Review of Fauna of Dehang-Debang Biosphere Reserve, Arunachal Pradesh (India)

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Abstract: The paper deals with the compilation of faunal diversity of Dehang-Debang Biosphere Reserve (DDBR) records from past works so as to create a comprehensive database of the faunal diversity of the BR at one place. Due to its rugged terrain and inaccessible landscape, the area has not been discovered so well from the biological diversity point of view, although its faunal diversity has been studied and reported by few workers. The areas in and around the Dehang Debang Biosphere Reserve contributes nearly 70% of the bird species of Arunachal Pradesh. The records reveal presence of 133 species of butterfly belonging to 8 families and 81 genera (as invertebrate record). While the vertebrate fauna is represented by 180 species of mammals, 492 species of birds,106 species of reptile, 43 amphibian species and 93 species of fish and yet to explore more.

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Key Words: Dehang Debang Biosphere Reserve, DDBR, Fauna, Arunachal Pradesh, Biodiversity.

1. Introduction

The Eastern Himalaya being the transition zone between Indian Indo-Malayan and Indian Indo-Chinese biogeographical regions is referred as "*Biogeographical gateway*" and it has created one of the biologically rich areas on the earth and recognized as Global Biodiversity Hotspots. Arunachal Pradesh is located between 26°28'and 29°30'North latitudes and 91°30' and 96°30' East longitude which covers an area of 83743sq.Km. The state is an abode for a wide range of floral and faunal wealth. It is one of the largest states of the Indian Himalayan Region (IHR). It is nature's repository of medicinal plants and has an assemblage of 5 hornbill species and is one of the topmost birding areas in the world and has the second highest Important Bird Area (IBAs) in the northeast India (IBCN, 2004; Islam *et al*, 2004) and has rich avifauna with over 760 bird species and 10 species of Pheasants (SFRI, 2008). The state has nearly 213 species of fish and 55 species of Amphibians, more than 55 species of Snakes (Maheswaran, 2012) and as many as 71 species of chiropterans.

The Dehang-Debang Biosphere Reserve (DDBR) is one of the biologically very rich and largely undisturbed protected areas in Arunachal Pradesh. The DDBR was notified on 02.09.1998, it spreads over an area of 5111.5 km^2, with buffer zone of 1016.7 km^2. It represents one of the most diverse wildlife assemblages hosting one of the Eastern Himalayan Biodiversity Hotspot. The Reserve is an abode for wide variety of floral and faunal species. The two protected areas, Mouling National Park (483 Km^2) and Debang Wildlife Sanctuary are located fully and partially within the Biosphere Reserve respectively. There are 12 major tribal communities inhabiting in and around DDBR whose main occupation is agriculture (mainly Jhum cultivation), cattle rearing and hunting and they depend directly on the forest resources for their daily needs. The topography of the Biosphere is characterized by steep to very steep and rugged terrain typical high mountainous, well drained with numerous rivers and gorges. Due to inaccessibility, the reserve though bestowed with rich faunal species, is poorly studied and much of its parts remains unexplored.

2. Methodology

The information available in the form of published literature paper, articles, reports, management plan and state faunal records from Zoological survey of India were collected and compiled. The different sources explored includes research papers, books, reports etc., for example Chaudhury (2003, 2004, 2008 & 2010), Sen and Mukhopadhyay (1999), Singh (1994), Athreya (2006), WWF (2006), Ghosh and Ringu (2002), Naoroji et al. (2005) etc. The data extracted from various sources was also processed and rectified with the help of online resources (such as www.iucnredlist.org) to prepare a detailed list of fauna with the systematic position, common name, scientific name, global distribution and status as per IUCN redlist of threatened animals.

Table 1. Faunal diversity with global threat status of DDBR.

Zoological Classification	Fauna	Family	Genera	Species	Global Status						
					CE	EN	NT	VU	LC	DD	NA
Vertebrate	Mammals	32	108	180	0	6	11	18	133	8	4
	Birds	71	237	492	2	4	15	16	455	0	0
	Reptiles	14	61	106	0	2	3	5	20	3	73
	Amphibian	7	26	43	0	0	1	1	27	4	10
	Fish	23	57	93	0	1	9	3	61	3	16
Invertebrate	Butterfly	8	81	133	0	0	0	0	0	0	133
Total		155	570	1047	2	13	39	43	696	18	236

TH-Threatened, CE-Critically Endangered, EN-Endangered, NT-Near Threatened, VU-Vulnerable, LC-Least Concern, DD-Data Deficient, NA-Not Assessed.

