

Northeast India: A Unique Biodiversity Hotspot

Jeev Prabha¹ and Dr. Anju Jain²

¹Undergraduate Student, Department of Zoology, Daulat Ram College, University of Delhi

²Assistant Professor, Department of Zoology, Daulat Ram College, University of Delhi

Abstract—Biodiversity hotspots are the regions which are lavish in endemic species and have lost 70% of the original habitat. The untouched part of India i.e. the Northeast Region is nestled in the Indo-Burma biodiversity hotspot and forms a major part of it. The Northeast region represents a great fusion of endemic flora, fauna and microbes along with unmatched natural beauty of evergreen forest of Brahmaputra river valley, broad leaf forest, sub-alpine coniferous vegetation, dense bamboo and pine forest. The serene beauty of this area is ineffable. This area nurtures 8,000 flowering plants. 137 species of reptiles and 160 species of mammals are found in this region. 24 species of birds are endemic to this region. A record of 3,624 species of insects and 50 mollusks are found from this region. The presence of silk worms, Asian elephant, one horned rhinoceros and some medicinal plants and sacred grooves like Than, Pandam make the genetic treasure of this region richer. Due to various reasons the immense variety and variability of species is getting vanished. Some of the reasons are deforestation, agriculture, encroachment, grazing, human-wildlife conflict, forest fires, illegal extraction, replacement of indigenous species with exotics, immigration etc. If these cruel incidents don't come to an end, the time is not far when this marvelous beauty of nature will be no more in sight. This paper focuses on the wide range of biodiversity and the major factors which cause its destruction in North east region.

Keywords: - Northeast India, Biodiversity, Endemic Species, Conservation.

1. INTRODUCTION

Astounding waterfalls, milky white snow covered mountains, crystal clear water bodies, lush green forests, untainted air, beautiful and colorful fauna and flora- the picture perfect land, the undiscovered part of India, the north east region harbors it all. North east India consists of 8 states:- Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim,, Tripura, each having its own dazzling and magnificent beauty. This region is gateway to paradise because of its intimidating natural beauty. This region along with its picturesque locations has a very wide range of rare and endemic

species living in its nurturing lap. This region comprises of nearly 8 per cent of the total geographic area of the country. Despite of having such less area coverage it has abundant number of wildlife and plants and forms a major part of Indo Burma biodiversity hotspot. Biodiversity of an area may be defined as the species richness (animals, plants, micro organisms) in that particular area (on land, sea, sky). Biodiversity hotspots are the regions which are lavish in endemic species and have lost 70% of the original habitat. North East India because of its vast variety of native species gets the title of biodiversity hotspot but due to human interference and because of his own lust for superiority, man damages the biodiversity but we need to remember that the only key to our survival is the conservation of this nature.

2. BIODIVERSITY IN NORTHEAST INDIA

Biodiversity provides us with living. The air we need to breathe, water, home, all the other companions with whom we share this planet- everything is given to us by the biodiversity. The biodiversity of Northeast is a genetic treasure of various forms of plants, animals and micro organisms. The northeast region comes under the Indo Burma biodiversity hotspot which ranks 6th among the 25 biodiversity hotspot of the world. The Brahmaputra river valley, broad leaf forest, sub-alpine coniferous vegetation, dense bamboo and pine forest make this area more diversified and support different types of endemic species. Most of the North Eastern states have more than 60% of their area under forest cover. This region has 17 national parks which is quite high in number. The following facts and figures show that the title of biodiversity hotspot given to North East India is very apt.

