 1908

Sympetrum orientale Selys, 1883

ecosystem. The larvae are yet to be identified and the female of *Aeshna petalura* was found to lay eggs in the ponds side mud-wall.

Several Aeshnidae and Libellulidae larvae were also found in another lake full of submerged and emergent vegetations in an altitude of 1800 mt. Larva of Indolestes sp. Were also found in this lake.

One more not so common species belonging to family Libellulidae, *Sympetrum orientale* (Selys, 1883) was found in copula near a waterhole and a marshy lake in an altitude of 1500 and 1700 mt respectively.

A small grassland damselfly species belonging to the family Coenagrionidae, *Agriocnemis pygmaea* was surprisingly found in an altitude of 1600 mt drifting inside alpine forest without any trace of stagnant water within few kilometers. There are instances for small species like this under genus *Agriocnemis* to be found in unexpected localities and it is known to be air borne to those places. This time the only single male individual may have come to this altitude being driven by the warm breeze from the valley.

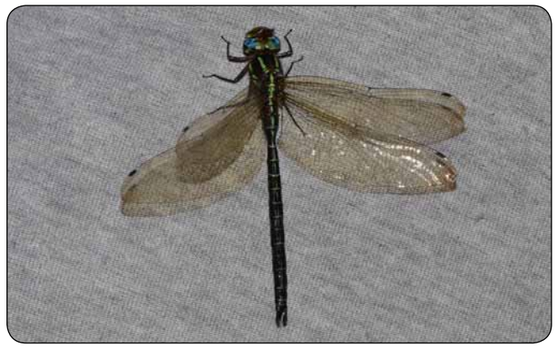
These drifted individuals may not breed in nearby waterbodies but just thrive in the forests for food for next few months and then die, or become the victim of some other's appetite.

The *Megalestes* Irma was earlier recorded from the same locality but this time a different species of *Megalestes*, i.e. *ghalsey* is found along with its larva. *Megalestes irma* larvae were earlier found in small stream fully covered with vegetation and a small water catchment pool under a PHE water supply line. It is notable that the pool is supplied by the water leaked from a joint in PHE pipeline. This time *M. ghalsey* larvae was found in a small stream inside bamboo patch and the larvae were found to remain attached with the submerged floating roots of the trees beside the stream.

The Aeshnidae family consists a wide range of cryptic species in this Darjeeling Himalayan Range and thus most of our collections are still remaining unidentified.

Drastic land-use change in Darjeeling Himalayas, change in the streams and other temporary or perennial water sources might have huge effect upon the Odonata diversity richness across the landscape. Every special type of habitat harbours

Agriocnemis pygmaea Rambur, 1842



Aeshnidae Dragonfly

special Odonata larvae so a small change in parameters might cause local extinction for several species.

Due to human interference the natural "pokhri" or waterholes are facing abnormally high rate of succession. Most of these Pokhris were used regularly by people visiting with their animal livestock herds. It brought in huge source of nutrition to the lake water by means of droppings of animals etc. Uncontrolled supply of nutrients pushed the waterbodies to eutrophication in many cases and finally towards Bog and Marshy habitats. The species composition also should changed over time with the changing available microhabitats in those waterbodies. As we don't have much baseline idea about the species composition of the lakes at the initial stages, it is difficult to comments on this.

Lateral view of the Larva of *Megalestes ghalsey*

Aeshnidae larvae under water

Orthetrum sp.

Identification and Text by: Sri Prosenjit Dawn

Photographs by: Sri Prosenjit Dawn & Ujjal Ghosh, IFS

Gogune Camp

Himalayan Bicolor Commodore

Butterflies

Introduction: Butterflies are a group of phytophagous insects belonging to order Lepidoptera. They show stenophagy towards their hostplant and nectar plant selection. Thus, distribution and abundance of a butterfly species is highly correlated with the abundance of its host and nectar plants. This factor also attributes to the altitudinal variation in butterfly species richness. During the 2nd NVNP Biodiversity Camp we covered a wide range of altitude (1330-3127m) within the National Park which covers different high-altitude species of butterflies and host plants.

Methodology: Survey of butterflies for 2nd NVNP Biodiversity Camp was carried out using 'Time-constrained Point Count'. We took 30 minutes count data daily during the entire survey period. Photographic documentations were done for taxonomic identifications of the encountered species. For the survey of host plants, we did extensive searching along the transact and also noted the egg laying behavior if encountered.

Result: During the survey we encountered 2 species of family: Papilionidae, 3 species of family: Pieridae, 4 species of family: Lycaenidae, 5 species of family: Riodinidae, 21 species of family: Nymphalidae and 2 species of family: Hesperiidae. We sighted total 10 species of genus *Lethe* due to presence of huge patches of their host plant, *Bambusa sp*. The elevation of the survey area was found to be highly suitable for the family Riodinidae as we got 3 species of *Dodona* out of 8 species found in India.

Interestingly during the host plant and nectar plant survey we got *Aristolochia* sp. and *Magnolia campbellii* which are the host plants of *Bhutanitis lidderdalii* and *Teinopalpus imperialis* respectively. We also found *Buddleja asiatica* which is a very unique and specific nectar plant for *Bhutanitis lidderdalii*. Both of these butterfly species are very rare and charismatic and protected under Wildlife Protection Act. *B. lidderdalii* and *T. imperialis* are very choosy about their host and nectar plants, thus their distribution along the north-east India is confined to some selective zones where their host and nectar plants are well-abundant. For this reason, we assume that there is a high chance of presence of these two species in the survey areas of NVNP. However, we did not find any adult individual or early stages of these species as they show univoltinism and can be seen during a short time-window of a year.

We carried out a basic comparative analysis of recorded species between NVNP Camp 1 and 2 using PAST3 software. We found that number of sighted species in each family was higher in 1st NVNP Camp except the family Riodinidae. We mainly covered lower-middle elevation in 1st Camp whereas, middle-upper elevation in 2nd Camp. We tried to visualize altitude-dependent species accumulation pattern from our sighting records of both 1st and 2nd NVNP Camp. We got total 98 species cumulatively from 1st and 2nd camp which covers an altitudinal range from 650m to 3127m. We got 47 species in 650-750 m elevation, cumulated records of 34 more species in 1200-1600m and finally sighted 17 more species in 2000-3127m altitude. Our result shows that the probability of species sighting is higher in lower to middle elevation than the upper elevation but there are few exceptional species which were exclusively sighted in upper elevation viz. *Heliophorus brahma*, *Lethe nicetas* etc.

Discussion: Neora Valley National Park harbours a hidden treasure of ample biodiversity, most of which is still unexplored. During the survey period we sighted several rare species of not only butterflies, but also other fauna and flora. It gives us inkling that this National Park should be thoroughly surveyed throughout the year. If we can get a chance to do that, we may come up with discovery of some new species which have no previous record of distribution from India.

Heliophorus tamu tamu - Himalayan Powdery Green Sapphire

Butterflies Encountered During the 2nd NVNP Biodiversity Camp

Sl. No.	Family	Scientific Name	English Name
1	**Papilionidae**	*Byasa polyeuctes*	Common Windmill
2		*Meandrusa payeni*	Yellow Gorgon
3	**Pieridae**	*Eurema brigitta*	Small Grass Yellow
4		*Eurema hecabe*	Common Grass Yellow
5		*Colias fieldii*	Dark Clouded Yellow
6	**Lycaenidae**	*Heliophorus tamu*	Powdery Green Sapphire
7		*Heliophorus brahma*	Golden Sapphire
8		*Udara dilecta*	Pale Hedge Blue
9		*Jamides celeno*	Common Cerulean
10	**Riodinidae**	*Abisara fylla*	Dark Judy
11		*Zemeros flegyas*	Punchinello
12		*Dodona dipoea*	Lesser Punch
13		*Dodona ouida*	Mixed Punch
14		*Dodona adonira*	Striped Punch

Byasa polyeuctes - Common Windmill

Dodona adonira - Striped Punch

Sl. No.	Family	Scientific Name	English Name
15	Nymphalidae	*Ypthima sakra*	Himalayan Five-ring
16		*Sumalia daraxa*	Green Commodore
17		*Parasarpa dudu*	White Commodore
18		*Parasarpa zayla*	Himalayan Bicolor Commodore
19		*Lethe verma*	Straight-banded Treebrown
20		*Lethe sidonis*	Common Woodbrown
21		*Lethe nicetas*	Yellow Woodbrown
22		*Lethe siderea*	Scarce Woodbrown
23		*Lethe scanda*	Blue Forester
24		*Lethe isana*	Common Forester
25		*Lethe sinorix*	Tailed Red Forester
26		*Lethe kansa*	Bamboo Forester
27		*Lethe sura*	Lilacfork
28		*Lethe baladeva*	Treble Silverstripe
29		*Argynnis childreni*	Large Silverstripe
30		*Neptis hylas*	Common Sailer
31		*Neptis narayana*	Broadstick Sailer
32		*Neptis ananta*	Yellow Sailer
33		*Hestinalis nama*	Circe
34		*Orinoma damaris*	Tiger Brown
35		*Athyma orientalis*	Hill Sergeant
36	Hesperiidae	*Celaenorrhinus dhanada*	Yellow-banded Flat
37		*Pelopidas assamensis*	Great Swift

Lethe sinorix - Tailed Red Forester

Orinoma damaris - Tiger Brown

Host Plants of Butterflies Encountered During the 2nd NVNP Biodiversity Camp

SL.	Butterfly		Host Plant	
	Common Name	Scientific Name	Family	Scientific Name
1	Himalayan Kaiser-i-Hind	*Teinopalpus imperialis imperialis* Hope, 1843	Magnoliaceae	*Magnolia campbellii*
2	White Tufted Royal	Pratapa deva deva Moore, 1857	Loranthaceae	*Scurrula ferruginea*
3	Nepalese Great Blackvein	Aporia agathon agathon Gray, 1831	Berberidaceae	*Mahonia* sp.
4	Himalayan Bhutan Glory	Bhutanitis lidderdalii lidderdalii Atkinson, 1873	Aristolochiaceae	*Aristolochia* sp.
5	-	Lethe sp.	Poaceae	*Bambusa* sp.
6	Himalayan Yellow Coster	Acraea issoria issoria Hübner, 1818	Urticaceae	*Urtica dioica*
7	Himalayan Tortoiseshell	Aglais caschmirensis Fruhstorfer, 1912	Urticaceae	*Urtica dioica*
8	Chinese Blue Admiral	Kaniska canace canace Linnaeus, 1763	Smilacaceae	*Smilax* sp.
9	Himalayan Cabbage White	Pieris canidia indica Evans, 1926	Brassicaceae	*Nasturtium officinale*
10	Sylhet Common Windmill	Byasa polyeuctes polyeuctes Doubleday, 1842	Aristolochiaceae	*Aristolochia* sp.
11	-	Papilio sp.	Rutaceae	*Zanthoxylum* sp.
12	Himalayan Krishna Peacock	Papilio krishna krishna Moore, 1857	Rutaceae	*Evodiafraxinifolia*
13	Nepalese Large Cabbage White	Pieris brassicae nepalensis Gray, 1846	Brassicaceae	*Sinapis* sp.
14	Himalayan Bath White	Pontia daplidice moorei Röber, 1907	Brassicaceae	*Sisymbrium* sp.
15	-	Cepora sp.	Capparaceae	*Capparis* sp.
16	Hairstreak	Zephyrus sp.	Ericaceae	*Rhododendron arboreum*
17	Himalayan Yellow Coster	Acrae aissori aissoria Hübner, 1818	Rosaceae	*Rubus ellipticus*
18	Himalayan Yellow Coster	Acrae aissori aissoria Hübner, 1818	Scrophulariaceae	*Buddleja asiatica*
19	Himalayan Grey Count	Tanaecia lepidealepidea Butler, 1868	Melastomataceae	*Melastoma imbricatum*
20	Sylhet Branded Yamfly	Yasoda tripunctata tripunctata Hewitson, 1863	Smilacaceae	*Smilax* sp.
21	Grass Demon	Udas pesfolus Cramer, 1775	Zingiberaceae	*Zingiber* sp.
22	Painted Lady	Vanessa cardui Linnaeus, 1758	Urticaceae	*Girardinia diversifolia*
23	Himalayan Tabby	Pseudergolis wedah wedah Kollar, 1844	Urticaceae	*Debregeasia hypoleuca*
24	Hairstreak	Zephyrus sp.	Fagaceae	*Quercus* sp.
25	Hairstreak	Zephyrus sp.	Ericaceae	*Rhododendron wardii*
26	Bengal Leopard Lacewing	Cethosia cyane cyane Drury, 1770	Passifloraceae	*Passiflora* sp.

Some Recorded Species of Butterflies from 2nd NVNP Camp

Lethe nicetas - Yellew Woodbrown

Heliophorus brahma brahma - Himalayan Golden Sapphire

Lethe sura - Lilacfork

Parasarpa dudu dudu - Sylhet White Commodore

Neptis ananta ochracea - East Himalayan Yellow Sailer

Dodona dipoea dipoea - Himalayan Lesser Punch

Some Host Plants

Buddleja asiatica

Rubus ellipticus

Melastoma imbricatum

Smilax sp.

Magnolia campbellii

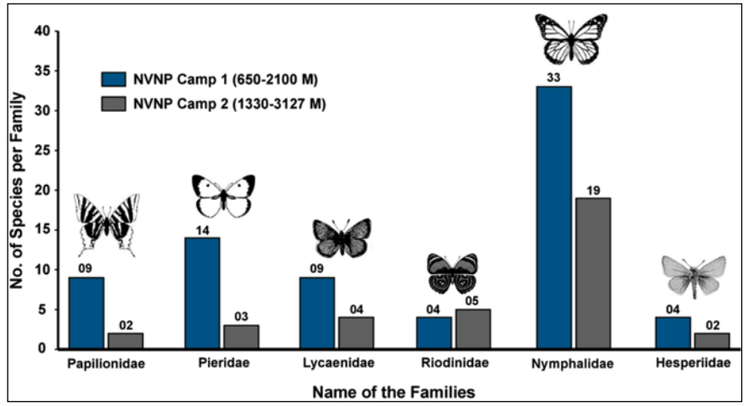
Quercus sp.

Scurrula ferruginea

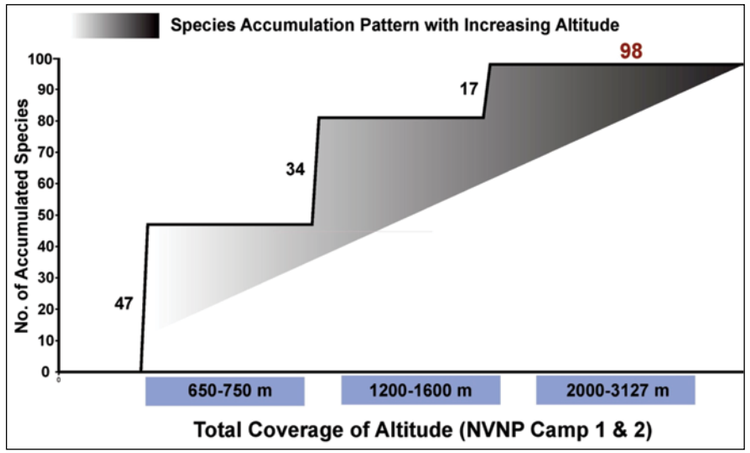
Nasturtium officinale

Urtica dioica

Comparative Analysis of Sighting Records of Butterfly Species Belonging to Different Families between NVNP Camp 1 and 2



Elevation-based Species Accumulation Pattern Obtained from Survey of NVNP Camp 1 and 2



Identification and Text by: Sarika Baidya & Tarun Karmakar

Photographs by: Tarun Karmakar, Sarika Baidya & Ujjal Ghosh, IFS

Lilacfork

Lesser Golden Emperor moth

Moth

Expertise on Eastern Himalayan Moths is a rarity and they are surveyed very little. During the 2nd Biodiversity Assessment of NVNP the moths were only carefully photographed when astonishing variety of them visited the camp sites at evening being attracted to camp lights. The following list suggests presence and status of Moth we have observed and photographed during the camp.

Family Cossidae

***Zeuzera multistrigata* (Moore, 1881)** Common Name : Hill goat moth

The species is well distributed throughout Himalaya from Jammu & Kashmir to Arunachal Pradesh, North East India and Andaman Islands. Globally its range extends from South-East Asia and Russia. Larva is a serious pest known as Stem-Borers attacking plants of various families like Fagaceae, Rosaceae, Rubiaceae, Moraceae etc.

Family Limacodidae

***Chalcoscelides castaneipars* (Moore, 1865)**

The species is primarily distributed in Himalaya, North East India and globally up to Indonesia. Wide generalist in host plant choices including families Theaceae, Lauraceae, Palmae, Myrtaceae, Anacardiaceae etc.

Family Pyralidae

***Locastra pachylepidalis* (Hampson, 1896)**

The species is extremely rare and was previously reported only from Bhutan. This would be the first report from Indian Himalaya. Larval host plants recorded for the genus are of families Anacardiaceae, Juglandaceae etc.

Family Crambidae

***Lamprophaia ablactalis* (Walker, 1859)**

The species is distributed widely in Central Himalaya (Sikkim), North East India as well as Western Ghats and Deccan Peninsula. Globally it is found in South-East Asia, Africa and up to Australia. Larva is reported to feed on members of Family Urticaceae.

***Maruca vitrata* (Fabricius, 1787)**

The species is a wide-ranging pest species distributed throughout Oriental, Palaearctic, Ethiopian, Australian and Neotropical regions. Within India, it is reported from Himachal to Arunachal Pradesh, Chhattisgarh and Andaman Islands. Larva primarily feeds on plants of Leguminosae family.

***Metoeca foedalis* (Guenée, 1854)**

This is also a wide-ranging species occurring in Oriental, Ethiopian, Australian and Palaearctic regions. Within India reported from Western Himalaya, North-East India, Western Ghats and Deccan peninsula. Commonly pest of Rice (Gramineae).

***Patania ruralis* (Scopoli, 1763)**

Commonly known as “Mother of Pearl”, this moth is widely distributed in Palaearctic, Oriental (Indonesia) and Australian realms. Within India it is reported from Himalaya, North-East India and Western Ghats. The genus is reportedly feeds on Sal (Dipterocarpaceae).

***Pygospila* sp.**

Widely distributed genus found in Oriental, Ethiopian, Australian and Palaearctic regions.

Family Drepanidae

***Cyclidia rectificata* (Walker, 1862)**

Typically, a Himalayan species found in North-Western to Eastern Himalaya, North-East India and Tibet, Nepal, Bhutan and Myanmar. Larva is known to feed on *Alangium* (Alangiaceae).

***Gaurena sinuata dierli* (Werny, 1966)**

This species is also a typical Himalayan species reported from Western and Eastern Himalaya, Tibet and Nepal. Host plant record is unavailable for the entire genus.

***Gaurena florens* (Walker, 1864)**

This species is reported from Western Himalaya to North East India. Globally distributed in Nepal, Bhutan, Myanmar to China, Vietnam and Thailand.

Family Geometridae

***Abraxas* sp.** Common Name : Pale Clouded Magpie

This is a highly cryptic species group of moths with many similar looking species whose diagnosis can only be achieved through examination of Genitalic structure and DNA barcoding. They survive in high abundance, predominantly active during monsoon season. Most of the species are polyphagous with wide choices including members of family Pinaceae, Salicaceae, Fagaceae, Rosaceae etc.

***Alcis maculata* (Moore, 1868)**

This is a predominantly Himalayan species reported from Tibet, Nepal, Bhutan and extending up to Taiwan, Thailand and Indonesian islands of Sumatra and Borneo. It is also reported from Russia and Mongolia. The genus primarily feeds on Fagaceae, Rosaceae, Lauraceae, Ericaceae etc.

***Antipercnia belluaria* (Guenee, 1858)** Common Name : Lesser black-spotted Geometer

A highly abundant and common species occurring from Jammu & Kashmir to Arunachal Pradesh, and North-Eastern states like Assam, Meghalaya, Nagaland and Mizoram. Globally it has been reported from Nepal, Bhutan, China, Thailand and Malaysia. Larva are Moderate Specialist about host choice feeding primarily on Lauraceae.

***Arichanna furcifera* (Moore, 1888)**

A rare and uncommon species reported from Central Himalaya (Darjeeling, Sikkim) and Khasi Hills. Globally reported from Nepal, China, Japan, Laos and Thailand. The genus solely feeds on plants of family Ericaceae, chiefly Rhododendrons.

***Lassaba albidaria* (Walker, 1866)** Common Name : White Medasina

A very common and abundant species inhabiting every kind of Himalayan habitats, except alpine meadows. Reported from Jammu & Kashmir to Sikkim and Meghalaya. Globally reported only from Pakistan, Nepal and China. Larva is reported to feed on Pine (Pinaceae), Prunus and Rosa (Rosaceae).