3. Results and Discussion

A total number of 1047 faunal species have been found reported in different sources belonging to (in and around) the Dehang Debang Biosphere Reserve, belonging to 570 genera and 155 families (Table 1). Table 1 is also representing faunal group wise number of species falling in different global conservation status as per IUCN redlist. Table 1 above clearly depicts that birds or avifauna is the largest group among all faunal groups reported in and around DDBR. The bird fauna contributes 47% with 492 species among other faunal groups followed by mammals (17%) and butterflies (13%) etc. (Figure 1). Amphibian is the lowest populated faunal group among others. Talking about the mammals, a total of 180 mammalian species are reported in and around DDBR which comprises of the order Chiroptera with the maximum 52 (29%) species followed by the Order Rodentia with 47 (26%) species, Carnivora of 39 (21%) species order Cetartiodactyla exhibits 16 (9%) species, order Eulipotyphla with 11(6%) species, order Primates contributes 6 (3%) species of which 5 are globally threatened, order Lagomorpha with 5 (3%) species and order Scandentia with 2 (1%) species, while the least of 1 species is contributed by the order Insectivora and Pholitoda.

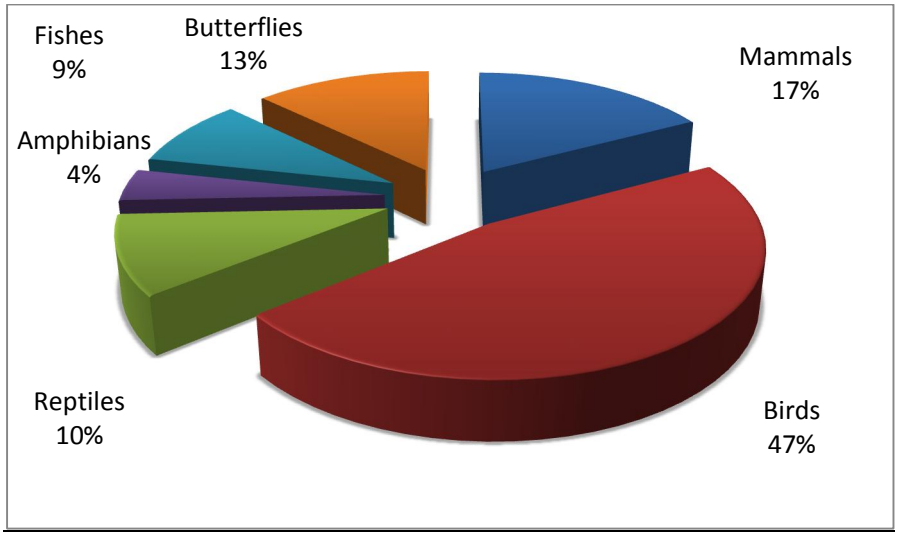

Figure 1. Percent species contribution of different faunal groups in DDBR.

Avifauna which is the largest faunal group reported in and around DDBR comprises 492 species of 18 order, 71 families and 237 genera. The order Passeriformes is dominant with total 287 (58.3%) species belonging to 34 families followed by the order Falconiformes with 34 (6.9%) species, Charadriiformes with 28 (5.6%) species, order Galliformes 25 (5.8%) species with 8 globally threatened species, Anseriformes 23 (4.7%) species, order Piciformes 19 (3.8%) species, Ciconiiformes

and Columbiformes 13 (2.6%) species each, order Coraciiformes 11 (2.2%) species, order Strigiformes and order Gruiformes 8 (1.6%) species each, order Cuculiformes, order Pelecaniformes and Apodiformes with 5 species each, order Caprimuliformes 3 species and the least species contributed by the order Podicipediformes and Trogoniformes (2 each) and Psittasiformes with only 1 species. Some 23 (4.6%) species of Migratory birds were also reported from the same area. It is important to highlight that out of 21 restricted range species in the Eastern Himalayan Endemic Bird Areas, 16 (76%) species namely *Arborophila mandellii, Garrulax virgatus, Spelaeornis caudatus, heterophasia pulchella, Tragopan blythii, Lophophorus sclateri, Stachyris oglei, sphenocichla humei, Actinodura waldeni, Yuhina bakeri, Alcippe ludlowi, Heterophasia picaoides, Phyllocospus cantator, Spelaeornis troglodytes, Tickellia hodgsoni and Harpactes wardii,* are reported to be found in DDBR.