A) Flora:-

- This area embodies 51 forest types which are broadly classified under 6 categories of forest: - Tropical moist deciduous forest, Tropical semi evergreen forest, Tropical wet evergreen forest, Subtropical forests, Temperate forests and Alpine forests.
- The Alpine regions and the broad leafed forest in this region is regarded as the most species rich region in the world.
- 6 out of 9 important vegetation type in India is found in this region.
- 8,000 out of 15000 flowering plants reside in this area which include:- 40 out of 54 species of gymnosperms, 500 out of 1012 species of pteridophytes, 825 out of 1145 species of orchids, 80 out of 90 species of rhododendrons, 60 out of 110 species of bamboo and 25 out of 56 species of canes.
- Arunachal Pradesh and Sikkim has the highest diversity of floral species.
- Out of 1500 endangered floral species 800 are present in North East India.
- This region is blessed with some unique species like *Clethra sp.* and *Nepenthus khasiana*.
- It has a wide cover of mountains adding to the beauty of region and supporting some rare species.
- This region has over 28 conifers, 500 mosses, 700 ferns and 728 lichen species.
- The occurrence of primitive plants like *Euptelea*, *Tetracentron*, *Haematocarpus*, *Alnus Betula*, *Paryatia*, *Stannonia*, *Distyllum* etc have rendered Northeast region as the "Cradle of flowering plants".
- 4000 angiospermic plants are present. This place has 34 species of edible plants.
- Many medicinal plants are found here. It has been noted that 200 plant species from Arunachal Pradesh are used for treatment of 44 diseases, Nagaland has 526 plant species which can be used to cure 83 different diseases, about 50 ailments and diseases can be cured by 194 plant species of Tripura. 834 medicinal plants have been found in Meghalaya by

Foundation for Revitalization of Local Health Tradition (FRLTH).

- This region is rich with 40 endemic rice cultivars.
- *Sapria himalayana Griff.* Which is the largest root parasite is present in Arunachal Pradesh. It belongs to the family Rafflesiaceae.
- Over 50 species of economic plants have their genetic diversity in this region.
- 300 out of 800 food plants which are consumed are present in this region.
- Meghalaya, Manipur and Karbi-Anglong area of Assam has high number of sacred grooves.

B) Fauna:-

- There are approximately 3624 species of insects, 50 mollusks, 236 fishes, 54 amphibians, 137 reptiles, 541 birds and 160 mammalian species making this region genetically rich.
- Some new species like leaf deer and Tawang macaque are reported in this area.
- 9 out of 15 species of primates are present in this area. Golden langur, stump-tail macaque, northern Pigtailed macaque are some of the examples and many of these species are endangered.
- Out of the 6 world's largest feline species identified 4 are present in the region of Arunachal Pradesh (Tiger, leopard, snow leopard, clouded leopard) and 1 in Sikkim (snow leopard).
- This area has the prestige of having all the bear species that are present in India. Red pandas are also found in abundance in Arunachal Pradesh region of Northeast.
- This region holds the esteem of possessing Asian Elephant, one horned rhinoceros, brow-antlered deer (Sangai) and wild water buffalo.
- Another fascinating animal-pygmy hog is the rarest and smallest wild pig in the world. This animal is also present in northeast region.
- Some animals like Chinese Goral, Red Goral, Takin, and Serow are newly discovered from Northeast region of India.

- 137 species of reptiles have been recorded from this area. The first species of *Amyda cartilaginaea* in India was found in Myanmar. The Black soft shell which was extinct has been rediscovered in Assam valley.
- 20 different species of lizards are found in Assam region.
- Northeast region is abundant in snakes. 58 species of snakes are found in Assam, 34 in Manipur, 92 from Arunachal Pradesh
- 19 new amphibians are found in the northeast region. Orang sticky frog is found exclusively in Assam.
- This region has maximum number of butterflies and moths in India. Atlas moth and *Priniceps polyctor ganesa* are very common in this region.
- The Northeast region is rich with the avian population. This region has reported local as well as migratory birds of long and short distances. Elliot's Laughing Thrush and Brown Cheeked Laughing Thrush are newly added to this amazing diversity. Santge valley in Arunachal Pradesh is the only habitat for wintering Black Necked Crane.
- Greater adjutant is the extinct bird which is only found in Assam.
- Bengal florist is one of the rarest bird species but it is found in Man as sanctuary of NE region. Lesser Fish eagle is the rarest of the fish and sea eagle; it is reported to be seen in Arunachal Pradesh.
- Northeast India has a high variety of fishes. More than 62.81% of freshwater fishes are available in this region.
- There are 35 endemic fish species living in this area.

