

**Revisiting Century Old Abor Expedition:  
Arunachal Pradesh, India  
- *Final Report* -**





*Final Report*

# Revisiting Century Old Abor Expedition: Arunachal Pradesh, India



29 September to 26<sup>th</sup> October 2018

Supported by-



Executed By-



भारतीय वन्यजीव संस्थान  
Wildlife Institute of India

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## **1. INSTITUTIONAL PROFILES**

### **The Wildlife Institute of India**

Established in 1982, Wildlife Institute of India (WII) is an autonomous institution under ministry of Environment, Forest and Climate Change of Government of India. The mission of the Institute is to nurture the development of wildlife science and promote its application in conservation, in consonance with our cultural and sociology-economic milieu. The objectives of WII are to 1. Build up scientific knowledge on wildlife resources, 2. Train personnel at various levels for conservation and management of wildlife, 3. Carry out research relevant to management including the development of techniques appropriate to Indian conditions. 4. Provide information and advice on specific wildlife management problems. 5. Collaborate with international organizations on wildlife research, management and training. 6. Develop as a regional center of international importance on wildlife and natural resource conservation. Institutions research activities have covered all the 10 biogeographic zones and 27 biogeographic provinces of India. These includes rain forest of western Ghats, Indian Deserts, Wet Evergreen forest of Northeast India, Dry deciduous forest of Peninsular India, Alluvial grassland, Sal forest of Northern India, Alpine meadow, greater Himalaya, lesser Himalaya, trans- Himalaya, Sivalik landscape, Terai arc landscape, Banj Oak forest, Mangrove ecosystems, Freshwater ecosystem and Marine ecosystems. To know more about the Institute, please visit [www.wii.gov.in](http://www.wii.gov.in)

## **2. THE ABOR EXPEDITION: BACKGROUND**

The Abor Expedition was a punitive expedition against the Abors in Assam on the North-Eastern Frontier of India lasting from October 1911 to April 1912, following the murder of Mr Noel Williamson (Assistant Political Officer in the districts of Sadiya and Lakhimpur) and his party. The idea was to launch an expedition to dominate a “trouble state” lying in-between Mishmi hills in the east, Tibet in the North, Land of Miris (Mishing) in the west and the mighty Brahmaputra on the south. The expedition had a very proficient scientific contingent as well. Thus, what was primarily an exploratory, political and punitive expedition which was organized by the military and education departments of the Government of (British) India, turned out to be an excellent scientific expedition as well. The Abor expedition led by Major General Hamilton Bower covered a 130 km stretch along the Siang river from the base camp at Kobo Chapori (elevation ~121 m asl) to the head quarter at Yembung (~3,500 m asl) and beyond.

The scientific component of the expedition, consisted of Mr. Stanley Kemp and his assistant Mr. Hodgart, an energetic young man from the Indian Museum, and they conducted the Zoological exploration during this expedition, between November 13, 1911 to April 3, 1912. The first fifteen days were devoted to Kobo (a place which now falls in between D’ering Memorial Wildlife Sanctuary, Arunachal Pradesh and Dibru-Saikhowa National Park, Assam) observing and collecting the fauna from low elevation areas such as Dibrugarh, Pasighat and Janakmukh (~183 m). Next, the team made a one month survey

and collection at a place called Rotung (East Siang) at mid elevation (~ 700m) before proceeding to Yembung near Along. The team continued to explore the forests along the Siyom and Shimang Rivers, areas which we now know as Mouling National Park in Arunachal Pradesh. Majority of the faunal specimens were collected from lower elevations (121-757 m asl). However, the expedition was conducted as far as Geku Hills (~3,000 m asl), near present day Yingkiong in Upper Siang, which was also the highest point of the expedition.

The staggering Zoological result includes description of 244 species and 14 genera new to science. The hard work of Stanley Kemp was commemorated by naming 21 species of various taxa after him and two species after his assistant Mr. Hodgart. Further, 29 species were named after the Adi land. The mammalian collection studied by Herbert C. Robinson adds upto 26 species that includes records of Takin. As regards birds, Stuart Baker reported a total of 111 species based on a collection of 192 skins. The reptile and amphibian collection of the expedition was described by Nelson Annandale. Amphibian collection comprised of 25 species and tadpoles of which seven species are described as new to science. Reptilian collection had 124 specimens belonging to 43 species of which four are described as new species. Fish fauna of Abor expedition was reported by B. L. Chaudhuri who was the lone Indian author who contributed to the Vertebrate section. A list of 43 species was enriched by addition of a three new species and a new genus named after the land and the man who collected it, *Aborichthys kemp* is a mountain loach now considered as a near-threatened species in the IUCN list. A new species of swamp eel *Monopterus hodgarti* was named after Mr. Hodgart. Among invertebrates, the butterfly and moths were reported by William Harry Evans that included a modest collection of 74 species of butterflies and 37 species of moths. The molluscan fauna was studied by famous mountaineer – Henry Haversham Godwin-Austen. He appreciated Kemp for his excellent preservation skills that yielded descriptions of several new genera and species such as a small air breathing land snail *Bapua renginensis* collected from Bapui Hills and a small terrestrial glass snail *Dihangia koboensis* collected from forests near Kobo. Perhaps the most celebrated zoological discovery was that of a Velvet Worm, a living fossil that has tremendous biogeographic significance. Discovery of this rare Onychophoran filled the gap in global distribution of this connecting link invertebrate. The specimens were collected from under boulders near Siang River a totally different habitat from that of its nearest relative from Malaysia that lives under rotten logs. It was named *Typhloperipatus williamsoni* after Noel Williamson by none other than Kemp himself. Isaac Burkill along with his two Indian assistant conducted the Botanical Survey. Realizing the vastness, remoteness and hostility of the area, the team opted for an “intensive search” approach along a line using all the camping sites along the Siang River from Kobo to Yembung. The specimens were transferred regularly to Calcutta and Royal Botanical Garden, Kew. He made 8000 botanical observations in his notebook that included almost thousand species records and their natural history observations. The culture, traditions and anthropology of the Abor land were meticulously documented by Angus Hamilton in his book “In Abor Jungles” published in 1912. A. Bentinck published a separate book on geographical results of the expedition in the Geographical Journal in February 1913. Thus, the Abor Expedition was one of the most comprehensive one-time biological, geographical and anthropological documentation ever conducted for any particular region in India. This fine contribution

was possible through a unique partnership that yielded invaluable information for generations to rejoice.

Thus, the Abor expedition is one of the most comprehensive biological, geographical and anthropological documentation ever conducted in India. This fine contribution was possible through a partnership between the scientific and defense departments of British India that yielded invaluable information from a remote part in Eastern Himalaya that is now recognized as a biodiversity hotspot.

One of the important biogeographic interpretation made out of the observations is that the faunal and floral elements of Abor lands are rather similar to fauna of Assam, south of the Brahmaputra or even to that of Burma Myanmar, rather than to the fauna of Eastern Himalaya (Sikkim, Bhutan and Aka Hills).

We revisited the route of the expedition to the extent possible and undertook a comprehensive and intensive survey of mammals, birds, reptiles, amphibians, butterflies, odonates and cicadas of the Abor landscape, paying special emphasis on threatened taxa. We also undertook an intensive collection of select lower taxa for voucher specimens, especially those of species potentially new to science. The entire expedition was exhaustively photo documented.

### **3. SHORT ITINERARY**

#### **29th September 2018**

Expedition flagged off at Pasighat (159 MSL)

#### **30th September - 2nd October**

Camp Pasighat: Survey of the lowland evergreen forest of Poba RF (120m MSL), grassland habitats of D'Ering WLS (120 MSL) and low to mid-elevation foothills at Renging (256m MSL) and Rotung (560m MSL).

#### **3rd-6th October**

Camp Jengging: Survey at Jengging (562m MSL) and adjoining areas having subtropical evergreen forests in various stages of degradation.

#### **7th-10th October**

Camp Tuting (516m MSL): Surveyed Tuting- Gelling road up to Kapu Village (611m MSL). On our way back surveyed Mosin area (515m MSL).

#### **11th-12th October**

Camp Jengging: Survey nearby areas.

#### **13th-19th October**

Reached Yibuk Village (c.900m MSL): Camped inside primary sub-tropical forests (1000-1500m MSL) of Mouling National Park. Surveyed various areas of the park including a ridgeline with montane broadleaved forests leading up to Mouling Peak. Maximum altitude covered was 2600m MSL.

#### **21st-25th October**

Camp Pasighat: Surveyed in and around Pasighat including Lalli RF, Poba RF, Siang River side and Rengging.

#### **25th October 2018**

Last survey at Poba RF. Expedition concludes in the evening.



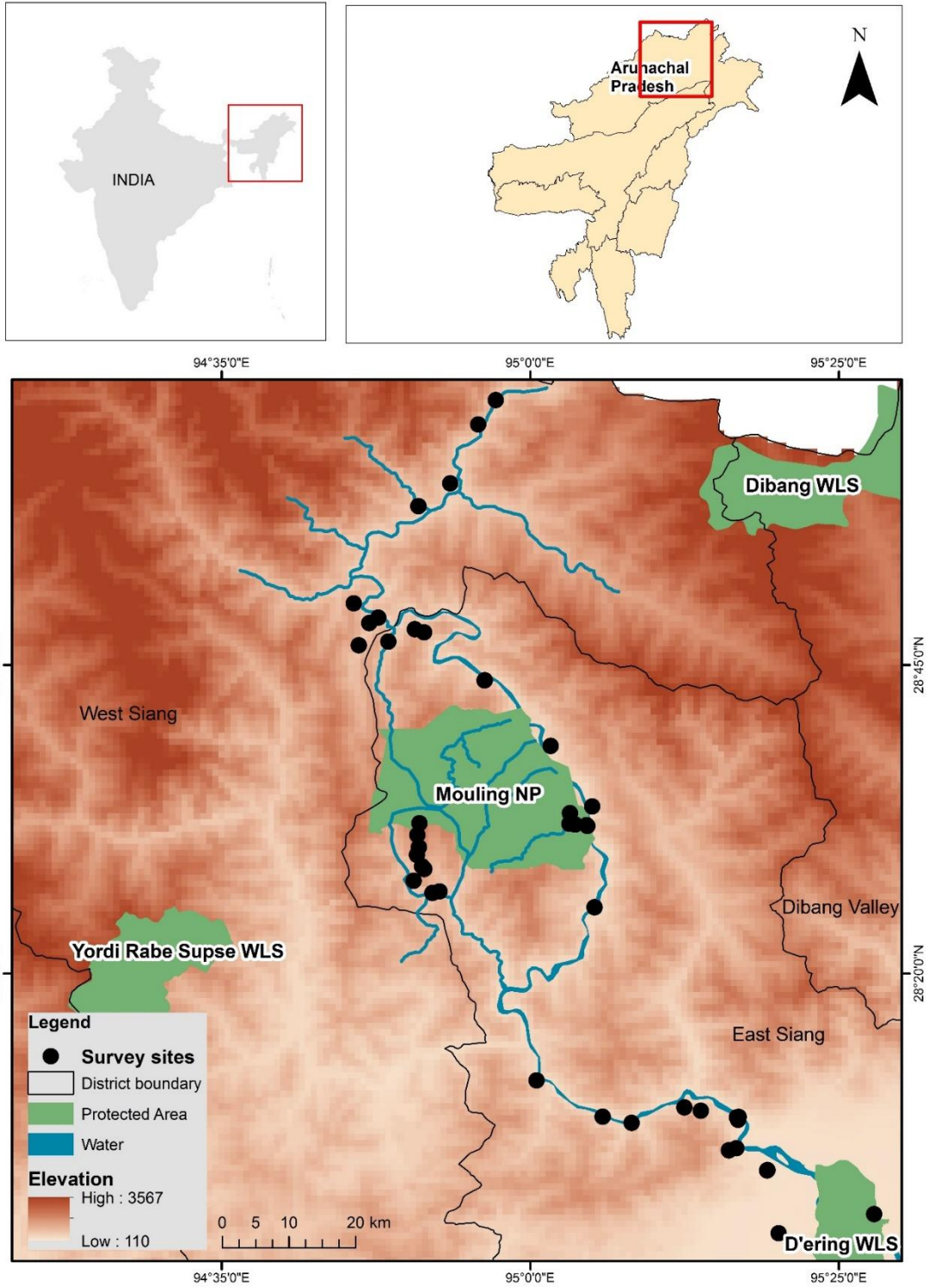


Figure 1 Map showing the Expedition Route along Siang river basin and Mouling National Park