Among the 106 species of reptilian fauna found in and around DDBR, order Squamata dominates the reptilian fauna with 97 (91%) species whereas, order Testudines represents only 9 (8.4%) species of which 8 species are threatened globally. The Threatened species includes *Batagur dhongoka, Cuora mouhotii, Cuora amboinensis*, Cyclemys dentate, *Melanochelys tricarinata, Nilssonia hurum, Ophiophagus Hannah, Pangshura smithii, Pangshura sylhetensis* and *Python molurus.*

The 43 species of Amphibian fauna is contributed by family Rhacophoridae contributing the maximum species of 15 (34.8%) species, followed by family Ranidae with 11 (25%) species, family Dicroglossidae with 7 (16%) species,family Megophryidae with 5 (11.6%) species, Bufonidae with 3 (7%) species, the family Microhylidae and Palobatidae contributes only 1 species each only. The species *Theloderma moloch* and *Rhacophorus reinwardtii* are the two threatened species that were reported among the amphibian fauna from DDBR. Among the Butterflies, the dominant family being Nymphalidea with 28 genera and 41 species followed by Papilionidae and Satyridae with 9 and 12 genera and 22 species each, Lycanidae comprising of 14 genera and 20 species and Peridae with 10 genera and 16 species.

While the 93 species of fish fauna comprises of 7 orders of which the order Cypriniformes represented by 53 (57%) species, followed by order Siluriformes with 22 (24%) species, Perciformes with 12 (12%) species, order Symbranchiformes with 3 species and least species by the order Osteoglossiformes, Clupeiformes and Beloniformes contributes only 1 species. There are 13 globally threatened fauna that were recorded from the BR, these includes *Aborichthys kempi, Bagarius bagarius, Botia rostrata, Cyprinion semiplotum, Labeo pangusia, Neolissochilus hexagonolepis, Ompok bimaculatus, Ompok pabda, Ompok pabo, Schizothorax richardsonii, Tor putitora, Tor tor* and *Wallago attu.* Most of the fish species representing the fish fauna of DDBR were recorded from Mouling National park as per the available sources.

4. Conclusion

As per the available database it is clearly reflected that DDBR is indeed a treasure of faunal wealth and certainly there is a lot more to be further explored. In general the biotic components face a lot of threats globally but as far as Dehang-Debang Biosphere Reserve is concern, due to its inaccessible terrain and topography the place is somewhat safe from many forms of the threats. However, in contrast, many studies have revealed that a significant number of faunal species found in and around DDBR are facing local threats because of various reasons. Among these species, many are listed under different IUCN threat categories and also listed under schedule I-IV of Wildlife Protection Act (WPA) 1972 (Table 2). As presented in Table 2, there are 36 species belonging to different faunal groups which are being harnessed for medicinal, cultural and different other uses (Chakravorty et al., 2011; Chakravorty et al., 2011; Solanki & Chutia, 2004; Chinlampiaga et al, 2013 etc.). Consequently, these species are under stress locally. Hornbills and galliformes are most threatened species. Some of the faunal species those are known to be Least Concern (LC) as per the Global status in the IUCN redlist are being hunted for various ritualistic and medicinal values. For example, Squirrels are hunted for marriage related rituals (Table 2), if hunting of this species continuous there are likely chances that squirrels may come under vulnerable (VU) or endangered (EN) status in near future. In Arunachal Pradesh, there is the seasonality of hunting and hunting is intensive during jhum cultivation and harvesting of the crops (Chutia and Solanki, 2013), although the role of Jhum agriculture can again be a matter of separate debate. However, it is important to understand that the presented facts and figures are alarming and clearly showing the need of conservation efforts.

Table 2. Conservation status of faunal species found in and around DDBR and their local uses.