C) Micro organisms

There are a variety of microorganisms present in the Northeastern India.

- *Brevibacillus laterosporus* strain BMP3 showed antifungal behavior against a number of phyto pathogenic fungi. This was isolated from Assam.
- Manipur has a vast variety of microbes residing in the lakes, salt springs, wetlands etc. 156 actinomycetes were isolated from Nambul river of

Manipur. Some of them showed antifungal activity against the human and plant pathogens.

- A study has showed the presence of 45 and 39 fungal taxa belonging to 22 genera, in grade I and grade II litter respectively. 24 taxa of fungus showed common properties for both grades.
- The wood rotting fungi is a kind of fungi which decomposes wood causing its rottenness. These are found in the Bamboo vegetation of Northeast India and constitute a major 10% of all kinds of fungi taxa found here. In Meghalaya, 78 wood rotting fungi were found. *Heterobasidion perplexais* a rare wood rotting fungi which was first discovered in the Northeast region of India.
- An endophytic fungus associated with the medicinal plant *Osbeckia stellata* aids in techniques like thin layer chromatography (TLC) and gas chromatography (GC).
- There are around 703 fungal endophytes associated with the sacred forests of Meghalaya.
- The ethanolic extraction of *Aspergillus sp.* and *Sirococcus conigenus* show antioxidant activity and anti inflammatory activity.
- *Cryptosporiopsis ericae* is a rare endophytic fungus found in Northeast region. It is employed in biosynthesis of silver nanoparticles.
- *Streptomyces manipurensis*, *Rhodococcus canchipurensis*, are extremophiles found in limestone quarry of Manipur. *Aquimonas voraii*, *Aeromonas sharmana* etc are found in hot springs of Assam. Fluorescent *Pseudomonas aeruginosa* and three metal tolerant *Serratia spp.* were isolated from the sediments of pre mined Uranium ore deposit of Meghalaya. Many more bacteria were also found in soil samples, crude oil refinery etc.

3. THREATS TO BIODIVERSITY OF NORTHEAST INDIA

For the fulfilment of selfish needs and requirements, human has robbed the nature to the fullest. Northeast region is regarded as one of the most precious areas of biodiversity but due to anthropogenic activities, the number of flora, fauna, the forest area cover etc is decreasing day by day. Mother Nature has provided us with everything but because of our self-centered

obsessions we are blindly harming our nature and thus the biodiversity associated with it. There are various reasons for the loss of biodiversity due to man associated activities. Some of these are: deforestation and degradation, agriculture, encroachment, grazing, human-wildlife conflict, forest fires, illegal extraction, replacement of indigenous species with exotics, immigration etc.

i) Deforestation and degradation:

The rate of deforestation has risen to a very high level. Man is cutting trees for agriculture purpose as well as for some other needs of his. The practice of 'Jhum Cultivation' is also in fashion in the Northeast India. Trees are cut down and burned in this practice. Forest based companies also have increased the timber extraction and logging of tress.

ii) Agriculture:

Agriculture is the main livelihood among the plains and hill tribes and people practice paddy and Jhum cultivation which further increases the problem. Bun cultivation used for growing potatoes on the hill slopes of Meghalaya causes soil and water erosion. People here have limited means of survival so they depend on cultivation mostly.

iii) Encroachment

Encroachment onto forest land is a serious threat to forests and their conservation. Some major steps should be taken immediately with political will. Unsuccessful efforts were made to evict encroachers from a reserve forest near Guwahati subsequent to Supreme Court order in January 1998.

iv) Over Grazing

It is estimated that 60 per cent of the domestic herbivore population graze in the forest. Due to this the top fertile layer is removed. The number of cattle is more than what the forest can support. As a result the vegetation is lost and the land becomes barren. In lower elevations, damage is done by the cattle and in higher elevations, yak and sheep do the same function.

iv) Human wildlife conflict:

Natural corridors of movement for the animals are not well made and protected. The animals rush in the fields and cause havoc by destruction of crops. Moreover some people also die due to the conflict between human and wildlife. The effects of organization like WWF and

Aranyak will be ineffective unless safe corridors will be made for wildlife movement.