***Menophra serpentinaria* (Warren, 1896)**

Very rare species till now reported only from Eastern Himalaya (Arunachal Pradesh) and Khasi Hills (Meghalaya). Outside India, reported from Nepal and Thailand. The genus primarily feeds on members of Fagaceae, Polygonaceae, Moraceae etc.

***Odontopera bivittaria* (Moore, 1868)**

Very rare species occurring in Nepal and Arunachal Pradesh. Larva feeds on Fagaceae, Theaceae, Betulaceae etc.

***Psilalcis albibasis* (Hampson, 1895)**

A fairly common species distributed from Western Himalaya to North-Eastern India, and globally through Nepal and Taiwan. Larva feeds on Lantana (Verbenaceae), Gramineae.

***Psilalcis conspicuata* (Moore, 1888)**

Relatively uncommon species reported till now only from Darjeeling Hills of West Bengal and Myanmar. Larva is primarily dependent on Graminaea and Verbenaceae.

***Sinameda basistrigaria* (Moore, 1868)**

This species is only reported from Central Himalayan landscapes of Sikkim and Darjeeling. No host plant data available.

***Xandrames dholaria* (Moore, 1868)** Common name : White-edged Xandrames

The species is distributed throughout Himalaya from Uttarakhand to West Bengal and Nagaland. Globally reported from Nepal, China, Thailand, Japan, China and Taiwan. A narrow specialist in feeding habit, primarily dependent on *Lindera* (Lauraceae).

***Spaniocentra lyra* (Swinhoe, 1892)**

An uncommon species till now reported only from Western Himalaya, Nepal and Thailand. Recorded host plants of the genus are primarily members of Anacardiaceae, Myrtaceae.

***Tanaoctenia haliaria* (Walker, 1861)**

A predominantly Himalayan species distributed from Uttarakhand to Arunachal Pradesh, Nepal, Bhutan and South-East Asian countries like Myanmar, China, Vietnam and Taiwan. The genus has a preference for plant family Fagaceae.

***Corymica specularia* (Moore, 1888)**

A relatively rare species occurring from North-Western Himalaya to North-East India and Deccan Peninsula. Globally the species is found in Sri Lanka, Nepal, Bhutan, China, Japan, Korea and Thailand. A narrow specialist in larval food choice feeding exclusively on Lindera (Lauraceae).

***Thalassodes* sp.**

This genus of moth containing several cryptic species groups are generally distributed in Oriental tropics to Australian and Ethiopian realm. Larva feeds on considerably wide-ranging plant families, mainly fruit plants.

***Scopula* sp.**

A very complicated genus of moth containing several cryptic group of species and widely distributed throughout major biogeographic regions. Polyphagous in their feeding habit.

Family Saturniidae

***Archaeoattacus edwardsi* (White,1859)** Common Name : Edward's Atlas Moth

A fairly common species occurring through Central to Eastern Himalaya and North-Eastern India. Globally reported from Nepal, Bhutan, Myanmar up to Indonesia. Host plant families recorded are Lauraceae, Oleaceae, Rosaceae, Saliaceae etc.

***Loepa miranda* (Moore, 1865)** Common Name : Lesser Golden Emperor

Reported from Central Himalaya (Sikkim & Darjeeling) and Oriental Tropics (Myanmar, Laos, Thailand). Sympatrically abundant with two other very similar looking species *L. katinka* and *L. sikkima*. The genus Loepa feeds mainly on Vitaceae, Dilleniaceae, Leeaceae.

Family Notodontidae

***Lanna obliquiplaga* (Moore, 1879)**

A very rare species reported only from Sikkim, Darjeeling and Assam. Globally its range extends up to Myanmar and Sumatra (Indonesia). Regarded as serious defoliators of forest tree species, primarily *Ilex excelsa*.

Family Erebidae — Subfamily Arctiinae

***Aglaomorpha plagiata* (Walker, 1855)**

A relatively rare species occurring throughout Himalaya from Himachal Pradesh to Arunachal Pradesh and Assam. Globally reported from Nepal, Myanmar, China up to Malaysia and Indonesia. A polyphagous species.

***Barsine defecta* (Walker, 1854)**

Sympatrically abundant with many cryptic species, this particular species is common throughout Himalayas up to Myanmar. A taxonomically challenging species group, they have very limited data on host plant preference.

***Barsine roseata* (Walker, 1864)**

A rare species occurring throughout Himalaya from Himachal Pradesh to Arunachal Pradesh and North-Eastern states like Assam. Globally reported from Nepal, Bhutan, Vietnam, China and Thailand.

***Chrysorabdia viridata* (Walker, 1864)**

A very common species occurring from Himachal Pradesh to Arunachal Pradesh, including Khasi Hills and Brahmaputra plains. Globally reported from Pakistan, Bangladesh, Bhutan, Myanmar and China. Larva are primarily Lichen feeders.

***Lyclene* sp.**

Species of the genus are distributed throughout India and are globally reported from Tibet, Sri Lanka, Malaysia, Bhutan, Myanmar, Thailand, Indonesia, Taiwan, Japan.

***Spilarctia* sp.**

Species of the genus are reported from Palaearctic and Oriental Region. Larva feeds on plants of family Leguminosae, Compositae, Euphorbiaceae, Pedaliaceae, Verbenaceae and Orchidaceae.

***Vamuna remelana* (Moore,1865)**

The species is reported from Himalayan region of India from states of Arunachal Pradesh, Assam, Mizoram, Sikkim, Uttarakhand, West Bengal. Globally it is distributed in China, Vietnam, Thailand, Malaysia and Indonesia.

***Macrobrochis pallens* (Hampson, 1894)**

In India the species is reported from Himachal Pradesh and Uttarakhand. Host plant record is unavailable for the entire genus.

***Cyana puer* (Elwes, 1890)**

The genus is very complicated with plenty of cryptic species groups whose identity can only be surely determined through genitalia inspection. This particular species is distributed in Central to Eastern Himalaya and North-Eastern India. Globally reported from Nepal and Myanmar. Host plant of the genus are Lichens and plants of family Anacardiaceae, Dipterocarpaceae, Sapindaceae, Theaceae, Leguminosae, Verbenaceae and Convolvulaceae.

***Cyana intercomma* (Cerny, 2009)** Common Name : Crimson-tipped Cyana

The species is reported from Jammu & Kashmir to Sikkim, and globally from Malaysia and Thailand.

***Numenes patrana* (Moore, 1859)**

The species is very common throughout India, reported mainly from Himalayas (Himachal to Arunachal), North-East India, Deccan peninsula and Odisha coast. Globally distributed in Myanmar, Bhutan, Nepal, Taiwan and China.

***Dasychira complicata* (Walker, 1865)**

A typical Himalayan species occurring from Himachal to Arunachal Pradesh and in Nepal, China. The larva is polyphagous feeding on plant of family Iridaceae, Lythraceae, Rosaceae and Dennstaedtiaceae.

***Euproctis similis* (Fuessly, 1775)**

A highly polymorphic and cryptic group of moths, distributed throughout Palearctic and oriental region. Larva of this genus are polyphagous and feeds on Leguminosae, Lauraceae, Asclepiadaceae, Euphorbiaceae, Magnoliaceae, Loranthaceae, Fagaceae, Rosaceae, etc.

***Nygmia* sp.**

Species of the genus are distributed throughout India and globally they are reported form Sri Lanka, Thailand, Malaysia, Japan, New Guinea, Indonesia (Borneo, Java, Sumatra) and Australia. Larva of this genus feeds on plants of families Loranthaceae, Theaceae, Juglandaceae and Rosaceae.

***Lymantria* sp.**

Species of the genus are widely distributed throughout Europe, Japan, India, Sri Lanka, Myanmar, Java, and Celebes. Larva of this genus are polyphagous feeding on plants of varying families as Theaceae, Palmae, Rubiaceae, Apocynaceae, Leguminosae, Moraceae, Dipterocarpaceae, Fagaceae, etc.

Family Erebidae — Subfamily Hypeninae

***Dichromia trigonalis* (Guenee 1854)**

The species is distributed almost throughout India having occurrence records from Jammu & Kashmir to Sikkim, Meghalaya and Madhya Pradesh. Globally reported from Oriental tropics and middle-eastern countries like Iran. The larva is narrow specialist feeding primarily on *Boehmeria macrophylla*.

Family Erebidae — Subfamily Erebinae

***Mocis undata* (Fabricius, 1775)**

The species is widely distributed throughout India including Himalayas, North-East India, Gangetic plains, Semi-Arid and Deccan peninsula. Globally, it is reported from Sri Lanka, China, Malaysia, Thailand and Africa. Larva of the family feeds on plants of family Leguminosae, Malvaceae, Dipterocarpaceae, Euphorbiaceae and Solanaceae.

***Aedia* sp.**

The genus is distributed in Palearctic, Oriental and Australian realm. Larva are known to feed on plants of family Convolvulaceae, Compositae, Rutaceae and Solanaceae.

Family Erebidae — Subfamily Calpinae

***Tamba* sp.**

Globally the genus is distributed across Asia and Australia. Caterpillars of the genus are known to feed on host plants of families Euphorbiaceae, Verbenaceae, Meliaceae, Lecythidaceae and Combretaceae.

Family Noctuidae — Subfamily Amphipyrinae

***Clethrorasa pilcheri* (Hampson, 1896)**

A very rare species reported only from Sikkim and North Eastern India. Globally it is distributed in Nepal, Thailand, Malaysia and Indonesia (Borneo, Sumatra).

***Diphtherocome pallida* (Moore, 1867)**

A truly Himalayan endemic species reported from Himachal Pradesh, Uttarakhand, Sikkim and Nagaland and Nepal.

***Diphtherocome discibrunnea* (Moore, 1867)**

This species is known from Himalaya and North-Eastern India, and globally from Pakistan, Nepal, Bangladesh, Myanmar, Thailand, Vietnam and West China.

Family Noctuidae — Subfamily Hadeninae

***Paroligia pallidisca* (Moore, 1881)**

A very rare species reported only from Central Himalayan region of India and Nepal. Host plant record is unavailable for the entire genus.

Family Noctuidae — Subfamily Eriopinae

***Callopistria repleta* (Walker, 1858)**

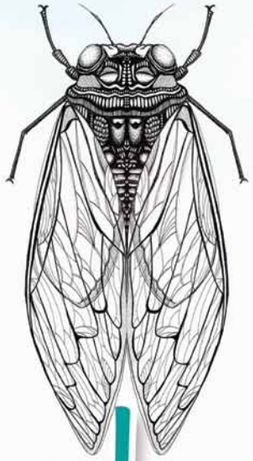
The specie is widely distributed in Western Himalaya, Brahmaputra plains and Deccan peninsula. Globally it is distributed in Pakistan, Nepal, Laos, Vietnam, Malaysia, Indonesia, Taiwan, China, Korea, Japan and Russia. Globally, larva of this species feeds mainly on ferns of genus *Pteridium, Lygodium, Ficialis, Adiantum, Nepharolepis, Pellaea*.

Family Nolidae

***Ariolica superba* (Moore, 1867)**

A very rare and uncommon species reported from Northern India, Nepal and Thailand. Host plant record is unavailable for the entire genus.

Identification and Text by: Dr. Abesh Kumar Sanyal & Kamalika Bhattacharya *Photographs by*: Ujjal Ghosh, IFS & Dr. Nakul Chettri



Cicada

Dundubia hastata

Platylomia spinosa

Platylomia insignis

Pycna repanda

Scieroptera splendidula

Tibeta sp

Identification and Text by: Tarun Karmakar

Photographs by: Tarun Karmakar & Ujjal Ghosh, IFS

Cicadas are insects belonging to order Hemiptera and family Cicadidae. Cicadas mainly live in trees and feed on tree sap. They typically show concealing behaviour by perfectly camouflaging with the colour of stem bark. They also oviposit into the slits of bark and the freshly hatched nymphs make their way underground through burrowing. Inside soil they undergo developmental changes following which the final instar nymph comes out of the soil and moult on the bark for the last time to emerge.

Male cicadas have very unique periodic calling pattern which is achieved by alternative buckling of a pair of structures, called 'Tymbal'. The main purpose of this calling is intraspecific communication. Cicadas are eaten by several other animals like birds, squirrels, bats, wasps etc. and thus contribute a significant role in food chain.

Methodology: Cicadas were sighted mainly by tracking their calls and photographically documented for taxonomic identification.

Result: Total 6 species of cicada were sighted during 2nd NVNP Biodiversity Camp. The recorded species are as follows:

SL	Scientific Name
1	*Pycna repanda*
2	*Dundubia hastata*
3	*Scieroptera splendidula*
4	*Platylomia cf. insignis*
5	*Platylomia cf. spinosa*
6	*Tibeta* sp.

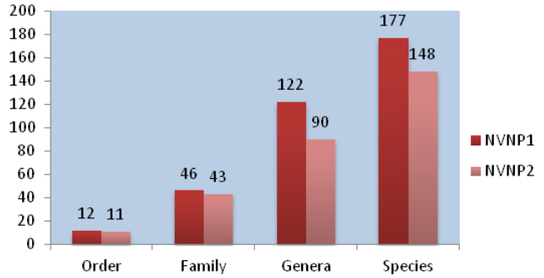
Himalayan Forest Thrush (*Zoothera salimalii*) first discovered from North East India during 2009 and subsequently found in NVNP during 2016. This photograph has been captured from NVNP few months before 2nd Biodiversity Camp.
Photo: Ujjal Ghosh, IFS

Avifauna

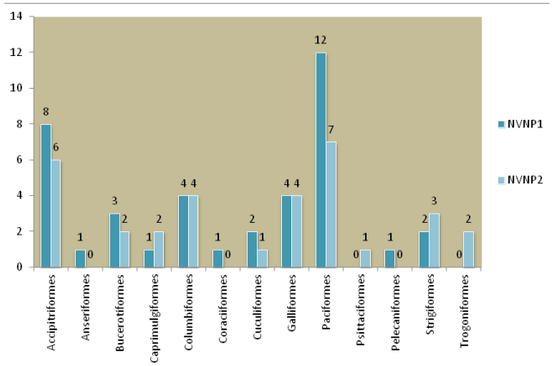
Avifauna, i.e. birds is arguably best documented group in West Bengal, thanks to the emergence of passionate amateur birders in large numbers in recent years along with some great ornithologists from ZSI, Kolkata, in the past. Yet, NVNP remains comparatively lesser explored area in the state due to its difficult terrains. The remarkable report on birds and other wildlife from this pristine wildness is available from the `Note Book on Biodiversity of Neora Valley National Park' published by the Dept. of Forests, GoWB, in 2010. In this book, the number of bird species reported to be inhabitants of NVNP is 308. Following were the records of bird diversity during 1st and 2nd Biodiversity assessment of NVNP. Howard and Moor 4th edition (2013, 2014) has been followed for Taxonomic purpose.

Avifauna species recorded during 1st and 2nd biodiversity assessment camp, NVNP

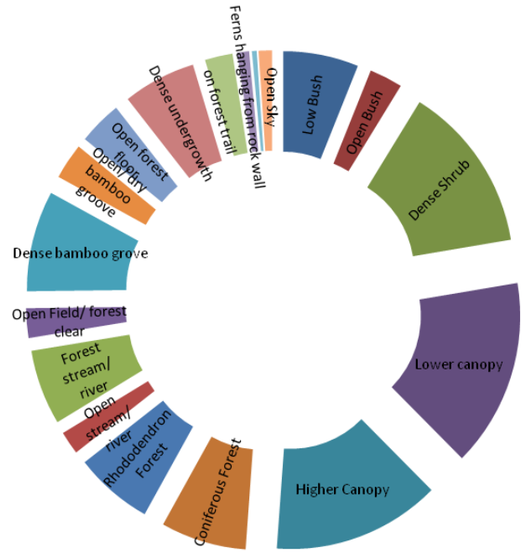
	NVNP1	NVNP2
Total Number of Orders of Birds recorded	12	11
Total Number of Bird Families Recorded	46	43
Total Number of Bird Genera Recorded	122	90
Total Number of Bird Species Recorded	177	148



Taxon wise comparison between 1st and 2nd annual survey at NVNP



Habitat preference of bird species recorded during 2nd biodiversity assessment camp at NVNP.



Checklist of the bird diversity documented at altitudes between 560m and 3127m ASL (NVNP1 and NVNP2)

SL	Family	Common Name	Scientific Name
1	Accipitridae (kates, hawks & eagles)	Besra	*Accipiter virgatus* (Temminck, 1822)
2	Accipitridae (kates, hawks & eagles)	Mountain Hawk Eagle	*Spizaetus nipalensis* Hodgson, 1836
3	Accipitridae (kates, hawks & eagles)	Crested Serpent Eagle	*Spilornis cheela* (Latham, 1790)
4	Accipitridae (kates, hawks & eagles)	Rufous-bellied Eagle	*Hieraaeteus kienerii* (de sparre, 1835)
5	Accipitridae (kates, hawks & eagles)	Northern Goshawk	*Accipiter gentilis* (Linnaeus, 1758)
6	Accipitridae (kates, hawks & eagles)	Black Eagle	*Ictinaetus malayensis* (Temminck, 1822)
7	Accipitridae (kites, hawks & eagles)	Changeable Hawk Eagle	*Nisaetus cirrhatus* (J.F. Gmelin, 1788)
8	Accipitridae (kites, hawks & eagles)	Himalayan Vulture	*Gyps himalayensis* Hume, 1869
9	Aegithalidae (long-tailed tits)	Black-throated Tit	*Aegithalos concinnus* (Gould, 1855)
10	Anatidae (Duck,geese,swan)	Bar-headed Goose	*Anser indicus* (Latham, 1790)
11	Apodidae (swifts)	Asian Palm Swift	*Cypisurus balasiensis* (J. E. Gray, 1829)
12	Apodidae (swifts)	Himalyan Swiftlet	*Collocalia brevirostris* (Horsfield, 1840)
13	Bucerotidae (hornbills)	Great Hornbill	*Buceros bicornis* Linnaeus, 1758
14	Bucerotidae (hornbills)	Rufous-necked Hornbill	*Aceros nipalensis* (Hodgson, 1829)
15	Campephagidae (minivets & cuckooshrikes)	Grey-chinned Minivet	*Pericrocotus solaris* Blyth, 1846
16	Campephagidae (minivets & cuckooshrikes)	Short-billed Minivet	*Pericrocotus brevirostris* (Vigors, 1831)
17	Campephagidae (minivets & cuckooshrikes)	Scarlet Minivet	*Pericrocotus flammeus* (J. R. Forster, 1781)
18	Campephagidae (minivets & cuckooshrikes)	Long-tailed Minivet	*Pericrocotus ethologus* Bangs & J.C. Phillips, 1914
19	Certhiidae (treecreepers)	Rusty-flanked Treecreeper	*Certhia nipalensis* Blyth, 1845
20	Cinclidae (dippers)	Brown Dipper	*Cinclus pallasii* Temminck, 1820
21	Cisticolidae (cisticolas)	Hill Prinia	*Prinia atrogularis* (F. Moore, 1854)
22	Cisticolidae (cisticolas)	Common Tailorbird	*Orthotomus sutorius* (Pennant, 1769)
23	Columbidae (Pigeons)	Green Imperial Pigeon	*Ducula aenea* (Linnaeus, 1766)
24	Columbidae (Pigeons)	Oriental Turtle Dove	*Streptopelia orientalis* (Latham, 1790)
25	Columbidae (Pigeons)	Speckled Wood Pigeon	*Columba hodgsonii* Vigors, 1832
26	Columbidae (Pigeons)	Mountain Imperial Pigeon	*Ducula badia* (Raffles, 1822)
27	Columbidae (Pigeons)	Wedge-tailed Green Pigeon	*Treron sphenura* (Vigors, 1832)

