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Biodiversity and its Conservation

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ABSTRACT : The most important thing we can do to protect biodiversity is to use the POWER of our voices. We must share this type of information because no matter how much it 'makes sense' or seems like a no brainer to you and I, the rest of the world needs to understand the importance and impact that it has on US, as humans, too. Your voice is more powerful than you could ever imagine. Being an ambassador makes you an active member of the Survival Revolution.

KEYWORDS: biodiversity, conservation, revolution,power, survive, protect

I. INTRODUCTION

Biodiversity means the variety of life on Earth from genes level to level of ecosystems. It takes into consideration the evolutionary, ecological, and cultural processes that sustain life.

Biodiversity includes all types of species be it rare, threatened, or endangered. It also includes all living things from humans to organisms we are little aware of such as microbes, fungi, and invertebrates.

Looking at biodiversity from a philosophical aspect it represents the knowledge learned by evolving species about how to survive through the vastly varying environmental conditions Earth has experienced over the years.[1,2,3]
Biodiversity
Biodiversity is a valuable characteristic of all living nature. It can be defined as the various varieties of life organisms with all their variability both at the microscopic and macroscopic levels.

Scientists have researched and found that almost two million species of plants and animals out of about 10 million ones occur on Earth. It means that almost 80% of them do not even have a name. These researches show the multitude and variety of forms that living matter can take.

Nature develops and sustains diversity in the evolution process. On the other hand, the ongoing development of specimens with new traits and their new combinations increases the likelihood of species existence in the event of subsequent changes in the environment.

Levels of Biodiversity

Biodiversity is segregated into different levels on the basis of diversity of genes, species and resources in a particular region.

Species Diversity: A unique collection of species which interacts with each other is found in every ecosystem. Some ecosystems may have many more species in comparison to others. In some ecosystems, one species dominates the natural community as it has grown so larger than the others. A large number of species can help recover from ecological threats in an ecosystem, even if some species go extinct.

Genetic Diversity: Genetic diversity describes how the members of one species are closely related in a given ecosystem. Simply, if all members have many similar genes, a low genetic diversity is seen in the species. Endangered species may have low genetic diversity due to inbreeding and thus they have small populations. Inheritance of

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undesirable traits can make the species more susceptible to diseases and thereby can pose a threat to the population. A high genetic diversity helps species to adapt to the changing environments.

Ecosystem Diversity: A region may have one or several ecosystems. Examples of regions with low ecological diversity would be wide expanses of oceans or deserts. In accordance with this sense, a mountain area that has lakes, forests and grasslands would have higher biodiversity. A region that has several ecosystems may be able to provide more resources for the survival of native species, especially when an ecosystem is suffering from drought or disease.

Functional Diversity: Functional diversity means a way of how species behave, obtain food and use the natural resources of an ecosystem. A species-rich ecosystem is assumed to have high functional diversity, because there exist many species with many different natures. A functional diversity of the ecosystem can be useful to ecologists who are trying to conserve or restore it, because with the known nature and roles of species, they can point to gaps in a food cycle or ecological niches which species lack.[4,5,6]

II. BIODIVERSITY CONSERVATION

Biodiversity conservation simply means to protect and manage the biodiversity for obtaining sustainable development of resources.

The three main objectives to conserve biodiversity are:

Preservation of the diversity of species.
Utilization of species and ecosystems to make them sustainable.
Maintenance of systems supporting life and essential ecological processes.

Types of Conservation

Conservation of biodiversity can be done in two different types, namely the ex-situ conservation, in-situ conservation and agriculture diversity conservation.

Ex situ conservation: Ex situ conservation means conserving the areas beyond where they naturally occur. Animals and plants that are reared or cultivated in areas like zoological or botanical parks come under this method of conservation. Introducing an animal or plant which has become extinct back to its habitat is also a form of ex situ conservation. Seed Banks, botanical, horticultural and recreational gardens are important centres for ex situ conservation.

In situ conservation: In situ conservation means conserving the areas within the natural habitat of animals and plants. The establishment of natural reserves, national parks, sanctuaries, etc. comes under in situ conservation. It is a method which is cost-effective and convenient to conserve biodiversity. Organisms live a natural ecosystem and thereby evolve more efficiently and adjust to various environmental conditions. Also, a large number of living organisms can be conserved under a natural habitat.

Agrobiodiversity conservation: The result of the interaction between the environment, genetic resources and systems of management and practices used by culturally diverse people is known as agriculture diversity conservation. The land and water resources are used for production in different agriculture diversity. Agrobiodiversity includes the variety and variability of animals, plants and micro-organisms which are necessary for performance of key[7,8,9] functions of the agriculture ecosystem.

