

Conservation and Management of Biodiversity of Daringabadi Hill Forest of Eastern Ghat, Odisha

R.P.Panda *, N.Peetabas **

* Department of Zoology, Anchalik Science College, Kshetriyabarapur

** Department of Botany, Science College, Kukudakhandi

Abstract- Biodiversity plays an important role in the sustenance of mankind. Loss of Bio-resources will lead to extinction of living beings. The health of natural environment depends upon continuing diversity, if one species is lost from the ecosystem, then all the other species of ecosystem are affected. our earth has already witnessed three mass extinctions in the past and another is on the way. This bio-resources which are not only key to our future food security but also our healthy living and sustenance. It has been estimated that there exists about 5-30 million species on our earth of these only 1.5 million species have been identified. These include 3 lakh species of green plants and fungi , 8 lakh species of insects, 40,000 species of vertebrates and 36,000 species of micro-organisms. Distribution of bio-diversity is not uniform over the earth surface, some regions are rich in biodiversity, while other regions are poor in biodiversity. India has a rich and varied heritage of biodiversity encompassing a wide spectrum of habitats from tropical rain forest to alpine vegetables and from temperate forest to coastal wetlands. Loss of biodiversity in Daringabadi Hill Forest is a burning problem. The causes are deforestation, climatic change, shifting cultivation , soil erosion, infiltration, encroachment, forestfire and grazing etc. The current rate of extinction demands conservation, strategies of bio-diversity by using *in situ* and *ex-situ* method.

Index Terms- Bio-resources, Species, Bio-diversity, Threat, Conservation and Management .

I. INTRODUCTION

India with a total geographical area of 329 million hectares is the second largest nation in Asia and seventh in the world. The great diversity of habitats owing to varied climates and altitudes endorsed India's rich and diverse flora. India is fortunately endowed with a wide range of agro-climatic conditions that support the growth of an equally diverse range of plant and animal species. But the loss of Biodiversity is a very serious problem of the country. Several species of the living organism are disappearing and biodiversity is more threatened now than at any time in the past. These currently are disappearing at an alarming rate, ranging between 0.8-2% per year (May and Stumpf, 2000; Sagar et al., 2003). Many tropical forests are under great antropogenic pressure and require management interventions to maintain the overall biodiversity, productivity and sustainability (Kumar et al. 2006).

Daringabadi is a hill station in Odisha state of Eastern India. It is widely known as Kashmir of Odisha situated at a height of 915m above the sea level in Kandhamal district, between 19°34'

to 20°26'N latitude and 83°34' to 84°34'E longitude with an area of 7649Km² . This area is enriched by thick rain forest with wild animals.

Tropical forests are the most complex of all the terrestrial ecosystems. They provide many good ecosystem services, such as prevention of soil erosion and preservation of habitats for plants and animals (Anbarashan and Parthasarathy, 2013). All though tropical forests occupy only 7% of the earth's land surface. (Wilson, 1988), they harbors about two thirds of all biological populations (Hughes et al., 1997). Phytogeographically, these forests are characterized by a large biological diversity and enriched with economically important species (Hare et al., 1997).

It is generally believed that deforestation is the main cause behind the current crisis and along with this global climatic change, shifting cultivation, soil erosion., unchecked expansion of urban areas etc are the other main causes of this problem. The current rate of extinction demands immediate concerted efforts for conservation of biodiversity for future generations. Conservation of biodiversity could be accomplished using both *in situ* and *ex situ* methods.