SL	Family	Common Name	Scientific Name
28	Columbidae (Pigeons)	Barred Cuckoo Dove	*Macropygia unchall* (Wagler, 1827)
29	Corvidae (crows & jays)	Collared Treepie	*Dendrocitta frontalis* Horsfield, 1840
30	Corvidae (crows & jays)	Eurasian Nutcracker	*Nucifraga caryocatactes* (Linnaeus, 1758)
31	Corvidae (crows & jays)	Large-billed Crow	*Corvus macrorhynchos* Wagler, 1827
32	Corvidae (crows & jays)	Common Green Magpie	*Cissa chinensis* (Boddaert, 1783)
33	Corvidae (crows & jays)	Yellow-billed Blue Magpie	*Urocissa flavirostris* (Blyth, 1846)
34	Corvidae (crows & jays)	Grey Treepie	*Dendrocitta formosae* Swinhoe, 1863
35	Cuculidae (cuckoos)	Large Hawk Cuckoo	*Hierococcyx sparverioides* (Vigors, 1832)
36	Cuculidae (cuckoos)	Grey-bellied Cuckoo	*Cacomantis passerinus* (Vahl, 1797)
37	Dicaeidae (flowerpeckers)	Pale-billed Flowerpecker	*Dicaeum erythrorhynchos* (Latham, 1790)
38	Dicaeidae (flowerpeckers)	Plain Flowerpecker	*Dicaeum concolor* Jerdon, 1840
39	Dicaeidae (flowerpeckers)	Fire-breasted Flowerpecker	*Dicaeum ignipectus* (Blyth, 1843)
40	Dicruridae (drongos)	Lesser Racket-tailed Drongo	*Dicrurus remifer* (Temminck, 1823)
41	Dicruridae (drongos)	Ashy Drongo	*Dicrurus leucophaeus* Vieillot, 1817
42	Dicruridae (drongos)	Greater Racket-tailed Drongo	*Dicrurus paradiseus* (Linnaeus, 1766)
43	Dicruridae (drongos)	Hair-crested Drongo	*Dicrurus hottentottus* (Linnaeus, 1766)
44	Dicruridae (drongos)	Bronzed Drongo	*Dicrurus aeneus* Vieillot, 1817
45	Eurylaimidae (typical broadbills)	Long-tailed Broadbill	*Psarisomus dalhousiae* (Jameson, 1835)
46	Fringillidae (finches, euphonias & Hawaiian honeycreepers)	Brown Bullfinch	*Pyrrhula nipalensis* Hodgson,1836
47	Fringillidae (finches, euphonias & Hawaiian honeycreepers)	Common Rosefinch	*Carpadacus erythrinus* (Pallas, 1770)
48	Fringillidae (finches, euphonias & Hawaiian honeycreepers)	Dark-breasted Rosefinch	*Procarduelis nipalensis* (Hodgson, 1836)
49	Fringillidae (finches, euphonias & Hawaiian honeycreepers)	Golden-naped Finch	*Pyrrhoplectes epauletta* (Hodgson, 1836)
50	Fringillidae (finches, euphonias & Hawaiian honeycreepers)	Grey-headed Bullfinch	*Pyrrhula erythaca* Blyth, 1862

Black-throated Parrotbill

Blue-winged Laughingthrush

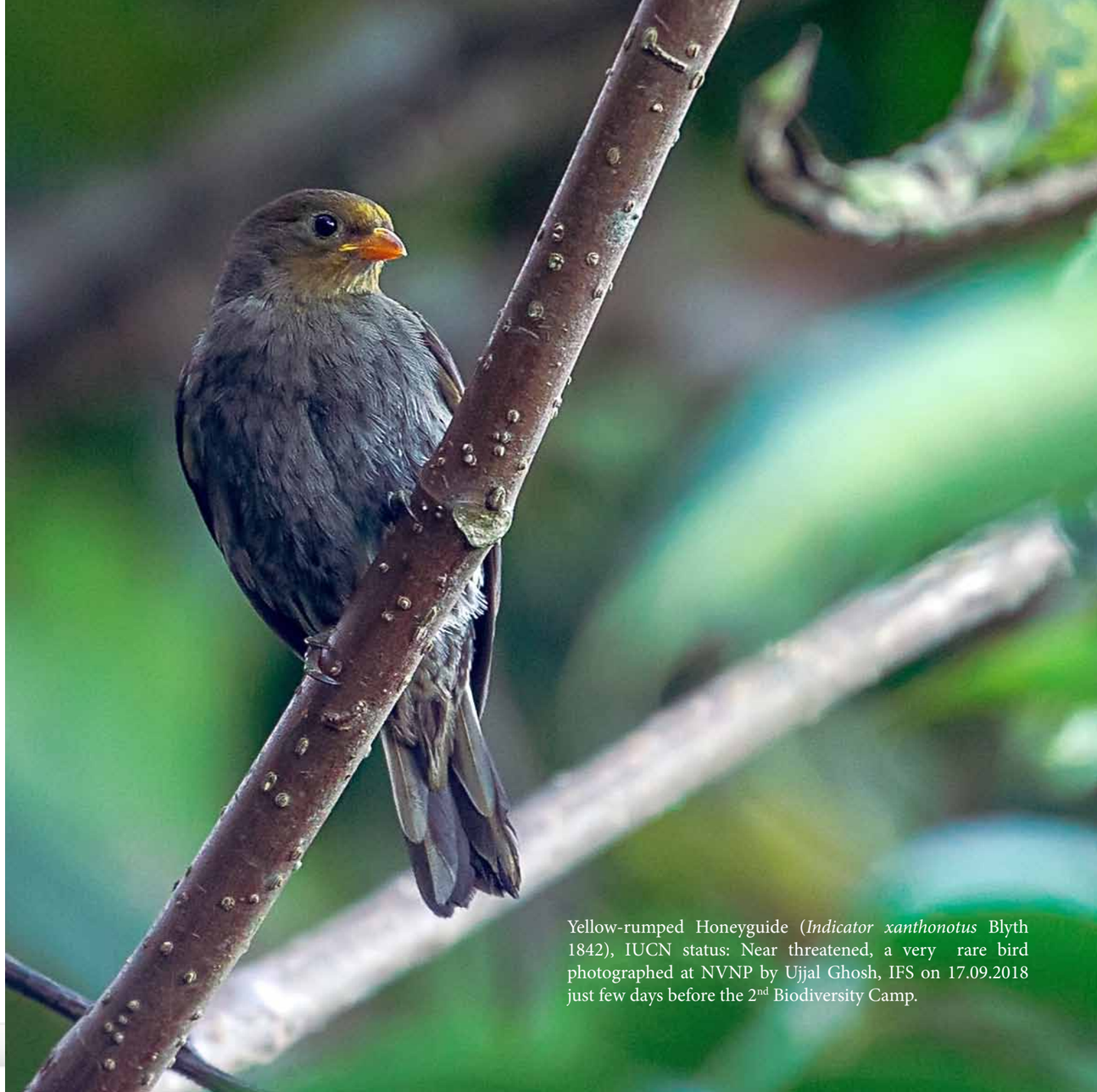
Rufous-throated Wren-babbler

Rusty-fronted Barwing

SL	Family	Common Name	Scientific Name
51	Fringillidae (finches, euphonias & Hawaiian honeycreepers)	Red-headed Bulfinch	*Pyrrhula erythrocephala* Vigors, 1832
52	Fringillidae (finches, euphonias & Hawaiian honeycreepers)	Scarlet Finch	*Haematospiza sipahi* (Hodgson, 1836)
53	Hirundinidae (Swallows)	Nepal House Martin	*Delichon nipalensis* F. Moore, 1854
54	Irenidae (fairy-bluebirds & leafbirds)	Orange-bellied Leafbird	*Chloropsis hardwickii* Jardine & Selby, 1830
55	Irenidae (fairy-bluebirds & leafbirds)	Golden-fronted Leafbird	*Chloropsis aurifrons* (Temminck, 1829)
56	Laniidae (shrikes)	Grey-backed Shrike	*Lanius tephronotus* (Vigors, 1832)
57	Laniidae (shrikes)	Long-tailed Shrike	*Lanius schach* Linnaeus, 1758
58	Leiothrichidae (babblers, laughingthrushes and allies)	Black-faced Laughingthrush	*Garrulax affinis* (Blyth, 1843)
59	Leiothrichidae (babblers, laughingthrushes and allies)	Blue-winged Laughingthrush	*Garrulax squamatus* (Gould, 1835)
60	Leiothrichidae (babblers, laughingthrushes and allies)	Grey-sided Laughingthrush	*Garrulax caerulatus* (Hodgson, 1836)
61	Leiothrichidae (babblers, laughingthrushes and allies)	Red-faced Lioncichla	*Liocichla phoenicea* (Gould, 1837)
62	Leiothrichidae (babblers, laughingthrushes and allies)	Scaly Laughingthrush	*Garrulax subunicolor* Blyth, 1843
63	Leiothrichidae (babblers, laughingthrushes and allies)	Spotted Laughingthrush	*Garrulax ocellatus* (Vigors, 1831)
64	Leiothrichidae (babblers, laughingthrushes and allies)	Striated Laughingthrush	*Garrulax striatus* (Vigors, 1831)
65	Leiothrichidae (babblers, laughingthrushes and allies)	White-throated Laughingthrush	*Garrulax albogularis* (Gould, 1836)
66	Leiothrichidae (babblers, laughingthrushes and allies)	Nepal Tit Babbler	*Alcippe nipalensis* (Hodgson, 1837)
67	Leiothrichidae (babblers, laughingthrushes and allies)	Long-tailed Sibia	*Heterophasia picaoides* (Hodgson, 1839)
68	Leiothrichidae (babblers, laughingthrushes and allies)	Hoary-throated Barwing	*Actinodura nipalensis* (Hodgson, 1836)
69	Leiothrichidae (babblers, laughingthrushes and allies)	Red-billed Leiothrix	*Leiothrix lutea* (Scopoli, 1786)

SL	Family	Common Name	Scientific Name
70	Leiothrichidae (babblers, laughingthrushes and allies)	Rusty-fronted Barwing	*Actinodura egertoni* Gould, 1836
71	Leiothrichidae (babblers, laughingthrushes and allies)	Greater Necklaced Laughingthrush	*Garrulax pectoralis* (Gould, 1836)
72	Leiothrichidae (babblers, laughingthrushes and allies)	Silver-eared Mesia	*Leiothrix argentauris* (Hodgson, 1837)
73	Leiothrichidae (babblers, laughingthrushes and allies)	Chestnut-tailed Minla	*Minla strigula* (Hodgson, 1837)
74	Leiothrichidae (babblers, laughingthrushes and allies)	Blue-winged Minla	*Minla cyanouroptera* Hodgson, 1837
75	Leiothrichidae (babblers, laughingthrushes and allies)	Chestnut-crowned Laughingthrush	*Garrulax erythrocephalus* (Vigors, 1832)
76	Leiothrichidae (babblers, laughingthrushes and allies)	Cutia	*Cutia nipalensis* Hodgson, 1837
77	Leiothrichidae (babblers, laughingthrushes and allies)	White-crested Laughingthrush	*Garrulax leucolophus* (Hardwicke, 1816)
78	Leiothrichidae (babblers, laughingthrushes and allies)	Red-tailed Minla	*Minla ignotincta* Hodgson, 1837
79	Leiothrichidae (babblers, laughingthrushes and allies)	Rufous sibia	*Heterophasia capistrata* (Vigors, 1831)
80	Meropidae (bee-eaters)	Blue-bearded Bee-eater	*Nyctyornis athertoni* (Jardine & Selby, 1828)
81	Motacillidae (wagtails & pipits)	Western Yellow Wagtail	*Motacilla flava* Linnaeus, 1758
82	Motacillidae (wagtails & pipits)	White Wagtail	*Motacilla alba* Linnaeus, 1758
83	Motacillidae (wagtails & pipits)	Olive-backed Pipit	*Anthus hodgsoni* Richmond, 1907
84	Muscicapidae (chats and flycatchers)	Dark-sided Flycatcher	*Muscicapa sibrica* J. F. Gmelin, 1789
85	Muscicapidae (chats and flycatchers)	Himalayan Blue Robin	*Tarsiger rufilatus* (Hodgson, 1845)
86	Muscicapidae (chats and flycatchers)	Pygmy-blue Flycatcher	*Ficedula hodgsoni* (F. Moore, 1854)
87	Muscicapidae (chats and flycatchers)	Taiga Flycatcher	*Ficedula albicilla* (Pallas, 1811)
88	Muscicapidae (chats and flycatchers)	White-browed Shortwing	*Brachypterryx montana* Horsfield, 1821
89	Muscicapidae (chats and flycatchers)	Large Niltava	*Niltava grandis* (Blyth, 1842)
90	Muscicapidae (chats and flycatchers)	White-rumped Shama	*Kittacincla malabarica* (Scopoli, 1786)
91	Muscicapidae (chats and flycatchers)	Little Forktail	*Enicurus scouleri* Vigors, 1832

SL	Family	Common Name	Scientific Name
92	Muscicapidae (chats and flycatchers)	Slaty-backed Forktail	*Enicurus schistaceus* (Hodgson, 1836)
93	Muscicapidae (chats and flycatchers)	Small Niltava	*Niltava macgrigoriae* (E. Burton, 1836)
94	Muscicapidae (chats and flycatchers)	Spotted Forktail	*Enicurus maculatus* Vigors, 1831
95	Muscicapidae (chats and flycatchers)	Red-breasted Flycatcher	*Ficedula parva (Bechstein, 1792)*
96	Muscicapidae (chats and flycatchers)	Sapphire Flycatcher	*Ficedula sapphira* (Blyth, 1843)
97	Muscicapidae (chats and flycatchers)	Blue-fronted Redstart	*Adelura frontalis* (Vigors, 1831)
98	Muscicapidae (chats and flycatchers)	Chestnut-bellied Rock Thrush	*Monticola rufiventris* (Jardine & Selby, 1833)
99	Muscicapidae (chats and flycatchers)	Blue-whistiling Thrush	*Myophonus caeruleus* (Scopoli, 1786)
100	Muscicapidae (chats and flycatchers)	Grey Bushchat	*Saxicola ferreus* J.E. & G.R. Gray, 1847
101	Muscicapidae (chats and flycatchers)	Plumbeous Water Redstart	*Rhyacornis fuliginosus* (Vigors, 1831)
102	Muscicapidae (chats and flycatchers)	Rufous-bellied Niltava	*Niltava sundara* Hodgson, 1837
103	Muscicapidae (chats and flycatchers)	Rufous-gorgeted Flycatcher	*Ficedula strophiata* (Hodgson, 1837)
104	Muscicapidae (chats and flycatchers)	Tickell's Blue Flycatcher	*Cyornis tickelliae* Blyth, 1843
105	Muscicapidae (chats and flycatchers)	Verditer Flycatcher	*Eumyias thalassinus* (Swainson, 1838)
106	Muscicapidae (chats and flycatchers)	White-capped Water Redstart	*Chaimarrornis leucocephalus* (Vigors, 1831)
107	Muscicapidae (chats and flycatchers)	Little Pied-Flycatcher	*Ficedula westermanni* (Sharpe, 1888)
108	Nectariniidae (Sunbirds)	Mrs Gould'sSunbird	*Aethopyga gouldiae* (Vigors, 1831)
109	Nectariniidae (Sunbirds)	Black-throated Sunbird	*Aethopyga saturata* (Hodgson,1836)
110	Nectariniidae (Sunbirds)	Ruby-cheeked Sunbird	*Chalcoparia singalensis* (J.F. Gmelin, 1789)
111	Nectariniidae (Sunbirds)	Little Spiderhunter	*Arachnothera longirostra* (Latham, 1790)
112	Nectariniidae (Sunbirds)	Fire-tailed Sunbird	*Aethopyga ignicauda* (Hodgson,1836)
113	Nectariniidae (Sunbirds)	Green-tailed Sunbird	*Aethopyga nipalensis* (Hodgson,1836)
114	Nectariniidae (Sunbirds)	Streaked Spiderhunter	*Arachnothera magna* (Hodgson,1836)
115	Oriolidae (orioles)	Maroon Oriole	*Oriolus traillii* (Vigors, 1832)
116	Paridae (tits, chickadees)	Black Lored Tit	*Machlolophus xanthogenys* (Vigors, 1831)
117	Paridae (tits, chickadees)	Yellow-browed Tit	*Sylviparus modestus* E. Burton, 1836



Yellow-rumped Honeyguide (*Indicator xanthonotus* Blyth 1842), IUCN status: Near threatened, a very rare bird photographed at NVNP by Ujjal Ghosh, IFS on 17.09.2018 just few days before the 2nd Biodiversity Camp.

SL	Family	Common Name	Scientific Name
118	Paridae (tits, chickadees)	Yellow-cheeked Tit	*Parus spilonotus* (Bonaparte, 1850)
119	Paridae (tits, chickadees)	Green-backed Tit	*Parus monticolus* Vigors, 1831
120	Paridae (tits, chickadees)	Sultan Tit	*Melanochlora sultanea* (Hodgson, 1837)
121	Pellorneidae (smaller babblers)	Long-billed Wren Babbler	*Rimator malacoptilus* Blyth, 1847
122	Pellorneidae (smaller babblers)	Puff-throated Babbler	*Pellorneum ruficeps* Swainson, 1832
123	Pellorneidae (smaller babblers)	Rufous-winged Fulvetta	*Alcippe castaneceps* (Hodgson, 1837)
124	Pellorneidae (smaller babblers)	Yellow-throated Fulvetta	*Alcippe cinerea* (Blyth, 1847)
125	Phalacrocoracidae (cormorants)	Little Cormorant	*Microcarbo niger* (Vieillot, 1817)
126	Phasianidae (Partridges, pheasant, grouse)	Chestnut-breasted Hill Partridge	*Arborophila mandellii* Hume, 1881
127	Phasianidae (Partridges, pheasant, grouse)	Kalij Pheasant	*Lophura leucomelanos* (Latham, 1790)
128	Phasianidae (Partridges, pheasant, grouse)	Satyr Tragopan	*Tragopan satyra* (Linnaeus, 1758)
129	Phasianidae (Partridges, pheasant, grouse)	Red Junglefowl	*Gallus gallus* (Linnaeus, 1758)
130	Phasianidae (Partridges, pheasant, grouse)	Common Hill Partridge	*Arborophila torqueola* (Valenciennes, 1825)
131	Phylloscopidae (Old World leaf warblers)	Ashy-throated Warbler	*Phylloscopus maculipennis* Blyth, 1867
132	Phylloscopidae (Old World leaf warblers)	Blyth's Leaf Warbler	*Phylloscopus reguloides*(Blyth, 1842)
133	Phylloscopidae (Old World leaf warblers)	Grey-cheeked Warbler	*Seicercus poliogenys* (Blyth, 1847)
134	Phylloscopidae (Old World leaf warblers)	Tickell's Leaf Warbler	*Phylloscopus affinis* (Tickell, 1833)
135	Phylloscopidae (Old World leaf warblers)	Whistler's Warbler	*Seicercus whistleri* Ticehurst, 1925
136	Phylloscopidae (Old World leaf warblers)	Hume's Leaf Warbler	*Phylloscopus humei* (W.E. Brooks, 1878)
137	Phylloscopidae (Old World leaf warblers)	Buff-barred Warbler	*Abrornis pulcher* (Blyth, 1845)
138	Phylloscopidae (Old World leaf warblers)	Grey-hooded Warbler	*Seicercus xanthoschistos* (J.E. & G.R. Gray, 1847)
139	Phylloscopidae (Old World leaf warblers)	White-spectacled Warbler	*Seicercus affinis* (F. Moore, 1854)
140	Phylloscopidae (Old World leaf warblers)	Chestnut-crowned Warbler	*Seicercus costaniceps* (Hodgson, 1845)
141	Phylloscopidae (Old World leaf warblers)	Greenish Leaf Warbler	*Seicercus trochiloides* (Sundevall, 1837)
142	Picidae (woodpeckers)	Grey-headed Woodpecker	*Picus canus* J.F. Gmelin, 1788
143	Picidae (woodpeckers)	Bay Woodpecker	*Blythipicus pyrrhotis* (Hodgson, 1837)
144	Picidae (woodpeckers)	Darjeeling Woodpecker	*Dendrocopos darjellensis* (Blyth, 1845)
145	Picidae (woodpeckers)	Fulvous-breasted Pied Woodpecker	*Dendrocopos macei* (Vieillot, 1818)