Importance of Biodiversity Conservation

Economic growth and poverty reduction: Biodiversity helps to derive food, construction material, fibre, firewood, industrial products, and medicinal value from natural environments that benefit humans. Researches prove that the majority of the world's poor live in rural areas and depend upon wetlands, forests, pastures, and water for their livelihoods.

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Continuity of various ecosystems globally: Biodiversity plays an important role for rendering and protection of organisms in the ecosystem. Through biodiversity conservation, ecosystems like the coral reefs, tundra, rivers and streams, and grasslands can as well be supported and protected.

Aesthetic value: People's culture is enhanced as the environment provides great pleasure to human beings with its shape, structure, senses, and colour. Visits to animal parks, bird watching, nature art, and cultural heritage enjoying and appreciating nature are only made possible through biodiversity conservation.

Ecological balance: Biodiversity helps balance between atmospheric carbon dioxide and oxygen. Global warming and natural calamities are results of failure to conserve biodiversity. Biodiversity influences the air turbulence, temperature and precipitation for maintenance of the micro, local or regional climate.

Ethical value: Ethics on environmental sustainability and conservation can be encouraged through biodiversity. Ecosystem's right of an organism states that every form of life in any ecosystem is unique in its own way and deserves respect from human beings.

Biodiversity and the various methods for its conservation has been discussed in the article. We have discussed the various levels of biodiversity like the ecosystem diversity, genetic diversity, etc. Also, we have learnt about the different types of methods to conserve biodiversity for example the ex situ diversity and in situ diversity. We have further discussed the various reasons why it is important to conserve biodiversity. To sum up, we can conclude that biodiversity is an important topic to discuss as it gives us details about various species around us and their importance and lifestyles.

III. DISCUSSION

Biodiversity is not limited to the number of different species present but also incorporates genetic diversity within those species, as well as the diversity of ecosystems. It is a measure of the variety and complexity of biological life on our planet. Biodiversity can be observed at different levels - from genetic diversity within a single species to the diversity of species within an ecosystem.

The Importance of Biodiversity Conservation:

Conservation of biodiversity is essential for a variety of reasons that span ecological, economic, social, and ethical dimensions. Here are some of the key reasons why biodiversity conservation is critically important:

Ecosystem Services: Biodiversity supports a wide range of ecosystem services that are vital for human well-being. These services include clean air and water, pollination of crops, regulation of climate, nutrient cycling, flood control, and more. Ecosystems with higher biodiversity tend to be more resilient and capable of providing these services.

Food Security: Biodiversity is the foundation of agriculture and food production. Diverse ecosystems contribute to genetic diversity in crops and livestock, which is crucial for developing new varieties that are resilient to pests, diseases, and changing environmental conditions. Loss of biodiversity can lead to decreased agricultural productivity and food security.

Medicinal Resources: Many of the world's pharmaceuticals and medicinal compounds are derived from plants, animals, and microorganisms. Biodiversity provides a vast source of potential treatments for various diseases and health conditions. Loss of biodiversity could mean losing potential cures and treatments.

Cultural and Aesthetic Value: Biodiversity is deeply intertwined with cultures, traditions, and aesthetics. Different species and ecosystems have cultural significance for various communities around the world. They also contribute to the beauty and inspiration of natural landscapes.

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Economic Benefits: Biodiversity is a foundation for various economic sectors, including tourism, fisheries, forestry, and agriculture. Ecosystems that are rich in biodiversity can attract tourists and generate revenue, while also providing resources for livelihoods and industries.

Climate Change Mitigation: bio-diverse ecosystems, such as forests, grasslands, and wetlands, play a significant role in sequestering carbon dioxide, a major greenhouse gas contributing to climate change. Healthy ecosystems can help mitigate the impacts of climate change.

Ecosystem Resilience: Biodiversity enhances the resilience of ecosystems in the face of disturbances such as natural disasters, disease outbreaks, and climate variability. More diverse ecosystems are often better able to recover and adapt to changing conditions.

Ethical and Moral Responsibility: Many people believe in the intrinsic value of all species and the responsibility to protect life forms on Earth. The loss of species due to human activities raises ethical concerns about our role in causing extinction.

Ecological Balance: Each species in an ecosystem has a role to play, and their interactions contribute to the overall stability and balance of the ecosystem. The removal of certain species can lead to ecological imbalances and cascading effects throughout the ecosystem.