S. No.	SCIENTIFIC NAME	COMMON NAME	IUCN STATUS (IUCN 3.1 RED DATA	STATUS AS PER WPA 1972 AND CITES	USES OF FUANAL RESOURCES IN ARUNACHAL PRADESH
1.	Neofelis nebulosa Griffith, 1821	Clouded Leopard	Vulnerable	WPA,1972 Sch – I	Hunted for meat,skin and Bone marrow to massage body pain (Chakravorty *et a*l., 2011)
2.	Panthera pardus Linnaeus, 1758	Leopard	NT	WPA,1972 Sch – I/CITES appen - I	Hunted for meat and medicine for Malaria,typhoid and rheumatic pain. (Solanki & Chutia, 2004)
3.	Panthera tigris Linnaeus, 1758)	Tiger	EN	WPA,1972 Sch – I/CITES appen - I	Hunted for meat,skin and dried bones as paste used for curing rheumatic and body pain. (Solanki & Chutia, 2004)
4.	Pardofelis marmorata Martin, 1837	Marbled Cat	VU	WPA,1972 Sch – I	Hunted for meat and skin. (Solanki & Chutia, 2004)
5.	Ursus thibetanus G. [Baron] Cuvier, 1823	Himalayan Black Bear	VU	WPA,1972 Sch – I	Hunted for meat, teeth and gall bladder (medicine for malaria, typhoid and T.B.), dried skin as armour (known as *Khuk* by Monpas) and headgear & shoulder belt (Nyshi), (Solanki & Chutia, 2004)
6.	Felis chaus Schreber, 1777	Jungle cat	LC	WPA,1972 Sch – II/CITES - II	Skin and fur for aesthetic use by males during special occasion. (Solanki & Chutia, 2004)
7	Vulpes bengalensis Shaw, 1800)	bengal fox	LC	WPA,1972 Sch – II/CITES – III	Hunted for food. Meat boiled or roasted is used for treatment of TB and bones in fertility. (Chakravorty *et a*l, 2011)
8.	Canis aureus Linnaeus, 1758	golden jackal	LC	WPA,1972 Sch – III/ CITES – III	Hunted for meat and bones to treat skin disease. (Solanki & Chutia, 2004)
9.	Bos gaurus C.H. Smith, 1827	Indian Bison	VU	WPA,1972 Sch – I/CITES appen – I	As wild meat (Solanki & Chutia, 2004)
10.	Budorcas taxicolor Hodgson, 1850	Takin	VU	WPA,1972,Sch – I/ CITES appen - II	One of the endemic species is hunted for meat,skull and skin display at household. (Solanki & Chutia, 2004)
11	Moschus fuscus Li, 1981	Black musk deer	EN	CITES append - I	Musk pod exported illegally from the local by outsider (Solanki & Chutia, 2004)
12	Moschus moschiferus Linnaeus, 1758	Siberian Musk Deer	VU	CITES appen - II	Hunted for meat and musk which is used for therapeutic purpose for malaria and diarrhea (Solanki & Chutia, 2004)
13	Naemorhedus goral Hardwicke, 1825	Himalayan Goral	NT	WPA,1972,Sch – III/ CITES - I	Skin to partly covered hand fan (Solanki & Chutia, 2004)
14.	Rusa unicolor Kerr, 1792	Sambar	VU	WPA,1972,Sch – III	Dried skin as coat (known as *Pakcha)* to protect from severe climate. Crush horn with salt for bursting boils (Chakravorty *et a*l, 2011)
15.	Sphaerias blanfordi Thomas, 1891	Blandford's fruit bat	LC	----------	Hunted for meat,skin used for skin diseases and bones as taboo item. (Chinlampiaga et al., 2013)
16.	Manis pentadactyla Linnaeus, 1758	Chinese pangolin	EN	WPA,1972,Sch – I/CITES append - II	Nails used to pierce boils (Chakravorty *et a*l, 2011)
17.	Macaca assamensis M'Clelland, 1840	Assamese Macaque	NT	WPA,1972,Sch – II/CITES append - II	Hunted for meat as it has good medicinal properties and used to treat disease like small pox,malaria etc. (Solanki & Chutia, 2004)
18.	Trachypithecus pileatus Blyth, 1843	Capped langur	VU	WPA, 1972,Sch – I/CITES append - I	Meat as food and as ethno-medicine and for socio-cultural practices (Solanki & Chutia, 2004)

