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Review Paper of the Rich Floral and Faunal Diversity in Chhattisgarh, India

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Abstract

Chhattisgarh, a state in central India, is renowned for its rich biodiversity, encompassing a wide variety of plants and animals. This review highlights the critical role that sacred grove – small, often isolated forest patches preserved by local communities – play in maintaining this biodiversity. These groves are repositories of genetic diversity and serve as sanctuaries for numerous species, many of which are threatened by habitat loss and fragmentation. However, the integrity of these groves is increasingly compromised due to anthropogenic pressures, leading to their fragmentation and a decline in traditional conservation practices. Our review delves into the implications of this fragmentation on the genetic diversity of flora and fauna within these sacred groves, with a particular focus on endemic and endangered species. Among the animal species documented, the Bengal tiger (Panthera tigristigris), which is listed as endangered, and various butterfly species stand out for their ecological significance and vulnerability. The survival of these species is intricately linked to the preservation of their habitats within these groves. In addition to sacred groves, Chhattisgarh's efforts to conserve its biodiversity extend to the management of protected areas and zoos, where sustainable practices are employed to ensure the long-term survival of species. This review underscores the state's commitment to biodiversity conservation but also emphasizes the pressing need for increased research and community engagement to address the challenges posed by habitat fragmentation and changing socio-cultural dynamics. In conclusion, preserving the unique floral and faunal diversity of Chhattisgarh requires a multifaceted approach that includes scientific research, policy interventions, and the revitalization of traditional conservation practices. By fostering greater awareness and participation among local communities, we can help safeguard Chhattisgarh's natural heritage for future generations.

Keywords: Chhattisgarh, biodiversity, sacred groves, genetic diversity, habitat fragmentation, conservation, endangered species, zoos, protected areas

INTRODUCTION

"Holy groves", also known as sacred woodlands, are small areas of natural vegetation that are maintained and protected by nearby communities for religious purposes [1]. These groves serve as sanctuaries for certain plant species and play a significant role in preserving biodiversity. Despite significant land use changes and deforestation in recent decades, these sacred groves have remained resilient and continue to be important for conservation efforts. A compliment protocol was developed for in-vitro plant regeneration [2].

India, with its vast forest cover of 76.87 million hectares, ranks among the world's most wooded nations [3, 4].

These forests are estimated to be home to a significant portion of the Earth's biodiversity, with millions of species found within them. India boasts

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three mega diversity centers, located in the forests of Indo-Burma, the Eastern Himalayas, and the Western Ghats, highlighting the country's rich biodiversity [5, 6].

However, the sacred groves are facing challenges due to the decline in religious faith and encroachment on these woodlands [7]. The fragmentation of these groves has significantly reduced their total area over the past century, leading to concerns about their ability to provide refuge for rare, endangered, and endemic species. Many economically significant species are also facing habitat disturbance and poor regrowth due to grove fragmentation [8].

To assess the impact of grove fragmentation on genetic diversity, research has been conducted to compare the genetic variety among small fragments and large forest fragments [9, 10]. The study aims to evaluate the genetic diversity of flora and fauna species across different fragment sizes. This research is crucial for understanding the conservation value of sacred groves and identifying strategies to protect and restore these important ecosystems [11].

Chhattisgarh, known as the "herbal state" of India, has been the subject of extensive ethnobotanical research, focusing on the properties of plant species by various scholars. This research has contributed significantly to understanding plant diversity and its uses in the region. In particular, the present survey focuses on plant species in Chhattisgarh, a public green space, highlighting the importance of conservation and management of this resource [12].

Chhattisgarh is a reserved woodland area where almost all sports activities are prohibited, emphasizing its conservation value [13]. The garden is home to a variety of animals, including endangered species like Bengal and White tigers, sloth bears, leopards, and others. The zoo's management employs strategic pairing of animals for reproduction, with offspring often being sent to forests or other zoos once they reach maturity. Records show that animals at this area typically complete their natural lifespans, reflecting the zoo's commitment to animal welfare [14].

The zoo's approach to animal care aligns closely with the animals' natural behaviors. Reproductive seasons and periods remain unaffected, and feeding habits are carefully considered based on individual preferences. For carnivores, tissues undergo a sanitization process before being delivered, while herbivores receive a specialized diet that includes various ingredients like pumpkin, rice, wheat bran, soybeans, and others [15].