SL	Family	Common Name	Scientific Name
146	Picidae (woodpeckers)	Greater Yellow-naped Woodpecker	*Picus flavinucha* (Gould, 134)
147	Picidae (woodpeckers)	Lesser Yellow-naped Woodpecker	*Picus chlorophus* Vieillot, 1818
148	Pnoepygidae (wren babblers)	Pygmy Wren Babbler	*Pnoepyga pusilla* Hodgson, 1845
149	Pnoepygidae (wren babblers)	Scaly-breasted Wren Babbler	*Pnoepyga albiventer (Hodgson, 1837)*
150	Prunellidae (accentors)	Maroon-backed Accentor	*Prunella immaculata*(Hodgson, 1845)
151	Prunellidae (accentors)	Rufous-breasted Accentor	*Prunella strophiata* (Blyth, 1843)
152	Psittaculidae (Old World parrots)	Red-breasted Parakeet	*Psttiacula alexandri* (Linnaeus, 1758)
153	Pycnonotidae (bulbuls)	Red-vented Bulbul	*Pycnonotus cafer* (Linnaeus, 1766)
154	Pycnonotidae (bulbuls)	Mountain Bulbul	*Ixos mcclellandii* (Horsfield, 1840)
155	Pycnonotidae (bulbuls)	Ashy Bulbul	*Hemixos flavala* Blyth, 1845
156	Pycnonotidae (bulbuls)	White-throated Bulbul	*Alophoixus flaveolus* (Gould, 1836)
157	Pycnonotidae (bulbuls)	Himalayan Bulbul	*Pycnonotus leucogenis* (J.F. Gray, 1835)
158	Pycnonotidae (bulbuls)	Striated Bulbul	*Pycnonotus striatus* (Blyth, 1842)
159	Pycnonotidae (bulbuls)	Black Bulbul	*Hypsipetes leucocephalus* (J.F. Gmelin, 1789)
160	Ramphastidae (toucans & barbets)	Blue-throated Barbet	*Megalaima asiatica* (Latham, 1790)
161	Ramphastidae (toucans & barbets)	Golden-throated Barbet	*Psilopogon franklini* (Blyth, 1842)
162	Ramphastidae (toucans & barbets)	Great Barbet	*Megalaima virens* (Boddaert, 1783)
163	Regulidae (goldcrests or kinglets)	Goldcrest	*Regulus regulus* (Linnaeus, 1758)
164	Rhipiduridae (fantails)	White-throated Fantail	*Rhipidura albicollis* (Vieillot, 1818)
165	Scotocercidae (bush warblers and allies)	Black-faced Warbler	*Abroscopus schisticeps* (J.E. & G.R. Gray, 1847)
166	Scotocercidae (bush warblers)	Broad-billed Warbler	*Tickellia hodgsoni* (F. Moore, 1854)
167	Scotocercidae (bush warblers)	Grey-bellied Tesia	*Tesia cyaniventer* Hodgson, 1837
168	Scotocercidae (bush warblers)	Chestnut-headed Tesia	*Tesia castaneocoronatta* (E. Burton, 1836)
169	Sittidae (nuthatches, spotted creepers and wallcreeper)	White-tailed Nuthatch	*Sitta himalayensis* Jardine & Selby, 1835
170	Sittidae (nuthatches, spotted creepers and wallcreeper)	Beautiful Nuthatch	*Sitta formosa* Blyth, 1843

SL	Family	Common Name	Scientific Name
171	Sittidae (nuthatches, spotted creepers and wallcreeper)	Chestnut-bellied Nuthatch	*Sitta castanea* Lesson, 1830
172	Stenostiridae (fairy-flycatcher and crested-flycatchers)	Grey-headed Canary Flycatcher	*Culcicapa ceylonensis* (Swinhoe,1870)
173	Stenostiridae (fairy-flycatcher and crested-flycatchers)	Yellow-bellied Fairy Fantail	*Rhipidura hypoxantha* (Blyth, 1843)
174	Strigidae (owls)	Mountain Scops Owl	*Otus spilocephalus* (Blyth, 1846)
175	Strigidae (owls)	Collared Owlet	*Glaucidium brodiei* (E. Burton, 1836)
176	Strigidae (owls)	Asian Barred Owlet	*Glaucidium cuculoides* (Vigors, 1831)
177	Sturnidae (starlings)	Hill Myna	*Gracula religiosa* Linnaeus, 1758
178	Sturnidae (starlings)	Chestnut-tailed Starling	*Sturnia malabarica* (J. F. Gmelin, 1789)
179	Sylviidae (Sylvia warblers, parrotbills and allies)	Black-brested Parrotbill	*Paradoxornis flavirostris* Gould, 1836
180	Sylviidae (Sylvia warblers, parrotbills and allies)	Fire-tailed Myzornis	*Myzornis pyrrhoura* Blyth, 1843
181	Sylviidae (sylvia warblers, parrotbills and allies)	Black-throated Parrotbill	*Paradoxornis nipalensis* (Hodgson, 1837)
182	Sylviidae (sylvia warblers, parrotbills and allies)	Brown Parrotbill	*Paradoxornis unicolor* (Hodgson, 1843)
183	Sylviidae (sylvia warblers, parrotbills and allies)	Golden-breasted Fulvetta	*Alcippe chrysotis* (Blyth, 1845)
184	Sylviidae (sylvia warblers, parrotbills and allies)	White-browed Fulvetta	*Alcippe vinipectus* (Hodgson, 1837)
185	Timaliidae (scimitar babblers and allies)	Coral-billed Scimitar Babbler	*Pomatorhinus ferruginosus* Blyth, 1845
186	Timaliidae (scimitar babblers and allies)	Golden Babbler	*Stachyris chrysaea* (Blyth, 1844)
187	Timaliidae (scimitar babblers and allies)	Rufous-throated Wren Babbler	*Spelaeornis caudatus* (Blyth, 1845)
188	Timaliidae (scimitar babblers and allies)	Slender-billed Scimitar Babbler	*Xiphirhynchus superciliaris* (Blyth, 1842)
189	Timaliidae (scimitar babblers and allies)	Spotted Wren Babbler	*Spelaeornis formosus* (Walden, 1874)
190	Timaliidae (scimitar babblers and allies)	Streak-breasted Scimitar Babbler	*Pomatorhinus ruficolis* Hodgson, 1836
191	Timaliidae (scimitar babblers and allies)	Grey-throated Babbler	*Stachyris nigriceps* Blyth, 1844


Scaly Laughingthrush

SL	Family	Common Name	Scientific Name
192	Timaliidae (scimitar babblers and allies)	Rufous-capped Babbler	*Stachyris ruficeps* (Blyth, 1847)
193	Trogonidae (trogons)	Red-headed Trogon	*Harpactes erythrocephalus* (Gould, 1834)
194	Trogonidae (trogons)	Ward's Trogon	*Harpactes wardi* (Kinnear, 1927)
195	Turdidae (thrushes)	Alpine Thrush	*Zoothera mollissima* (Blyth, 1842)
196	Turdidae (thrushes)	Purple Cochoa	*Cochoa purpurea* Hodgson, 1837
197	Turdidae (thrushes)	Scaly Thrush	*Zoothera dauma* (Latham, 1790)
198	Turdidae (thrushes)	Grey-winged Blackbird	*Turdus boulboul* (Latham, 1790)
199	Turdidae (thrushes)	Green Cochoa	*Cochoa viridis* (Hodgson, 1836)
200	Vangidae (vangas and helmet-shrikes)	Large Woodshrike	*Tephrodornis virgatus* Temminick, 1842
201	Vireonidae (shrike-babblers,erpornis and vireos)	Green Shrike Babbler	*Pteruthius xanthochlorus* J.E. & G.R. Gray, 1847
202	Vireonidae (shrike-babblers,erpornis and vireos)	Black-eared Shrike Babbler	*Pteruthius melanotis* Hodgson, 1847
203	Vireonidae (shrike-babblers,erpornis and vireos)	Black-headed Shrike Babbler	*Pteruthius rufiventer* Blyth, 1842
204	Vireonidae (shrike-babblers,erpornis and vireos)	White-browed Shrike Babbler	*Pteruthius aeralatus* Blyth, 1855
205	Zosteropidae (white-eyes and yuhinas)	Black-chinned Yuhina	*Yuhina nigrimenta* Blyth, 1845
206	Zosteropidae (white-eyes and yuhinas)	White-naped Yuhina	*Yuhina bakeri* Rothschild, 1926
207	Zosteropidae (white-eyes and yuhinas)	Whiskered Yuhina	*Yuhina flavicollis* Hodgson, 1836
208	Zosteropidae (white-eyes and yuhinas)	White Eye Oriental	*Zosterops palpebrosus* (Temminck, 1842)
209	Zosteropidae (white-eyes and yuhinas)	Rufous-vented Yuhina	*Yuhina occipitalis* Hodgson, 1836
210	Zosteropidae (white-eyes and yuhinas)	Stripe-throated Yuhina	*Yuhina gularis* Hodgson, 1836

Rusty-flanked Treecreeper

SL	Abundance Score at different NVNP camps (0= Not Recorded; 1= Rarely; 2= Common; 3=highly Abundant)	Asheley	Mouchuki	Gogune	Dolley	Alubari & Chaudaferi
	Common Name	**560m-1100m**	**950m-1200m**	**1300m-1600m**	**1950m-2150m**	**2200m-3127m**
1	Besra	0	0	1	1	0
2	Crested Serpent Eagle	2	0	2	0	0
3	Rufous-bellied Eagle	0	1	1	0	0
4	Changeable Hawk Eagle	1	0	0	0	0
5	Himalayan Vulture	0	1	0	0	0
6	Bar-headed Goose	0	0	0	1	0
7	Great Hornbill	1	1	2	0	0
8	Rufous-necked Hornbill	2	3	2	0	0
9	Grey-chinned Minivet	1	0	1	0	0
10	Short-billed Minivet	1	0	0	0	0
11	Scarlet Minivet	2	2	0	0	0
12	Long-tailed Minivet	3	2	0	1	0
13	Rusty-flanked Treecreeper	0	0	1	2	0
14	Hill Prinia	1	0	2	0	0
15	Common Tailorbird	2	0	1	0	0
16	Green Imperial Pigeon	0	0	2	0	0
17	Oriental Turtle Dove	0	0	2	0	0
18	Speckled Wood Pegion	1	0	0	0	0
19	Mountain Imperial Pigeon	1	1	0	0	0
20	Collared Treepie	0	0	1	0	0
21	Large-billed Crow	0	0	0	1	0
22	Common Green Magpie	2	2	2	0	0
23	Grey Treepie	2	3	2	0	0
24	Large Hawk Cuckoo	0	0	1	2	0

SL	Abundance Score at different NVNP camps (0= Not Recorded; 1= Rarely; 2= Common; 3=highly Abundant)	Asheley	Mouchuki	Gogune	Dolley	Alubari & Chaudaferi
	Common Name	**560m-1100m**	**950m-1200m**	**1300m-1600m**	**1950m-2150m**	**2200m-3127m**
25	Grey-bellied Cuckoo	0	1	0	0	0
26	Pale-billed Flowerpecker	2	0	0	0	0
27	Plain Flowerpecker	0	1	0	0	0
28	Lesser Racket-tailed Drongo	0	0	1	0	0
29	Greater Racket-tailed Drongo	2	1	0	0	0
30	Hair-crested Drongo	2	2	2	0	0
31	Bronzed Drongo	3	2	3	0	0
32	Long-tailed Broadbill	2	1	0	0	0
33	Dark-breasted Rosefinch	0	0	0	1	0
34	Golden-naped Finch	0	0	0	2	0
35	Red-headed Bulfinch	0	0	0	1	0
36	Scarlet Finch	0	1	0	2	0
37	Nepal House Martin	0	0	3	0	0
38	Orange-bellied Leafbird	0	1	0	0	0
39	Golden-fronted Leafbird	2	1	0	0	0
40	Grey-backed Shrike	0	0	2	0	0
41	Long-tailed Shrike	1	2	0	0	0
42	Blue-winged Laughingthrush	0	0	1	0	0
43	Grey-sided Laughingthrush	0	0	1	0	0
44	Red-faced Lioncichla	0	0	1	0	0
45	Nepal Tit Babbler	1	0	1	0	0
46	Long-tailed Sibia	3	0	0	0	0
47	Greater Necklaced Laughingthrush	1	1	0	0	0
48	Silver-eared Mesia	1	1	0	0	0

SL	Abundance Score at different NVNP camps (0= Not Recorded; 1= Rarely; 2= Common; 3=highly Abundant)	Asheley	Mouchuki	Gogune	Dolley	Alubari & Chaudaferi
	Common Name	**560m-1100m**	**950m-1200m**	**1300m-1600m**	**1950m-2150m**	**2200m-3127m**
49	White-crested Laughingthrush	2	2	0	0	0
50	Blue-bearded Bee-eater	1	1	0	0	0
51	Olive-backed Pipit	1	3	2	1	0
52	Himalayan Blue Robin	0	0	0	2	0
53	Pygmy-blue Flycatcher	0	0	0	1	0
54	Large Niltava	1	0	1	0	0
55	White-rumped Shama	1	0	0	0	0
56	Little Forktail	2	0	1	0	0
57	Small Niltava	2	0	0	0	0
58	Red-breasted Flycatcher	1	1	0	0	0
59	Sapphire Flycatcher	2	1	0	0	0
60	Blue-fronted Redstart	0	2	0	2	0
61	Blue-whistiling Thrush	2	2	0	2	0
62	Grey Bushchat	2	2	2	2	0
63	Tickell's Blue Flycatcher	2	2	0	0	0
64	Verditer Flycatcher	2	2	2	0	0
65	Little Pied-Flycatcher	2	3	1	2	0
66	Mrs Gould'sSunbird	0	0	0	1	0
67	Black-throated Sunbird	1	0	2	0	0
68	Ruby-cheeked Sunbird	0	1	0	0	0
69	Little Spiderhunter	1	1	0	0	0
70	Streaked Spiderhunter	3	2	2	2	0
71	Maroon Oriole	2	2	2	0	0
72	Black Lored Tit	0	0	0	3	0

Satyr Tragopan (Juvenile)

SL	Abundance Score at different NVNP camps (0= Not Recorded; 1= Rarely; 2= Common; 3=highly Abundant)	Asheley	Mouchuki	Gogune	Dolley	Alubari & Chaudaferi
	Common Name	**560m-1100m**	**950m-1200m**	**1300m-1600m**	**1950m-2150m**	**2200m-3127m**
73	Sultan Tit	0	2	0	0	0
74	Long-billed Wren Babbler	0	0	0	1	0
75	Puff-throated Babbler	0	0	1	0	0
76	Yellow-throated Fulvetta	1	1	1	1	0
77	Little Cormorant	1	0	0	0	0
78	Chestnut-breasted Hill Partridge	0	0	1	0	0
79	Kalij Pheasant	0	0	2	2	0
80	Red Junglefowl	1	0	0	0	0
81	Buff-barred Warbler	2	1	0	0	0
82	White-spectacled Warbler	2	1	0	1	0
83	Chestnut-crowned Warbler	2	2	2	1	0
84	Greenish Leaf Warbler	2	2	0	1	0
85	Grey-headed Woodpecker	1	0	1	0	0
86	Bay Woodpecker	1	1	1	1	0
87	Fulvous-breasted Pied Woodpecker	2	2	0	0	0
88	Greater Yellow-naped Woodpecker	2	2	2	1	0
89	Lesser Yellow-naped Woodpecker	2	2	2	0	0
90	Scaly-breasted Wren Babbler	2	0	1	0	0
91	Rufous-breasted Accentor	0	0	0	1	0
92	Red-breasted Parakeet	1	0	1	0	0
93	Mountain Bulbul	1	0	0	0	0

SL	Abundance Score at different NVNP camps (0= Not Recorded; 1= Rarely; 2= Common; 3=highly Abundant)	Asheley	Mouchuki	Gogune	Dolley	Alubari & Chaudaferi
	Common Name	**560m-1100m**	**950m-1200m**	**1300m-1600m**	**1950m-2150m**	**2200m-3127m**
94	Ashy Bulbul	2	1	2	0	0
95	White-throated Bulbul	2	1	0	0	0
96	Himalayan Bulbul	2	2	0	0	0
97	Black Bulbul	2	3	0	2	0
98	Blue-throated Barbet	1	0	1	0	0
99	Golden-throated Barbet	1	1	0	0	0
100	Goldcrest	0	0	0	1	0
101	Black-faced Warbler	0	0	0	2	0
102	Beautiful Nuthatch	2	2	0	0	0
103	Chestnut-bellied Nuthatch	3	3	3	2	0
104	Grey-headed Canary Flycatcher	2	3	2	3	0
105	Yellow-bellied Fairy Fantail	3	3	2	2	0
106	Mountain Scops Owl	0	0	2	0	0
107	Asian Barred Owlet	1	1	2	1	0
108	Hill Myna	0	0	2	0	0
109	Chestnut-tailed Starling	1	0	1	0	0
110	Black-brested Parrotbill	0	0	0	2	0
111	Fire-tailed Myzornis	0	0	0	1	0
112	Coral-billed Scimitar Babbler	0	0	1	0	0
113	Golden Babbler	0	0	1	1	0
114	Grey-throated Babbler	1	0	1	1	0
115	Red-headed Trogon	0	0	1	0	0
116	Grey-winged Blackbird	1	0	2	0	0
117	Green Cochoa	0	1	0	0	0

SL	Abundance Score at different NVNP camps (0= Not Recorded; 1= Rarely; 2= Common; 3=highly Abundant)	Asheley	Mouchuki	Gogune	Dolley	Alubari & Chaudaferi
	Common Name	**560m-1100m**	**950m-1200m**	**1300m-1600m**	**1950m-2150m**	**2200m-3127m**
118	Large Woodshrike	1	1	0	0	0
119	White-browed Shrike Babbler	1	2	2	0	0
120	Black-chinned Yuhina	2	0	2	0	0
121	White-naped Yuhina	1	1	0	0	0
122	White Eye Oriental	2	2	0	1	0
123	Northern Goshawk	1	1	0	0	1
124	Brown Dipper	0	0	0	0	1
125	Eurasian Nutcracker	0	0	0	0	1
126	Ashy Drongo	2	0	1	0	1
127	Brown Bullfinch	0	0	0	0	1
128	Grey-headed Bullfinch	0	0	0	0	1
129	Western Yellow Wagtail	0	0	0	1	1
130	White Wagtail	0	1	0	1	1
131	Dark-sided Flycatcher	0	0	1	0	1
132	White-browed Shortwing	0	0	0	0	1
133	Spotted Forktail	2	0	0	1	1
134	Yellow-browed Tit	0	0	0	2	1
135	Rufous-winged Fulvetta	0	0	1	1	1
136	Satyr Tragopan	0	0	0	2	1
137	Tickell's Leaf Warbler	0	0	0	0	1
138	Hume's Leaf Warbler	1	1	0	0	1
139	Pygmy Wren Babbler	2	0	1	0	1
140	Red-vented Bulbul	0	0	1	0	1
141	Striated Bulbul	2	2	1	1	1

Red-headed Bullfinch

SL	Abundance Score at different NVNP camps (0= Not Recorded; 1= Rarely; 2= Common; 3=highly Abundant)	Asheley	Mouchuki	Gogune	Dolley	Alubari & Chaudaferi
	Common Name	**560m-1100m**	**950m-1200m**	**1300m-1600m**	**1950m-2150m**	**2200m-3127m**
142	Broad-billed Warbler	0	0	0	1	1
143	Brown Parrotbill	0	0	0	0	1
144	Rufous-throated Wren Babbler	0	0	1	1	1
145	Spotted Wren Babbler	0	0	0	1	1
146	Purple Cochoa	0	0	0	0	1
147	Scaly Thrush	0	0	0	0	1
148	Green Shrike Babbler	0	0	0	0	1
149	Black-eared Shrike Babbler	1	2	0	2	1
150	Black-headed Shrike Babbler	1	2	0	0	1
151	Mountain Hawk Eagle	0	0	2	1	2
152	Black Eagle	1	2	2	1	2
153	Black-throated Tit	0	0	0	3	2
154	Asian Palm Swift	0	0	0	0	2
155	Himalyan Swiftlet	2	3	0	1	2
156	Wedge-tailed Green Pigeon	1	1	2	0	2
157	Barred Cuckoo Dove	2	1	2	1	2
158	Yellow-billed Blue Magpie	2	2	0	2	2
159	Fire-breasted Flowerpecker	1	1	1	1	2
160	Common Rosefinch	0	0	1	0	2
161	Black-faced Laughingthrush	0	0	0	2	2
162	Scaly Laughingthrush	0	0	0	0	2
163	Spotted Laughingthrush	0	0	0	0	2
164	Hoary-throated Barwing	0	1	0	2	2
165	Rusty-fronted Barwing	0	1	2	2	2

SL	Abundance Score at different NVNP camps (0= Not Recorded; 1= Rarely; 2= Common; 3=highly Abundant)	Asheley	Mouchuki	Gogune	Dolley	Alubari & Chaudaferi
	Common Name	**560m-1100m**	**950m-1200m**	**1300m-1600m**	**1950m-2150m**	**2200m-3127m**
166	Chestnut-tailed Minla	0	2	0	2	2
167	Blue-winged Minla	2	2	2	0	2
168	Cutia	2	2	0	0	2
169	Red-tailed Minla	2	3	0	2	2
170	Rufous sibia	3	3	3	2	2
171	Taiga Flycatcher	0	0	2	0	2
172	Slaty-backed Forktail	2	0	0	0	2
173	Chestnut-bellied Rock Thrush	0	2	0	2	2
174	Plumbeous Water Redstart	2	2	2	0	2
175	Rufous-bellied Niltava	2	2	2	1	2
176	Rufous-gorgeted Flycatcher	2	2	2	0	2
177	White-capped Water Redstart	2	2	0	0	2
178	Green-tailed Sunbird	1	2	3	3	2
179	Green-backed Tit	0	2	2	3	2
180	Common Hill Partridge	2	2	2	2	2
181	Blyth's Leaf Warbler	0	0	0	1	2
182	Grey-cheeked Warbler	0	0	2	0	2
183	Whistler's Warbler	0	0	0	0	2
184	Grey-hooded Warbler	2	1	0	0	2
185	Darjeeling Woodpecker	1	2	1	1	2
186	Maroon-backed Accentor	0	0	0	2	2
187	Great Barbet	2	3	2	2	2
188	White-throated Fantail	3	3	2	2	2
189	Grey-bellied Tesia	0	0	1	0	2