19.	Macaca mulatta Zimmermann, 1780	Rhesus Monkey	LC	WPA, 1972,Sch – I/CITES append - II	Meat for treating diseases like malaria, cholera. Skull & finger or palms are hung to door to calm evil spirit (Solanki & Chutia, 2004)
20.	Macaca munzala Madhusudan & Mishra, 2005	Arunachal Macaque	VU	CITES append -II	Hunted for meat,sport and medicine for sick livestocks as well,juveniles as pet. (Solanki & Chutia, 2004)
21.	Ratufa bicolor Sparrman, 1778	Malayan Giant Squirrel	NT	WPA,1972,Sch – II	Hunted for meat and used dowry item. (Chinlampiaga et al, 2013)
22.	Hystrix brachyura Linnaeus, 1758	Himalayan Crestless Porcupine	LC	WPA, 1972,Sch – II	Boiled gall bladder,stomach and intestine are used to cure Diahoea, gastritis and TB. (Chakravorty *et a*l, 2011)
23.	Dremomys lokriah Hodgson, 1836	Orange bellied Himalayan Squirrel	LC	WPA, 1972,Sch – IV	As gift to bride's family during marriage ceremony and other social ceremonies and as medicine also. (Chinlampiaga et al, 2013)
24	Callosciurus pygerythrus, I. Geoffroy Hilaire, 1832	Irrawaddy squirrel	LC	WPA, 1972,Sch – II	Hunted for meat and used dowry item (Chinlampiaga et al, 2013)
25.	Hylopetes alboniger (Hodgson, 1836)	Particolored Flying Squirrel	LC	WPA, 1972,Sch – II	Hunted for meat and used dowry item (Chinlampiaga et al, 2013)
26.	Belomys pearsonii Gray, 1842	hairy footed flying squirrel	DD	WPA, 1972,Sch – II	Hunted for meat and used dowry item (Chinlampiaga et al, 2013)
27.	Tamiops macclellandi Horsfield, 1840	Himalayan striped Squirrel	LC	WPA, 1972,Sch – IV	Hunted for meat and used dowry item (Chinlampiaga et al, 2013)
28.	Aceros nipalensis Hodgson, 1829	Rufous necked hornbill	VU	WPA, 1972,Sch- I /CITES append – I/II	Mostly hunted species, beak, decorate traditional headgear (*Nyshi* tribe), feathers to adorn headdresses (*Wancho* & *Nocte* tribe), fat for body massage. (Chakravorty *et a*l., 2011)
29.	Tragopan blythii Jerdon, 1870	Blyths tragopan	VU	WPA,1972 Sch – I/CITES append- I	Tail feather as hand fan. (Aiyadurai, 2012).
30.	Lophophorus sclateri Jerdon, 1870	Sclater's monal	VU	WPA,1972 Sch - I	Feather used as hand fan by chanting priest, wing feather worn around neck by women (Aiyadurai, 2012)
31.	Gracula religiosa Linnaeus, 1758	Hill myna	LC	----------	Hunted for meat as energy enhancement. (Chinlampiaga et al, 2013)
32.	Python molurus Linnaeus, 1758	Indian Python	NT	WPA,1972 Sch – I/CITES, append- I	Body fat massage for joint pain (Chakravorty *et a*l., 2011)
33.	Naja kaouthia Lesson, 1831	Monocled Cobra	LC	CITES, appendix – I	Cooked meat used in disease like cold (Chakravorty, *et a*l., 2011)
34.	Bagarius bagarius Hamilton, 1822	NA	NT	----------	Smoked dried bones/Fins are used for burns and stomach ache. (Chakravorty, *et a*l, 2011)
35.	Sus scrofa Linnaeus, 1758	Wild Boar	LC	WPA, 1972,Sch – III	Meat in food,bones in fertility and skull in hunting art. (Chinlampiaga et al, 2013)
36.	Varanus bengalensis.	Monitor lizard	LC	WPA, 1972,Sch – III	Flesh boiled and taken as preventive measure for cough and fever. (Chakravorty *et a*l, 2011)

TH-Threatened, CE-Critically Endangered, EN-Endangered, NT-Near Threatened, VU-Vulnerable, LC-Least Concern, DD-Data Deficient, NA-Not Assessed.

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