#### 4. ECOLOGICAL PROFILE

Adi Hills region of Eastern Himalayas is a part of global biodiversity hotspot. The Siang River is a dominant feature in the landscape, carving through forested, high and rugged mountains. This major tributary of Brahmaputra is well drained by a number of streams flowing swiftly into the deep valley of the Siang, which flows as low as 100 m near D'Ering Wildlife Sanctuary near its confluence with the Brahmaputra. The area is extremely humid, with high rainfall, only November to January being the rainless period. This valley, which cuts low and deep into the Himalayas, 'carries' wet tropical conditions with it, facilitating dispersal of tropical elements along it (Pawar and Birand, 2001). The low to mid elevation forests along the valley are dominated by tropical wet evergreen and semi-evergreen forests, tending towards wet subtropical broad-leaved forest and temperate forests at around 2000 m elevation. The forest appears quite contiguous at the landscape level (Singh, 1999b). With the ongoing development of National Highway from Pasighat to Tuting and associated settlements, the forest along the road is now represented by various states of degradation. Much of the forested slopes are now land slip zones, palm-dominated open patches on steep slopes, terraced agricultural fields, *jhum* fields and fallows, and village gardens. However, in comparison to the larger Indian scenario, the area is still sparsely populated. Major tributaries of Siang are Siyom, Angom, Mosin, Kabung, Sirnuik, Bomdo, and Sikke.

Mouling National Park is the largest conservation area in the landscape. This also hold the highest peak (ca. 3064m msl) of the area. Much of the PA is still covered with primary forest. Occasional hunting, fishing and cane extraction are current levels of disturbance that we have observed.



## **5. Abor Expedition Report: Plant Component**

### Introduction:

Documenting plants in a place like Arunachal is a challenging task due to the sheer diversity and richness of species. What adds to this challenge is the difficulty in field identification of plants in absence of reproductive characters such as flowering and fruiting. The objective of the plant component of the Abor expedition was to carry out a rapid survey of the plant diversity of Siang valley along its elevation gradient. On account of the challenges described above, we decided to focus on and prioritise predominantly the flowering individuals, both for specimen collection as well as for photographic documentation. However, we recorded non-flowering species to the level of genus and species where identification based on vegetative characters was possible. Since the survey was carried out in the post monsoon season, most of the plants that were flowering at this time were herbaceous species. Nonetheless, we also recorded a number of noteworthy woody plants that were flowering during this period. The documentation was carried out in a completely ad hoc and opportunistic manner however efforts were made to ensure that all habitats were explored and surveyed to maximise the species inventory for an area.

As a result of the floristic survey, we recorded ~400 species of Angiosperm plants (flowering plants). At this stage it will be difficult to present exact figures for the number of Species, Genera and Families recorded in our study since we are still in the process of identification and validation of specimens and photographs recorded during the survey.

Features and characteristics of the broad vegetation types covered during the survey

### **1. Lowland evergreen forest (Poba RF and forest around D'Earing WLS):**





Poba RF and a few patches around D'Earing WLS perhaps represent the last remaining patches of what was once a low elevation tropical wet forest. The terrain here is flat and is intersected by a number of small perennial streams and rivulets. There are patches of habitats which are more or less permanently water logged and marshy which support species of *Musa*, *Alpinia*, *Lasia spinosa* and *Tacca*. The structure and composition of these forests have been highly modified as a result of past logging events and other forms of extraction. The topmost strata of the forest i.e. the canopy is more than 30 m and is composed of *Terminalia myriocarpa*, *Anthocephalus kadamba*, *Bombax ceiba*, *Alstonia scholaris*, *Stereospermum sp*, *Castanopsis sp*, *Lithocarpus sp* and *Ailanthus grandis*. Mid strata is composed of *Syzygium sp*, *Gynocardia odorata*, *Lagerstroemia sp*, *Leea sp*, *Dillenia indica*, *Vitex pentaphylla*, *Litsea monopetala* and *Archaedendron sp* . Understorey comprises of shrubs such as *Sterculia hamiltonii*, *Myrioneuron nutans*, *Citrus sp*, *Trivalvaria sp*, *Rhynchotechum sp*, *Boeica sp* and a number of herbaceous species such as *Globba multiflora*, *Tacca integrifolia*, *Impatiens sp*, *Forrestia marginata* and *Tupistra sp*. Lianas and scandent shrubs contribute significantly to the structural and compositional diversity of this forests and is represented by species such as *Styxis suaveolens*, *Beaumontia grandiflora*, *Dalhausia bracteata*, *Naravelia zeylanic*, *Uncaria sp*. Canopy openings are forests edges are typically occupied by large leaved species such as *Mallotus albus* and *Dendrocnode sinuate*.

## **2. Mid elevation tropical-sub tropical evergreen forest (Renging, Rotung, Jenging, Moling):**



This vegetation type supports the most luxuriant and most diverse assemblage of tropical and subtropical species, most of which are evergreen in nature. This type is seen on gentle to steep slopes of the hilly and mountainous areas at elevations ranging from 300 to 1500 m. The species composition and structure varies a lot depending on the slope, aspect and other topographic features. The lower elevations of this vegetation type around 300 to 600 meters is characterised by the dominance of *Hopea shingkeng*, a species endemic to Abor hills. Other associate tree species of the *Hopea* forest include *Ficus spp*, *Heritiera grandifolia*, *Kydia calycina*, *Diploknema butyracea*, *Milusa roxburghiana*, *Sauarauia nepalense*, *Chionanathus sp*, *Pandanus sp*, *Lithocarpus sp*, while the understorey consists of *Gymnosporia acuminata*, *Trignostemon viridissimus.*, *Syzygium balsamea* while the herbaceous community is represented by *Impatiens spp*, *Begonia sp*, *Chirita sp*, *Amomum sp*, *Lindernia sp*. This forests is also characterised by presence of some prominent palms such as *Arenga*, *Pinanga*, *Wallichia* and *Calamus*.

Above 1000 meters, *Hopea singkeng* disappears completely and there is a notable increase in the abundance of members of family Araliaceae such as *Schefflera spp* and *Heteropanax spp* as well as members of Fagaceae such as *Castanosis* and *Lithocarpus*. Family Annonaceae contributed predominantly to the woody climbing (lianas) communities and is represented by species of geus *Fissidens*, *Artabotrys* and *Desmos* along with leguminous climbers such as *Bauhinia* and *Mucuna*. Large and lofty trees of these forests support a diverse assemblage of epiphytic plants belonging to genera such as *Agapetes*, *Loxostigma*, *Aeschynanthus*, *Lysionotus*, *Dendrobium* and *Coelogyne*.

### 3. Montane broad-leaved forests (Moling peak):





This vegetation types occurs along high mountain ridges roughly above 2000 m to 3000 m and is characterised by short and stunted canopy, dense bamboo undergrowth and a luxuriant growth and mosses and other epiphytic plants such as ferns and orchids. The dominant tree species of the montane forests are *Rhododendron* spp, *Magnolia* spp, *Ilicium* sp, *Quercus lamellosa*, *Lithocarpus* spp. The understorey is represented by shrubby species of *Smilax*, *Aralia*, *Daphne*, *Strobilanthes*, *Euonymus*, *Damnacanthus indicus* etc., while the epiphytic communities are dominated by orchids belonging to multiple species of *Bulbophyllum*, *Coelogyne* and *Lipparis*.

### Significant plant findings of the Abor expedition

#### New records for India:

##### 1. *Whytockia bijieensis* (Gesneriaceae)



During our survey we came across a small population of a species of *Whytockia* comprising of just a few individuals in a single location in the Rotung forest. The genus *Whytockia* is currently considered endemic to China with about 8 species described so far. A quick review of literature suggests that the species we discovered from Siang could be *Whytockia bijieensis*, known from Guizhou province of China. This discovery will be first record of this species as well as a new generic record for India.

##### 2. *Saurauia sinohirsuta* (Actinidiaceae)





There are 8 species of *Saurauia* recorded from India. During our survey in Moling NP, we recorded a species that was distinct from the India species in having solitary flowers with densely hairy sepals. This species was identified as *Saurauia sinohirsute*, a species known from Xizang province of China.

3. *Agapetes subsessilifolia* (Ericaceae)



This is yet another example of species known previously from south-east Tibet that has turned up as a new record from Indian Eastern Himalayas. This species was described in 2008 from Medog region of Tibet just north of the Siang district of Arunachal.

### Species potentially new to science:

#### 1. *Meiogyne* sp



This handsome tree is characterised by its horizontal spreading branches and flowers that appear on the old branches. We observed this species at multiple locations during the expedition. There is however, no mention of this species in the literature published previously from India or adjoining areas of China, Bhutan and Burma. It is unlikely that such a striking species has gone completely unnoticed by the previous workers. Preliminary literature review suggests that it may have been misidentified and put under a wrong name and we therefore believe that it is most probably a new species.

#### 2. *Prunus* sp



This species is unique from all the so far described species from Indo-China in having hairy, caudate leaves and few flowered short axillary racemes. A few individuals of this species were seen at 1600 m elevation in Moling NP and so far we have not been able to identify this species based on available published literature.

#### 3. *Henckelia* sp



*Henckelia* is diverse genus of herbaceous plants belonging to family Gesneriaceae. This group is distributed all across south and south-east Asia. There are about 15 species known from north-east India. We recorded this species of *Henckelia* growing along streams in Moling NP which has characteristic shaped bracts that are not reported in Indian or Chinese species. Further investigation is required to ascertain if it is species new to science.

#### **Endemic and threatened species:**

##### **1. *Hopea shingkeng***



This species of family Dipterocarpaceae is narrowly endemic to the Siang valley and considered Extinct by the IUCN Red List of Threatened Taxa. We found this species in great abundance at low-mid elevation hill forests on the on the way to Rotung.



## 2. *Vatica lanceifolia*



This is yet another threatened Dipterocarpaceae member that is endemic to Assam and Arunachal. Due to small range size and loss of primary habitat which is low land riparian forests, its current IUCN status is Endangered. During our survey, we recorded this species in two previously unreported locations, one in Poba RF and another in along an hill stream between Paashighat and Rotung.

### **Conclusion:**

Arunachal Pradesh is by far the most biodiversity rich states of our country and yet it also the most unexplored. Our expedition and our findings underscored the need to carry out multiple such surveys and initiate long term studies to fill the gap in our understanding or taxonomy and distribution of the plants of Arunachal Pradesh. This will serve as a foundation if we are to take any conservation efforts to save the biodiversity in this region before it is lost forever.