SL	Abundance Score at different NVNP camps (0= Not Recorded; 1= Rarely; 2= Common; 3=highly Abundant)	Asheley	Mouchuki	Gogune	Dolley	Alubari & Chaudaferi
	Common Name	**560m-1100m**	**950m-1200m**	**1300m-1600m**	**1950m-2150m**	**2200m-3127m**
190	Chestnut-headed Tesia	1	1	0	0	2
191	White-tailed Nuthatch	0	2	2	1	2
192	Collared Owlet	1	0	2	2	2
193	Black-throated Parrotbill	0	0	1	0	2
194	Golden-breasted Fulvetta	0	0	0	0	2
195	White-browed Fulvetta	0	0	0	0	2
196	Slender-billed Scimitar Babbler	0	0	0	2	2
197	Streak-breasted Scimitar Babbler	0	0	1	2	2
198	Rufous-capped Babbler	0	2	1	2	2
199	Ward's Trogon	0	0	0	0	2
200	Alpine Thrush	0	0	0	1	2
201	Striated Laughingthrush	0	0	1	2	3
202	White-throated Laughingthrush	0	0	1	3	3
203	Red-billed Leiothrix	0	1	2	1	3
204	Chestnut-crowned Laughingthrush	2	2	2	3	3
205	Fire-tailed Sunbird	1	2	0	3	3
206	Yellow-cheeked Tit	0	0	2	3	3
207	Ashy-throated Warbler	0	0	0	1	3
208	Whiskered Yuhina	2	2	3	2	3
209	Rufous-vented Yuhina	3	3	0	3	3
210	Stripe-throated Yuhina	3	3	0	3	3

Sub-habitats recorded during the study period of 2nd annual biodiversity camp at NVNP

SL	Habitat Codes	Habitat description
1	**Low Bush**	Bush made of low height shrub and undergrowth or ferns. Total height of this Bush is within 1 m. Often seen near dense canopy or around forest trails.
2	**Open Bush**	Bush within 3 feet height. Made of low height shrubs and undergrowth or ferns. But these types of bushes are not dense at all and generally with considerable distance with dense forest canopy or other bushes. Commonly on hill slopes.
3	**Lower canopy**	Lower story of canopy with moderate height trees. This canopy is mostly discontinuous and little light reaches to this layer due to higher canopy layer.
4	**Higher Canopy**	Primary canopy cover. Made up of largest trees of the forest. Sometimes height of this canopy can reach up to 40 m.
5	**Coniferous Forest**	Higher altitude forest, made up of cone producing trees with little undergrowth.
6	**Rhododendron Forest**	Another type of high altitude forest. Rhododendron is the primary tree species of this habitat. Though many other species of trees may occur.
7	**Dense Shrub**	Dominated by various species of shrubs. Generally dense and dark due to lack of adequate sunlight. Height of this habitat hardly exceeds 2 m.
8	**Open stream/ river**	Mainly Neora river bed. Very little or no vegetation at all. Sometimes some herbs or shrubs may present. Generally full of direct sunlight, though there are places where trees of the river banks cover the sun and make the habitat shady.
9	**Forest stream/ river**	Streams running between dense forests. Presence of water in those streams depends of season. Boulders are covered by moss bed.
10	**Open Field/ forest clear**	Open area, without considerable amount of plants. May be on open slope of mountain. Also canopy fall of a area can create this type of habitat.
11	**Dense bamboo grove**	Bamboo forest. Without any other types of plants. Most of the times impenetrable due to high density of bamboo plants.
12	**Open/ dry bamboo groove**	This bamboo forests are not dense, due to dry groves of a considerable area.
13	**Open forest floor**	Forest floor under canopy with no considerable undergrowth.
14	**Dense undergrowth**	Forest floor under canopy with considerable undergrowth.
15	**Forest trail**	Trails within the forest.
16	**Ferns hanging from rock wall**	Different species of ferns hanging from the rock wall. Under fresh leafs of ferns dry leaf bed can provide a good cover for small birds.
17	**Rocky caves/ cliffs**	Rocky caves or cliffs on open mountain face. Some specific birds like to take shelter in this habitat.
18	**Open Sky**	Some birds like swallows like to fly in open air.

Identification and Text by: Sri Soumya Sarkar, Sri Apurba Chakraborty

Photographs by: Ujjal Ghosh, IFS

Megophrys cf. parva at Gogune Camp

Herpetofauna

Neora Valley National Park is comparatively a less explored area in recent times as far as documentation of herpetofauna is concerned. We tried to do a scan a block method survey during the survey period. The region holds great prospect for further extensive surveys which may yield in more fruitful desired results. Owing to the season during which this survey was done, it was not very conducive as far as herpetofauna finding was concerned, but yet we were able to encounter quite a few species of Reptiles and Amphibians. We also interviewed guards who are posted in the region and noted there encounters with various reptiles and amphibians. They also described some of the natural history moments which they have come across. A recent record of Himalayan Pit Viper (*Gloydius cf. himalayanus*) was also reported (Chaudhuri et. al 2018) from Kolakham region of Neora Valley. This was the first documented report of the species and a new Genus of Pit Viper recorded from West Bengal. Previously the Genus *Gloydius* was reported only from Himachal Pradesh, Uttar Pradesh, Kashmir, Uttarkhand in the east and unconfirmed record from Sikkim exists in India. Other than this it is reported from Nepal, Eastern Afghanistan and Pakistan. This new find gives hope that the NVNP holds much scope of exploration and not only new records for West Bengal but species new to science awaits discovery.

During the rapid survey period we encountered 6 species of reptiles, 8 species of amphibians which includes a Caecilian.

Nanorana sp

Herpetofauna recorded in NVNP2

Species	Common names	Comments
Japalura variegata	Variegated mountain lizard	Non-venomous, observed at Gogune camp
Asymblepharus sikimmensis	Sikkim Skink	Non-venomous, observed at Gogune camp
?	? a different Skink	
Ichthyophis sikkimensis	Sikkimese Caecilian	Amphibian, Gogune camp
Megophrys cf. parva	?	
Megophrys sp	?	Frog, species unidentified
Raorchestes sp	?	Frog, species unidentified
Nanorana cf. liebigii	?	Frog, Above Alubari camp
Nanorana sp	?	Frog, Unidentified species, Above Alubari camp
Therloderma sp	?	
Pseudoxenodon macrops	False Cobra	
Ovophis monticola	Mountain Pit Viper	Venomous, Near Choudaferi
Trachischium guentheri	Guenther's worm eating snake	

Nanorana sp at Chowdaferi

Megophrys sp at Gogune

Reptiles

Lizards:

Variegated mountain lizard (*Japalura variegate*), Gray, 1853. **Family:** Agamidae

More than 4 individuals were encountered in and around Gogune camp during the survey period. It is one of the Common agamid lizard which inhabits the region. All the encounter took place on shrubs along the mountain trail. All the lizards where found to be basking.

Sikkim Ground Skink (*Asymblepharus sikimmensis*), Blyth, 1854. **Family:** Scincidae

A fairly common Skink. 3 individual were encountered on boulders around Gogune camp area at an altitude of 1525 mt.

Unidentified Skink

Another Skink was encountered near chowdaferi camp. The Skink could not be identified as it could not be captured.

False Cobra (*Pseudoxenodon macrops*) at Aloobari Camp

Snakes:

Large Eyed False Cobra (*Pseudoxenodon macrops*), Blyth, 1855. **Family:** Pseudoxenodontidae

A common snake of the region. More than 6 individuals were recorded at various altitudes between Gogune and Alubari camp. 4 individuals were encountered while they were crossing the mountain trail from one side to the other and two were encountered hiding in rocky boulders on the side of trails. During our interviews with the guards we plenty photographic records of the snake. From this and from our encounters of so many individuals in that short span of time, it can be derived that a fairly common snake and is found in quite abundance.

Guenther's Worm Eating Snake (*Trachischium guentheri*), Boulenger, 1890. **Family:** Natricidae

A dead specimen was encountered on the middle of the mountain trail near Chowdaferi camp at an altitude of (2373 mts). It is a fossorial snake, preferring loose leaf litters on forest floor. No other individual was found. Our interview with the guards revealed that they encounter this species rarely.

Mountain Pit Viper (*Ovophis monticola*), Günther, 1864. **Family:** Viperidae

A common species of ground dwelling pit viper from eastern Himalayas. A female was encountered on leaf litters, under a dead log on forest floor near Chowdaferi, on the way back from Alubari camp at an altitude of 2472 mt. during day time. This species though not medically important but is responsible for most bites in the region. This is most encountered during June to September as per our forest guards who petrol the forests regularly.

Mountain Pit Viper (*Ovophis monticola*) Venomous, at Choudaferi Camp

AMPHIBIANS

Sikkimese Caecilian (*Ichthyophis sikkimensis*), Taylor, 1960. **Family:** Ichthyopiidae
An amphibian which lives under soil cover. The species encountered is one of the common species of Caecilian found in the region. 3 individuals were recorded after rain under loose soil cover at Gogune camp site.

Sikkimese Caecilian (*Ichthyophis sikkimensis*) Amphibian, at Gogune camp

Family: Megophryidae
Two species of Megophryidae frogs of the genus *Megophrys* were encountered one (*Megophrys cf. parva*) near Murtikhola at an altitude of 1175 mt. and another (*Megophrys* sp.) near Gogune at 1407 mt. Both individuals were encountered near a Jhora (small waterfall) beside the forest road trail.

Family: Rhacophoridae
Two different species of Bush frogs from the family Rhacophoridae were encountered at Gogune camp site under wet leaf litters. Owing to the complexities in this species group it was difficult to identity them to the species level. The genus Raorchestes has a vast distribution which includes much of the indo-chinese region and south south-east Asia. A detailed study is needed of the eastern Himalaya to ascertain the status of the species found in the region. Hence we refrain from commenting on the species level identification of this broad spectrum species group. Many of the frogs we encountered could well be new to science.

Family: Dicroglossidae
Three species of Paa frog were encountered during the survey period (One individual each of every species). One of which resembled close to Sikkim Paa Frog (*Nanorana cf liebigii*) and the other two remains unidentified. We consulted experts who were unable to comment on the species level based on morphological and photographic evidences. This again points to the richness of the NVNP region and diversity of many complex species of amphibians. Our rapid survey indicates the vast scope this area has in terms of discovery of newer species and newer records. A detailed study over a period of time (including peak and post monsoon time, when reptiles and amphibians are more active) is suggested.

Megophrys sp

Raorchestes sp

Nanorana cf. leibigii

Identification and Text by: Sri Anirban Chowdhury, Sri Prosenjit Dawn

Photographs by: Sri Prosenjit Dawn, Sri Anirban Chowdhury, Dr Nakul Chettri & Ujjal Ghosh, IFS

First DSLR trap camera photograph of Tiger from North Bengal (NVNP) on 30-11-2018

Mammals

Photographic record of presence of different mammalian species in NVNP

During 2016-17 and onwards systematic effort of assessment of presence – absence of mammals in NVNP is being carried out. Considering the inaccessibility of the terrain and adverse weather condition through out the maximum period of year it becomes almost impossible to carry out 'direct count' or 'total count' of animals in NVNP. In stead attempts are being made to record the presence and absence of mammals through camera trap installation on pre-designed grid of 4 sq km. The result of such camera trap exercise is very encouraging and really surprising. Animals have been recorded which were never directly encountered e.g. Spotted Linsang, Tiger in North Bengal Landscape, Gaur at an altitude of 8000 ft. etc. Perhaps other than Namdapha NP of Arunachal Pradesh, NVNP of WB is one such protected area where presence of Seven (07) cat species has been recorded. Out of 24 (Twenty Four) mammals recorded through photographic evidences 13 (Thirteen) has been categorized as Vulnerable/Threatened/Near Threatened/Endangered as par IUCN red list and 12 (Twelve) is Schedule-I as par WLPA 1972.

Tiger : *Panthera tigris* (Linnaeus, 1758)

Family : Felidae

IUCN/WPA/Indian Status : Endangered/I/Uncommon

Every year since 2016 movement and presence of Tiger has been recorded in NVNP. Presence of at least Two (02), one male and one female has been confirmed through camera trap exercise in NVNP. The presence of Tiger has been recorded at an elevation between 2250 mt to 2600 mt in NVNP.

Clouded Leopard : *Neofelis nebulosa* (Griffith, 1821)

Family : Felidae

IUCN/WPA/Indian Status : Vulnerable/I/Rare

The clouded leopard is a wild cat found from the Himalayan foothills, Its total population size is suspected to be fewer than 10,000 mature individuals, with a decreasing population trend. Clouded leopards are the most talented climbers among the cats. They can easily jump up to 1.2 m high. They are rare, secretive, arboreal, and nocturnal denizens of dense primary forest. They live a solitary lifestyle, resting in trees during the day and hunting at night. Their prey includes both arboreal and terrestrial vertebrates.

Leopard : *Panthera pardus* (Linnaeus, 1758)

Family : Felidae

IUCN/WPA/Indian Status : Near Threatened/I/Occasional

The leopard (*Panthera pardus*) is one of the five "big cats" in the genus *Panthera.* The leopard's success in the wild is due to its well camouflaged fur; its opportunistic hunting behaviour, broad diet, and strength to move heavy carcasses into trees; its ability to adapt to various habitats ranging from rainforest to steppe and including arid and montane areas; and to run at speeds up to 58 kilometers per hour.

Jungle Cat : *Felis chaus* (Schreber 1777)

Family : Felidae

IUCN/WPA/Indian Status : Lower risk/II/Locally common

It prefers grassland, scrub, dry deciduous and evergreen forests. Can hunt animals much larger than itself, diet consists of rats, lizards, mice, small snakes, frogs etc. Not so frequently found in higher elevation of NVNP. Recorded from lower & middle hill forest during the dry period.

Marbled Cat : *Pardofelis marmorata* (Martin, 1836)

Family : Felidae

IUCN/WPA/Indian Status : Vulnerable/I/Rare

Marbled Cat is one of least known small wild cats and its like a miniature version of Clouded Leopard. There are no estimates of its abundance in any part of its range. They are mostly arboreal, nocturnal, tail is disproportionately long, which is characteristically held in a horizontal fashion when walking & provides a useful counterbalance when climbing Its diet consists mainly of rats, birds, bats and squirrels with occasional reptiles, frogs and insects,

Golden Cat : *Catopuma temminckii* (Vigors & Horsfield, 1827)

Family : Felidae

IUCN/WPA/Indian Status : Vulnerable/I/Rare

It prefers forest habitats interspersed with rocky areas and inhabits dry deciduous, subtropical evergreen and tropical rainforests. Asian golden cats are territorial and solitary. Previous observations suggested that they are primarily nocturnal. Asian golden cats can climb trees when necessary. They hunt birds, hares, rodents, reptiles, and small ungulates. They are capable of bringing down prey much larger than themselves.

Leopard Cat : *Prionailurus bengalensis* (Kerr, 1792)

Family : Felidae

IUCN/WPA/Indian Status : Least concern/I/Uncommon

Leopard cats are carnivorous, feeding on a variety of small prey including mammals, lizards, amphibians, birds and insects. In most parts of their range, small rodents such as rats and mice form the major part of their diet, which is often supplemented with grass, eggs, poultry, and aquatic prey.

The breeding season of leopard cats varies depending on climate.

Indian wild dog or Dhole : *Cuon alpinus* (Pallas, 1811)

Family : Canidae

IUCN/WPA/Indian Status : Endangered/I/Common

The Dhole or Indian Wild Dog (*Cuon alpinus*) is a Canid native to Central, South and Southeast Asia. The Dhole is a highly social animal, living in large clans without rigid dominance hierarchies and containing multiple breeding females. It is a diurnal pack hunter which preferentially targets medium and large sized ungulates and in tropical forests, the Dhole competes with tigers and leopards.

Himalayan Goral : *Naemorhedus goral* (Hardwicke, 1825)

Family : Bovidae

IUCN/WPA/Indian Status : Near Threatened/I/Rare

They are found in the forests of the Himalayas including Bhutan, northern India including Sikkim, Arunachal Pradesh and Nepal at elevations from 900 to 2750 mt. They often form small bands of 4-12 individuals, older males often remain solitary. They are active in the early morning and late evening. After a morning meal, it often drinks and then rests on a rock ledge through the day. It feeds on leaves and associated softer parts of plants, mainly grasses.

Himalayan Serow : *Capricornis thar* (Hodgson, 1831)

Family : Bovidae

IUCN/WPA/Indian Status : Near Threatened/I/Rare

The Himalayan Serow, also known as the Thar is a goat-antelope native to the Himalayas. It inhabits rugged steep hills and rocky places, especially limestone regions up to 3,000 m above sea level, and also in hill and mountain forest areas with gentler terrain. Habitat disturbance and poaching are the greatest threats to its survival.

Forests of NVNP (2000-3000mt)

Himalayan Crestless Porcupine : *Hystrix brachyura* (Linnaeus, 1758)

Family : Hystricidae

IUCN/WPA/Indian Status : Least Concern/II/Locally common

It can be found in various forest habitats, and in scrubby, open areas close to forest. It can be found in agricultural areas, but needs to have rocky outcrops or other areas in which it can create a den or dig burrows. Burrows are generally occupied by family groups.

Himalayan Palm Civet : *Paguma larvata* (Smith, 1827)

Family : Viverridae

IUCN/WPA/Indian Status : Least Concern/II/Common

It occupies a wide range of habitats across its large range. In Southeast Asia, most records come from evergreen and semi-evergreen forest, including heavily degraded areas and strips of riverine evergreen forest through deciduous landscapes and is widely camera-trapped across its range and in many evergreen biomes it is amongst the more commonly recorded small carnivores.

Yellow-throated Marten : *Martes flavigula* (Boddaert, 1785)

Family : Mustelinae

IUCN/WPA/Indian Status: Least Concern/II/Locally Common

It is an omnivore, whose sources of food range from fruit and nectar to small deer. A fearless animal with few natural predators, because of its powerful build, its bright coloration and unpleasant odour. It primarily hunts on the ground, but can climb trees proficiently, being capable of making jumps up to 8 to 9 meters in distance between branches. It preys on rats, mice, hares, snakes, lizards, eggs and ground nesting birds such as pheasants and francolins. A potential predator of Red Panda in NVNP and adjoining landscape.

Red Panda : *Ailurus fulgens* (Cuvier, 1825)

Family : Ursidae

IUCN/WPA/Indian Status : Vulnerable/I/Rare

Red Panda is closely associated with the temperate forests and is considered to be a crucial indicator of health of these forests. The species prefers to dwell within an elevation range of 1500 – 4800 m. Across its range, within India, Red Panda seems to prefer Maling bamboos like *Yushania maling* and *Thamnocalamus aristatus*. A bamboo diet is supplemented by fruits and berries of *Sorbus* sp., *Rosa sericea*, *Lycopodium* sp., and leaves of various other plants.

Spotted Linsang : *Prionodon pardicolor* (Hodgson, 1852)

Family : Prionodontidae

IUCN/WPA/Indian Status : Least concern/II/Rare

Smallest Viverrid found in India, solitary, inhabits tree hollow, known to build nests with leaves and branches, mostly arboreal, males are much larger, rarely seen, found in both primary and secondary forests.

Barking Deer : *Muntiacus muntjak* (Zimmermann, 1780)

Family : Cervidae

IUCN/WPA/Indian Status : Least concern/III/Locally Common

Remain solitary or in pairs during breeding season, prefers hilly and moist areas, in thick deciduous and evergreen forests but adaptable to secondary forests (1000 to 3500 mt).

Sambar : *Rusa unicolour* (Kerr, 1792)

Family : Cervidae

IUCN/WPA/Indian Status : Vulnerable/III/Common

It has wide ranging habitat types from mixed deciduous forest, arid and dry forest and oak, evergreen forests, prefers moist habitat with undulating terrain. In NVNP it has been recorded at an elevation upto 2400 mt.

Gaur : *Bos Gaurus* (C.H Smith, 1827)

Family : Bovidae

IUCN/WPA/Indian Status : Vulnerable/I/Locally Common

It prefers moist deciduous forests with open grasslands. However it has been recorded at NVNP upto elevation of 2400 mt.

Asiatic Black Bear : *Ursus thibetanus* (G. Cuiver, 1823)

Family : Ursidae

IUCN/WPA/Indian Status : Vulnerable/I/Uncommon

A large forest-dwelling bear of the Himalayas, prefers heavily forested broad-leaved and coniferous forests as habitat.

