

PREFACE

Biodiversity at global scale is a balance between the rate of speciation and the rate of extinction. At a regional level it is a balance between the rate of immigration/invasion and that of local/regional extinction. These rates determine the persistence of the communities. It can be assessed at genetic, population, species, ecosystem and landscape levels, at three spatial scales, viz., local, regional and global. While for assessment at genetic level, molecular techniques are most profitably used, assessment at other levels depends upon field samplings. Depending upon the objectives, the inventory could focus on single species or multiple taxa. For single species inventories, the focus could be on high impact, indicator, umbrella, flagship, threatened or economically important species.

Biodiversity provides to the humankind enormous benefits in the form of food, medicines and industrial products, and has the potential for offering many more yet unknown benefits. It also provides an array of essential services through natural ecosystems. These include maintenance of the gaseous composition of the atmosphere, shaping the climate and producing the soil. It is essential for the ecosystem function and stability. There are several hypotheses being tested for relationship between biodiversity and ecosystem function.

Biodiversity is not uniformly distributed on the earth. There are broad patterns, such as increasing variations in plants and animals from poles to the equator. It is more concentrated in the tropics because of conditions which permit higher rates of speciation and lower rates of extinction. About 44% of vascular plants and 35% of vertebrates are concentrated as endemic species in 25 hotspots, which account for only 1.4% of the local land area.

The pool of living diversity is dynamic, it increases when new gene variation is produced, a new species is created or a novel ecosystem formed and it decreases when the genetic variation within the species decreases, a species becomes extinct or an ecosystem complex is lost. Today, as ever, human-beings are dependent on their sustenance, health, well-being and enjoyment of life on fundamental biological systems and processes. Humanity derives all of its food, many medicines and industrial products from wild or domesticated components of biological diversity. Biotic reservoirs are source of recreation, and tourism and underpin the ecosystem which provides us with many services.

The Indian region represents an immense variety of climatic and altitudinal zones and is floristically rich. The ecological habitats vary from humid tropical Western Ghats to the hot deserts of Rajasthan and ice-capped mountains of the Himalaya to warm coasts of Peninsular India. These habitats favor a wide variety of plants and animals as well. It is estimated that over 45,000 species of plants are accounted for in India which represent 11% of the known

plant species of the world. These are distributed in varied groups, viz., Angiosperms-16657 spp., Gymnosperms-64 spp., Pteridophytes-1022 spp., Bryophytes-2584 spp., Lichens-1600 spp., Fungi-23000 spp., Algae-2500 spp., and Bacteria-850 spp. The flowering plants of India comprise about 6% of the world's known flowering plants. About 315 families (of a total of 400 now defined) and 2250 genera of flowering plants are known to occur in India in different ecosystems.

The loss of biodiversity is a global crisis. There is hardly any reason on the earth that is not facing ecological catastrophes. Biological extinction has been a natural phenomenon in geological history. However, man's intervention has speeded up extinction rates all the more. The destruction of the world's tropical forests, which are disappearing at an alarming rate, is one of today's urgent global environmental issues. The loss of plant/animal diversity has immediate and long-term effects on human survival. The plant genetic resources are being depleted at an alarming pace throughout the world. Current rates of extinction demand immediate concerted efforts for conservation of biodiversity.

We seem to be entering into the phase of mass extinction. Today, we are losing two to five species per hour from tropical forests alone. This amounts to a loss of 16 m populations per year or 1800 populations per hour. If the present trend continues, about 25% of the total 2,50,000 higher plant species will be lost in the next few decades and another 25% by the end of the 21st century. There were around 25,000 species of flowering plants some 125 million years ago, by the late Cretaceous this number had swelled to 100,000 and today there are some 2,00,000 species of plants on Earth. Additionally, while the past extinctions occurred each time over a span of million years or less, the present mass extinction may well occur within a short period of about 200 years, and plants (which make the base of the food chain) will be equally or worse affected.

India's phytodiversity is one of the most significant in the world. India is one of the twelve mega-biodiversity centers in the world and also an important center of origin of agrobiodiversity. It is therefore, very important to study, document and conserve the plant wealth of India and also of the world before its extinction. While it is generally accepted today that the conservation of all biodiversity should be our goal, especially through the preservation and sustainable use of natural habitats, this is an ideal that is unlikely to be achieved and there are convincing scientific, economic and sociological reasons for giving priority to the conservation of the major centers of plant diversity throughout the world.

The strategies to conserve the biodiversity include establishment of protected area network and corridors with emphasis on appropriate levels of management, reduction of anthropogenic pressure on natural populations by cultivating them elsewhere, programmes of augmentation, reintroduction and introduction of target taxa, restoration of degraded habitats, etc. The conservation strategies can be either, *in-situ* conservation of genetic resources within their ecosystem and natural habitat or *ex-situ* conservation of components of genetic material of biological diversity outside their natural habitat. The choice of conservation strategy depends upon the nature of the material to be conserved, i.e., the life cycle and mode of reproduction, size of individual population and ecological status. *Ex-situ* techniques include the establishment of botanical and zoological gardens, banks of pollen, seed tissue culture, DNA, etc. Establishment of forest reserves, national parks,

protected areas and on farm conservation of valuable plant varieties is being promoted to facilitate their *in-situ* conservation.

The present book is compilation of 29 chapters in the form of research papers and review articles contributed by eminent scientists and research workers who are acknowledged internationally in their respective fields. The book has been prepared with the intention of providing sufficient depth of the subject to satisfy the academic needs of the reader up to a higher level, which will be comprehensive and interesting. There are articles on the various groups of plants, i.e., angiosperms, sedge vegetation, grassland vegetation, wetland flora, sacred groves, ethnobotany, pharmacognosy of drug-plants, phenology of medicinal plants, changing water regimes, hotspots and biodiversity conservation. In totality, it contains useful information for the postgraduate students, teachers, scientists and researchers dealing with basic and Applied Botany, Ethnobotany, Environmental Biology, Forestry and Agricultural Botany. Moreover, it will prove helpful for Government departments dealing with forestry, social forestry and the cultivation of medicinal plants. We do hope that all those interested in the pursuit of plant diversity and its conservation will find the volume handy and stimulating.

The editors are thankful to all the academicians and scientists whose contributions have enriched this volume. We also express our deep sense of gratitude to our parents whose blessings have always prompted us to pursue academic activities deeply. It is quite possible that in a work of this nature, some mistakes might have crept in inadvertently and for these we owe undiluted responsibility.

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