The Eastern Ghats are endowed with an extensively rich variety of biological species, geological formations and different ethnic tribes. More than 2,600 plant species of angiosperms, gymnosperms and pteridophytes including 160 species of cultivated plants, are reported to occur in the Eastern Ghats region which includes 454 endemic species belonging to 243 genera and 78 families. The topography and varied climate promoted luxurious growth of plants and diverse forests with a number of invaluable medicinal plant species (Rawat, 1997; Sahu et al., 2012a). This rich biodiversity is being utilized by the inhabitants of the region for medicine, food (wild edible), fodder, fuel, timber, making agricultural tools, religious and other purposes. As the Eastern Ghats constitute important catchments of the peninsula and natural resource, they are threatened due to anthropogenic disturbances , such as indiscriminate collection of fodder, fuel species, extraction of timber and minerals from the forests besides the shifting cultivation (Reddy et. Al., 2008)

The Eastern Ghats region is being exploited in an unregulated manner for its natural wealth. Conservation efforts including documentation of the available medicinal plant diversity and other floristic wealth is the need of the hour. In this regard National Bureau of Plant Genetic Resources, Indian Council of Agricultural Research, Govt. of India has initiated efforts in the form of collection, conservation and documentation of agro biodiversity, including medicinal plant wealth of Eastern Ghats.

II. MATERIALS AND METHODS

After several visit was undertaken to the different sites during the year 2005 to onwards and biodiversity of Daringibadi Hill Forest was noted various information and data were collected during interaction with local inhabitants as well as the Forest Range Development Authority.

III. RESULTS AND DISCUSSIONS

Geography and climate:

The Eastern Ghats one of the major hill ranges of India and these hill ranges form an assembly of discontinuous ranges, hills, plateaus and narrow basin and spread an area of 75,000 km². The Eastern Ghats cover parts of Orissa, Andhra Pradesh, Tamil Nadu and smaller area of Chattisgarh, Maharashtra and Karnataka states. The Mahanadi basin marks the north boundary while southern boundary lies in the Nilgiri hills. In the west lie the tips of Bastar, Telengaria and Karnataka plateaus and Tamil Nadu uplands. The Coastal belt forms the boundary in the east. According to the latitude, the Eastern Ghats fall in the tropical climatic zone. Humid climate prevails in the higher altitudes while semi-arid climate is experienced at the foothills in majority region of the Eastern ghats. Hence, the hill peaks of Eastern Ghat and its foothill experience a contrasting climate.

Air temperature in January ranges between 200 and 25⁰C and shoots upto 41⁰ C during hot summer months and goes down to 2⁰C during winter months. South-west and north-east monsoons contribute rain to the Eastern Ghats and the average annual rainfall ranges from 120 to 150' mm in the northern region and 60' to 100' mm in the central and southern parts indicating sub-humid and semi-arid climates respectively. Heavy rains with cyclonic storms characterize the coastal plains. The humidity usually ranges from 65-75%.

Ethnic diversity:

The Eastern Ghats region is inhabited by nearly 54 tribal communities, which constitute nearly 30% of total population. Most of the tribal inhabitants are small and marginal farmers and are engaged in lash and burn, and shifting cultivation which is not at all productive or sustainable because of the short cycle. The tribal living in the Eastern Ghats depend monthly on various forest product but their careless collection resulted in much damage to the forest wealth, particularly rare and endangered medicinal plant species. Many tribal communities are practicing their local health on traditional methods using medicinal herbs to cure various ailments.

Medicinal and aromatic plants

Out of an estimated and 7,500 plant of medicinal value reported in India, about 1,800 species are known to occur in the region. At least 50 dye yielding and 40 aromatic plant species are also known to occur in the region. In medicinal and aromatic plants rich variability occurs and some species are endemic/occur in greater population in this part of the country. Plants such as *Bixa oreliana*, *Mallotus philippensis* are some of the dye yielding plants and *Artemisia vulgaris*, *Cymbopogon citrates*, *Ocimum basilicum*, *Vetiveria zizanioides* etc., are other aromatic plants that occur in this region. Threat status of some of the important medicinal plant specie occurring in the Eastern Ghats region is *Acorus calamus*, *Aegle marmelos*, *Costus speciosus*,

Gloriosa superba, *Gymnema sylvestre*, *Mucuna pruriens*, *Plumbago indica*, *Rauwolfia serpentine*. *Piper nigrum*. *Terminallia pallida*, *Sterno tubero sa* .