Chhattisgarh exemplifies a commitment to maintaining a holistic and natural environment for its diverse animal residents. The zoo's sustainable practices, including fertilization and watering techniques for plants, further demonstrate its dedication to conservation and animal welfare [16].

REVIEW OF LITERATURE

The article highlights the urgent need for positive solutions to the global biodiversity crisis, focusing on the protection of flora and fauna, the importance of plants in daily life, and the effective use of ecotourism resources, aiming to increase services, create jobs, and adapt to modern requirements [17, 18]. This review provides a comprehensive summary of knowledge on mangroves in the Maldives, highlighting 14 species documented on 108 islands and highlighting the need for future research for informed decision-making and long-term ecosystem sustainability [19].

This research focuses on identifying free-living microorganisms in Bhilai's water habitat, including dangerous species like protozoans, arthropods, fungi, bacteria, and algae, and separating them from the four kingdoms of microorganisms, which are distributed worldwide [20]. This mini-review aims to identify pathogenic protozoans from Bhilai (C.G.) ponds, synthesizing free-living parasitic protozoans that are pathogenic for humans and animals [21]. This mini-review aims to identify pathogenic protozoans from Bhilai (C.G.) ponds, synthesizing free-living parasitic protozoans that are pathogenic

for humans and animals [22]. This study explores the impact of climate change on plant and animal diversity and distribution in tropical African regions, highlighting its significant influence on flora and fauna, to raise awareness and recommend measures to mitigate adverse effects [23].

Figure 1. Dence forest area Kawardha, Chhattisgarh.

International Biodiversity Day on May 22, 2023, underscores the crucial role of biodiversity in addressing climate change, ecosystem enhancement, and reducing greenhouse gases like nitrous oxide. Biodiversity worldwide faces threats from the destruction of forests, hunting, and developmental activities. Human activities disrupt the balance of ecosystems, leading to species extinction [24]. The Behali Reserve Forest in Assam, India, is a rich center for biodiversity. A study aimed to identify threatened species, recording 1047 plant and animal species. Out of these, 3 were flowering plants, and 40 were animals. Strategies are being prepared to conserve these species to maintain the balance of the ecosystem [25]. A six-month study in Dongargarhq and Rajnandgaon assessed bird species diversity across 15 square kilometers. Seven identified species were migratory, including common Koel, greater Flamingo, and common Pochard, while other resident species included house Crows, black Drongos, blue rock Pigeons, spotted Owlet, common Mynas, and jungle Owlet. The abundant trees in the region influenced the diversity [26]. From January to May 2023, a study was conducted at Maitri Garden in Durg District, Chhattisgarh, India, identifying 26 butterfly species from different families. The Shannon diversity index was used to determine butterfly diversity, with the garden open area having the highest index. The most common butterfly was *Demoleus linnaeus*, while the rarest was *Chilades trochilus*

[27]. A study in Khapparwada village, Chhattisgarh, India, found 135 butterflies and 7 species from two families. The most abundant families were *Nymphalidae* and *Pieridae*, with 60% and 40% of butterfly species documented. The Vishnudham Mandir Garden had the most butterflies, with 57. The study highlights the richness of butterflies in the area, urging further research for conservation and butterfly parks.

Microbial diversity is a crucial bioresource, underexplored [16]. India has declared 5 microbial-designated national repositories as vital for biodiversity conservation. The National Biodiversity Authority has created guidelines for identifying repositories and managing biodiversity heritage sites. Kerala, a biodiversity hotspot, has numerous small biodiversity-rich patches, requiring conservation for ecosystem functioning [28]. A study conducted in Faridkot district from 2012 to 2022 documented 181 angiosperm species, 56 families, two gymnosperms, and one pteridophyta. The fauna included 56 species, with birds being the dominant species. This information will be beneficial for researchers, botanists, zoologists, and ornithologists [29]. Biodiversity, a crucial aspect of living organisms and ecological complexes, is at its highest in tropical regions, largely lost due to habitat destruction, overexploitation, and natural disasters [30]. Feral cats form colonies, where adult females care for and raise kittens, including nesting, grooming, and guarding. Male cats may have home ranges that overlap or are closely linked to a colony. Between two and seven weeks, kittens are most susceptible to social learning, but older kittens and juveniles show signs of social learning [31]. An ethnobotanical plant survey was conducted in Bagicha block, Jashpur district, Chhattisgarh, India, to explore the knowledge and usage of medicinal plants. The survey involved 36 plant species from 32 genera and 24 families, used for treating wounds, jaundice, renal problems, headaches, and diabetes. The data was collected through questionnaires and interviews, emphasizing the importance of preserving flora and ethno-medicinal practices for future health improvement [19].