**Table 1. A checklist of Species, Genera and Families of Plants recorded during the Expedition**

<b>Sr. No.</b>	<b>Scientific Name</b>	<b>Family</b>
1	Asystasia spp (2)	Acanthaceae
2	Phlogacanthus sp	Acanthaceae
3	Pseuderanthemum spp (2)	Acanthaceae
4	Rhinacanthus grandis	Acanthaceae
5	Strobilanthes sp 1 (purple pubescent)	Acanthaceae
6	Strobilanthes sp 2 (hanging flowers)	Acanthaceae
7	Strobilanthes sp 3 (purple glabrous)	Acanthaceae
8	Strobilanthes sp 4 (zigzag)	Acanthaceae
9	Acer spp (2)	Aceraceae
10	Gynocardia odorata	Achariaceae
11	Saurauia armata	Actinidiaceae
12	Saurauia nepalense	Actinidiaceae
13	Saurauia sinohirsuta	Actinidiaceae
14	Altingia excsa	Altingiaceae
15	Deeringia amaranthoidea	Amaranthaceae
16	Chaerospondias axillaris	Anacardiaceae
17	Mangifera sylvatica	Anacardiaceae
18	Rhus sp	Anacardiaceae
19	Tupistra sp	Anacardiaceae
20	Desmos chinensis	Annonaceae
21	Fissistigma sp (2)	Annonaceae
22	Milusa roxburghiana	Annonaceae
23	Polyalthia argentia	Annonaceae
24	Alstonia scholaris	Apocynaceae
25	Beaumontia grandiflora	Apocynaceae
26	Dischidia benghalensis	Apocynaceae
27	Hoya bella	Apocynaceae
28	Hoya pendula	Apocynaceae
29	Hoya sp (tiny leaves)	Apocynaceae
30	Wrightia coccinea	Apocynaceae
31	Alocasia spp (2)	Araceae
32	Arisaema sp	Araceae
33	Lasia spinosa	Araceae
34	Pothos sp	Araceae
35	Rhaphidophora glauca	Araceae
36	Rhaphidophora hookeri	Araceae
37	Rhaphidophora sp	Araceae
38	Brassaioopsis sp	Araliaceae

39	Heteropanax sp	Araliaceae
40	Schefflera spp (6)	Araliaceae
41	Arenga sp	Arecaceae
42	Calamus spp (3)	Arecaceae
43	Caryota sp	Arecaceae
44	Pinanga sp	Arecaceae
45	Wallichia sp	Arecaceae
46	Peliosanthes sp	Asparagaceae
47	Balanophora dioica	Balanophoraceae
48	Balanophora polyandra	Balanophoraceae
49	Impatiens arguata	Balsamaniaceae
50	Begonia palmata	Begoniaceae
51	Begonia spp (6)	Begoniaceae
52	Podophyllum sp	Berberidaceae
53	Stereospermum hypostictum	Bignoniaceae
54	Ehretia sp	Boraginaceae
55	Canarium resiniferum	Burseraceae
56	Bauhinia sp (climber)	Caesalpinaceae
57	Mesoneurum cuculatum	Caesalpinaceae
58	Calophyllum polyanthum	Calophyllaceae
59	Codonopsis sp	Campanulaceae
60	Capparis multiflora	Capparidaceae
61	Styxis suaveolens	Capparidaceae
62	Viburnum colebrookianum	Caprifoliaceae
63	Euonymus spp (2)	Celastraceae
64	Microtropis sp	Celastraceae
65	Salacia sp	Celastraceae
66	Garcinia paniculata	Clusiaceae
67	Garcinia spp (2)	Clusiaceae
68	Mesua ferrea	Clusiaceae
69	Combretum sp	Combretaceae
70	Terminalia myriocarpa	Combretaceae
71	Forrestia sp	Commelinaceae
72	Alangium chinense	Cornaceae
73	Mastixia sp	Cornaceae
74	Hodgsonia macrocarpa	Cucurbitaceae
75	Cyathea sp	Cyatheaceae
76	Daphniphyllum sp	Daphniphyllaceae
77	Dichapetalum sp	Dichapetalaceae
78	Dillenia indica	Dilleniaceae
79	Tacca integrifolia	Dioscoreaceae
80	Hopea shingkeng	Dipterocarpaceae
82	Vatica lancaefolia	Dipterocarpaceae



83	<i>Elaeocarpus aristatus</i>	Elaeocarpaceae
84	<i>Elaeocarpus floribundus</i>	Elaeocarpaceae
85	<i>Elaeocarpus rugosus</i>	Elaeocarpaceae
86	<i>Elaeocarpus</i> sp	Elaeocarpaceae
87	<i>Agapetes</i> spp (3)	Ericaceae
88	<i>Rhododendron</i> spp (2)	Ericaceae
89	<i>Balacata baccata</i>	Euphorbiaceae
90	<i>Baliospermum calycinum</i>	Euphorbiaceae
91	<i>Bischofia javanica</i>	Euphorbiaceae
92	<i>Macaranga</i> spp (2)	Euphorbiaceae
93	<i>Mallotus tetracocus</i>	Euphorbiaceae
94	<i>Ostodes paniculata</i>	Euphorbiaceae
95	<i>Trigonostemon nemoralis</i>	Euphorbiaceae
96	<i>Dalhausia bracteata</i>	Fabaceae
97	<i>Maeletia</i> sp	Fabaceae
98	<i>Mastersia assamica</i>	Fabaceae
99	<i>Mucuna</i> sp	Fabaceae
100	<i>Castanopsis</i> spp (2)	Fagaceae
101	<i>Lithocarpus elegans</i>	Fagaceae
102	<i>Lithocarpus</i> spp (3)	Fagaceae
103	<i>Quercus lamellosa</i>	Fagaceae
104	<i>Dicentra scandens</i>	Fumariaceae
105	<i>Aeschynanthus lanceolatus</i>	Gesneriaceae
106	<i>Aeschynanthus</i> spp (2)	Gesneriaceae
107	<i>Henckelia pathakii</i>	Gesneriaceae
108	<i>Henckelia pumila</i>	Gesneriaceae
109	<i>Henckelia</i> spp (3)	Gesneriaceae
110	<i>Loxostigma griffithii</i>	Gesneriaceae
111	<i>Lysionotus</i> spp (3)	Gesneriaceae
112	<i>Gnetum</i> sp	Gnetaceae
113	<i>Exbucklandia</i> sp	Hamamelidaceae
114	<i>Illigera</i> sp	Hernandiaceae
115	<i>Engelhardtia spicata</i>	Juglandaceae
116	<i>Calamintha</i> sp	Lamiaceae
117	<i>Gomphostemma</i> sp	Lamiaceae
118	<i>Actinodaphne obovata</i>	Lauraceae
119	<i>Beilschmiedia</i> sp	Lauraceae
120	<i>Cinnamomum</i> sp	Lauraceae
121	<i>Cryptocarya</i> sp	Lauraceae
122	<i>Litsea monopetala</i>	Lauraceae
123	<i>Litsea</i> spp (4)	Lauraceae
124	<i>Machilus</i> sp	Lauraceae
125	<i>Neolitsea</i> sp	Lauraceae

126	<i>Fragrea</i> sp	Loganiaceae
127	<i>Macrosolen</i> sp	Loranthaceae
128	<i>Scurulla</i> sp 1 (green flowers)	Loranthaceae
129	<i>Scurulla</i> sp 2 (short flowers)	Loranthaceae
130	<i>Duabanga grandiflora</i>	Lythraceae
131	<i>Lagerstroemia</i> sp	Lythraceae
132	<i>Magnolia</i> spp (2)	Magnoliaceae
133	<i>Talauma hodgsonii</i>	Magnoliaceae
134	<i>Bombax ceiba</i>	Malvaceae
135	<i>Byttneria grandiflora</i>	Malvaceae
136	<i>Firmiana colorata</i>	Malvaceae
137	<i>Heritiera macrophylla</i>	Malvaceae
138	<i>Kydia calycina</i>	Malvaceae
139	<i>Pterospermum acerifolium</i>	Malvaceae
140	<i>Sterculia rubiginosa</i>	Malvaceae
141	<i>Sterculia villosa</i>	Malvaceae
142	<i>Phrynium capitatum</i>	Marantaceae
143	<i>Phrynium</i> sp	Marantaceae
144	<i>Medinella</i> sp	Melastomataceae
145	<i>Melastoma malabathrum</i>	Melastomataceae
146	<i>Osbeckia</i> spp (3)	Melastomataceae
147	<i>Oxyspora cernua</i>	Melastomataceae
148	<i>Oxyspora paniculata</i>	Melastomataceae
149	<i>Oxyspora vagans</i>	Melastomataceae
150	<i>Sarcopyramis nepalensis</i>	Melastomataceae
151	<i>Aglaiia chittagonga</i>	Meliaceae
152	<i>Aglaiia</i> sp	Meliaceae
153	<i>Aglaiia spectabilis</i>	Meliaceae
154	<i>Aphanamixis polystachya</i>	Meliaceae
155	<i>Chisochaeton paniculatus</i>	Meliaceae
156	<i>Chukrasia tabularis</i>	Meliaceae
157	<i>Dysoxylum procerum</i>	Meliaceae
158	<i>Micromelum minutum</i>	Meliaceae
159	<i>Picnarrhaena pleniflora</i>	Menispermaceae
160	<i>Albizia chinensis</i>	Mimosaceae
161	<i>Albizia lucidior</i>	Mimosaceae
162	<i>Archidendron</i> spp (2)	Mimosaceae
163	<i>Entada scandens</i>	Mimosaceae
164	<i>Artocarpus integrifolius</i>	Moeaceae
165	<i>Ficus auriculata</i>	Moraceae
166	<i>Ficus</i> spp (5)	Moraceae
167	<i>Ficus</i> spp (5)	Moraceae
168	<i>Maclura</i> sp	Moraceae

169	Musa spp (3)	Musaceae
170	Horsfieldia kingii	Myristicaceae
171	Knema sp	Myristicaceae
172	Ardisia sp	Myrsinaceae
173	Maesa sp	Myrsinaceae
174	Syzygium balsamea	Myrtaceae
175	Syzygium sp 1 (large flowers)	Myrtaceae
176	Syzygium sp 2 (large leaves)	Myrtaceae
177	Syzygium sp 3 (medium leaves)	Myrtaceae
178	Chionanthus sp	Oleaceae
179	Jasminum spp (2)	Oleaceae
180	Myxopyrum smilacifolium	Oleaceae
181	Bulbophyllum spp (2)	Orchidaceae
182	Calanthe spp (2)	Orchidaceae
183	Coelogyne sp	Orchidaceae
184	Dendrobium spp (4)	Orchidaceae
185	Liparis sp	Orchidaceae
186	Naravelia zeylanica	Orchidaceae
187	Phaius mishmensis	Orchidaceae
188	Pandanus sp	Pandanaceae
189	Bridelia spp (2)	Phyllanthaceae
190	Glochidion sp	Phyllanthaceae
191	Peppromia sp	Piperaceae
192	Piper spp (3)	Piperaceae
193	Thysanolaema maxima	Poaceae
194	Podocarpus nerifolius	Podocarpaceae
195	Polygala sp	Polygalaceae
196	Helicia sp	Proteaceae
197	Drypetes sp	Putranjivaceae
198	Clematis spp (2)	Ranunculaceae
199	Hovenia dulcis	Rhamnaceae
200	Rhamnus sp	Rhamnaceae
201	Ventilago sp	Rhamnaceae
202	Carallia brachiata	Rhizophoraceae
203	Rubus ellipticus	Rosaceae
204	Rubus spp (3)	Rosaceae
205	Lasianthus spp (2)	Rubiaceae
206	Meyna spinosa	Rubiaceae
207	Morinda sp	Rubiaceae
208	Myrioneuron nutans	Rubiaceae
209	Neolamarkia cadamba	Rubiaceae
210	Ophiorhiza spp (3)	Rubiaceae
211	Psychotria spp (2)	Rubiaceae