v) Forest fires:

Villagers sometimes knowingly and sometimes unknowingly set fire in the forest floor. After winters the forest floor is covered with inflammable grass, leaves and twigs. A small spark can initiate the fire during this time. The fire also spreads to the surrounding areas causing disturbance to the villagers and also affecting catchment areas. The biodiversity of that forest comes under great threat. The survival becomes tough. Many micro flora and micro fauna also die during this act. Accidental or deliberate fire causes great loss for the forest ecosystem thus affecting the biodiversity nurturing in it.

vi) Illegal Extraction of Forest Products:

Bangladesh surrounds Tripura from 3 sides. The population is quite high in that country. The borders with Bangladesh are very long and not very secure thus smuggling of trees often happen. This also affects the revenue rates of forests. This causes extinction of the vegetation from the border areas. *Taxud baccata* is a medicinal plant which is used to treat ovarian and breast cancer. It is overexploited and smuggled in the state of Arunachal Pradesh profoundly.

vii) Commercial Plantations:

In the greed of money human is planting more of commercial products rather than conserving the natural ones. Rubber and tea plantation have caused extinction of natural vegetation of forests. For the good yield pesticides and other chemicals are added which further causes pollution in that area. In Lohit district tea plantation is being done by removing the large tropical evergreen forests. Same situation is also arising in Tirap and Changlang district of Arunachal Pradesh.

viii) Replacement of Indigenous Species with Exotic Species

Due to increasing demand of food and other products exotic species are bought in. These species give high yield thus eradicate the use of local species. In Tripura more than 280 plants have been introduced to increase the yield. Cross breeding is done to get maximum benefit. In this act the natural germ line is getting lost. In Mizoram the introduction of exotic fish species into rivers by the state fisheries department has resulted in reduction of indigenous species. The incoming of these

species fade out the natural species and compete with them for space and nutrition.

ix) Bad Policy Making in Infrastructure Development:

With the passage of time there is a need to develop the infrastructure. The construction of roads leads to the road of destruction as many forest areas are cleared off. This also results in landslides. There are examples where the construction has led to the depletion of the biodiversity. In Arunachal Pradesh a species called *Sapria himalayana* has become extinct due to the development of roads. Construction near Eagle nest foothill is causing extinction of some species of plants. A rare species of epiphytic plant called *Agapetes* is also in danger. Due to lack of proper information, coordination and planning the construction of infrastructure has become a great threat to the biodiversity. Mining in these areas for coal, minerals and oils has also caused reduction of the species richness.

x) Immigration

The immigrants from outside don't have much respect for the beliefs and customs of the native people. Due to westernization people are also forgetting their culture. The sacred grooves of Meghalaya and Manipur are decreasing due to the reducing beliefs of people. Immigration also causes the competition for food so that results in the over exploitation of the resources. The per capita forest area has been reduced from 0.97 hectares to the present level of 0.18 hectares.

4. CONSERVATION OF BIODIVERSITY

Some effective steps should be taken to conserve biodiversity. We should use the resources and nature responsibly so that our future generations could also get the chance to behold this natural beauty. Some of the steps which can be taken are:-

- Conservation of biodiversity through national parks and wildlife sanctuary.
- Protection of indigenous species of plants and animals against exotic species.
- Laws and regulations must be made in order to avoid over exploitation.
- Micro flora and micro fauna must not be eradicated as they help in succession.
- Stem cells or primordial cells can be cry preserved in order to get the original species in case it gets extinct.
- Identification and propagation of endemic species as they are of immense importance.
- Jhum cultivation, paddy cultivation and bun cultivation should be reduced in practice.
- New saplings should be planted in vacant areas.
- During construction, the number of trees which are cut down should be compensated with growing of plants in some other areas.
- Control of deliberate forest fires induced by humans.
- Avoid cutting of trees for selfish purposes.
- Awareness amongst people regarding the importance of biodiversity and nature.
- Promotion of eco-friendly measures to reduce threats on biodiversity.
- Studying environmental science in a more practical and application based way.
- Encourage research scholars to study various aspects of biodiversity, nature etc.
- Control the immigration rates and using the resources wisely.
- Maintenance of safe corridors for movement of different species of fauna to avoid human wildlife conflict.
- More emphasis on studies of in situ and ex situ conservation.
- Over grazing must be avoided. A planned way should be followed for grazing to avoid loss of vegetation.
- Infrastructure should be made taking in consideration all the pros and cons along with a planned detailed study of the area.
- Illegal extraction should be banned completely by sensitizing people more about the environment.
- Awareness programs should be conducted to sensitize people about the biodiversity and the environment in total.