India, a biogeographical province, has vast biological diversity due to its diverse climatic zones and ecosystems. Despite its small size, India represents 12% of the world's species, with 1, 50, and 170 cataloged species. The country has a dense network of protected areas, including national parks, wildlife sanctuaries, conservation reserves, and community reserves. This chapter provides insights into India's biodiversity status, species richness, pressures faced, and conservation strategies [32]. India, a top ten natural resource-rich nation, has a rich biodiversity of 102,616 animals and 49,441 plants [33]. Its diverse ecosystems include forests, wetlands, deserts, coastal and marine ecosystems, and grasslands. India has 703 globally threatened animal species, with 92 classifieds as critically endangered, 219 as endangered, and 389 as vulnerable. The National Wildlife Action Plan 2017–2031 aims to address major conservation issues like human-wildlife conflict, habitat degradation, climate change, and invasive species infestation Chandra. The study examines groundwater quality in Nagapattinam district, India, focusing on seasonal variations. Results show alkaline water with higher Cl^{-}, Na^{+}, and EC levels, particularly near the Bay of Bengal [34]. Urbanization and human activity are the primary causes of biodiversity loss, which is a serious environmental concern [35, 36]. There is little agreement on conservation priorities despite national and international conservation programs. The extinction of species driven by humans is hastened by industrialization, pollution, invasive species, habitat degradation, poaching, and farming practices [37]. Although India's rules and regulations are institutionalized, they are not well implemented. Encouraging public involvement may be able to stop the loss of biodiversity and preserve ecological services. Because of human activity, estuaries – a type of habitat that lies between freshwater and marine environments – are in danger. This paper offers a combined strategy for association rule mining and bi-clustering to focus on knowledge discovery from Indian estuarine data. The study intends to support estuarine variety and encourage additional research based in the region, emphasizing the significance of thorough surveys for effective management [38, 39].

The Maitri Bagh Zoo in Bhilai, Chhattisgarh, is the largest in the region, covering 167 acres and offering 111 acres of parkland [40]. It houses 39 unique animal, bird, and reptile species, many of which are endangered. The zoo uses digital technologies to enhance visitor experience and ensure the well-

being of plants and caged animals. The article presents an updated spider diversity catalog in Tamil Nadu, India, revealing 547 species of spiders from 33 out of 38 districts [41]. The most abundant family is Salticidae, with 100 species in 25 districts. Other families are moderate to poor, with 10–22 species represented and 7–2 species in 1–3 districts. *Mimetidae* and *Eresidae* are represented by only 2 species each, while *Eresidae* contains 3 species of a single genus. There is no spider record in 5 districts of Tamil Nadu, and some areas in the West Bengal region still require extensive survey programs to record a near-complete spider fauna [42, 43]. The study recorded 72 butterfly species from the Kaziranga National Orchid and Biodiversity Park in Assam, India, covering five consecutive days from February 6th to 10th, 2024. The butterfly community was found to be highly diverse, with *Nymphalidae* being the most common family. The study also found that 17 butterfly species are protected under the Protection Act of 1972 (Indian Wildlife). The findings contribute to the development of biodiversity restoration plans, habitat management, and conservation of butterfly fauna in the park [44, 45].

Roadside trees, in particular, which are not part of forests, are very important for maintaining biodiversity and providing ecosystem services. Floristic variety and its possible role in providing ecosystem services were noted in a study conducted at the campus of Dr. Harisingh Gour University [46, 47]. 1252 individuals from 85 species, 73 genera, and 38 families were found in the study. These included endangered species that escaped from forests and fragile species like Santalum album. 34 species–including religious species – provided cultural services, whereas the majority of species offered food, fuel wood, timber, fodder, and ethnomedicine [48]. Alien species, particularly biological invasions, pose a hazard to the Indian Himalayan Region (IHR) in India. To look at the diversity, distribution, and drivers of alien flora, a thorough checklist was created [49]. According to the study, the majority of the species were determined to be native to Southern America, have a perennial life span, and have herbaceous growth types. While total traffic length was the strongest predictor of naturalized plant richness, average yearly rainfall was the best explanation for the total richness of alien plants [50]. The results can be used to create a management and policy framework that is based on science to lessen the effects of plant invasions and anticipate new invaders in the Himalayas [51].