212	<i>Silvianthus bracteatus</i>	Rubiaceae
213	<i>Uncaria glabrous</i>	Rubiaceae
214	<i>Wendlandia</i> sp	Rubiaceae
215	<i>Citrus</i> sp	Rutaceae
216	<i>Clausina</i> sp	Rutaceae
217	<i>Paramignya</i> sp	Rutaceae
218	<i>Toddalia asiatica</i>	Rutaceae
219	<i>Meliosma pinnata</i>	Sabiaceae
220	<i>Meliosma simplicifolia</i>	Sabiaceae
221	<i>Sabia</i> sp	Sabiaceae
222	<i>Casearia rubescens</i> cf	Salicaceae
223	<i>Casearia</i> sp	Salicaceae
224	<i>Homalium</i> sp	Salicaceae
225	<i>Sambucus</i> sp	Sambucaceae
226	<i>Alophyllus</i> sp	Sapindaceae
227	<i>Lepisanthes</i> sp	Sapindaceae
228	<i>Diploknema butyracea</i>	Sapotaceae
229	<i>Sarcosperma arboreum</i>	Sapotaceae
230	<i>Kadsura roxburgiana</i>	Schisandraceae
231	<i>Ailanthus grandis</i>	Simaroubaceae
232	<i>Picrasma javanica</i>	Simaroubaceae
233	<i>Smilax</i> sp 1 (erect)	Smilacaceae
234	<i>Smilax</i> sp 2 (large leaves)	Smilacaceae
235	<i>Smilax</i> sp 3 (small leaves)	Smilacaceae
236	<i>Turpinia pomifera</i>	Staphyleaceae
237	<i>Abroma augusta</i>	Sterculiaceae
238	<i>Styrax serrulata</i>	Styracaceae
239	<i>Symplocos</i> sp	Symplocaceae
240	<i>Eurya</i> spp (2)	Theaceae
241	<i>Gordonia obtusa</i>	Theaceae
242	<i>Pyrenaria barringtoniaefolia</i>	Theaceae
243	<i>Thunbergia coccinea</i>	Thunbergiaceae
244	<i>Thunbergia lutea</i>	Thunbergiaceae
245	<i>Grewia serrulata</i>	Tiliaceae
246	<i>Trema orientalis</i>	Ulmaceae
247	<i>Ulmus lancifolia</i>	Ulmaceae
248	<i>Dendrocnide sinuata</i>	Urticaceae
249	<i>Clerodendrum</i> spp (3)	Verbenaceae
250	<i>Leea</i> spp (2)	Vitaceae
251	<i>Vitex pentaphylla</i>	Vitaceae
252	<i>Alpinia alughas</i>	Zingiberaceae
253	<i>Amomum</i> spp (2)	Zingiberaceae
254	<i>Globba multiflora</i>	Zingiberaceae

255

Hedychium sp

Zingiberaceae

## 6. BUTTERFLIES

**Author: Vivek Sarkar**

During the colonial Abor hill expedition, only 72 species of butterflies were recorded over a period of few months. During the current survey, 269 Species of butterflies belonging to 6 families have been recorded between 30<sup>th</sup> September to 25<sup>th</sup> October, 2018 (**Annexure-I**). The butterflies were recorded at ad libitum basis. An effort was made to spot the larval feeding signs on plants and document the early life history as well. The detail of the findings are as follows,

**Family Papilionidae: 36 Species of Papilionids** represented by 9 species of the genus *Graphium*; 2 species of Genus *Lamproptera*, 13 species of the genus *Papilio*; 1 species of genus *Meandrusa*; 2 species of genus *Atrophaneura*; 5 species of genus *Byasa*, 1 species of genus *Pachliopta* and 2 species of the genus *Troides*.

**Family Pieridae: 30 species of Pierids** represented by 2 species of the genus *Catopsilia*; 1 species of the genus *Colias*; 4 species of genus *Eurema*, 1 species each of genus *Gandaca*, *Belenois*, *Hebomoia*, *Leptosia* and *Pareronia*; 5 species of the genus *Appias*; 2 species of genus *Cepora*; 4 species of genus *Delias*; 2 species of genus *Ixias*; 2 species of genus *Pieris*; and 2 species of genus *Prioneris*.

**Family Nymphalidae:** This family have maximum representation of butterfly diversity recorded during the expedition. The identification of **132 species of Nymphalids** have been confirmed, represented by 63 genus. Genus *Dilipa*, *Herona*, *Hestinalis*, *Apatura*, *Rohana*, *Sephisia*, *Chersonesia*, *Cyrestis*, *Dichorragia*, *Pseudergolis*, *Stibochiona*, *Acraea*, *Cupha*, *Phalanta*, *Vagrans*, *Vindula*, *Libythea*, *Abrota*, *Lexias*, *Neurosigma*, *Bhagadatta*, *Lebadea*, *Moduza*, *Sumalia*, *Lasippa*, *Phaedyma*, *Parthenos*, *Hypolimnas*, *Doleschallia*, *Kallima*, *Aglais*, *Kaniska*, *Discophora*, *Faunis*, *Stichophthalma*, *Orinoma*, *Ethope* and *Neorina* represented by 1 species each; genus *Charaxes*, *Euthalia*, *Athyma* represented by 7 species each; genus *Euploea*, *Parantica*, *Elymnias* and *Ypthima* represented by 3 species each; genus *Ariadne*, *Danaus*, *Tirumala*, *Euripus*, *Cethosia*, *Argynnis*, *Tanaecia*, *Pantoporia*, *Vanessa*, *Enispe*, *Melanitis*, *Neope* and *Cirrochroa* represented by 2 species each; Genus *Neptis* is represented by 10 species; genus *Junonia* is represented by 6 species; genus *Symbrenthia* is represented by 5 species and genus *Lethe* is represented by 11 species. The early life History of *Lethe visrava* and *Cirrochroa aoris aoris* were recorded for the first time during this expedition. Apart from that, many interesting and lesser known enigmatic species such as *Symbrenthia silana*, *Enispe cycnus* and *Neorina patria* have been recorded during the expedition. There is a species named Abor Nawab which is a subspecies of Chinese Nawab and originally was described from Abor Hills. This butterfly usually emerges in the month of May. Possibly due to this reason, despite a desideratum, this species was encountered during the expedition.

**Family Riodinidae: 3 species of Riodinids** were recorded belonging to 3 genus, *Abisara*; *Dodona* and *Zemeros*.

**Family Lycaenidae: 44 species of blues** were recorded represented by 31 genus.



**Family Hesperidae: 25 species of skippers** were recorded belonging to 21 genus. Except two species each of genus *Burara*, *Aeromachus*, *Erionota*, *Pithauria* and *Polytremis*; and 3 species of genus *Celaenorrhinus*, all other genus were represented by a single species. The swifts belonging to genus *Caltoris*, *Baoris* and *Pelopidas* can only be identified by male genitalia or early-stage natural history documentation which is subjected to long term study. Similarly, the Darts (*Potanthus* sp.) and Palm Darts (*Telicota* sp.) has to be sampled further in order to confirm the species. Many rare species such as *Pyronneura margherita*, *Celaenorrhinus aurivittata* and *Burara vasutana* were recorded during the expedition. Early life history was also documented for *Ancistroides nigrita*, *Celaenorrhinus putra* and *Notocrypta paralysos*.

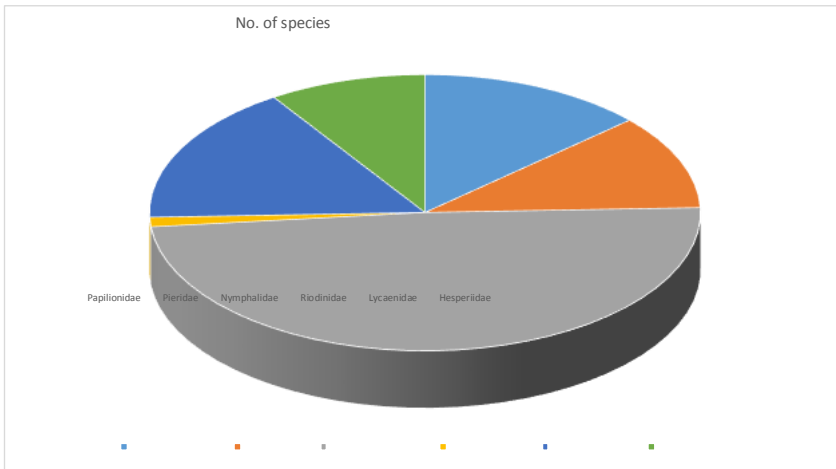


Figure 2. Species representation per butterfly family



Larva and newly eclosed imago of *Cirrochroa aoris*

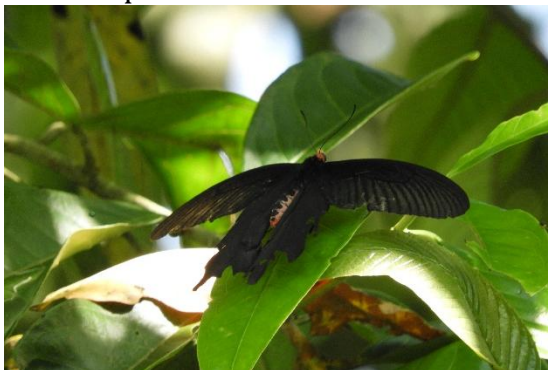


Pupa and adult of *Lethe visrava*



Scarce Jester

Blue Caliph



Yellow-vein Lancer

Pluto Windmill

## 7. CICADA

**Author: Vivek Sarkar**

Cicadas are one of the Major players of Forest orchestra. Despite having the highest generic diversity in the world Indian cicadas have remained one of the most understudied taxa. Due to their season specific emergence only the post monsoon cicadas were covered during the expedition period.

14 species of cicadas were recorded during the survey among them 4 cicadas viz. Bell Cicada (*Dundubia hastata*); *Macrosemia assamensis*, *Pycna verna* and *Chryptotympana mandarina* have been identified based on the call and specimen. During the expedition *Orientopsaltria fangrayae* was also recorded which is the second report of this species from India. This species was described from Thailand by Boulard in 2001 and only reported in India for the first time from Meghalaya last year (Sarkar et al. In prep). Apart from this an interesting crepuscular cicada was also recorded and collected from higher elevation of Abor Hills which tymbalizes at dawn for around 15-20 min. This is probably a species of the genus *Neoterpnosia* and requires further diagnosis and comparison with its counterpart in China. This is most likely a new report for India or even better. Two species of *Mata* which is also crepuscular in nature and calls only at dusk has been recorded. These species were also first encountered in Meghalaya in the year 2014 and in 2017. It was later diagnosed as two species which are new to science (Sarkar et al. In press, Sarkar et al. in prep). This survey discovered a location of this species outside its type locality. A species of *Meimuna* has also been recorded which belongs to the microdon group. Although initially it was identified as *Meimuna microdon* but after further study on its acoustics revealed very different pattern from the tymbalizations of *Meimuna microdon*. The diagnosis of this species is ongoing and it will require time to determine the species level identification. Another such group is Scieroptera. They are tiny and colourful aposematic cicadas who occupied all sorts of habitats in Southeast Asia, starting from grass land to forest canopy. The *Scieroptera* in Abor hills occupy the lower perches of tall trees in mid to high elevations. This species has been recorded and collected. The diagnosis of this species is ongoing and it will require long time to determine the species level identification as this group requires major revision.

Apart from these 11 species of cicadas there are three more species belonging to genus *Tosena*, *Macrosemia* and probably *Terpnosia* that has been recorded in the field but could not be collected. Survey in different season is required in order to achieve a baseline data regarding the cicada diversity of Abor Hills.