Agro-biodiversity:

The tanning community in the Eastern Ghats constitutes only the tribal population initially. Their contribution in the domestication and enrichment of the genetic variability is immense. They selected plants of their interest through trial and error. Permutations and combinations of culinary processes were perfected over a period of time. Such variability has become indispensable in the present crop improvement programmes being carried out now. The diversity of plants under cultivation includes an array of crops belonging to cereals, millets, pulses, tubers. Fruits, vegetables and spices. Eastern Ghats farming communities including tribes, significantly contributed to the development of several landraces / primitive cultivars / folk varieties. These landraces represent food preferences, cultural heritage and local health traditions. Enumeration and registration of landraces is an important activity in the light of global developments related to rights, conservation and utilization of plant genetic resources. Further landraces and germplasm collected from farming communities are essential building blocks for developing modern high yielding varieties. National Bureau of Plant Genetic Resources (NBPGR) is the nodal organization for the *ex-situ* collection, conservation and utilization of agrobiodiversity .

Significant ethnic diversity is reported in rice (*Oryza sativa*), sorghum (*Sorghum vulgare*), pearl millet (*Pennisetum typhoides*), finger millet (*Eleusine coracana*). Italian millet, proso millet, little millet, kodo millet and barnyard millet from Eastern Ghats. Tremendous diversity in both the cultivated and wild *Oryza* species occur in Koraput (Orissa) which could be the place of origin and domestication for the Asian rice. Important known landrace of crop from the Eastern Ghats are recorded.

Wild relatives of crop plants

The wild relatives of crop plants and related species are gaining significance in crop improvement and evolutionary studies. Atleast, 91 wild related species of crop plants are reported in the region. They occur as members of disturbed, bio-edaphic communities within the major vegetation types throughout the Eastern Ghats. Many wild species are distributed in this region which are the sources of genes for different biotic / abiotic stresses.

Landraces

Landraces evolve over thousands of years in ecosystems designed/ modified through a selection pressure operated by the native communities. Invasion of culture and advancements in agriculture as a motive for development of tribal group interfered with the natural evolutionary process of landrace development. In view of the importance of the landraces, global awareness on biodiversity, environment and plant variety rights on commercial exploitation it has become necessary to identify natural ecosystems, hotspots and heritage site etc. of agro-biodiversity for effective conservation and utilization. The issues involved in the process have social, economic, legal and scientific dimensions. Culture, traditions, food preferences, life style and habitats, available income options, influence of leadership and connectivity (transport and information technology) etc. pertaining to tribal communities, naturally occurring populations

of plant species and their wild relatives, associated organisms including microbes and pollinators need to be taken into consideration while identifying agro-biodiversity hotspots. Selection criteria might vary in different ecosystems and in different crops, which primarily depends upon the breeding system, involved.

Biodiversity Act - 2002:

The National legislation - The Biodiversity Act - 2002 passed in Parliament during December-2002 is being implemented by the National Biodiversity Authority (NBA) which primarily deals with all matters relating to requests for access by foreign individuals, Institutions or Companies and all matters relating to transfer of results of research to any foreigner and approval of IPR related Bio-resources. The State Biodiversity Board (SBB) deals with all matters relating to access by Indians for commercial purposes. The Biodiversity Management Committee (BMC) are set up by the state Biodiversity Boards at local level in every Panchayat in their respective areas for conservation, sustainable use, documentation of biodiversity and creating awareness among the local people on the importance of conservation and sustainable use of Biodiversity. The primary objectives of the Biological Diversity Act is i) Conservation ii) Sustainable use iii) Fair and equitable sharing of benefits arising out of the use of these genetic resources and associated traditional knowledge to the country and the people.

IV. THREAT TO BIO-RESOURCES

It is indubitable that biodiversity is decreasing world wide due to human interventions. It is difficult to quantify this trend simply by making lists of species that have become extinct. In highly populous countries like India-there has been considerable stress on species as well as ecosystem, many critical ecosystem such as forests and wetlands are fast disappearing and losing its ecological services values due to degradation. The major threat to biodiversity in the country are habitat fragmentation and degradation, pollution, over-exploitation, poaching, climatic change, soil erosion, etc.