Biodiversity as a Source of Knowledge: Studying different species helps us understand life processes, evolution, and ecological interactions. This knowledge can have practical applications in various scientific fields.

Hence biodiversity is crucial for the health and functioning of ecosystems, as well as for human well-being. Its conservation is necessary to ensure a sustainable and prosperous future for both the natural world and human [10,11,12] societies.

IV. RESULTS

In-Situ and Ex-Situ Conservation System

Conservation of biodiversity is crucial for maintaining the ecological balance and ensuring the sustainable existence of life on Earth. In this endeavor, two primary approaches have emerged: in-situ and ex-situ conservation. While both aim to safeguard species and ecosystems, they employ different methodologies and strategies to achieve their objectives.

In-Situ Conservation

In-situ conservation refers to the preservation of species and ecosystems in their natural habitats. It focuses on protecting and managing entire ecosystems, including the diverse flora and fauna within them. This approach recognizes the intrinsic value of biodiversity and emphasizes the importance of maintaining the intricate relationships between organisms and their environment.

Strategies employed in in-situ conservation include the establishment and management of protected areas such as national parks, wildlife sanctuaries, and marine reserves. These areas serve as havens for a wide range of species, providing them with adequate habitat and protection from human activities such as habitat destruction, poaching, and pollution. Additionally, in-situ conservation efforts often involve community-based conservation initiatives, where local communities are actively engaged in the management and protection of natural resources, promoting sustainable practices that benefit both people and the environment[13,14,15].

One of the key advantages of in-situ conservation is its ability to preserve the natural evolutionary processes that shape ecosystems over time. By allowing species to interact and adapt within their natural environment, in-situ conservation helps maintain genetic diversity and enables species to evolve in response to changing environmental conditions.

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Ex-Situ Conservation

Ex-situ conservation, on the other hand, involves the conservation of species outside their natural habitats. This approach is typically employed when species face imminent threats such as habitat destruction, overexploitation, or disease outbreaks that cannot be adequately addressed through in-situ conservation alone.

Ex-situ conservation methods include captive breeding programs, botanical gardens, seed banks, and gene banks. These facilities serve as repositories for endangered species or genetic material, providing a safety net against extinction. Captive breeding programs, for example, involve breeding endangered species in controlled environments with the aim of reintroducing them into the wild once their natural habitats are restored or threats are mitigated.

While ex-situ conservation plays a vital role in preventing the extinction of species, it also presents certain challenges. Maintaining genetic diversity and preventing inbreeding depression are significant concerns in captive breeding programs. Moreover, reintroducing captive-bred individuals into the wild can be challenging, as they may lack the necessary skills to survive in their natural habitat.

Integration of In-Situ and Ex-Situ Conservation: In recent years, there has been a growing recognition of the complementary nature of in-situ and ex-situ conservation approaches. Integrated conservation strategies that combine elements of both approaches have proven to be more effective in safeguarding biodiversity.

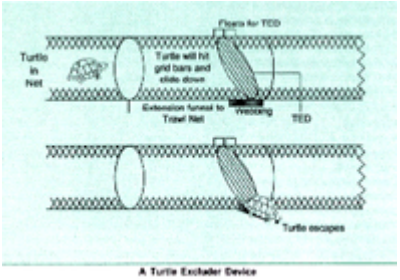
For example, ex-situ conservation efforts can support in-situ conservation by providing individuals for reintroduction programs, genetic material for breeding programs, and scientific research to inform management decisions. Conversely, in-situ conservation provides the ultimate goal for ex-situ efforts by ensuring the long-term survival of species within their [16,17,18]natural ecosystems.

In-situ and ex-situ conservation are two distinct approaches to preserving biodiversity, each with its strengths and limitations. While in-situ conservation focuses on protecting species within their natural habitats, ex-situ conservation provides a safety net against extinction by conserving species outside their natural environments. By integrating these approaches and implementing holistic conservation strategies, we can maximize our efforts to safeguard biodiversity for future generations. Ultimately, the preservation of Earth's rich tapestry of life requires a concerted effort from governments, conservation organizations, local communities, and individuals worldwide.

V. CONCLUSION

The UNDP/GEF Small Grants Programme is currently being implemented in over forty countries. The apex body which has the over all responsibility for sanction of projects is the National Selection Committee (NSC) constituted by the Government of India. The NSC Members comprise Government Officials, UNDP (the implementing agency in India) and representatives from NGOs. A National Coordinator looks after the activities of the SGP in India. Development Alternatives was the National Host Institution and has housed the National Coordinator supported by a small secretariat, since the inception of the programme in 1995, till recently. The first phase of the GEF SGP was setup with an initial outlay of approximately US $ 300,000 to provide funding assistance to projects to be implemented by NGOs. Projects included in the Pilot Phase (1996-98) focused on Biodiversity Conservation and Climate Change Mitigation. Three of the projects are briefly described below as samples of projects undertaken for Biodiversity Conservation.

