Chapter 7

Conclusions
7.0. CONCLUSIONS

Study undertaken at Matha Protected Forest of Purulia district, West Bengal, India was one of the most biodiversity rich areas of the district which has been subjected to repeated maltreatment by human. While considering habitat fragmentation and its effect on biodiversity, it is worth mentioning that effects are multiple that has got several consequences with profound negative effects. The study area is characterized by undulating topography and to some extent naturally fragmented. But with the advent of urbanization, agricultural settlements and land use changes, the process of habitat fragmentation has accelerated causing habitat loss that subsequently leads to loss of species. Apart from this, certain biotic factors like grazing, fire, illegal felling, hunting of animals also leads to loss of habitat and its destruction that affect the wild species residing in that area.

Forest or habitat fragmentation is a process and follows the pattern that effectively causes (i) reduction in total habitat amount, (ii) increase in the amount of edge, (iii) decrease in the amount of interior habitat and (iv) increase in isolation of patches and all these causes indeed begets habitat fragmentation. Habitat fragmentation occurs through anthropogenic activities prevailing in the study area from years after years as has been depicted from land use and land cover of the area. Analysis of satellite imageries revealed considerable loss of habitat. Degraded forest has increased to manifold. Although afforestation has been done to reduce the open forest area, illegal felling occurs that indeed increases loss of habitat in the forest.

Patch characteristics in the study area further revealed that shape and isolation of patch affects the distribution of species and richness also varies from larger to smaller habitat patches. Patch isolation provides negative effect on biodiversity as it is a measure of lack of habitat in landscape surrounding the patch. However, smaller patches contain fewer species as revealed by the study on species diversity along the three habitat patches of Matha Protected Forest. Biotic factors are more pronounced in recent years and rituals of tribal people residing in the forest fringes cause great damage of habitat and species loss as for example, during MaghPurnima in the month of January hunting festival occurs and during this time they encroach the forest to a large extent.
Thus two major consequences of habitat fragmentation are observed. One is direct consequence that causes loss and finally extinction of species mainly of plants that can neither migrate to other places nor can adapt the adverse condition prevailing in the area. Another consequence is indirect that cause emigration of species mainly of birds and mammals as no evidence is found for animals except few hare, wild boar, peacock and jungle fowl (as reported through the present study). Hence, the study on patch characteristics considering habitat fragmentation and species diversity, differences in species occurrence and their richness is noticed for several fragmented habitat patches (habitat patch A, B and C) of Matha Protected Forest.

Habitat fragmentation has got adverse impact on ecology of an area specially when forests are considered. As deforestation occurs, it accelerates the process of habitat loss or fragmentation that eventually reduce the species richness in the area that hinders in maintaining proper cycling of nutrients in that forested area. Forest fragmentation directly or indirectly affects the functional aspect of the forests that mainly cause hindrance to nutrient dynamics. As the cycling of essential nutrients depends upon the soil and litterfall, when forests are destroyed, the vegetation in that particular habitat is also destroyed that provide the initiation of nutrient cycling, thus hampering proper cycling of nutrients. Apart from this, the influence of grazing and fire can also generate fragmented ecosystems and nutrient loss in that habitat.

Ecosystem functions are constrained by low rates of nutrient supply in most of the tropical forests. Nutrient limitation in dry tropical forest is related to water limitation because dry conditions prevent plant uptake of nutrients from soil and reduce the release of nutrients during decomposition. The role of litter nutrients is critical in this tropical dry forest where seasonal pulses of nutrients in litterfall constitute an important aspect of nutrient cycling. Soil availability also plays a very important role in microbial activity and nutrient dynamics in tropical seasonal forest ecosystems.

Considering nutrient cycling it is found that transfer of nutrients and energy from living biological components to the soil is closely related to litterfall and is the starting point for nutrient cycling. Studies on nutrient content in litterfall gives the functional state of the forest and can be used to improve forest management and production. However,
the index of nutrient use efficiency in litterfall can be used as an indicator of soil nutrient conditions. But along with nutrient use efficiency, nutrient retranslocation efficiency is also very essential for the production of new tissues at all stages of development from the seedling to mature tree.

Finally from the study it can be inferred that Matha Protected Forest is dry and a nutrient-poor ecosystem where the amount of nutrient retranslocation is very low that certainly retards the growth rate and development of plants. However, invariably higher leaf litter nutrient concentrations were observed during monsoon (rainy season) in the area. Peak period of leaf fall for those species in the study area occurs during winter season and new leaves appear on the onset of rainy season.

Consequently, stored nutrients in the branches are transferred to the newly expanded foliage mass, which forms litter for rainy season and showed higher concentration of nutrients. This may be probable reason for higher nutrient concentration in leaf litter during rainy season. Apart from this, sometimes higher variations of nutrient concentrations in rainy season in the study area might be due to reflection of insect pest that cause premature leaf fall on the site during this period. Above all, it was observed between-species nutrient difference as well as site-dependent differences of nutrients at all the three fragmented habitats (A, B, and C) of the forest. It is also revealed from the study that P and K are more proficient in the stands. Therefore, P and K constraint to primary production appears to be worth examining. Naturally the nutrient cycling in the forest is poor that reduces the growth and development of the plants mainly at smaller encroached fragmented habitat B. Thus proper management of the forest is required for the survival of plant species and maintenance of biodiversity in the area.

Inventory of the existing plant and animal species in MPF indicate gradual decrease in their number. It has been observed that there is a reduction in abundance of plant species (63%) and animal species (88%) during the last 28 years. The growth and development of plant species is constrained by poor availability of nutrient in the MPF, limits the natural regeneration of forest.
It is obvious that habitat fragmentation has both positive and negative effects on distribution of plants and animals that often leads to ecological imbalance leading to improper nutrient cycling in the smaller fragmented habitat patches. Thus, studies on tropical dry deciduous forest in relation to nutrient cycling have to be made as less attention has been given to the dry tropics. Hence, further research work is needed to understand how fragmentation affects cycling of nutrients in the forest in global climate change context.

Apart from these, biodiversity conservation practices are to be introduced in the area by Forest Protection Committees so that local people and villagers are aware of all the facts i.e., adverse effects of forest destruction and values of forest or biodiversity (both ecological and economical values). For this, proper training and capacity building are to be given by forest officials and other organizations to the villagers or members of Forest Protection Committee (FPC). Participatory Vegetation Monitoring (PVM) should be implemented in the area. PVM will help villagers to protect their forest by themselves and regular monitoring can be achieved along with strong legislation. Alternative livelihood generation and rural development may reduce biotic pressure in the forest. Alternative livelihood generation include lac culture, pisciculture, horticulture etc. in the area. Therefore, with this approach of sustainability of forest, biodiversity can be protected and conserved.