*Dundubia hastata*



*Macrosemia assamensis*



*Pycna verna*



*Cryptotympana mandarina*



*Orientopsaltria fangrayae*



crepuscular cicada



*Mata sp.*

*Meimuna sp.*

## 8. ODONATA

**Author: Manoj Nair**

Of about 5,600 species of Odonata known globally, approximately 503 species occur within Indian limits, of which 186 species of them are endemic. Despite being diurnal, brightly coloured, active and therefore conspicuous, odonates (dragonflies and damselflies) remain inadequately studied. This is particularly true for north-eastern India, with Arunachal Pradesh being no exception. As is the case with other taxa, the diversity hotspots for odonates also largely lie within the Western Ghats and northeast India.

Therefore, the opportunity for a rapid diversity assessment of odonates of the entire Siang valley that this expedition provided, was enormous. Odonates were surveyed using visual encounter / active search method, largely opportunistically, along the banks of both lotic and lentic waterbodies, marshes and swamps. Voucher specimens of both sexes (to the extent possible) of unidentified or interesting species were collected using a hand-held net and preserved in alcohol for subsequent taxonomic examination.

66 species of odonates belonging to 11 families were recorded during the expedition, which represents a huge increase from the 14 species recorded during the earlier Abor expedition. Of these, there was a nearly even distribution between Anisoptera (dragonflies) consisting of 32 species and Zygoptera (damselflies) having 34 species. Libellulidae with 25 species was the most speciose family followed by Coenagrionidae and Platycnemididae with 13 and 7 species each respectively. All the rest of the families had less than 5 species each.

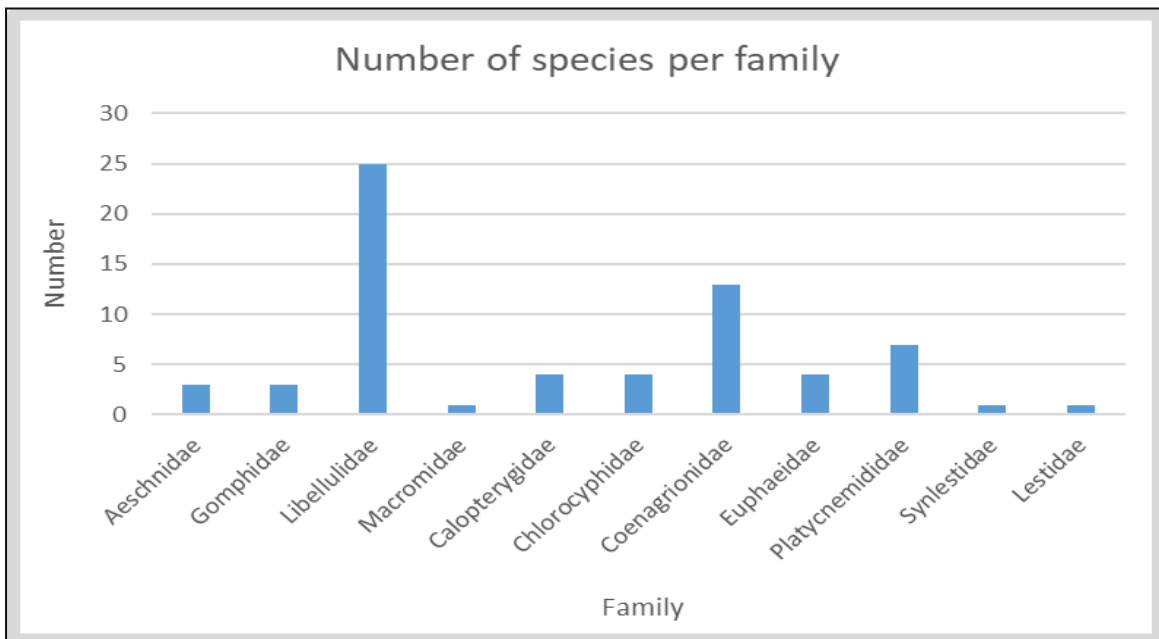


Figure 3: Diversity of Odonates recorded during this survey

It may be noted that these are preliminary findings as taxonomic examination of collected specimens are currently underway along with literature survey and concurrent consultation with experts from the region.

## **INTERESTING FINDINGS**

### New record for India

*Echo perornata* Yu & Hämäläinen, 2012



This beautiful species, described in 2012 from Medong, Xizang, Tibet was recorded between Tuting and Gelling and constitutes a first record for the Indian subcontinent. Voucher specimens have been collected and is currently being studied for the description of the male anal appendages, the earlier description of which was reconstructed from a distorted teneral specimen. Possibly, the first photographs of the species, ever taken from nature were also during this survey.



**New description of female and new photographic record of the species**

*Pseudocoperia superplatypes* (Fraser, 1927)

This extremely interesting species with its characteristically dilated tibia was photographed for the first time. Two voucher specimens of the female which was hitherto unknown was also collected and is currently being described.



**Species still under taxonomic investigation**

This libellulid is still being examined and there is high possibility of it being a *sp.nov.*



This libellulid, photographed but not collected, is possibly yet undescribed.



## 9. AMPHIBIANS AND REPTILES

**Author: Abhijit Das**

Thomas Nelson Annandale in his publication Zoological Result of Abor Expedition (1912) reported 25 species of amphibians and 44 species of Reptiles. Revisiting this expedition, we have recorded 52% of amphibians and 40% of reptile species from Annandale's list after a century!

### **Survey Method:**

We employed opportunistic observations and nocturnal visual encounter surveys to record herpetofaunal species richness. Opportunistic observations include night driving, roadkill records, moulted skin, tadpoles and animals killed by local villagers. We employed one pitfall trap array of 15 m length, with four buckets to serve as pits, and with drift fences constructed of 0.5 m tall plastic sheeting. The trap was placed on the forest floor with thick leaf litter yielded only one species of ranid frog. Acoustic survey at night along streams, ponds, pools, and forest trails yielded two species records. Visual encounter survey along streams and forest trails yielded maximum species records (almost 70%) followed by opportunistic observations. We conducted visual surveys for non-calling individuals using flashlights and headlamps. During the day, we conducted one or two visual surveys by walking along or adjacent to trails, turning logs and rocks, and searching in trees and bushes for lizards and snakes. We also walked along streams and pools in search of adult and tadpoles of frogs and toads. We have calculated relative abundance and encounter rate of each species based on Visual Encounter Survey.

### **Species Richness:**

We recorded 72 species of herpetofauna during the survey. Amphibians were represented by 37 species belonging to 19 genera and 6 families. Among the recorded amphibians family Ranidae and Rhacophoridae had the highest species number (35.14%) followed by Dicroglossidae (18.92%), Megophryidae (5.41%), Ceratobatrachidae and Bufonidae (2.7%). Reptiles are represented by 35 species belonging to 26 genera and 11 families. The family Colubridae, comprises 37.14% followed by Agamidae (17.14%), Elapidae (11.43%), Gekkonidae (8.57%), Scincidae and Viperidae (5.71%) and Natricidae, Pareidae, Typhlopidae, Varanidae, Anguidae (2.86%).

Among amphibians, *Humerana humaralis* was the most abundant species (relative abundance= 0.16) with the encounter rate 1.36/sampling in low land areas. Among the reptiles *Calotes cf. jerdonii* was the most abundant species (relative abundance= 0.21) with the encounter rate 0.82/sampling.

### **Herpetofaunal Habitats:**

Numerous forest streams with diverse channel morphology are the cradles of biodiversity. Cascade frogs are rather specific to the "fall" and "cascade" sections of the streams.

Equipped with an elaborate ventral sucker, their tadpoles could easily negotiate slippery rocks. Lacking these special adaptations, torrent frog tadpoles are rather restricted to the pool sections. At this time of the year, we found majority of adult frogs hanging around streamside vegetations. Moist leaves of *Colocasia* and *Zingibers* are the ones preferred by Ranid and Rhacophorid frogs while fallen leaf litter along streams are just the place for diminutive trickle Frog and Kemps Pelobatid Toad. Profusely growing fern banks along the road are just perfect to spot heliothermic reptiles. As the day progresses, Skink activities increase along road and stream edges. In the night, many tree frogs and agamid lizards are seen perched on the top fronds of ferns. Leaf sheath of *Pandanus* sp, tree holes and banana sheath are few special microhabitats for few specialized tree frogs.

### **Noteworthy Species and Species complexes:**

This post monsoon survey failed to record majority of amphibian breeding activities. We came across only one large calling aggregation and breeding activity of *Amolops* cf. *chunghanensis*, a species hitherto unreported from India. Torrent frogs of the genus *Amolops* appeared to be extremely specious in the region. We have recorded at least six putative species under this genus. Scientific validity of their identity will need integrated taxonomic approach and comparison with Chinese elements. Record of *Nasutixalus* cf. *medogensis* and *Liurana* cf. *medogensis* indicates a profound Sino-Tibetan signature in the amphibian fauna of Adi Hills. Collection of topotypic materials of *Ingerana borealis*, *Megophrys* cf. *kempi* adds to the taxonomic value. Record of *Rhacophorus translineatus* is a significant range extension of the species within Indian limit.

Interesting records among reptilian fauna includes a lowland evergreen forest species of natricine snake tentatively assigned under the genus *Amphiesma* sp. This record perhaps represent a significant rediscovery of a lost species. Record of Endemic *Japalura andersoniana* from Adi Hills significantly extend its distribution range in Arunachal Pradesh. Record of *Cyrtodactylus* sp might represent a species new to science (Ishan Agarwal, Pers, Comm). Record of limbless lizard *Dopasia gracilis* adds to the poorly known distribution and natural history of the species. Much of the ophidian's records comes as opportunistic observations. Significant among them are the records of rare colubrids such as *Gonyosoma prasinum*, Elapids such as *Ophiophagus hannah* and Limbless lizard *Dopasia gracilis*.

During our survey we came across several species of reptiles and amphibians whose identity is hitherto unknown or provisionally assigned to closely related species pending further studies. The positive identification of these taxa will follow integrative taxonomic studies and collaborative work with other herpetologists. Among amphibians these poorly identified species include four torrent frog taxa of the genus *Amolops* sp, Bush frogs of the genus *Raorchestes* and recently described genus such as *Nasutixalus*. Among reptiles these are *Amphiesma* sp. *Sphenomorphus* sp and *Dendrelaphis* sp.

The reported diversity is lower than that of other known inventory in the Northeast India (Pawar and Birand 2001, Sengupta *et al.* 2000; Ahmed *et al.* 2004, Athreya, 2006). We expect numerous forest species to be discovered especially in the low to mid elevation tropical to subtropical forest areas. This statement is supported by the sharp slopes in the species accumulation curve drawn from the survey effort as against species richness



(Figure 3 and 4). The generated curves indicate sheer diversity of the study area as with each sampling occasion we have added new species records. It appear that reptile's inventory needs far more attention given their cryptic nature of life history. This even limit us to make any remark on the approximation of the species number of the study area. This relatively short survey consisting of a single rainy season could only record a fraction of total diversity of Adi hill. We believe more survey at different altitudinal grades of this hill range spanning across few seasons will significantly increase the number reptiles and breeding amphibian species.

Obligate stream frogs are exceedingly diverse in this region. We have recorded atleast seven species of Cascade Frogs from Adiland. We were also able to record few "lost" species that were not seen from the area from where they were described, technically called "topotypic material". We were fortunate to record topotypes of Yembung Sucker Frog, Trickle frog and perhaps a pelobatid toad described during the Abor Expedition. The record of Medog Litter Frog and Medog Tree Frog showed similarities of Adi Hill fauna with Medog Region of China.