The project titled "Protection of the Olive Ridley Sea Turtles by the Use of the Turtle Excluder Device (TED) of the Orissa Sea Coast" was implemented by an NGO called Project Swarajya located at Cuttack in Orissa. The sea turtles, often called the living fossils, have wandered around the oceans of the world for more than 150 million years without undergoing any significant morphological or physiological change. There are seven existing species of sea turtles in the world today including the Olive Ridley, Green Hawksbill, Leatherback, Flatback, Kemp's Ridley and Loggerhead. The sea turtles migrate from ocean to ocean and seem to have no particular habitat of their own except that the pregnant female



A Turtle Excluder Device

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turtle instinctively returns to the same beach year after year for laying its eggs as if equipped with an accurate radar to guide its breeding habits. The other peculiarity about this living fossil, which feeds basically at the bottom of the ocean, is that it breathes air and must periodically come to the surface of the ocean to replenish its supply of oxygen. These two features make the sea turtle highly vulnerable from being drowned in trawler nets or killed by predators including man while laying its eggs in the coastal sands. Altogether, five out of the seven species of sea turtles are found in the oceans of the Indian sub-continent, the Olive Ridley being the most populous amongst them. As is well-known, the Gahirmatha Beach on the coast of Orissa, along the Bay of Bengal, is by far the largest site for Olive Ridley turtles to lay eggs. Thousands of them turn up at night during December to February every year and lay eggs enmasse at Gahirmatha Beach. This arribada (Spanish word for mass nesting) of Olive Ridley is an amazing natural phenomenon. Not only, Gahirmatha but the entire coastal stretch of Orissa is endowed with numerous big and small estuarine eco-systems providing ideal mating, nesting and hatching grounds for the Olive Ridley sea turtles. This amphibian nature requiring Olive Ridley to come to the surface to breathe and to its natal beach for laying eggs once a year, is the cause for its vulnerability resulting in it being declared as an endangered species under the Indian Wildlife Act of 1972. One and a half decades of mechanised trawling and gill netting have killed more Olive Ridley sea turtles than centuries of fishing by traditional methods. The problem has been compounded by widespread collection of the eggs laid on the coast for human consumption.

In the mid-‘70s in the US a simple gadget originally called "Trawling Efficiency Device" was designed which when fitted into the trawl nets, allowed unwarranted objects like sharks, dolphins, turtles or even inorganic trash to escape while still harvesting the shrimp. The turtle excluder device, as it is now called, is a simple grid like structure made of steel, aluminum or even iron having inter-spaced bars and a flap made of net attached to it, thereby creating an exit hole for the turtle and other undesirable objects to escape while allowing fishes, especially shrimp, to pass through between the bars into the bag of the trawl net. While several models and prototypes of TED have evolved over the years, six of them are now prescribed for use in different coasts of the world. Georgia Jumper is one of the simplest of the hard TEDs suitable for most of the coasts of the world [19,20]including the Orissa Coast. Admittedly, the use of TED results in a loss of fish catch by 10-15%. In view of this, the natural reluctance of trawl operators to use this device requires counteraction by extensive environmental education to convince them to use this device and prevent the extinction of the species. The project holder, a grassroots NGO, successfully transferred the technology of TED from the National Marine Fishery Services, Government of USA, to the local artisans and net binders of the Orissa Coast. The project also involved enhancing public awareness about the actual operation of TED in sea fishing and also lobbying for enactment of laws, both at the Central and State level, to make it mandatory to use TED in mechanised fishing. Although, this has yet to happen what has happened is the notification of the Gahirmatha Turtle rookery and its adjacent areas as a Marine Turtle Sanctuary.

The project on "Distribution, Behavior and Conservation of the Endangered Gangetic Dolphin, Platanista gangetica Roxburgh (Mammalia: Cetacea) was implemented from 1996-98 in the National Chambal River Conservancy, Kota (280 square kilometers) – a biographical area under the conservancy management of the forest department of Madhya Pradesh, Uttar Pradesh and Rajasthan States. This project was implemented by the District Development Society, Ajmer, a registered non-profit society of Rajasthan. The fact that the gangetic dolphin faces extinction resulted in the generation of the project which had been initiated to study the distribution pattern, behaviour and reproductive ecology specially in the context of formulating recommendations for sustainable management of the wetland river eco-system which forms the habitat for the species. Systematic extensive, intensive and exhaustive repeated field surveys of the eco-system divided in six zones was conducted from boats, motor boats and on foot to assess the relative abundance of dolphin populations, their nature of distribution, morphology, behaviour and reproductive ecology.