Wild Boar : *Sus scrofa* (Linnaeus, 1758)

Family : Suidae

IUCN/WPA/Indian Status : Least Concern/III/Abundant

One of the widest ranging mammals found in plenty between 1200 mt to 2600 mt elevation in NVNP through out the year. Found in habitats including scrub, grassland, mixed deciduous and evergreen forests.

Orange-bellied Himalayan Squirrel : *Dremomys lokriah* (Hodgson, 1836)

Family : Sciuridae

IUCN/WPA/Indian Status : Least Concern/II/Locally Common

Nests in tree holes close to ground. Habitat is forested hills and foothills (900 to 3000 mt).

Malayan or Black-giant Squirrel : *Ratufa bicolor* (Sparrman, 1778)

Family : Sciuridae

IUCN/WPA/Indian Status : Near Threatened/II/ Common

Remains solitary or in pairs, feeds on nuts, seeds, leaves, flowers, tree bark and fruit pulp but may not eat insects, habitat is Montane moist deciduous, semi-evergreen and evergreen forests. In NVNP recorded in lower and middle hill forests.

Identification and Text by: Ujjal Ghosh, IFS

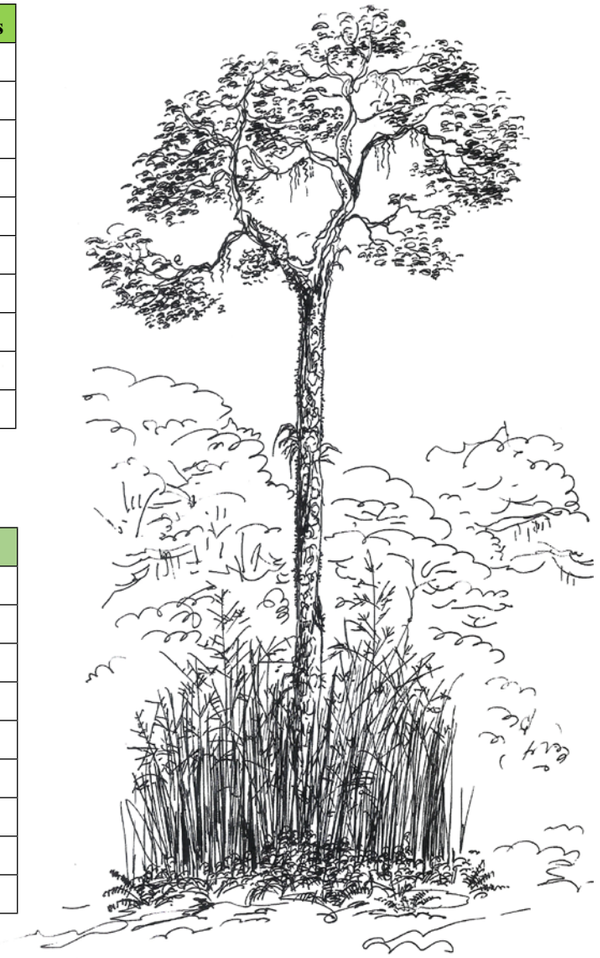
Photographs by: Dept. Camera Trap & Ujjal Ghosh, IFS

Sketch: Dr S K Sinha

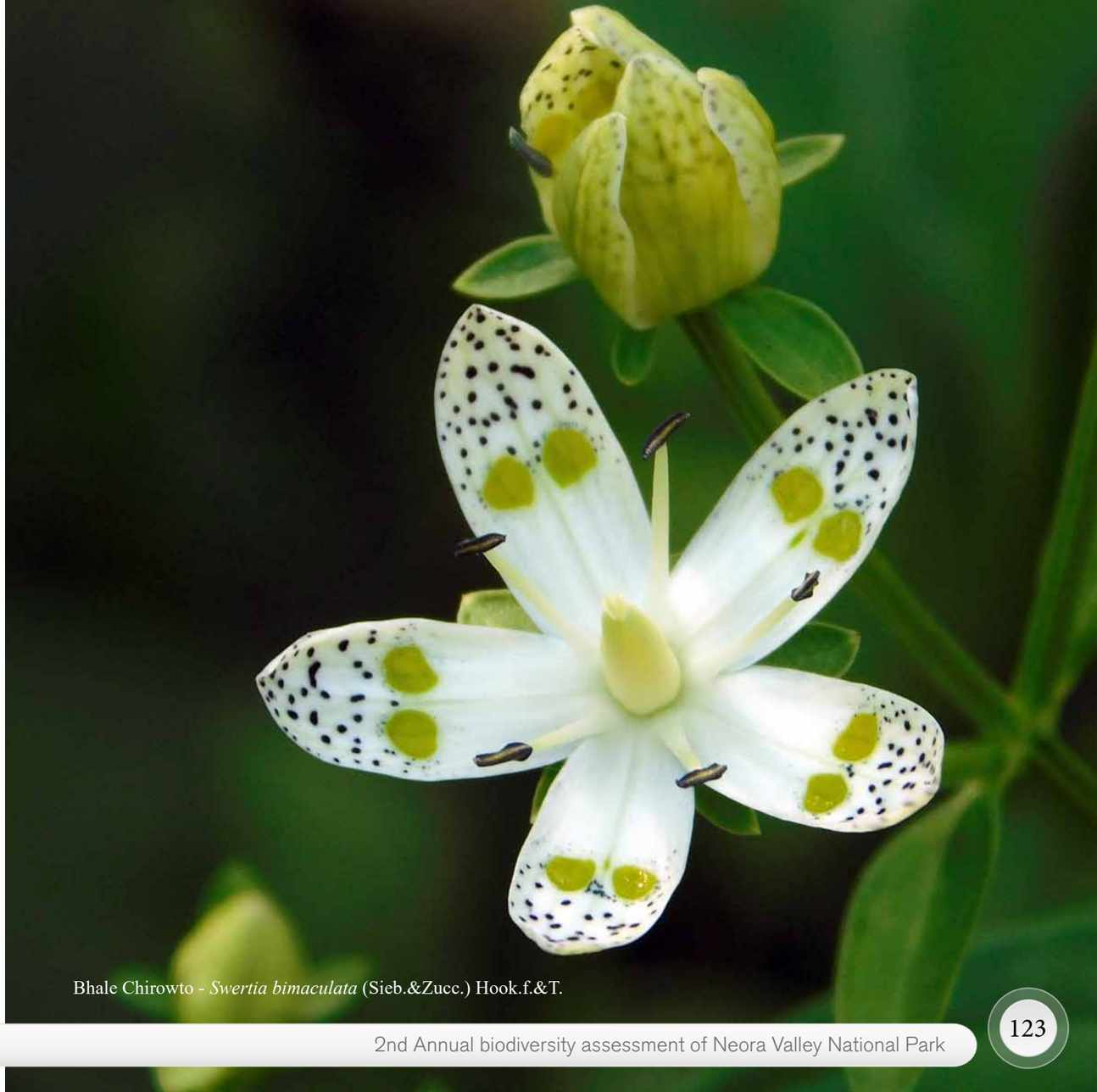
Flora

	Species Richness
TREE	40
SHRUBS AND WOODY CLIMBER	59
HERBS	101
PARASITIC HERBS	2
BAMBOO	2
PALMS AND CANES	0
FERNS AND ALLIES	4
GEOPHYTIC ORCHID	6
EPIPHYTIC / LITHO ORCHID	12
TOTAL	226

Abundance STATUS	No of spp
Critically Endangered (CR)	3
Endangered (EN)	4
Rare	30
Near threatened (NT)	3
Vulnerable (VU)	2
Least Concern (LS)	1
Less common	84
Common	99
Total	226



Sketch: Dr S K Sinha



Bhale Chirowto - *Swertia bimaculata* (Sieb.&Zucc.) Hook.f.&T.

Checklist of Plants in localities surveyed during NVNP2

SL	Species	Local name	Family	Habit	Status
1	*Acer campbelli* Hook.f.& T. ex Hiern	Kapasi	Sapindaceae	T	Common
2	*Acer sikkimensis* Miq.	Lahare Kapasi	Sapindaceae	T	**EN**
3	*Aconitum bisma* (Buch.-Ham.) Rapaic	Seto Bikhuma	Ranunculaceae	H	**EN**
4	*Aconogonom molle* (D.Don) Hara	Thotne	Polygonaceae	Cl _S	Common
5	*Acrophorus stipellatus* (Wall.) Moore		Aspidiaceae	FERN	Less common
6	*Actinidia strigosa* Hook. f.& Tex Benth.	Thekiphal	Actinidiaceae	CL_S	RARE
7	*Aeschynanthus acuminatus* Wall .ex A.DC.		Gesneraceae	H	Less common
8	*Agapetes serpens* (Wight) Sleumer		Eriaceaec	CL_S	Less common
9	*Ainisadenia sexatalis* Wall.ex Meisn.		Linaceae	H	Less common
10	*Ainsliaea aptera* DC.		Asteraceae	H	Common
11	*Ainsliaea latifolia* (D.Don) Sch.	Sahadevi	Asteraceae	H	Common
12	*Ajuga lobata* D.Don		Lamiaceae	H	Common
13	*Allium wallichii* Kunth.	Ban Lhasun	Liliaceae	H	Less common
14	*Anaphalis contorta* (D. Don) Hook.f.	Bukiphul	Asteraceae	H	Common
15	*Anaphalis margaritacea* (L.) Benth & Hook.f.		Asteraceae/ Compositae	H	Common
16	*Anaphalis triplinervis* (Sims)Sims.ex C.B.Clarke.	Buki phool	Asteraceae	H	Common
17	*Aralia leschenaultii* (DC) J.Wen	Chinde	Araliaceae	T	Common
18	*Arisaema conciinnum* Schott	Cobra lily/Gurbo	Araceae	H	Common
19	*Arisaema speciosum* (Wall.) Mart.ex Schott	Gurbo	Araceace	H	Less common
20	*Aristolochia griffithii* Hokk.f & T.	Baleyka	Aristolochiaceae	CL_S	RARE
21	*Astilbe rivularis* Buch-Ham. ex D.Don	Buro Okhati	Saxifragaceae	S	Common
22	*Balanophora involucrata* Hook.f.&T.		Balanophoraceae	Para_H	Rare
23	*Begonia gemmipara* Hook.f	Magar kache	Begoniaceae	H	Rare
24	*Begonia josephii* A.DC	Magar kache	Begoniaceace	H	Common
25	*Berberis conccinna* Hook.f.	Tsema/Chutro	Berberidaceae	S	Less common
26	*Berberis insignis* Hook .f.&T	Chutro	Berberidaceae	S	Less common
27	*Betula alnoides* B.Don.	Saur	Betulaceae	T	Less common
28	*Betula utilis* D. Don	Bhurjapatra	Betulaceae	T	Rare
29	*Boenninghousenia albiflora* (Hook.) Reichb. ex Meissn	Dampate	Rubiaceae	H	Rare
30	*Bulbophyllum reptans* (Lindl.)Lindl.	Lahare Bulbophyllum	Orchidaceae	EP_Orch	Less common
31	*Bulbophyllum* sp.		Orchidaceae	EP_Orch	Less common
32	*Calanthe* sp.		Orchidaceae	Geoph_ Orch	Less common
33	*Callitriche stagnalis* Scop.	Water starwort	Plantaginaceae	H	Common
34	*Cardamine hirsuta* L.	Simrayojhar	Brassicaceae	H	Common
35	*Carex terex* Boott		Cyperaceae	H	Less Common
36	*Cautelya gracilis* (Sm.)Dandy		Zingiberaceae	H	Common
37	*Chirita urticifolia* Buch.-Ham ex D.Don	Aankle	Gesneraceae	H	Common
38	*Chrysoplenium nepalense* D.Don	Sim jhar	Saxifragaceae	H	Rare
39	*Clematis montana* Buch.-Ham.ex DC		Ranunculaceae	CL_S	Less common
40	*Clematis acuminata* DC.		Ranunculaceae	CL_S	Less common
41	*Clematis buchnaniana DC.*	Pinase Lahara	Ranunculaceae	CL_S	Common
42	*Clematis connata* DC.	Pinase Lahara	Ranunculaceae	CL_S	Less common
43	*Coelogyne corymbsa* Lindl.		Orchidaceae	EP_Orch	Less common
44	*Coelogyne longipes* Lindl.		Orchidaceae	EP_Orch	Less common
45	*Coelogyne nitida* (Wall. D.Don) Lindl.	Chandi Gabha	Orchidaceae	EP_Orch	Less common
46	*Compylandra aurantiaca* Baker	Nakima	Liliaceae	H	RARE
47	*Crawfurdia affinis* Wall.ex C.B.Clarke	Crawfurdia	Gentianaceae	H	Less common
48	*Crawfurdia campnulaceae* Wall. & Griff.ex C.B.Clarke	Gentian vine	Gentianaceae	H	Less common
49	*Cymbidium lowianum* (H.G.Reich.) H.G. Reic.		Orchidaceae	EP_Orch	NT
50	*Cynoglossum zeylanicum* (Lehm.)Brand	Kanike Kuro	Boraginaceae	H	Common
51	*Dactylicapnos scandens* (D.Don.)Hutch.	Mutojhar	Papavaraceae	H	Common
52	*Decaisnea insignis* (Griffith) Hook.f.&T.	Rukh Gufla	Lardizabalaceae	S	RARE
53	*Dendrobium longicornu* Lindl.	Bawar	Orchidaceae	EP_Orch	Less common
54	*Didymocarpus aromatica* Wall ex D.Don	Kumkumpate/Ailo	Gesneraceae	H	Rare
55	*Elaegnus conferta* Roxb.	Malindo	Elaegnaceae	CL_S	Less common
56	*Elastostemma obtusum* Wedd.	Gagleto	Urticaceae	H	Common
57	*Elastostemma sessile* J.R.&G.forst.	Gagleto	Urticaceae	H	Common
58	*Elatostema monandrum* (Buch.-Ham ex D.Don)	Gagleto	Urticaceae	H	Less common
59	*Elsholzia fruiticosa* (D.Don.) Rehder	Sano Simal	Lamiaceae	H	Common
60	*Elsholzia strobilifera* (Benth.) Benth.	Ban Bawari	Lamiaceae	H	Common

SL	Species	Local name	Family	Habit	Status
61	*Enkianthus deflexus* (Griff.) C.K.Sch	Firke Kath	Ericaceae	T	Less common
62	*Equisetum diffusum* D.Don.	Kurkure jhar	Equisetaceae	FERN_ ALLIES	Common
63	*Eria spicata* (D.Don.) Hand.-Mazz.		Orchidaceae	EP_Orch	Less common
64	*Eurya accuminata* DC.	Sanu Jhiganae	Theaceae	T	Common
65	*Eurya japonica* Thunb.	Jhigini	Theaceae	T	Common
66	*Exbucklandia populnea* (R.Br.ex Griff.)R.W.Br.	Pipli	Hamamelidaceae	T	Common
67	*Ficus neriifolia* J.E. Smith	Dudhilo	Moraceae	T	Less common
68	*Fragaria nubicola* (Lind.ex Hook.f.) Lac..	Bhuin Aselu	Rosaceae	H	Common
69	*Fragaria vesca* L.	Bhuin Aselu	Rosaceae	H	Common
70	*Galinsaga parviflora* Cav.	Chitlange jhar	Asteraceae	H	Common
71	*Gallium elegans* Wall. Ex.Roxb.	Lahare Kuro	Rubiaceae	H	Common
72	*Gallium mollugo* L.		Rubiaceae	H	Common
73	*Gaultheria fragrantisima* Wall.		Ericaceae	H	Less common
74	*Gaultheria nummulariodes* D.Don		Ericaceae	S	Common
75	*Gaultheria* sp.		Ericaceae	S	Less common
76	*Gentiana albicalyx* Burkill.		Gentianaceae	H	Less common
77	Gerenium nepalense Sweet	Chunitro ghans	Geraniaceae	H	Common
78	*Goodyrea* sp.		Orchidaceae	Geop_ Orch	Less common
79	*Halenia elliptica* D. Don		Gentianaceae	H	Common
80	*Helewingia himalaica* Hook.f.&T.ex C.B.Clarke	Pipli	Hamamelidaceae	S	Rare
81	*Hemiphragma heterophyllum* Wall.	Lalgeri Jhar	Schrophulariaceae	H	Common
82	*Hemisdesmus indicus* (L) R.Br. Ex Schult.	Ananta mul	Apocynaceae	CL_S	Common
83	*Heracleum nepalense* D.Don	Chimphing	Apiaceae	H	Less common
84	*Holboelia latifolia* Wall.	Gufla	Lardizabalaceae	CL_ S	Less common
85	*Hydrangea heteromala* D.Don.	Halonre	Hydrangeaceae	S	Less common
86	*Hydrangea anomala* D.Don	Jangli Hydrangea	Hydrangeaceae	S	Less common
87	*Hydrocotyle himalaica* Hook.f.Muk.	Athanejhar	Umbelliferae	H	Common
88	*Hydrocotyle sibthorpoides* Lam	Athane jhar	Umbelliferae	H	Common
89	*Hypericum hookerianum* Wight & Arn.	Mehendi phul	Hypericaceae	S	Common
90	*Hypericum japonicum* Thunb.ex Murray		Hypericaceae	H	Less common
91	*Impatiens puberula* DC.	Bhende Ghans	Balsaminaceae	H	Common

Sketch: Dr S K Sinha

SL	Species	Local name	Family	Habit	Status
92	*Impatiens racemosa* DC.		Balsaminaceae	H	Common
93	*Impatiens stenantha* Hook.f.		Balsaminaceae	H	**EN**
94	*Juncus* sp.		Juncaceae	H	Less common
95	*Juncus effusus* L.	Jwane jhar	Juncaceae	H	Less Common
96	*Lactuca dissecta* D. Don	Dude jhar	Asteraceae	H	Common
97	*Laportea terminalis* Wight.	Patle sisnu	Urticaceae	S	RARE
98	*Leibritzia nepalaensis* (Kunt.) Kitamura	Zerbera	Asteraceae	H	Less common
99	*Leycesteria stipulta* (Hook.f. & T.) Fr.	Bherikuro	Caprifoliaceae	S	Rare
100	*Liparis* sp.		Orchidaceae	EP_Orch	RARE
101	*Lithocarpus pachyphyllus* (Kurtz) Rehder	Bante/Sungre katus	Fagaceae	T	Less common
102	*Lobelia montana* Reinw.	Eklebir	Campaanulaceae	H	Less Common
103	*Lobelia montana* Reinw.	Eklebir	Campaanulaceae	H	Less common
104	*Lonicera glabrata* Wall.	Honeysuckle	Caprifoliaceae	S	Less common
105	*Lycopodium clavatum* L.	Nagbeli	Lycopodiaceace	FERN_ ALLIES	Rare
106	*Lyonia ovalifolia* (Wall.) Drude	Balu jhar	Ericaceae	T	Less common
107	*Lyonia villosa* (Wall ex C.B.Clarke) Hand. Mazz.	Lek Angeri	Eriaceaec	S	RARE
108	*Machilus gamblei* King. Ex Hook.f.	Kawla	Lauraceae	T	Less common
109	*Machilus gammieana* King ex Hook.f.	Chiple Kawlo	Lauraceae	T	Less common
110	*Maesia montana* A.DC.	Kalo Bilaunae	Myrsinaceae	S	Common
111	*Magnolia doltsopa* (Buch.-Ham. Ex DC.)Figlar	Rani/Mithe Champ	Magnoliaceae	T	Less common
112	*Magnolia campbellii* Hook. F. & T.	Ghoge Champ	Magnoliaceae	T	Rare
113	*Mahonia nepaulensis* DC.	Kesari/Chtro	Berberidaceae	S	Less common
114	*Meliosma pinnata* (Roxb.) Max.	Lekh Dabdabe	Sabiaceae	T	Common
115	*Mimulus nepalensis* Benth.		Schrophulariaceae	H	Less common
116	*Molineria capitulata* (Lour.) Herb	Dhotisara	Hypoxidaceae	H	Less common
117	*Myriacts nepalensis* Less.	Tuke phul	Asteraceae	H	Common
118	*Myrsine semiserrata* Wall.	Kalikath	Myrsinaceae	S	Less common
119	*Nasturtium officinale* R.Br.	Simrayo	Brassicaceae	H	Common
120	*Neillia thyrsiflora* D.Don		Rosaceae	S	Common
121	*Neohymenopogon parasiticus* (Wall.) Bennet	Jhanti phul	Rubiaceae	S	Less common
122	*Oenanthe thomsoni* C.B.Clarke	Water dropwort	Apiaceae	H	Less common