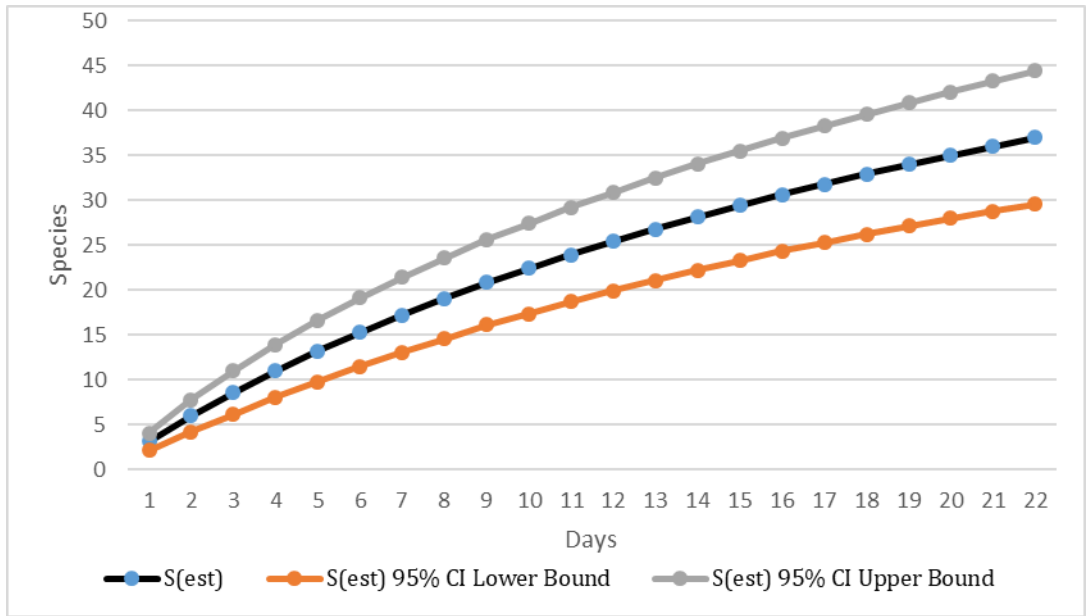


Figure 4 Species Accumulation Curve for Amphibians from Abor Expedition

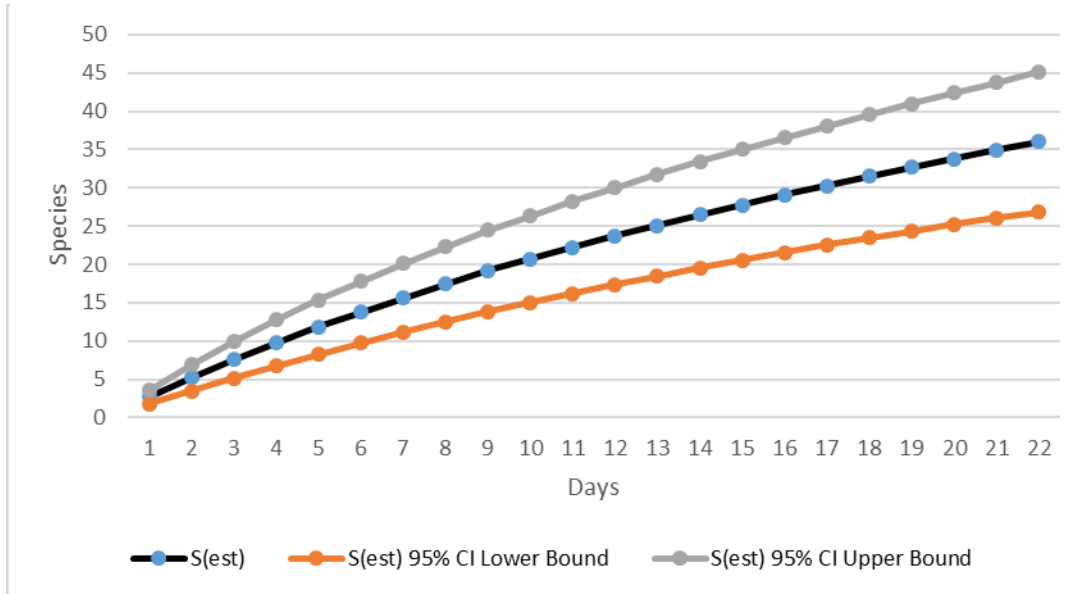


Figure 3 Species Accumulation Curve for Reptiles from Abor Expedition

**Table 1: Herpetofaunal field records**

Date 2018	Species	Individuals	Location	Habitat
29-09	<i>Naja kaouthia</i>	1	Between D'ering and Renging	Road
	<i>Amolops sp.</i>	4	Egar stream	Rocks
30-09	Natricinae	1	Poba RF	Stream
	<i>Typhlops cf. diardii</i>	8	Poba RF	Along road
	<i>Hylarana sp.</i>	1	Poba RF	Forest floor
	<i>Humerana humaralis</i>	30	Poba RF	Vegetation 30 cm – 3 m above
	<i>Polypedates (Small)</i>	1	Poba RF	Vegetation
	<i>Hylarana leptoglossa</i>	1	Poba RF	Vegetation ~ 30 cm above
	<i>Kurixallus sp.</i>	2	Poba RF	On leaf
	<i>Psammodynates pulverulentus</i>	1	Poba RF	On vegetation
	<i>Dendrelaphis proarchos</i>	1	Poba RF	Roadside
	<i>Hoplobatrachus crassus</i>	1	Poba RF	Puddle
	<i>Fejervarya teraiensis</i>	1	Poba RF	Water puddle edge
	<i>Eyphlyctis cyanophlyctis</i>	1	Poba RF	Water puddles
	<i>Cyrtodactylus khasiensis</i> cf.	3	Poba RF	Among vegetation along forest trail
01-10	<i>Varanus sp</i>	1	Borguli (Siang River)	Distinct tail drag and claw marks on sand
	<i>Hemidactylus platyurus</i>	2	Borguli (Siang River)	On tree
02-10	<i>Boiga siamensis</i>	1	Berung	Bamboo area near habitations
	<i>Ingerana borealis</i>	12	Dainakorong Stream	One was seen among Pandanus leaf
	<i>Raorchestes sp</i>	1	Dainakorong Stream	Among Pandanus stream
	<i>Amolops gerbillus</i>	10	Dainakorong Stream	Egar stream
	<i>Boiga quincunciata</i>	1	Dainakorong Stream	~ 1m among low vegetation near stream
	<i>Amolops cf. monticola</i>	1	Dainakorong	Near road.

			Stream	
	<i>Ptyctolaemus gularis</i>	1	Dainakorong Stream	Beside stream ~ 6-8 ft
	<i>Sphaenomorphus cf. maculatus</i>	1	Dainakorong Stream	On boulders
	<i>Amolops cf. monticola</i>	1	Dainakorong Stream	Near road.
	<i>Boiga quincunciata</i>	1	Dainakorong Stream	Active on riparian vegetation
<b>03-10</b>	<i>Ingerana borealis</i>	1	On the way to Jengging	Stream
	<i>Amolops sp.</i>	1	On the way to Jengging	road
	Tadpoles (Moderate size, black in colour)	*	On the way to Jengging (16 km from Rotung)	Near roadside ditch
	<i>Trimeresurus popeiorum</i>	1	Babuk/Kebang area	Roadkill
	<i>Rhacophorus cf. suffry</i>	2	Karko Village	Leaf of Cromolina
	<i>Bungarus niger</i>	1	Geku Village	Secondary information, roadkill
	<i>Calotes cf. jerdoni</i>	2	Jengging Circuit house	7 ft above near circuit house
<b>04-10</b>	<i>Varanus benghalensis</i>	1	Hydel road, Jengging	Basking
	<i>Naja kaouthia</i>	1	Along Sirnuik river, Hydel project	Along roadside vegetaion
	<i>Amolops gerbillus</i>	1	Siyap stream	~ 4-25 ft above on vegetation
	Tadpoles ( <i>Amolops</i> )	2	Siyap stream	Rocks of fast flowing stream, seen slowly climbing up
	<i>Amolops sp.</i>	5	Siyap stream	Vegetation (3-6ft) above flowing stream water
	Nanorana Tadpoles		Siyap stream	Pool of stream, collected
	<i>Megophrys cf. kemp</i>	2	Siyap stream	On leaf 2 ft above
	<i>Fejervarya sp.</i>	1	Siyap stream	On rocks of stream
	<i>Amolops gerbillus</i>	12	Siyap stream	On boulders of stream
	<i>Japalura andersoniana</i>	1	Siyap stream	Sleeping on fern



	<i>Pareas monticola</i>	1	Siyap stream	On vegetation ~ 5 ft away from stream
	<i>Rhacophorus smaragdinus</i>	1	Circuit house	~ 25 ft near circuit house
	<i>Ahaetula prasina</i>	1	Circuit house	Among vegetation along trail
<b>05-10</b>	<i>Sphaenomorphus</i> sp.	1	Circuit house Jengging	Small stream
	<i>Ahaetula nasuta</i>	1	Jengging Circuit house	Near roadside puddle
	<i>Hemidactylus</i> sp.	1	Jengging Circuit house	Under rocks along road
	<i>Calotes jerdoni</i>	1	Jengging Circuit house	Roadside vegetation
	<i>Fejervarya</i> sp	1	~ 4 km from last stream	On rock
	<i>Polypedates himalayanus</i>	1	~ 4 km from last stream	Shrub along stream ~ 7 ft above
	<i>Psammodynastes pulverulentus</i>	1	~ 4 km from last stream	~ 5 ft above
	<i>Ptyctolaemus gularis</i>	1	~ 4 km from last stream	4 ft above on vegetation beside stream
	<i>Pareas monticola</i>	1	~ 4 km from last stream	Vegetation beside stream
	<i>Rhacophorus smaragdinus</i>	1	~ 4 km from last stream	3 ft above on vegetation above flowing stream
	<i>Amolops</i> cf. <i>gerbillus</i>	3	~ 4 km from last stream	3 ft above on vegetation above flowing stream
	<i>Ingerana borealis</i>	2	~ 4 km from last stream	Leaf, slope of water trickling area
	<i>Amolops</i> sp	1	~ 4 km from last stream	On rock beside stream
	<i>Cyrtodactylus khasiensis</i> cf.	3	Sinnyu Stream	Riperian vegetation
	<i>Pareas monticola</i>	1	Sinnyu Stream	Cane leaf
	<i>Amolops</i> sp.	3	Sinnyu Stream	While coming back
<b>06-10</b>	<i>Sibynophis collaris</i>	1	From Jengging to Yingkiong	Roadkill while feeding on a large <i>Shaenomorphus</i>

	<i>Sphaenomorphus maculatus</i>	1	From Jengging to Yingkiong	Getting fed on by <i>Sibynophis</i> , roadkill
	<i>Psammodynastes pulverulentus</i>	1	Angom	Riperian vegetation
	<i>Amolops</i> sp.	1	Between Jambo and Angom	Stream
	<i>Bungarus niger</i>	1	Angom	Roadkill while feeding on <i>Ophiosaurus gracilis</i>
	<i>Ophiosaurus gracilis</i>	1	Angom	Getting fed on by <i>Bungarus niger</i>
	<i>Odorana livida</i>	1	Mingging	Roadside slope
<b>07-10</b>	<i>Dendrelaphis</i> sp.	1	Tuting	Basking on fern growing on the roadside (near Kapu)
	<i>Sphaenomorphus</i> sp.	2	Tuting	Active along roadside and also stream bank
	<i>Calotes jerdoni</i>	1	Tuting (Hitung Bukrung River)	Moulting condition
	<i>Duttaphrynus himalayanus</i>	1	Gelling	Along road
	<i>Calotes jerdoni</i>	2	Gelling	Sleeping along roadside vegetation
	<i>Rhacophorus smaragdinus</i>	1	Gelling	~ 10 ft – 12 ft or on road also
	<i>Rhacophorus suffry</i>	1	Gelling	On ferns
	<i>Polypedates assamensis</i>	1	Kapu village	With orange disc found abundant
	<i>Japalura</i> sp.	2		Sleeping on fern
	<i>Japalura andersoniana</i>	1		Sleeping on fern bank roadside
<b>08-10</b>	<i>Calotes jerdoni</i>	1	Near Gelling	Roadside vegetation
	<i>Odorana livida</i>	1	Near Gelling	Stream boulder
	Cobra skin	1	Near Gelling	Roadside slope
	<i>Megophrys</i>	1	Near Gelling	Calling from leaf above a small stream
	<i>Calotes jerdoni</i>	4	Before Tuting	Sleeping on fern 2 -6 ft above ground
	<i>Calotes jerdoni</i>	2	Before Tuting	Roadside vegetation
	<i>Japalura andersoniana</i>	1	Before Tuting	Beside stream on vegetation 5 ft above
	<i>Rhacophorus smaragdinus</i>	4	Before Tuting	On vegetation

