

# CHAPTER - XI

## CONCLUSION

Cooch Behar is a historically important district of West Bengal in India. The name 'Cooch Behar' has been derived from the *Koch Rajbongshi* tribe who were indigenous to this area since the time of Banasura, the great king of Asura. A Sanskrit word 'Bihar' (to travel) is the key source of word 'Behar', which means the land used to travel by 'Koch Rajbangshi' king. Koch Rajbangshi king has ruled the area since 16<sup>th</sup> century. In 1947, the state came to the dominion of India and merged with the Union of India shortly afterwards. On 19<sup>th</sup> January 1950, the state of Cooch Behar emerged as a new District for the Indian state of West Bengal (Banerjee, 1884; Ahamed, 1990). District Cooch Behar is located at the northeastern corner boundary of the State West Bengal. The Northern side is bounded by Jalpaiguri district, state of Assam in the eastern side to south and there is Bangladesh on the western border. The district is an important part of Himalayan Foothills and Duars of West Bengal.

In Bengali, the word 'Beel' means large water body. Rasik Beel is a complex of eight large wetlands and are known by different names: Noldoba Beel, Bochamari Beel, Rasik Beel, Batikata Beel, Ververi Beel, Borojan Beel, Chhotojan Beel and Raichangmari Beel. The Rasik Beel complex is lies between *Burah Raidak* and *Ghoramara* Rivers in the Salbari Block under Tufanganj Sub-Division of the District of Cooch Behar. The geographical location at the central part of the lake is 89°44' 10" E Longitude and 26° 25' 40" N Latitude. The Rasik Beel is located very near to two IUCN recognized Hotspots for Conservation, namely 'Himalaya' and 'Indo-Burma' (Biswas, 2013). It is an Ox Bow Lake and is a left over detached part of the river Raidak. The area of the Beel is 178 hectors (Chowdhuri and Pal, 2010; Ahamed, 1990; Chowdhuri, 1903; Paul, 2013). The nearby areas of the Beel was covered with dense forest vegetation (Annonimus, 2005). The Western and North-Western sides are covered with Changmari Protected Forests, North Eastern side is surrounded with Atiamocher Protected Forest and Takomari Protected Forest is spreading on the Eastern side of the Beel complex. But due to rapid increase of human settlements, acquiring land for cultivation and due to continuous legal and illegal timber extraction most of the forested area are now either missing or disappearing fast (Annonimus, 2011). Shifting of the courses of rivers in this part of the country was a common phenomenon in recent-past (Chowdhuri, 1903; Paul, 2013). And, that has created a number of large and small Ox Bow lakes in this region like Rasik Beel, Nildoba Beel, Raichangmari Beel, Bochamari Beel, etc. Rasik Beel wetland complex is surrounded by Chengmari, Baro Salmari, Atiamochar and Takomari protected forests. In Champion & Seth's (1968) classification the area's vegetation matches partially with 4D/SS<sub>2</sub> and 4D/SS<sub>4</sub> *Tropical Seasonal Forest: Syzygium cumini swamp forest* and *Low Swamp Forest*. In the surrounding area, there are about eight villages mostly inhabited by tribal people.

The original vegetation in the surrounding area was basically *Syzygium cumini* dominated semi-evergreen type but most of the natural forests have been removed. Plantations of different exotic and native plants are developing in many areas including the contour of the central island. The Central island is now planted with mainly *Salix tetrasperma*, *Terminalia arjuna* and *Lagerstroemia hirsuta*.

Rasik Beel Wetland deals with the recorded 124 angiospermic families, out of which 96 are dicotyledonous and the remaining 28 are monocotyledonous. Out of the recorded total of 614

species, 581 are angiospermic (dicotyledonous 428 and monocotyledonous 153), 3 gymnospermic and the remaining 30 species are pteridophytic.