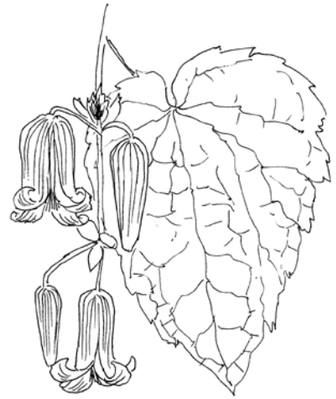
SL	Species	Local name	Family	Habit	Status
123	*Ophiopogon intermedius* D. Don.	Kaligeri	Liliaceae	H	Common
124	*Otochilus lancilabius* Sei.	Otochilous	Orchidaceae	EP_Orch	Less common
125	*Otochilus fuscus* Lindl.	Otochilous	Orchidaceae	EP_Orch	Less common
126	*Panax pseudoginseng* Wall.	Satpate	Araliaceae	H	**CR**
127	*Paris polyphylla* Sm.	Satuwa	Liliaceae	H	Rare
128	*Parochetus communis* Buch Ham ex D.Don	Chemgi phul	Fabaaceae	H	Common
129	*Pedicularis* sp.		Scrophulariaceae	H	Less common
130	*Pentapanax leschenaulty* Seem.	Chinde	Araliaceae	T	Common
131	*Peristylus* sp.		Orchidaceae	Geoph_ Orch	Less common
132	*Persicaria campanulata* (Hook.f.) Rons.	Thotne	Polygonaceae	H	Common
133	*Phlomoides hamosa* (Benth.) Math.	Dalle_Kuro	Lamiaceae	H	Less common
134	*Photinia integrifolia* Lindl.	Phalame	Rosaceae	T	Less common
135	*Pilea umbrosa* Blume		Urticaceae	H	Common
136	*Pimpinella diversifolia* DC.		Apiaceae	H	Less common
137	*Pinus* sp.	Salla	Pinaceae	T	Common
138	*Plagiogyria communis* R.C.Ching		Plgiogyriaceae	FERN	Less common
139	*Plantago asiatica ssp.erosa* (Wall.) Z.Yu.Li	Nasey jhar	Plantaginaceae	H	Common
140	*Pleione praecox* (Sm.) D.Don		Orchidaceae	EP/ LITH_ Orch	Less common
141	*Polygonatum oppositifolium* (Wall.) Royle		Liliaceae	H	Less common
142	*Populos glauca* Haines	Lek Pipalpatey	Salicaceae	T	Less common
143	*Potentila fruiticosa* L.	Bansupari	Rosaceae	H	Common
144	*Primula scapigera* (Hook.f.) Craib	Primula	Primulaceae	H	Less common
145	*Prunella vulgaris* L.		Labiatae/Lamiaceae	H	Common
146	*Querccus lineata* Blume	Phalant	Fagaceae	T	Less common
147	*Quercus lamellosa* Sm.	Buk	Fagaceae	T	Less common
148	*Ranunculus diffusus* DC.	Nakkore Jhar	Ranunculaceae	H	Less common
149	*Rhodendron dalhousae* Hook.f.	Lahare Chimal	Ericaceae	S	Rare
150	*Rhododendron arboreum* Smith.	Lali Gurans	Ericaceae	T	Common
151	*Rhododendron barbaratum* G. Don	Lal Chimal/Junge Chimal	Ericaceae	T	Vulnerable

Assesment team near Jaributi Camp

SL	Species	Local name	Family	Habit	Status
152	*Rhododendron cinnabarinum* Hook.f.**		Ericaceae	S	Near Threatened
153	*Rhododendron edgeworthii* Hook.f.	Edgeworth ko Chimal	Ericaceae	S	EN
154	*Rhododendron falconeri* Hook.f.	Pahenlo Korlinga	Ericaceae	T	LC
155	*Rhododendron glaucophyllum* Rehder**	Takme Chomal	Ericaceae	S	Rare
156	*Rhododendron grande* Wight.	Patle Korlinga	Ericaceae	T	Common
157	*Rhododendron griffithianum* Wight	Seto Chimal	Ericaceae	T	**NT**
158	*Rhododendron lindleyi* T.Moore	Sano Lahare Chimal	Ericaceae	S	Rare
159	*Rhododendron triflorum* Hook.f.	Pahenle Chimal	Ericaceae	S	Vulnerable
160	*Rhododendron vaccinoides* Hook.f	Khiune pate Chimal	Ericaceae	S	Rare
161	*Rhopalocnemis* sp.		Balanophoraceae	Para_H	Rare
162	*Rosa sericea* Wall.ex Lindl.	Jangli Golap	Rosaceae	S	Less Common
163	*Rubia manjith* Roxb.ex Fleming	Manjito	Rubiaceae	H	common
164	*Rubus calycinus* Wall ex D. Don	Bhuin Aselu	Rosaceae	H	Common
165	*Rubus ellipticus* Sm.	Aselu	Rosaceae	S	Common
166	*Rubus lineatus* Rein. Ex Blume	Ghyampe Aselu	Rosaceae	H	Common
167	*Rubus moluccanus* L.	Bhote Pan	Rosaceae	CL_S	Common
168	*Rubus moluccanus* L.	Bhote Pan	Rosaceae	CL_S	Common
169	*Rubus paniculatus* Sm.	Kalo Aselu	Rosaceae	CL_ S	Common
170	*Rubus rosifolius* Sm.	Gempe Aselu	Rosaceae	S	Common
171	*Rubus splendidissimus* H.Hara	Phusre Aselu	Rosaceae	CL_S	Common
172	*Rubus wardii* Merill	Kanre Aselu	Rosaceae	S	Common
173	*Rumex nepalensis* Spreng.	Halhale	Polygonaceae	H	Common
174	*Sabia campanulata* Wall.ex Roxb.	Simali Lahara	Sabiaceae	S	Less common
175	*Sanicula elata* D.Don		Umbelliferae	H	Less Common
176	*Sarcopyramis nepalensis* Wall.		Melastomataceae	H	Common
177	*Satyrium nepalense* D.Don		Orchidacea	Geop_ Orch	Rare
178	*Saurauia nepaulensis* DC.	Gogun	Actinidiaceae	T	Common
179	*Saussurea deltoidea* (DC) Sch.-Bip.		Asteraceae	H	Common

SL	Species	Local name	Family	Habit	Status
180	*Schefflera elata* (Buch.-Ham.) Harms	Gufla	Araliaceae	T	Less common
181	*Schefflera rhododendrifolia* (Griff.) Frodin	Bhalu Chinde	Araliaceae	T	Less common
182	*Scheflera elata* Harms	Gufla	Araliaceae	T	Common
183	*Schisandra grandiflora* Wall. Hook.f.& T	Singaute lahara	Schisandraceae	CL_S	Common
184	*Senecio acuminata* (DC.) Jeffrey & Chen		Asteraceae	H	Common
185	*Senecio scandense* Buch.-Ham ex D.Don		Asteraceae	H	Common
186	*Smilax elegans* Wall. Ex Kunth.	Kukurdaino	Smilacaceae	CL_S	Common
187	*Smilax ferox* Wall. ex Kunth.	Kukudaino	Smilacaceae	CL_S	Common
188	*Smilax myrtillus* A.DC. Var. *rigida* Nolie	Kare Kukurdaino	Smilacaceae	S	Rare
189	*Sorbus foliolosa* (Wall. ex Hook.f.)	Thulo Pasi	Rosaceae	T	Common
190	*Sorbus vestita* (G. Don) Lod.	Tenga	Rosaceae	T	Rare
191	*Stellaria sikkimensis* Hook.f. ex Edgeew.& Hook.f.		Caryophyllaceae	H	Common
192	*Strobianthes capitata* Nees	Ankhle	Acanthaceae	S	Common
193	*Strobilanthes helicta* T. Anderson	Ankle	Acanthaceae	S	Common
194	*Strobilanthes pentstemonoides* (Nees) T. And.	Ankhle	Acanthaceae	H	Common
195	*Strobilanthus divericata* (Nees) T. Anderson	Ankhle	Acanthaceae	H	Common
196	*Swertia bimaculata* (Sieb.&Zucc.) Hook.f.&T.	Bhale Chirowto	Gentianaceae	H	Common
197	*Swertia chirayita* (Roxb.) H.Karst.	Chiraito	Gentianaceae	H	**CR**
198	*Swertia paniculata* Wall.		Gentianaceae	H	Less common
199	*Swertia* sp.		Gentianaceae	H	Less common
200	*Symplocos glomerata* King ex C.B. Clarke	Kharane	Symplocaceae	T	Common
201	*Symplocos lucida* (Thunb.) Sieb & Zucc.	Ghole/Kharane	Symplocaceae	T	Common
202	*Synotis alata* (Wall.ex Wall.) C.Jeff.		Asteraceae	H	Less common
203	*Synotis wallichii* (DC.) C.Jeff. & Y.L. Chen		Asteraceae	H	Less common
204	*Synotis alata* (Wall ex Wall.) C.J.		Asteraceae	H	Common
205	*Synotis wallichii* (DC.) C.Jeffrey & Y.L. Chen		Asteraceae	H	Common
206	*Tainia minor* Hook.f.		Orchidaceae	Geop._ Orch	Rare
207	*Taxus wallichiana* Zucc.	Dhyangre Salla	Taxaceae	T	**CR**
208	*Tetradium fraxinifolium* (Hook.f.) T.G. Hart.	Khanakpa	Rutaceae	T	Common
209	*Tetrastigma serrulatum* (Roxb.) Planch.	Charchare (Syaano)	Vitaceae	CL_S	Common
210	*Thalictrum saniculiforme* DC.		Ranunculaceae	H	Rare

SL	Species	Local name	Family	Habit	Status
211	*Thamnocalamus spathiflorus* (Trin.) Munro	Rato Nigalo	Poaceae	BAMB	Less common
212	*Tripterospermum volubile* (D. Don) H. Hara		Gentianaceae	H	Less common
213	*Tsuga dumosa* (D. Don) Eichler	Thingre Sall	Pinaceae	T	Less common
214	*Vaccinium nummularia* Hook.f.&T.		Ericaceae	S	Rare
215	*Vaccinium retusum* (Griff.) Hook.f.ex C.B.Clarke		Ericaceae	S	Common
216	*Vaccinum vaccinaceum* (Roxb.) Sleu.	Charu	Ericaceae	S	Less common
217	*Valeriana hardwickii* Wall.	Bhale Jatamansi	Valerianaceae	H	Less common
218	*Viburnum erubescence* Wall. ex DC.	Asare	Adoxaceae	S	Common
219	*Viburnum mullaha* Buch.-Ham. Ex D.Don	Mulla Asare	Adoxaceae	S	Less common
220	*Viola biflora* L.	Ghatte	Violaceae	H	Common
221	*Viola hamiltoniana* D. Don	Ghatte	Violaceae	H	Common
222	*Viola pilosa* Blume	Bunufsa	Violacea	H	Common
223	*Yushania maling* (Gamble) R.B.Majumdar	Malingo	Poaceae	BAMB	Common
224	*Zanthoxylum armatum* DC.	Bokey Timbur	Rutaceae	T	Rare
225	*Zanthoxylum oxyphyllum* Edgew.	Lahare Timbur	Rutaceae	CL _S	Common
226	*Zeuxine goodyeroides* Lindl.		Orchidaceae	Geop_ Orch	Less common



Sketch: Dr S K Sinha

Identification and Text by: D Basnet, WBFS

Photographs by: Ujjal Ghosh, IFS

A RARE HIBISCUS FRAGRANS (MALVACEAE) RECORDED FROM NEORA VALLEY NATIONAL PARK, KALIMPONG.

During our floristic survey in the NVNP, we came across a liana in flowering and fruiting condition in December 2018. It was identified as *Hibiscus fragrans* Roxb. of Malvaceae. Search in different herbaria including CAL, CUH, BSHC, NBU and Lloyd Botanic Garden, Darjeeling failed to trace even a single specimen from West Bengal (Das *et al.*, 2013). Paul (1993) recorded its occurrence from the nearby states. Miller & Long (1991) recorded the occurrence of the species from Darjeeling Hills (300 – 1220 m). However, in all these cases the claimed records are based on very old specimens.

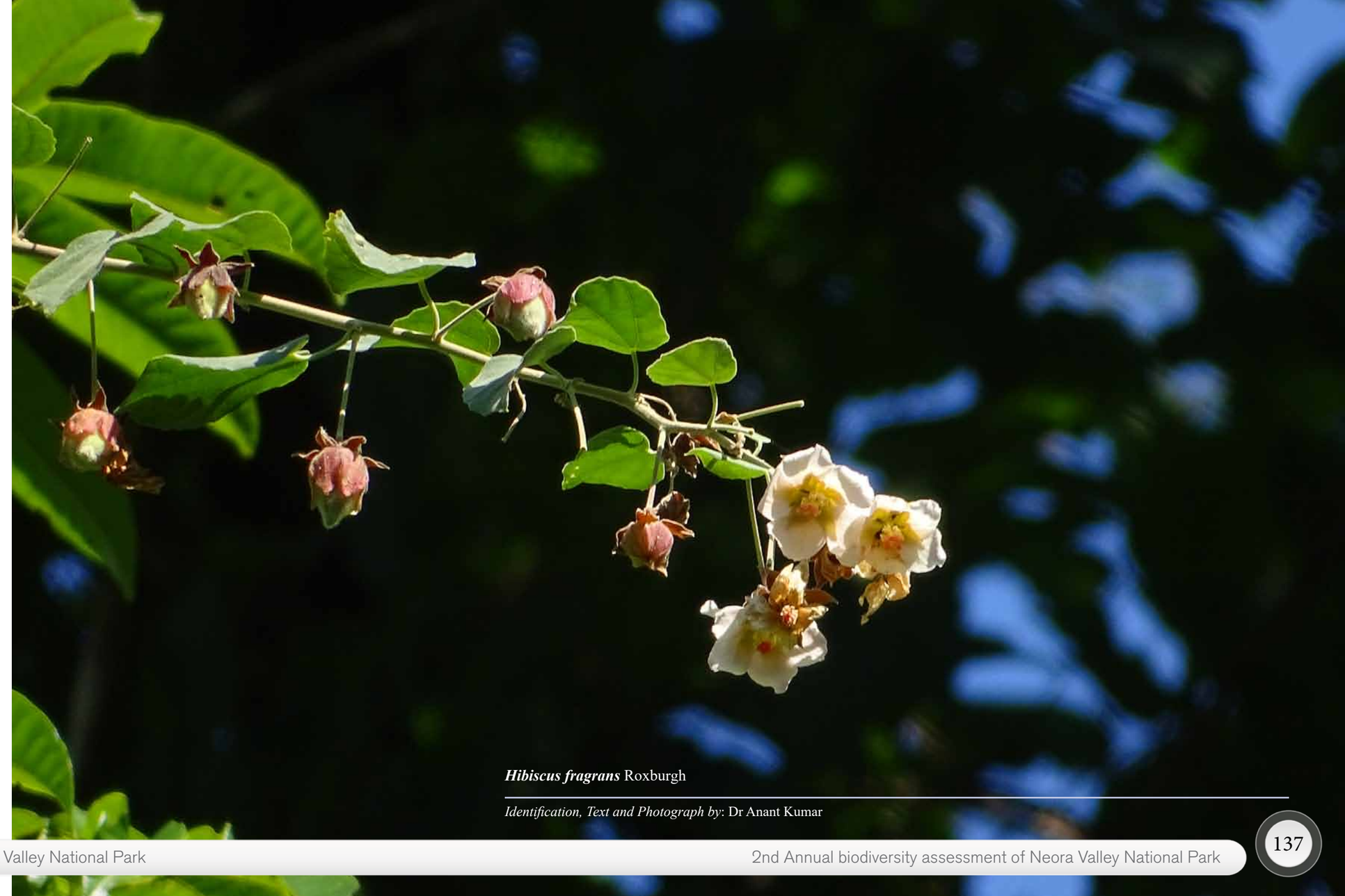
The last known collection of the species in India is from the Lohit district of Arunachal Pradesh in 1969. This expresses the rarity of the plant. In 2002, only one plant was recorded from Jaldapara WLS (Das *et al.*, 2013). Recently in December 2018, it is again recorded from Samsing range of Neora Valley National Park, Kalimpong.

Hibiscus fragrans Roxburgh (Hort. Beng. 97. 1814, *nom. nud.*) Fl. Ind. 3: 195. 1832.

Flowers & Fruits: October - January.

Distribution: INDIA: Arunachal Pradesh, Assam, Meghalaya, Nagaland, Mizoram, Manipur, Sikkim, West Bengal.

Note: *Hibiscus fragrans* Roxburgh is to be treated as an endangered plant. The plant may be explored for the production of perfume that can be used in cosmetics. The population of the species can be easily increased through vegetative propagation and can be re-introduced in its natural habitat. Also, the plant is also to be introduced into the *ex situ* conservatories for fast multiplication and exploitation (Das *et al.*, 2013).



Hibiscus fragrans Roxburgh

Identification, Text and Photograph by: Dr Anant Kumar

Cirrhopetalum wallichii

Orchids

Check List of available Orchid Species of second Biodiversity Camp at Neora Valley

SL	Terrestrial Orchid Species	Stage
1	*Anthogonium gracile* Lindl.	Flowering
2	*Calanthe biloba* Lindl.	Flowering
3	*Calanthe brevicornu* Lindl.	Vegetative
4	*Goodyera schlechtendaliana* Rchb. f.,	Flowering
5	*Goodyera vittata* (Lindl.) Benth. *ex* Hook. f.,	Flowering
6	*Herminium lanceum* (Thumb. *ex* Sw.) Vuijk.	Flowering
7	*Herminium mackinonii* Duthie	Vegetative
8	*Herminium quinquelobum* King & Pantl.	Vegetative
9	*Liparis petiolata* (D. Don) Hunt & Summerh.	Vegetative
10	*Microstylis wallichii* Lindl.	Vegetative
11	*Odontochilus crispus* (Lindl.) Hook. f.	Flowering
12	*Odontochilus grandiflora* (Lindl.) Benth. Hook. f.	Fruiting
13	*Odontochilus lanceolatus* (Lindl.) Bl.	Flowering
14	*Platanthera biermanniana* (King & Pantl.) Kranz.	Flowering
15	*Rhomboda lanceolata* (Lindl.) Ormerod	Vegetative
16	*Satyrium nepalense* D. Don, var. *nepalense*	Vegetative
17	*Satyrium nepalense* D. Don, var. *ciliatum* (Lindl.) Hook. f.	Flowering
18	*Spiranthes sinensis* (Pers.) Ames.	Flowering
19	*Tainia minor* Hook. f.	Vegetative
20	*Tipularia josephii* Rchb. f. *ex* Lindl.	Fruiting
21	*Zeuxine goodyeroides* Lindl.	Flowering

Satyrium nepalense D. Don, var. *ciliatum* (Lindl.) Hook. f.