	<i>Polypedates himalayanus</i>	1	Before Tuting	Near stream
	<i>Polypedates assamensis</i> cf.	4	Before Tuting	On ferns beside road
	<i>Amolops</i>	1	Before Tuting	On twig above stream
	<i>Amolops gerbillus</i>	3	Before Tuting	On leaf
	<i>Odorana livida</i>	1	Before Tuting	On bamboo near stream
<b>09-10</b>	<i>Amolops monticola</i>	22	Mosin	Aggregation from slope many amplexing pairs observed on road
	<i>Amolops</i> (female)	1	Mosin	One dead on road with whitish egg
	<i>Pareas monticola</i>	1	Mosin	Near stream
	<i>Calotes jerdoni</i>	1	Mosin	Roadside vegetation
<b>10-10</b>	<i>Ptyas nicromarginatus</i>	1	Jambo	Basking on road
<b>11-10</b>	<i>Ptyas korros</i>	1	Karko Village	Fresh road kill
	<i>Dendrelaphis cyanochloris</i>	1	Near Circuit house Jengging	Basking on low vegetation
<b>12-10</b>	<i>Bungarus niger</i>	1	After Jengging (Simong area 4 km from Nubo)	Roadkill
	<i>Calotes jerdoni</i>	4	From Kabung to Yubung village	Sleeping
	<i>Fejervarya</i> sp.	2	From Kabung to Yubung village	Paddy field
	<i>Rhacophorus smaragdinus</i>	2	From Kabung to Yubung village	On tree near circuit house
<b>15-10</b>	<i>Rhacophorus translineatus</i>	1	Mozik village stream	On Strobellianthus plant close to small stream
	<i>Megophrys</i> sp.	1	Mozik village stream	On leaf near stream
	<i>Amolops</i> sp.	1	Mozik village stream	On leaf near stream
	<i>Theلودerma asperum</i>	1	Mozik village stream	On leaf along forest trail
<b>16-10</b>	<i>Draco</i> sp	1	Second Mozik Camp	Secondary information from Manoj Nair
	<i>Nanorana</i> sp.	1	Second Mozik Camp	~ 10 cm on vegetation above stream

	<i>Amolops</i> (Green)	6	Second Mozik	Camp	With brown spots on the back
	<i>Philautus</i> (Big one)	1	Second Mozik	Camp	On leaf near stream
	<i>Megophrys</i> cf. <i>kempi</i>	6	Second Mozik	Camp	On vegetation near first order stream
	<i>Philautus</i> (Small one)	1	Second Mozik	Camp	On vegetation near first order stream
	<i>Rhacophorus</i> <i>translineatus</i>	1	Second Mozik	Camp	On leave near bamboo grove 7 ft above flowing water
<b>17-10</b>	<i>Ovophis monticola</i>	1	Back from stream	Ekko	On around below banana clump camouflaged 4 m away from stream
	<i>Megophrys</i>	1	Near stream	Ekko	Leaf near trail above stream
	<i>Philautus</i> sp.	1	Near stream	Ekko	On rotten log
	<i>Amolops</i> (Green with brown spots)	4	Near stream	Ekko	On leaf above flowing water
	<i>Megophrys</i> sp.	3	Near stream	Ekko	Along stream vegetation
	Tadpoles of <i>Nanorana</i>	2	Near stream	Ekko	stream pool
<b>18-10</b>	<i>Amolops</i> sp	1	Camp Mouling peak	on	On a climber 3 ft above flowing water.
<b>20-10</b>	<i>Sinomicrurus</i> <i>meclallendi</i>	1	Yubuk road		Crossing road
<b>23-10</b>	<i>Boiga siamensis</i>	1	Pasighat		roadkill
	<i>Naja kaouthia</i>	1	Sili Village		Killed by villagers
	<i>Naja kaouthia</i>	1	Muralali village		
<b>24-10</b>	<i>Varanus benghalensis</i>	1	Poba RF		Near agri field
<b>25-10</b>	<i>Rhadinophis prassina</i>	1	Rengging		Roadkill
	<i>Dopasia gracilis</i>	1	Rengging		Forest trail on a slope



**Table:2 Recorded Amphibian species and their relative abundance**

S. No	Family	Species Name	No. of Individuals	Relative abundance	Encounter Rate
1	Bufonidae	<i>Duttaphrynus himalayanus</i>	1	0.005	0.045
2	Ranidae	<i>Amolops cf. gerbillus</i>	29	0.149	1.318
3		<i>Amolops sp. 1</i>	4	0.021	0.182
4		<i>Amolops sp. 2</i>	11	0.057	0.500
5		<i>Amolops cf. monticola</i>	2	0.010	0.091
6		<i>Amolops sp. 3</i>	11	0.057	0.500
7		<i>Amolops sp. 4</i>	26	0.134	1.182
8		<i>Amolops sp. 5</i>	2	0.010	0.091
9		<i>Amolops sp. 6</i>	1	0.005	0.045
10		<i>Humerana humaralis</i>	30	0.155	1.364
11		<i>Hylarana leptoglossa</i>	1	0.005	0.045
12		<i>Hylarana sp.</i>	1	0.005	0.045
13		<i>Odorana livida</i>	1	0.005	0.045
14		<i>Odorana sp.</i>	2	0.010	0.091
15		Dicroglossidae	<i>Eyphlyctis sp.</i>	1	0.005
16	<i>Fejervarya sp. 1</i>		3	0.015	0.136
17	<i>Fejervarya sp. 2</i>		2	0.010	0.091
18	<i>Hoplobatrachus crassus</i>		1	0.005	0.045
19	<i>Ingerana borealis</i>		1	0.005	0.045
20	<i>Occidozyga sp.</i>		14	0.072	0.636
21	<i>Nanorana sp.</i>		1	0.005	0.045
22	Megophryidae	<i>Megophrys sp. 1</i>	3	0.015	0.136
23		<i>Megophrys sp. 2</i>	11	0.057	0.500
24	Rhacophoridae	<i>Kurixallus sp.</i>	2	0.010	0.091
25		<i>Polypedates himalayanus</i>	2	0.010	0.091
26		<i>Polypedates sp. 1</i>	1	0.005	0.045
27		<i>Polypedates sp. 2</i>	4	0.021	0.182
28		<i>Polypedates sp. 3</i>	1	0.005	0.045
29		<i>Raorchestes sp. 1</i>	3	0.015	0.136
30		<i>Raorchestes sp. 2</i>	1	0.005	0.045
31		<i>Raorchestes sp. 3</i>	1	0.005	0.045
32		<i>Rhacophorus maximus</i>	9	0.046	0.409
33		<i>Rhacophorus cf. suffry</i>	3	0.015	0.136
34		<i>Rhacophorus translineatus</i>	2	0.010	0.091
35		<i>Nasutixalus sp.</i>	1	0.005	0.045
36	<i>Theلودerma</i> cf.	1	0.005	0.045	

		<i>asperum</i>			
37	Ceratobatrachidae	<i>Liurana</i> sp.	4	0.021	0.182

**Table:3 Recorded reptile species and their relative abundance**

Sl. No.	Family	Species Name	Total No. of Individuals	Relative abundance	Encounter Rate
1.	Colubridae	<i>Boiga siamensis</i>	2	0.023	0.091
2.		<i>Boiga quincunciata</i>	2	0.023	0.091
3.		<i>Lycodon jara</i>	1	0.012	0.045
4.		<i>Ahaetula prassina</i>	1	0.012	0.045
5.		<i>Psammodynates pulverulentus</i>	3	0.035	0.136
6.		<i>Dendrelaphis cyanochloris</i>	1	0.012	0.045
7.		<i>Dendrelaphis</i> sp. 1	1	0.012	0.045
8.		<i>Dendrelaphis proarchos</i>	1	0.012	0.045
9.		<i>Dendrelaphis</i> sp. 2	1	0.012	0.045
10.		<i>Ptyas korros</i>	1	0.012	0.045
11.		<i>Ptyas nigromarginatus</i>	1	0.012	0.045
12.		<i>Rhadinophis prassina</i>	1	0.012	0.045
13.		<i>Sibynophis collaris</i>	1	0.012	0.045
14.	Natricidae	<i>Amphiesma</i> sp.	1	0.012	0.045
15.	Pareidae	<i>Pareas monticola</i>	4	0.047	0.182
16.	Elapidae	<i>Sinomicrurus meclallendi</i>	1	0.012	0.045
17.		<i>Naja kaouthia</i>	5	0.058	0.227
18.		<i>Bungarus niger</i>	3	0.035	0.136
19.		<i>Ophiophagus hannah</i>	1	0.012	0.045
20.	Viperidae	<i>Trimeresurus popeiorum</i>	1	0.012	0.045
21.		<i>Ovophis monticola</i>	1	0.012	0.045
22.	Typhlopidae	<i>Typhlops</i> cf. <i>diardii</i>	8	0.093	0.364
23.	Agamidae	<i>Calotes versicolor</i>	1	0.012	0.045
24.		<i>Calotes jerdonii</i>	18	0.209	0.818
25.		<i>Ptyctolaemus gularis</i>	2	0.023	0.091
26.		<i>Japalura andersoniana</i>	2	0.023	0.091
27.		<i>Japalura</i> sp.	3	0.035	0.136
28.		<i>Draco</i> sp.	1	0.012	0.045
29.	Scincidae	<i>Sphaenomorphus</i> sp. 1	3	0.035	0.136
30.		<i>Sphaenomorphus</i> sp. 2	2	0.023	0.091
31.	Varanidae	<i>Varanus benghalensis</i>	3	0.035	0.136
32.	Gekkonidae	<i>Hemidactylus platyurus</i>	2	0.023	0.091
33.		<i>Hemidactylus</i> sp.	1	0.012	0.045
34.		<i>Cyrtodactylus</i> sp.	4	0.047	0.182
35.	Anguidae	<i>Dopasia gracilis</i>	2	0.023	0.091

Some noteworthy herpetofaunal records during Abor expedition



*Rhacophorus translineatus*



*Theloderma asperum*



*Amolops* sp.



*Japalura andersoniana*



*as nigromarginatus*



*Dendrelaphis* sp.

Pty



*Odorrana livida*



*Liurana medogensis*



*Polypedates assamensis*



*Raorchestes sp.*



*Nasutixalus cf. medogensis*



*Rhacophorus suffry*



### Conservation perspective:

At least 15 species of amphibian and reptiles belonging to genus *Raorchestes*, *Nasutixalus*, *Liurana*, *Rhacophorus*, *Megophrys*, *Theloderma*, *Amolops*, *Nanorana*, *Ovophis* and *Sinomicrurus* are only recorded from undisturbed forest habitats and it is presumed that, loss of forest habitat may be detrimental for those forest species.