V. MEASURES TO BE TAKEN FOR IN SITU CONSERVATION

- . Preservation of endangered species through strict protection against poaching of both vegetation as well as animal resources.
- . Conservation of wildlife is currently given importance whereas conservation of plant species have not been given adequate attention particularly those which have potential importance and scientific value. Hence, there is a need to change our attitude.
- . Restoration of threatened species in their habitat, which currently occur in open sites.
- . Rehabilitation strategy for rare, threatened, endangered plant and animal species.
- . Incentives to grow domestically economic important biota for development of drug industry and for use of wasteland.
- . Immediate step needs to be taken to prepare a comprehensive biological inventory.

- . Ecological restoration of degraded micro and macro-habitat.
- . Identification of critical index species and their sensitive parameters.
- . Quantitative assessment of conservation status of the species.
- . Successional status of the key species in different ecosystems.
- . The possible climatic change and its impact on biodiversity.

VI. MEASURES TO BE TAKEN FOR EX SITU CONSERVATION

- . Establishment of genetic enhancement center for producing good quality seeds.
- . Enhancement of existing zoological park and botanical garden network.
- . Installation of seed gene bank, tissue culture gene bank, pollen and spore bank.
- . Initiation of captive breeding in zoological garden and use of both in vitro and in vivo conservation methods.

VII. CONCLUSION

The Eastern Ghat tropical forests is a critical repository of India's biodiversity and are threatened due to wide spread of habitat destruction. Plant diversity inventories in tropical forests have mostly been concentrated on tree species than other life-forms, because tree species diversity is an important aspect of forest ecosystem diversity and also fundamental for total tropical forest biodiversity. The present study clearly established the fact that the tree diversity in tropical forests of Eastern Ghats varied greatly from location to location, mainly due to variation in biogeography and habitat disturbance. Most of the species present in these communities are used for fuel, fodder, making agricultural tools, house building and miscellaneous purposes. During the surveys, it has been observed that huge-pressure on species along with heavy grazing is responsible for habitat degradation, poor regeneration and population depletion of the tree species.

The need for critical diversity in crop improvement like the novel traits in terms of sources for resistance or qualitative / quantitative traits lacking in the present accessions, which are well adapted in an ecosystem. It also include material which may get generated through natural hybridization / introgression through *in-situ* conservation and also development of precious material by purification / crossing without using alien parents *viz.*, Identification of traits vs crops.

The Eastern Ghats is an important area in India and the rich diversity. Conservation of these biodiversity and sustainable use and protecting the environment is the need of the hour.

REFERENCES

- [1] Anonymous. 1998. Compendium Environmental Statistics 1998. Central Statistical Org., Deptt. Statistics, Ministry of Planning and