Cymbidium hookerianum

Bulbophyllum yoksunense

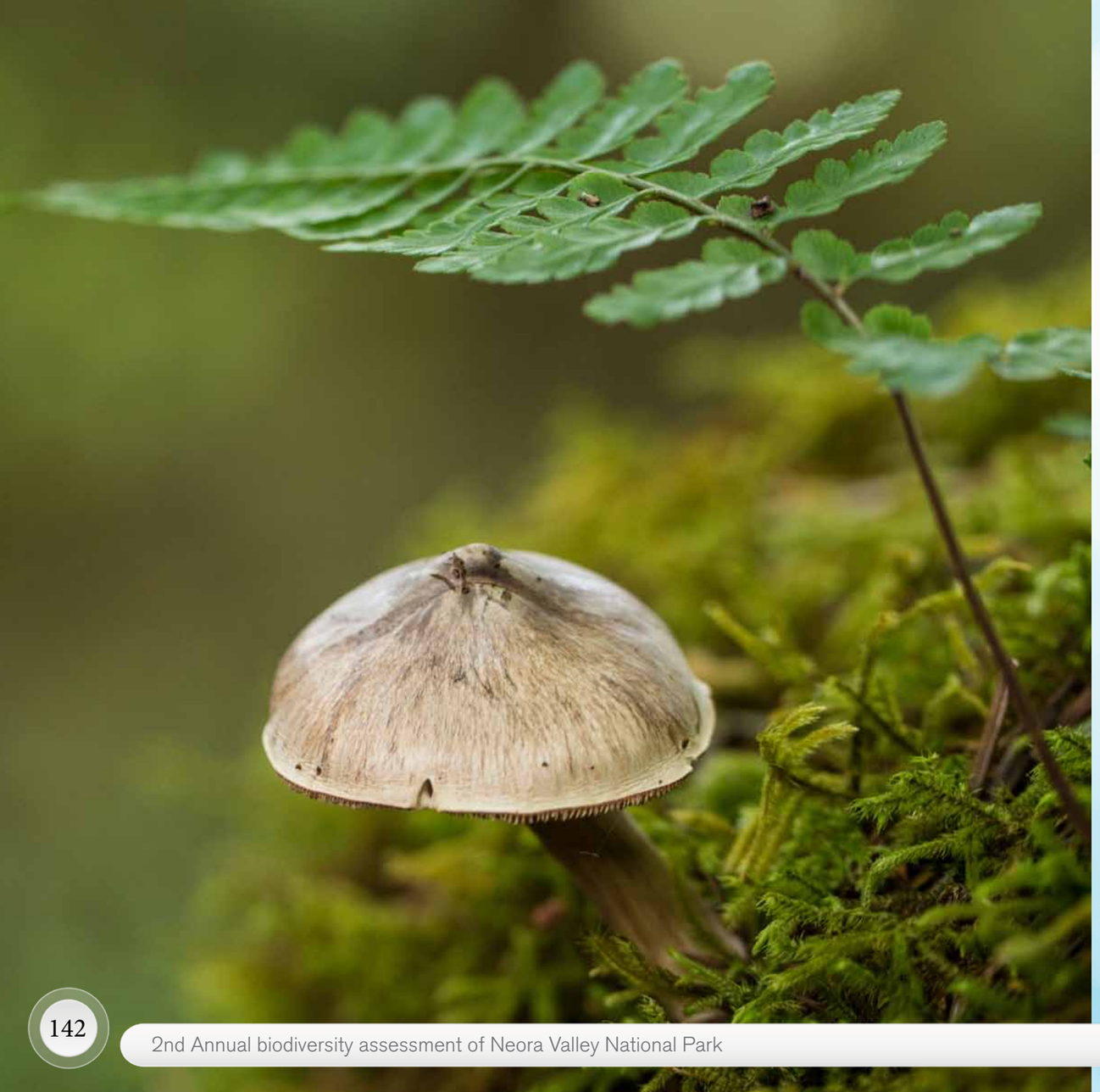
Dendrobium longicornu

Coelogyne barbata

SL	Epiphytic Orchid Species	Stage
22	*Acrochaene punctata* Lindl.	Vegetative
23	*Agrostophyllum myranthum* King & Pantl.	Vegetative
24	*Bulbophyllum bisetum* Lindl.	Vegetative
25	*Bulbophyllum cauliflorum* Hook. f.	Vegetative
26	*Bulbophyllum helenae* (Kuntze) J. J. Sm.	Vegetative
27	*Bulbophyllum hymenanthum* Hook. f.	Vegetative
28	*Bulbophyllum leopardinum* (Wall.) Lindl.	Vegetative
29	*Bulbophyllum reptans* (Lindl.) Lindl.	Flowering
30	*Bulbophyllum striatum* (Griff.) Rchb. f.	Vegetative
31	*Bulbophyllum yoksunense* J.J. Sm.	Flowering
32	*Cirrhopetalum wallichii* Lindl.	Flowering
33	*Coelogyne barbata* Lindl. *ex* Griff.	Flowering
34	*Coelogyne corymbosa* Lindl.	Vegetative
35	*Coelogyne longipes* Lindl.	Budding
36	*Coelogyne occultata* Hook. f.	Vegetative
37	*Coelogyne pantlingii* Lucksom	Vegetative
38	*Cymbidium erythraeum* Lindl.	Flowering
39	*Cymbidium hookerianum* Rchb. f.	Vegetative
40	*Cymbidium longifolium* D. Don	Flowering
41	*Dendrobium chrysanthum* Wall. *ex* Lindl.	Budding
42	*Dendrobium longicornu* Lindl.	Flowering
43	*Dendrobium porphyrochilum* Lindl.	Vegetative
44	*Epigenium amplum* (Lindl.) Summerh.	Vegetative
45	*Epigenium rotundatum* (Lindl.) Summerh.	Vegetative
46	*Eria coronaria* (Lindl.) Rchb. f.	Vegetative
47	*Eria spicata* (D. Don) Handel-Mazzetti	Vegetative
48	*Gastrochilus distichus* (Lindl.) Kuntze	Budding
49	*Gastrochilus pseudodistichus* (King & Pantl.) Schltr.	Budding
50	*Liparis botanensis* Griff.	Flowering
51	*Liparis cespitosa* (Lamk.) Lindl.	Vegetative
52	*Oberonia falcata* King & Pantl.	Vegetative
53	*Ornithochilus difformis* (Wall. *ex* Lindl.) Schltr.	Vegetative
54	*Otochilus fuscus* Lindl.	Vegetative
55	*Otochilus lancilabius* Seidenf.	Vegetative
56	*Pleione humilis* (J. E. Sm.) D. Don	Vegetative
57	*Pleione praecox* (J.E. Sm.) D. Don	Flowering
58	*Vandopsis undulata* (Lindl.) J. J. Sm.	Vegetative

Identification and Text by: Dr R Yonzone

Photographs by: Ujjal Ghosh, IFS



Fungi

Macrofungi are the visible reproductive structures produced by various species under the kingdom fungi. They come in numerous shapes, sizes, colours and smell; however, they are neither plants nor animals. They perform a number of ecological processes ranging from decomposing organic matter as saprotrophs, acting as ectomycorrhizal partner and buffering environmental stress along with providing nutritive support to the host plants, whereas some species also negatively impact hosts through parasitism. Globally 1069 species are used as food and 470 species are considered to have medicinal value (Boa 2004), while some are poisonous to humans.

Global fungal diversity is estimated to be 2.2 to 3.8 million (conservative estimate of 1.5 million) whereas only 120000 of them have currently been explored (Hawksworth & Lücking, 2017). About 14,400 species (including fungal analogues) are reported from India (bsienvis.nic.in, accessed 26.07.2019) of which more than 850 are macrofungi (Manoharachary et al., 2006).

Then where are the remaining fungi? to this Hawksworth & Lücking (2017) have pointed towards Biodiversity Hotspots as one of the sources of hidden fungal treasures, which India have four of them.

Once traversed and pioneering study on macrofungi of the region carried out by Sir J.D. Hooker, Eastern region of Himalayan Biodiversity Hotspot possess ample hosts and habitat for various assemblages of macrofungi to prosper. Preliminary study suggests Darjeeling-Kalimpong belt of Eastern Himalaya to be represented by more than 100 species of macrofungi (Pradhan et al., 2016; Paloi et al., 2015, 2016) with representation of more than 72 genera and 47 families. Reportedly 58.16% of which are saprotrophs, 17.34% are ectomycorrhizal and 10.2% are parasitic (Pradhan et al., 2016). Hawksworth & Lücking's theory has been proving to be true with the time and again discovery of novel species of macrofungi like *Russula buyckii*, *R. darjeelingensis*, *R. hookeri* etc. from the region (Paloi et al., 2015, 2016, 2018).

Amanita Sp. (close to *Amanita rubrovolvata*)

Russula sp.

Ecological role of macrofungi in Eastern Himalayan forests are significant in the sense those belonging to Amanitaceae (*Amanita* sp.), Boletaceae (*Boletus* sp., *Strobilomyces* sp.), Entolomataceae (*Entoloma* sp.), Hydnangiaceae (*Laccaria* sp.), Russulaceae (*Lactifluus* sp., *Russula* sp.) etc. enter into ectomycorrhizal association with native tree species, mainly *Castanopsis* sp., *Quercus* sp., *Lithocarpus* sp., and sometimes *Betula* sp. etc. thereby promoting wellbeing of overall forest health.

The saprotrophs belonging to Agaricaceae (*Lycoperdon pyriforme* Schaeff.), Auriculariaceae (*Auricula* sp.), Hygrophoraceae (*Hygrocybe* sp.), Omphalotaceae (*Gymnopus* sp.), Physalacriaceae (*Oudemansiella* sp.), Psathyrellaceae (*Coprinellus* sp.), Strophariaceae (*Hypholoma* sp., *Pholiota* sp.) etc. colonize plant detritus thereby playing crucial role in nutrient recycling along with conditioning of forest soil. On the contrary some parasitic/ weakly parasitic species such as *Laetiporus* sp. (Fomitopsidaceae) and other polypores are known to negatively affect health of forest trees.

Another interesting aspect of macrofungi are that they are ephemeral and sometimes cryptic, therefore certain fleshy macrofungi which may be associated with certain trees, may play cameo for a short while in the gala forest ecological affair; some hard fruit bodied polypores (mostly parasitic) may persist year after year; some cryptic species may have underground fruiting strategy and while some may not come under human observation at all.

Entoloma sp.

Russula sp

Laetiporus sp

Lycoperdon pyriforme

Laetiporus sp

Pholiota sp (close to *P. squarrosa*)

Member of Boletaceae

Hygrocybe sp

Strobilomyces sp

Identification and Text by: Dr Prakash Pradhan

Photographs by: Dr Nakul Chettri & Ujjal Ghosh, IFS

Exploration team at Alubari

CONCLUSION

Documentation and regular monitoring of biodiversity in any wild ecosystem is the very fundamental step to design an effective plan for the conservation of the wild habitats and wild inhabitants living in it, and to implement such plan successfully. But, that needs a long term and in-depth collaborations between ecologists, taxonomists, field naturalists and managers of such ecosystems. Unfortunately, rarely that happens in our country and managers of wild ecosystems, for example, the departments of forests, had to depend often on insufficient data on the biodiversity and ecosystem dynamics. Therefore, any effort to form such a collaborative team to do field survey of the biodiversity in any wildness habitat is commendable. More so, when the habitats are the hitherto unsurveyed, inaccessible forest patches on the slopes of a potentially rich biodiversity area the Neora Valley National Park (NVNP), West Bengal, lying within the global biodiversity hotspot - the Eastern Himalaya.

The NVNP, initially established with 84 km^2, has been added with adjoining forest areas and thus, expanded to an area of 159.78 km^2 by 2017. With a wide range of environmental gradients (183m – 3,200m), the park includes a diversity of habitats and ecosyetems, thus, expected to score high in beta diversity too in turning over of floral and faunal communities across the atitudinal gradient. These patterns are very much apparent from the changes in the species compositions of trees, birds, spiders and other communities across the altitudes, as observed in the last two biodiversity camps. The high topographic variations within an altitudinal zone and variations within species that are having wider vertical distributions, i.e. across the altitudes, are sure to add more to the overall biodiversity values of NVNP.

A total of 148 species birds have been identified and recorded, in comparison to 177 species recorded in the first camp. The decline in the species recording could be more to do with the lesser sampling opportunities due to higher frequency of rainy and mist covered hours in the second camp than any real difference in the species difference between two camp sites. Anyway, there are quite a few new species recorded during the 2nd Camp, thus adding up to the cumulative total of the bird species recorded in two Biodiversity camps so far. On has to keep in mind too that of all animal groups, birds are best observed one in NVNP, thanks to the frequent visits by bird loving trekkers for many years in the park area.

The intensive search Herpetofauna in all potential habitats except at the highest altitude of Alubari camp and above, which was expected to yield high species richness figures for reptiles and amphibians inhabiting the park, did not give much return, very likely owing to unfavourable weathers. Yet, the first ever recording of the Caecilian, *Icthyophys sikkimensis* from the state is a remarkable one. Also, all the five species of frogs documented are posing some challenges in the species level identifications of them by renowned experts. Further analysis of them are required for that.

More encouraging results have been awarded by the so called lesser wildlife groups, i.e. invertebrates. For example, survey of **Dipteran insects** during the second camp alone have yielded a species richness of 144 species of which **44 are of unknown status, i.e. with high probability of being species new to science, 14 are for the first time record from the state and one first time from India**! Similarly, one of the very encouraging reports came from the ants, of the only 16 species collected during the 2nd Camp (a low figure for a high tropical diversity group like Ants, probably, the rains and cold to blame for it), **one is certainly a new species of a genus which is reported to have only another species of the genus from Meghalaya, India**. The claim for the new species has been communicated by the collaborative ant taxonomists.

Spiders are also a keystone predator groups at the scale of smaller biomass in the tropical wilderness. The idea is corroborated by the diversity of spiders and their niche diversity recorded so far from the NVNP by just two survey camps. Unfortunately, the ultimate species identity of a spider resides hidden in its genitalia and thus, needs microscopic studies in the lab, it would take little more time to identify the species affiliations of 89 genera representatives sampled in the 2nd Camp. To expect a few new species, a few new records from the state or the country out of that study, is a guess but certainly a scientific one, as felt the field arachnologist in the team.

Odonates were not noted to be abundant, dominated by few species apparently common in the region and that altitudes but the larval microhabitats recorded so far have ignited more scientific questions for further enquiry during more favourable seasons in future.

Out of 37 species of butterflies recorded in the 2nd Camp, a representative picture of the butterfly diversity could be constructed, though far from being a complete one. Most significantly, an intense search for specific butterfly species were undertaken in the 2nd Camp which indicated the highly positive probability of two most celebrated species of Himalayan butterflies, namely the Kaiser-i-Hind and Bhutan Glory, being in the higher localities of the surveyed areas in NVNP.

The team had failed to include any Moth specialist in the camps so far. Yet, photographs of many moths of astounding forms in varieties of body shapes and colours visiting the Camp lights were photographed and send for identifications to Moth experts. They could identify almost all of them and added a few notes for each to give an idea of the diversity of this neglected animal group in most biodiversity surveys in India.

There was no attempt was made to search any other sampling methods other than depending on information obtained from the camera traps laid already by the NVNP authority in the region. A total of 24 mammals have been recorded by camera traps so far, 13 are of any IUCN categories of high concern for conservation, i.e. vulnerable/Threatened/near Threatened/Endangered ones, 12 are included in Schedule-I of the WLPA, 1972.

Scientists, researchers, orchid specialist, senior officer of forest dept having profound taxonomic knowledge of flora of Himalayan region undertook the floral assessment works & prepared detail list with a comparison with the previous year's assessment. New findings on Hibiscus, orchid has already been published by the concerned resource person.

Macrofungi (fungus of easily visible size by naked eyes) were not in the list of taxa planned to be sampled and studied in the two NVNP camps. But, the diversity of their eye catching colours and shapes like the moths forced us to capture their photos fortuitously. Based on these photos, the identifications were made.

The two camps so far organized have provided with 6 well scattered patches covering all altitudinal zones. But, they are far from being sufficient, given the diversity of topography, vegetations, biotic impacts, microclimates, etc. More patches in either camps needed to be sampled from different other areas, especially, those in the more inaccessible patches, along with better coverage of seasonal variations in these samplings, if, we want to get a nearly complete picture of biodiversity and its relations with habitat dynamics in NVNP. Of course, the management, i.e. NVNP authority can not and should not wait for such complete picture to emerge for planning its management strategies and act accordingly. Such actions can suitably be evolved and applied in piecemeal following understandings gained from successive biodiversity survey camps. One of the example of this, is the field experiments set immediately after the 2nd camp, to find out the best method for controlling the aggressive invasion of canopy habitats by Maling bamboo in most part of the NVNP.

Exploration team near PHE Camp

THE FIELD SURVEY TEAM

Dr Silanjan Bhattacharya

Professor, Department of Zoology, West Bengal State University is one of the few naturalist and biodiversity specialist of our country. He was instrumental in coordinating the biodiversity assessment camp as well as compiling and analysing the final report.

Dr Nakul Chettri

Sr. Biodiversity Specialist of International Centre for Integrated Mountain Development (ICIMOD) & Programme Coordinator, Kangchenjunga Landscape Conservation and Development Initiative (KLCDI) participated in the 2nd camp too as an advisor and guide which immensely helped us analysing and compiling the report.

Dr S N Ghosh

Sr. Research Officer of West Bengal Biodiversity Board participated this time in the camp as a resource person on Hymenoptera and other insects. His advise and guidance will help documenting important biodiversity resources of our state in the future.

Dr Anant Kumar

Sr. Research Scientist of Botanical Survey of India participated in the camp as a resource person on Himalayan Flora. Apart form identifying the tree of this region he has found some rare herbs & orchids from this region too.

Sri D B Basnet, WBFS

DFO, Darjeeling Social Forestry Division is probably the best working forest officer of our state having profound knowledge on Himalayan flora particularly the Angiosperms. He was instrumental in identifying the floral diversity of NVNP during this year also.

Sri Apurba Chakraborty

of Prakriti Sansad is a well-known Avifauna specialist of our country. His profound knowledge on the subject helped us a lot in identifying the avifauna of NVNP and updating its checklist.

Dr Shuvra Kanti Sinha

Asst. Professor of Zoology, Sonamukhi College, Bankura is a renowned Dipterist of our state. He has published many books and science articles in the national and international level. He has successfully completed many research projects. He also visited Costarica and Germany for research purpose and was instrumental during the camp in identifying the rare and unknown flies of this PA.

Sri Animesh Bose

Programme Co-Ordinator, **HNAF**, Siliguri - a well-known naturalist of our state, has vast experience on Himalayan flora and fauna. His guidance and effort in organizing several nature camps across the state tremendously helped us arranging the Biodiversity Assessment Camp of NVNP this year too.

Sri Prosenjit Dawn

of **Nature Mates-Nature Club** - an assistant professor working with the Odonates is the leading face from West Bengal in his area of research. He is having collaborations with various national and international group, who are working on Indian Odonates. He is currently pursuing his PhD under Dr. Kailash Chandra, Director ZSI on Odonates of Chattishgarh.

Dr Rajendra Yonzone

of Kalimpong is one of the leading expert on Himalayan Orchids. His knowledge on Orchids helped us immensely identifying the orchids of NVNP during the 2nd camp.

Miss Sarika Baidya

of **Nature Mates-Nature Club** is working on plant butterfly interdependence and life history of Butterflies, mostly from West Bengal and North-eastern States of India. She is doing her project under Dr. Krushnamegh Kunte. She is also instrumental in setting up various Butterfly Gardens, in West Bengal.

Sri Anirban Chaudhuri

of **Wildlife Conservation Society, India** - a specialist of Harpetofauna, though a commerce graduate, Anirban has published a large number of scientific papers and short notes on various aspects of reptiles from West Bengal in the recent past.

Sri Soumya Sarkar

A naturalist by passion and a research fellow doing his PhD under Dr Silanjan Bhattacharyya, on various aspect of Birds in Rural and Urban settlement. Soumya also keeps a keen interest in indigenous fish fauna and had authored a very popular Bengali book on snakes of West Bengal. His field drawings has also enriched the publication.

Sri Ayan Mondal

Participated in the camp as a spider specialist. He tirelessly roams in the forest in search of species. His attitude and enthusiasm in the field inspires the fellow participants a lot. Presently perusing his PhD from Burdwan university.

Sri Tarun Karmakar

Curator of NCBS, Bangalore partcipated in the camp as a specialist on Butterfly and Cicada. His photographic skill has enriched the publication immensely.

FOREST OFFICERS ATTENDED THE CAMP

Sl	Name	Designation	Present posting
1	**Sri Ujjal Ghosh**, IFS	Chief Conservator of Forests	Wildlife North, Jalpaiguri
2	**Sri Nilanjan Mallick**, IFS	Chief Conservator of Forests & Field Director	Sunderban Tiger Reserve
3	**Sri Subhankar Sengupta**, IFS	Chief Conservator of Forests & Field Director	Buxa Tiger Reserve
4	**Miss Nisha Goswami**, IFS	Divisional Forest Officer	Gorumara WL Division, Jalpaiguri
5	**Sri S S S Sherpa**, IFS	Divisional Forest Officer	Silviculture (Hills), Darjeeling
6	**Sri Badal Debnath**, WBFS	Asst. Divisional Forest Officer	Gorumara WL Division, Jalpaiguri
7	**Sri S S Giri**, FR	Range Officer	Lower Neora Range, Samsing
8	**Smt Sujata Gurung**, FR	Range Officer	Upper Neora Range, Lava
9	**Sri Raj Kumar Layek**, FR	Range Officer, Trainee	Budhuram Beat
10	**Sri Arghyadeep Roy**, FR	Range Officer, Trainee	Eastnar Beat

FRONTLINE STAFF PARTICIPATED IN THE CAMP

Sl	Name	Designation	Present posting
1	**Sri Pritam Mahat**	CDL	Samsing HQ, Lower Neora Range
2	**Sri Ganesh Chettri**	PDL	Lower Neora Range
3	**Sri Purana Rai**	PDL	Lower Neora Range
4	**Sri Kumar Bhujel**	CDL	Lower Neora Range
5	**Sri Rupen Lepcha**	CDL	Sansing HQ, Lower Neora Range
6	**Sri Joseph Lepcha**	CDL	Lava HQ, Upper Neora Range
7	**Sri Dhan Kumar Gurung**	CDL	Upper Neora Range
8	**Sri Ram Kumar Rai**	CDL	Upper Neora Range
9	**Sri Amit Kumar Tamang**	CDL	Lava HQ, Upper Neora Range
10	**Sri Ajit Rai**	CDL	Choudaferi, Upper Neora Range
11	**Sri Rupen Biswakarma**	FG	Khunia WL Squad

Survey Team at Gogune Camp

On way to Alubari Camp

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