In the back ground of local natural vegetation, the flora of the entire study area has been greatly modified. Main reason behind the changes is the establishment of tourism center around Rasik Beel. Clearing of local native vegetation developing plantations with desired species for ornamentation, fodder production, domestic requirement, etc. are the main reasons of modification. Critical analysis of the distribution pattern of all the recorded elements of the Rasik Beel flora revealed that out of the 614 species, 95 species has been recognized as exotics. Of these 54 species looks completely naturalized and are surviving in the vegetation through self-perpetuation. However, a search into the basic distribution of recorded exotics revealed that 24 of these plants are basically Tropical American, 14 are from South America, 12 from Brazil and Mexico and only 6 species are coming from different other Asian regions.

In the pre monsoon Wetland Vegetation, *Salvinia cucullata* showing highest frequency and *Salvinia cucullata* showing highest density. In monsoon season, whole wetland vegetation turns to change and highest frequency and density shows by *Najas graminea*. In postmonsoon Wetland vegetation, *Salvinia natans* has highest frequency but highest density showing by *Azolla pinnata* subsp. *Africana*. Highest EH showing by *Schoenoplectus juncooides* in the pre monsoon Wetland vegetation. In monsoon wetland vegetation highest EH shows by *Colocasia esculenta* and *Typha elephantina* showing heist EH in the Post monsoon vegetation.

In premonsoon ground cover, *Acmella uliginosa* has maximum frequency and maximum density presented by *Achyrospermum wallichianum* *Duchesnea indica* showing maximum IVI. Highest EH presented by *Solanum indicum* This ground cover scenario has been changed in the monsoon vegetation and *Ageratum conyzoides* contain highest frequency. *Clausena excavate*. *Oplismenus burmannii* presented maximum abundance, highest density and also has maximum IVI. Maximum EH presented by *Clausena excavate*. *Pilea cordifolia* and *Synedrella nodiflora* presented highest frequency in the post monsoon ground cover which is totally different from previous season's floral structure. *Crinum amoenum*, *Molineria capitulata* showing maximum EH in the post monsoon ground cover. Highest IVI presented by *Pilea cordifolia*.

From pre monsoon shrub, *Clerodendrum infortunatum* is dominating species and it makes middle green layer in that drought season. So, *Clerodendrum infortunatum* showing highest frequency, highest abundance, highest density, highest IVI. Highest SDI and highest EH presented by *Dendrocnide sinuate*, *Streblus asper* and *Morus indica*. In the monsoon, *Ichnocarpus frutescens* presented highest frequency with *Clerodendrum infortunatum* and start to change the middle layer of the vegetation cover. Highest density presented by *Ichnocarpus frutescens*. Highest EH presented by *Zizyphus mauritiana* and *Bridelia retusa*. Highest IVI presented by *Ichnocarpus frutescens*. Maximum dence middle layer seen in post monsoon season. *Lantana camara* showing highest frequency and highest density. *Solanum torvum* presented highest IVI. *Melastoma malabathricum* presented highest EH in the post monsoon shrub layer. From pre monsoon shrub data, highest SDI and highest EH presented by *Dendrocnide sinuate*, *Streblus asper* and *Morus indica*. *Zizyphus mauritiana*, *Bridelia retusa* and *Premna latifolia* presented highest SDI. In post monsoon shrub vegetation, *Melastoma malabathricum* presented highest EH.

In canopy layer of the vegetation, *Oroxylum indicum*, *Neolamarckia cadamba* and *Bischofia javanica* presented highest frequency. Highest density showing by *Bischofia javanica*. In the tree vegetation, highest SDI presented by *Chukrassia tabularis*, *Polyalthia longifolia* and *Magnolia champaca*. Highest EH shows by *Polyalthia longifolia* and lowest by *Bischofia javanica*. Menhinick Indices (D) showing 1.626 and Margalef Indices (RI) is 22.811 in canopy cover.