Extensive surveys, on foot, by boat and motor boats were made in the National Chambal River Sanctuary Area. Water samples collected from different points were analysed to study the water characteristics and its suitability for supporting the endangered dolphin. It was observed that the regular flow of the Chambal river had been checked by three dams, the Gandhi Sagar (Madhya Pradesh), Ranapratap Sagar (Rajasthan), Jawahar Sagar (Rajasthan) and Kota Barrage (Rajasthan), in the upper reaches of the Chambal river and was significantly influencing the water flow in the study area. This was the major cause of shrinkage of dolphin habitat. Population declines were attributed primarily to habitat degradation. It was also observed that around 58 mgd (approximate) of sewage and industrial waste from the Kota City found its way into the Chambal river through 25 nalas (drains) in a stretch of about 15 kilometers. The

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sewage and industrial waste significantly effected the physical and chemical characteristics of the Chambal river with adverse impacts on the river fauna.

Apparently, the construction of the dams and barrage for irrigation and hydro electric power generation, thermal power plants in the vicinity, untreated sewage inflow etc. had reduced not only the dolphin population but affected the habitat to such an extent that the dolphin populations now exist in small and isolated portions of the Chambal river. Use of pesticides and fertilizers were also adding to the pollution of the Chambal river. Quarrying for building stone on the Banks of the Chambal river was the primary cause of severe erosion. This was further aggravate by the mining of the Chambal river bed for stones and gravel. The disappearance of dolphins from certain stretches of the river was attributed to the above factors and the need to avoid shallow depths and/or move to other areas where dolphin populations existed for finding breeding mates. Seasonal local migrations were also noticed. The dolphins did not stay permanently at a particular place as they move about the river in search of fish which resulted in fluctuation of their numbers at different points. The project findings resulted in the formulation of the recommendation to upgrade the sanctuary into a National Park and enforce prohibition on catching of dolphins more effectively. It was also recommended that stringent measures be taken to reduce industrial pollution, water diversion, dam construction, over fishing etc. which were the major factors contributing to the decline of the gangetic dolphin populations in the Chambal river.

The project on "People's Participatory Approach for the Conservation of Wildlife Corridors - Studies in the Sujalkuttai - Bannari Corridor (Periyar Dt., Tamil Nadu) in the "Nilgiri Biosphere Reserve, Southern India" was implemented between 1996-98 in six villages neighbouring the Sujalkuttai-Bannari Corridor in the Nilgiri Biosphere Reserve (NBR). The overall, goal of the project was to demonstrate the application of People's Participatory Approach in the management of forests, small in extent, but critical to conservation at a regional scale. The Immediate Objective of the project was to reduce the impact of anthropogenic pressure on wildlife corridors in the Nilgiri Biosphere Reserve through People's Participatory Approach. The project was implemented by the Salim Ali Centre for Ornithology and Natural History (SACON), Coimbatore, Tamil Nadu. Six villages neighbouring the Sujalkuttai - Bannari Corridor in the Nilgiri Biosphere Reserve formed the target community for reducing anthropogenic pressures on the wildlife corridors.

As part of the project activities a transect of the corridor was carried out and data collected from 60 target wood cutters on the merits and demerits of the proposed alternative livelihood schemes, other assistance needed by the wood cutters, options for various forestry works etc. The District Rural Development Agency (DRDA) was mobilised to provide three drinking water borewells in the villages namely, Sujalkuttai, Pungar and Peerkadavu. The target community was also mobilised to implement afforestation activities promoted by the forest department through collection of seeds from dung piles of elephants. The alternative livelihoods promoted included animal husbandry, agriculture and working on the forest department's conservation schemes. These activities have significantly converted the "forest destroyers" into "forest protectors" and 80% of the wood cutters have abandoned their previous livelihoods for alternative professions and thereby significantly reduced the anthropogenic pressures on the forest corridor. While it is too early to conclude precisely the success of this strategic approach to prevent deforestation and thereby contribute to the survival, especially of elephants, it definitely is a promising innovative methodology for weaning away anthropogenic pressures on wildlife habitats[20]

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