- Sustainable use of biodiversity to conserve it for future generations and for better survival of human beings.

5. DISCUSSION

The Northeast region is blessed with variety or rare and endemic plants, animals and micro organisms. This region is best suited for the growth of such incredible species that enhance the species richness of the country and of the world as a whole. The mountains, forests and rivers provide this region with best of climate to nurture these organisms. The variability of species in this region has made it a part of Indo Burma biodiversity hotspot. Due to this wilderness and the aesthetic beauty in this area it attracts a lot of tourism also, thus increasing the economy of the country. But nowadays due to some anthropogenic activities this gift of nature is depleting day by day. We are losing the biodiversity from this area in a very rapid pace. This "treasure of nature" is limited and if not conserved, it will be depleted in a short span of time. A strict check is required for the conservation and various steps could be taken to safeguard this priceless treasure. Awareness is the most important key for conservation and continuation of these species. Thus Northeast India is a biodiversity hotspot enriching the country with the most colorful and fascinating species.

REFERENCES

- [1] AAMao, T. M. (2009). Plant wealth of North East India with reference to ethnobotany. *Indian Journal of Traditional Knowledge*, 96-103.
- [2] Bio-diversity in Ne under threat. (2011, november). *Times Of India*.
- [3] E.Jayantkumar singh, N. R. (2009). Biodiversity conservation and natural resources in North East India-with special reference to Manipur. *NeBio*, 42-47.
- [4] G.B. Pant Institute of Himalayan environment and development. (2011). Contribution towards developing a roadmap for biodiversity an dclimate change. *Climate summit for a living Himalayas*, 1-53.
- [5] Nath, A. (n.d.). Demography changes among the schedules tribes. 1961-1981.
- [6] Pramod Tandon, S. K. (n.d.). Biodiversity of Northeast India and its conservation. In *Biodiversity and its significance* (pp. 157-166). Meghalaya.
- [7] R.S. Tripathi, P. B. (n.d.). The practices of Sacred Grooves in North East India. *Practices concerning nature*.
- [8] S.R. Joshi, S. B. (2015). Northeast microbial Database:a web based database of cultureable soil microbes from North East India. *Current science*, 1702-1706.
- [9] S.R.Joshi, K. B. (2015). Microbial diversity distribution in the lower belt of Easter Himalayas. *Biodiversity in tropical ecosystems*, 261-288.
- [10] Saikia, M. K. (n.d.). Endemic vertebrate fauna of Northeast India with special reference to herpetofauna,avian and mammalian fauna: a priliminary review. 1-8.
- [11] Sen, N. (2003). Fish fauna of North East India with special reference to endemic and threatened species. *Records of the zoological survey of India*, 81-99.
- [12] Sudipto Chaterjee, A. S. (2006). Review of biodiversity in North East India. *Study on Natural resources,water and the environment nexus for development and growth in Northeast India.*, 1-45.
- [13] Sudipto Chatterjee, A. S. (2006). Biodiversity significance of northeast india. In *Natural Resources water and the environment nexus for Development and Growth in Northeast India*. WWF India.
- [14] team, N. (2016, December). Northeast India: the unique biodiversity hotshot with rich avifauna. *Balipara foundation*.
- [15] Umesh c. Goswami, S. K. (2012). Fish diversity of North East India,inclusive of the Himalayan and Indo Burma biodiversity hotspotszones: A checklist on their taxonomic status,economic importance, geographical distribution, present staus and prevailing threats. *International journal of biodiversity and conservation*, 592-613.