Roadkill appears to be a major threat for populations of widespread species. We have recorded 12 species of snakes as roadkill. These include, *Ophiophagus hannah*, *Ptyas korros*, *Naja kaouthia*, *Boiga siamensis*, *Boiga quincunciata*, *Sibynophis collaris*, *Gonyosoma prasinum*, *Popeia popeiorum*, *Dopasia gracilis* and *Bungarus niger*. We presume that species and individual roadkill count will significantly increase during breeding season. Such consistent loss may be detrimental for the local population of herpetofaunal species.

Of this recorded diversity *Varanus benghalensis* or Bengal Monitor falls under highest legal protection status of Schedule I species of Indian wildlife (protection) act, 1972. Two species viz. Monocled Cobra and King Cobra, Indian Rat Snake are listed as Schedule II species and



Limbless Lizard, *Dopasia gracilis*, a unique reptile recorded during this Expedition

rest all the snake species are listed under Schedule IV of IWLPA 1972. Among amphibians *Ingerana borealis* and *Ophiophagus hannah* are vulnerable species in IUCN criteria.

Our discussion with local inhabitants also indicated a significant portion of diversity in stream frogs, tree frogs and snakes that we failed to record owing to the timing of the survey. Nonetheless, this rapid herpetological assessment provides baseline natural history information for all the recorded species that may help in further research and

conservation. Reptiles and amphibians are important components of biodiversity, especially amphibians, which are valuable bioindicators (Hyne et al., 2009). These species are often under-represented in conservation planning (e.g., Pawar et al., 2007) despite having the highest threat status among all terrestrial vertebrates, with significantly more species at risk than either birds or mammals (Gascon et al., 2005; Cuttelod et al., 2008). This rapid assessment provides baseline information for conservation prioritization of the Herpetofauna of Adi Hill Region. We recommend that a long term herpetofaunal inventory should be taken up, and that ecological studies are conducted to better understand the diversity, biogeography, and ecology of herpetofaunal species of Mouling National Park of Arunachal Pradesh.

## 10. Birds

**Author: Manoj V. Nair**

Of 1310 species of birds which occur within Indian limits, 869 species are known to occur in the state of Arunachal Pradesh, thereby making this region one of the richest in the world, with three species new to science being described in the last decade from the state (Kumar & Singh 2003; Athreya 2006; Alström et al. 2016; Lepage 2017). Located within the Indo-Chinese and Indo-Myanmar Global Biodiversity Hotspots, this is the largest state in north-eastern India. Aided by the altitudinal variation, vegetation gradients and sparse human population density, it is largely forested and still harbours huge potential to yield species new to science, especially in lower forms.

During this expedition, we undertook a rapid assessment of avian diversity covering the entire Siang valley from the alluvial floodplains of D'Ering Wildlife Sanctuary, the lowland evergreen forests of Poba RF to the sub-tropical and broadleaved temperate forests higher up in the mountains. Birds were surveyed *ad libitum* using time-constraint method, along roads, jungle trails, jhum field edges and inside the forests. Apart from visual observations, mist-netting sessions were undertaken for trapping shy undergrowth species. Call-playback method was also used to lure some skulking species. Skins, feathers and tropihies displayed/found in homes of local people were also inspected. Further, interviews with local villagers, especially expert hunters were carried out wherein information about species of interest were sought using photographs and Field Guides.

239 species of birds belonging to 67 families were recorded during the expedition, which represents a substantial increase from the 109 species recorded during the earlier Abor expedition. Muscicapidae with 26 species was the most speciose family followed by Leiothricidae and Accipitridae with 12 and 9 species each respectively.

Though a fair number of species could be recorded during the survey, it is to be mentioned that densities encountered were extremely low, most probably due to extensive hunting and trapping, practiced by the local villagers throughout the valley. Except for small passerines such as warblers and heavy undergrowth-dwelling timaliids, most birds were found to be very shy and skulking; all medium-sized birds flushed at any hint of human presence and were found to fly very high, out of reach of catapults/arrows. The impact of hunting could be clearly discernible by the fact that apart from one unconfirmed distant sighting of a pair of Hornbills and extremely rare sightings of birds of prey, no large-bodied bird could be seen throughout the survey.

It may be noted that this is a work in progress; unidentified calls that were recorded during the expedition are currently being analysed and photographs of unidentified species are being studied. Concurrently, a thorough literature survey is being done to prepare a comprehensive annotated checklist to be included in the final report which will contain details of interesting behavioural, ecological and breeding observations.

## Significant ornithological records

### Globally threatened birds

- Slender-billed Vulture *Gyps tenuirostris* CE

One adult bird in distant flight en route D'Ering Sanctuary.

- Chestnut-breasted Hill-partridge *Arborophila mandellii*

Calls of individual birds as well as coveys heard during early morning and evening in Mouling NP.

- Blyth's Tragopan *Tragopan blythii* VU

A pair of these were hunted by a hunter inside Mouling NP, few weeks before our visit.

- Lesser Adjutant *Leptoptilos javanicus* VU

A pair soaring high above the river island inside D'Ering WLS.

- Black-breasted Parrotbill *Paradoxornis flavirostris* VU

Three birds attracted by call-play back inside D'Ering WLS.

- Marsh Babbler *Pellorneum palustre* VU

One bird, enticed to come close by call-play back inside D'Ering WLS.

### Near-threatened birds

- Black-headed Ibis *Threskiornis melanocephalus*

Two birds in flight above paddy fields near Pasighat.

- Spot-billed Pelican *Pelecanus philippensis*

One bird in soaring flight above the river islands near Kobo chapori.

- River Lapwing *Vanellus duvaucelii*

One bird along the river at D'Ering.

- Rufous-bellied Eagle *Lophotriorchis kienerii*

An adult flying above the FRH at Gengging.

- River Tern *Sterna aurantia*

One bird flying along the Siang river below Pasighat.



Crested Goshawk



Black Eagle





Rufous-necked Laughing Thrush



Streaked Spider Hunter



Common Hoopoe



Spotted Forktail

## **11. MAMMALS**

**Author: Bivash Pandav**

Our survey relied on direct evidence of animals through visual sightings or sounds, and indirect evidence through tracks, droppings and semi-structured interviews with villagers, especially hunters. To ensure reliable information in our interviews, we showed them picture of animals from field guides and also visited hunter's home to observe animal trophies. Our records include direct sightings of Wild Pig, Barking Deer, Malayan Giant Squirrel, Malayan Tree Shrews, and Bandicoot Rat. We have recorded five species of Bats and few more rodents that are under taxonomic study. We came across fresh signs and reliable secondary evidence of Himalayan Black Bears, Takin, Serow and Goral from the area. We have observed skin of Giant Flying Squirrel and Red Panda in Mosin village. The animals were reportedly killed from adjoining Hill Area. We observed photograph of Musk Deer from Nanga Pahar area beyond Mouling Peak.

Our nocturnal survey resulted in record of Slow Loris from Poba Reserved Forest. This is the only direct sighting of a primate species during our survey. Although our local interview and secondary records suggested presence of Capped Langur and Assamese Macaque in remote forest areas of Adi Hills. We have also recorded four individual of Particolored Flying Squirrel near Jengging. We came across Barking Deer call near Gelling close to Indo-China Border.

## 12. Target Habitat and Taxa for Conservation

Lowland Evergreen Forest (Poba Reserved Forest ~100 m elevation) is one of the last remaining patch needs protection. Beside, Evergreen formation on moderate hillslopes Siang River Valley appears to be exceptionally rich in Biological Diversity, warrants protection. Mid elevation evergreen forest and high elevation climax bamboo forest of Mouling National Park are biologically unique and conservation attention. Selective logging of certain timber species is the biggest threat to the remaining primary forests of Siang, like many other parts of Arunachal. Additionally, species of canes/*rattans* are one of the most exploited species from the low and mid elevation forests and are harvested indiscriminately not just for making objects for their day to day use but also selling in the market. These species are being extracted even from the protected area and the extent of collection does not seem sustainable. At this rate some of these species of canes are likely to face an imminent threat of local extinction and need to be prioritized for any conservation effort takes in this region.

Among animals, the arboreal guild of small mammals (Rodents, Himalayan squirrel, Giant Squirrels, Tree Shrews and Civets etc) are trapped extensively for local consumption. This particular phenomenon need immediate management intervention. Among Reptiles and Amphibians, harvested species such as large bodied steam frogs of the genus *Amolops* and *Nanorana* and *Varanus bengalensis*, Forest species such as *Rhacophorus translineatus*, *Ophiophagus hannah*, habitat specific species such as *Nasutixalus* cf. *medogensis* needs conservation attention.

## 13. CONSERVATION OPPORTUNITIES

Arunachal Pradesh, still represent the remotest wildlife frontier of India with ample conservation opportunity. Collaboration and handholding among local communities, scientists and wildlife management authorities may be the key to conservation success in these sparsely populated area. Local villagers are extremely knowledgeable about the wildlife resources. Their knowledge can be harnessed for developing better conservation models for India's one of the remotest protected areas such as Mouling National Park.

We envision further expansion of protected area network to protect some of the excellent evergreen forest formation around Bomdo, Jambo and Angom area of Siang Valley. Also Rengging area near Pasighat having some excellent mid elevation tropical evergreen forest needs urgent conservation attention.

At the same time, there is tremendous opportunity to conduct further research that will surely yield conservation benefits. Long term monitoring of Arboreal mammals guilds, Birds communities, steam amphibians as indicators species and diversity studies in Odonates, Butterflies, cicadas and moth should be taken up.

We strongly recommend to step up wildlife protection measures and a ban in hunting. Sustainable livelihood opportunities in the fringe villages may help in achieving this much

needed goal. We also recommend improving the capacity of fringe villagers (Yebuk village) and aware them about importance of wildlife conservation.





*Nycticebus bengalensis*



Flying Squirrel (Unidentified)



Flying Squirrel (Unidentified)



Bat (Unidentified)



Bat (Unidentified)



A Bandicote killed in Trap

## 14. CONCLUSION

Arunachal Pradesh is by far the most biodiversity rich states of our country and yet it also the most unexplored. Our expedition and our findings underscored the need to carry out multiple such surveys and initiate long term studies to fill the gap in our understanding or taxonomy and distribution of the flora and fauna of Arunachal Pradesh. This will serve as a foundation if we are to take any conservation efforts to save the biodiversity in this region before it is lost forever.

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## 16. Awareness Material Published

WILDLIFE • NATURAL HISTORY • PHOTOGRAPHY • CONSERVATION

# SAEVUS



# REPTILES and AMPHIBIANS of MOULING NATIONAL PARK

*'Unrevealing the unknown world of herpetofauna by revisiting century old 'Adi Expedition' in the Land of Rising Sun in India!'*

Mouling National Park (MNP) is one of the remotest protected area, literally a terra incognita. This primary forest is located in the Upper Siang district of Arunachal Pradesh, in Adi hills of eastern Himalayan biodiversity hotspot. Its tropical forests at lower elevation, sub-tropical broad leaf and temperate forests at upper ridges, are virtually center of diversity and endemism. Myriad of forest streams are cradle of biodiversity, most of them drains to the larger rivers like Siang, Siyom and Sikke. A seven day rapid biodiversity assessment during 14-20 October, 2018 has revealed a rich herpetofaunal assemblage, a glimpse of which is presented here

Herps are crucial link in the forest food chain. Their diversity is specific to forest streams, leaf litter & canopy habitats. Amphibians are 'ecological indicator' of fresh water ecosystem. Snakes are 'friend of farmers' as they control rodent population. A collaborative effort in research and awareness can help in conservation of these Cool Customers!!



Text & Photos: Abhijit Das & Dhirjitman Mukherjee  
 Concept & Design Preeti Sharma  
 Cover Photos: *Rhacophorus transilivatus* (Top)  
 & *Ahaetulla prasina* (Bottom)

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