Biological diversity is not only deals with plants, it also deals with faunal and microbial diversity. During the study, very little attention was expended for observing and listing of faunal diversity. However, present survey recorded 3 species of Annelids, 37 species of fishes, Amphibians 4 species, Reptiles 9 species, Mollusca 5, Mammals 9 and Birds 135 species.

A large part of the beel area is allowed free for fishing. The villagers cultivate economically important exotic fishes in that area. There is no obstacle between the conserved and free-fishing areas. So, the exotic fishes are certainly migrating into the conserved area, thereby affecting the original ichthyofauna of Rasik Beel. Due to regular harvesting of fishes, the local fishermen are also disturbing the local and migratory avifauna and damaging the free-floating and other aquatic vegetation. Aquatic rotifers, molluscs, zooplanktons and phytoplanktons are also highly affected by due to fishing and related activities. Poor knowledge of NTFP collection by local villagers is also one important cause of disturbing the food production and food-web leading to the food crisis of aquatic birds. Ecotourism also seriously disturbing the local floral and faunal communities.

From the present survey, 70 species of plants have been recorded, which are planted in the park, gardens and other conservatory sites. As much as 45 species of tree has been planted in the area which have good timber value. However, some of these are also having other types of importance too! Bird-food, bird-nesting etc. are desired characters in such a bird sanctuary. *Bischofia javanica*, *Magnolia champaca*, *Peltophorum pterocarpum*, *Shorea robusta*, *Swietenia macrophylla*, *Swietenia mahagoni*, *Tectona grandis*, *Terminalia arjuna*, *Terminalia bellirica* are planted by forest department basically for these purposes.

*Salix tetrasperma* is also introduced recently for the nature of its branching, which is very much suitable for bird nesting. *Terminalia arjuna* also planted in the middle Island and parts of Baroijan and Chhotojan Beel ares for its Bird-nest supporting branching pattern.

From the present survey, 614 species of plants are recorded from the study area, of which 283 species are used by local people to their daily life and in different social activities. But, only 52 species are recorded as marketable NTFP plants. But, the price fetched by the NTFPs in local markets is very low. As much as 92 species of medicinal plants, 27 ethnoveterinary plants, 54 edible plants as vegetable or ripe fruits, 14 plants used in various religious purposes, 4 plants use as spice are recorded from the study areas. and 173 species used as fodder for their domestic animals. However, only some edible fruits and few vegetables are marketed, others are collected by the people for their own use consumption and has no priced demand in the market.

Rasik Beel complex become a popular tourist spot since 2003 after establishment of Ghorial, Tortoise, Deer and Leopard ex-situ conservation center. Local people, Tourists, Students regularly visited there and create threats.

A large part of the beel area is allowed free for fishing. The villagers cultivate economically important exotic fishes in that area. There is no obstacle between the conserved and free-fishing areas. So, the original ichthyofauna of Rasik Beel regularly decreases. Natural habitat of the local fishes has been damaged and due to exotic fish culture, the food habit of local ichthyofauna has been changed. Local farmers use pesticide in their beel side cultivation lands and make a great threats to the native fishes.

Due to regular harvesting of fishes, the local fishermen are also disturbing the local and migratory avifauna and damaging the free-floating and other aquatic vegetation. Many times avifauna catches by the local people with fishing net. Nests and eggs of local aquatic birds also damaged by the fishermen in time of fishing. Poor knowledge of NTFP collection by local villagers is also one important cause of disturbing the food production and food-web leading to the food crisis of aquatic birds. Ecotourism also seriously disturbing the local floral and faunal communities. In picnic time

more the 100 of Mick create noise in the forests within 100m of beel areas and disturbing Birds. In the picnic season, more than 100 picnic parties cooked their foods and enjoying in the marginal forests areas and damaging the forest vegetation. Tourists also damaging the forests vegetation.

Local people acquired submerge and immerge lands for paddy cultivation. After 2 – 3 years of acquiring land, they establish house and the Wetland complex area decreasing every day.