- Programme Implementation. GOI, New Delhi. Anbarashan M. Parthasarathy N (2013). Tree diversity of tropical dry evergreen forests dominated by single or mixed species on the Coromandel Coast of India. *Trop Ecol* 54(2); 179-190. Champion, H.G. and Seth, S.K.(1968). *The Revised Forest Types of India*, New Delhi.
- [2] Chandrashekara. U.M. and P.S. Ramakrishnan: Vegetation and gap dynamics of a tropical wet evergreen forest in the western ghats of Kerala. *India. J. Trap. Ecol.* 10. 337-354 (1994).
- [3] Dhar, B. and Chaturvedi. S. (1998) Implications of the Regime of Intellectual Property Protection for Biodiversity. A Developing Country Perspective. RISNOPC. New Dehli.
- [4] Fuller, R.A., Irvine, K.N., Devine Wright, P., Warren P.H. and Gaston, K.J. Psychological Benefits of Greenspace Increase with Biodiversity *Biology Letters*, May 15, 2007.
- [5] Gadgil, M.(2006) *Ecology is for the People : A Methodology Manual for People's Biodiversity Register National Workshop on People's Biodiversity Register*, 22-23 June 2006. Chennai Organised By National Biodiversity authority, Chennai.
- [6] Gadgil, M. and Rao, P.R.S.(1998) *Nurturing Biodiversity: An Indian Agenda*. Centre for Environmental Education, Ahmedabad.
- [7] Hare MA, Lantagne DO, Murphy PG, Chero H(1997). Structure and tree species composition in a sub tropical dry forest in Dominican Republic comparison with a dry forest in Puerto Rico. *Trop Ecol* 38:1-7.
- [8] Holdrige LK(1967). *Life zone ecology*. San Jose, Coasta Rica, Tropical Science Centre, p.206.
- [9] Hughes JB, Daily GC, Ehrlich PR (1997). Population diversity: its extent and extinction. *Science* 278:689-692.
- [10] Kumar, V. and Asija (2000). Biodiversity Conservation. In : *Biodiversity Principles and Conservation*. Agrobiosis (India), Jodhpur.
- [11] Kothari, A. Understanding Biodiversity: Life, Sustainability and Equity. Orient Longman, New Delhi, 1997.
- [12] Kumar JIN, Kumar RN, Bhoi RK, Sajish PR(2010). Tree species diversity and soil nutrient status in three sites of tropical dry deciduous forest of western India. *Trop Ecol* 51(2):273-279.
- [13] Kumar A. Bruch GM, Ajai S(2006). Tree species diversity and distribution patterns in tropical forests of Garo Hills. *Curr Scie* 91:1370-1381.
- [14] Myers N. (1990). "The Biodiversity Challenge : Expanded Hot-sports Analysis", *Environmentalist* , 10, 243-256.
- [15] May RM, Stumpf MPH (2000). Species area relations in tropical forests. *Science* 290:2084-2086.
- [16] Purvis, A. and Hector, A. (2000) Getting a measures of Biodiversity, *Nature*, 405:212-219.
- [17] Reddy, C.S. Murthy, M.S.R. and Dutt, C.B.S.(2002). Vegetation Diversity and Endemism in Eastern Ghats, India. *Proceedings of National Seminar on Conservation of Eastern Ghats*, EPTRI, Hyderabad, pp. 109-134.
- [18] Rawat GS(1997). Conservation status of forests and wildlife in the Eastern Ghats, India. *Environ Conser* 24:307-315.
- [19] Reddy CS, Ugle P (2008). Tree species diversity and distribution patterns in tropical forest of Eastern Ghats, India; a case study. *Life Sci Jour* 5:1097-8135.
- [20] Reddy CS, Babar S. Giriraj A. Reddy KN, Rao T(2008). Structure and floristic composition of tree diversity in tropical dry deciduous forest of Eastern Ghats, southern Andhra Pradesh, India. *ASi J Sci Res* 1; 57-64.
- [21] Sagar, R. and J.S. Singh Tree density, basal area and species diversity in a disturbed dry Tropical forest of northern India. *Implications for conservation*. *Environ Conser.* 33. 256-262 (2006).
- [22] Sunderpandian, S.M. and P.S. Swamy: Forest ecosystem structure and composition along an altitudinal gradient in the western ghats, south India. *J. Trop. For. Sci.*, 12 104-123 (2000).
- [23] Sahu SC. Dhal NK, Lal B. Mohanty RC(2012a). Differences in tree species diversity, distribution and population structures in a tropical dry deciduous forest of Malayagiri hill range. Eastern Ghats, India, *J Mount Scie* 9:492-500.
- [24] Sahu SC. Dhal NK, Mohanty RC(2012b). Tree species diversity and soil nutrient status in a tropical sacred forest ecosystem on Niyamgiri hill range. Eastern Ghats, India. *Trop Ecol* 53:163-168..
- [25] Visalakshi. N.. Vegetation analysis of two tropical dry evergreen forests in Southern India. *Tropical Ecol*, 36, 117-127 (1995).
- [26] Wilson EO (1988). The current state of biological diversity. In: *Biodiversity* ed. Wilson EO, Peter FM, p.3-18. Washington DC, USA; National Academy Press.

AUTHORS

First Author – R.P.Panda, Department of Zoology, Anchalik Science College, Kshetryabarapur, E-mail : dr.rampanda@gmail.com
Second Author – N.Peetabas, Department of Botany, Science College, Kukudakhandi , E-mail: npeetabas@gmail.com