The study in Uttarakhand's Kedarnath Valley examines the area's distinctive wildlife resources. There are 100 vertebrate species in the valley, along with 26 mammals, 56 bird species, 13 reptile species, 5 amphibian species, and 17 butterflies. The study highlights how both human and natural activities pose risks to biodiversity in the Kedarnath Valley and offers solutions for habitat enhancement and conservation [52].

The paper reveals India's faunal diversity, with 1,01,167 species of animals known out of 15,66,353 worldwide. India accounts for 6.45% of its recorded faunal species, with only two-thirds of the country's total area explored. The vastness of India's faunal diversity could be several times greater than what is currently known, with remote islands and ecosystems still unexplored [53]. India, a biogeographical province, has vast biological diversity due to its diverse climatic zones and ecosystems. With 1,50,170 species registered, India accounts for 12% of all species worldwide despite its modest size [54]. The nation is home to a vast network of protected places, which includes community reserves, national parks, wildlife sanctuaries, and conservation reserves. This chapter offers information on the biodiversity situation, species richness, challenges encountered, and conservation tactics in India [55, 56].

India's biodiversity is threatened by factors like species extinction, climate change, pollution, and invasive species. To combat this, legislative and national policies are being implemented and supervised from the grassroots to the national level. Success stories highlight initiatives to safeguard and enrich India's diverse ecosystems, including two case studies. The chapter addresses the startling decline in biodiversity and its critical role in sustaining life on Earth. India, a nation with mega-biodiversity, contains 2.2% of the world's land area but 12% of its biota. Half of all known species are found in the Indian Himalayan Region (IHR), where the state of Jammu and Kashmir (J&K) has a remarkable biodiversity. However, knowledge of J&K's biodiversity is scattered and outdated. This chapter

provides an overview of the present-day state of biodiversity in different taxonomic groups by synthesizing 42 separate chapters. The study aims to assess the current status of flora and fauna in state symbols of the Indian Himalayan Region (IHR) towards the conservation of biodiversity, based on CITES, IUCN, and CMS lists. Sustainable development is directly related to the conservation and utilization of biodiversity, as the decline in biodiversity alarms many countries worldwide. Urbanization and human activity are the primary causes of biodiversity loss, which is a serious environmental concern. There is little agreement on conservation priorities despite national and international conservation programs. The extinction of species driven by humans is hastened by industrialization, pollution, invasive species, habitat degradation, poaching, and farming practices. Although India's rules and regulations are institutionalized, they are not well implemented. Encouraging public involvement may be able to stop the loss of biodiversity and preserve ecological services [57].

The study assesses India's protected areas and finds that future biodiversity declines are most likely to occur in developing tropical nations. Many protected areas are too tiny to support the entire range of species, even with strict laws, government funding for tiger reserves, and compensation plans. The report also emphasizes the significance of community support, the necessity of long-term monitoring programs, studies on biodiversity in buffer zones, and an evaluation of the financial and environmental benefits of tourism. This study offers baseline data on the richness and distribution of salt marshes along India's southeast coast. It located 37 sites of salt marsh vegetation in Tamil Nadu and one in the Union Territory of Puducherry. There were seven species of salt marsh plants identified, with Arucottuthurai having the highest benthic coverage at 93.3%. The ecosystem gives coastal people options for a living while preserving the integrity of the shore by offering special places for macrofauna to reproduce and avifauna to roost [58]. This biologically significant habitat is seriously threatened by the rapid expansion of the coast and aquaculture. Spiders are a dominant macro-invertebrate predator group in terrestrial ecosystems, sensitive to environmental factors like topography and season. A study investigated spider diversity and composition at Navdanya Biodiversity Farm in Uttarakhand, India. 112 spider specimens were collected, representing 52 species from 33 genera. *Salticidae* was the dominant family, with high generic diversity. Oxyope species controlled potential pests. The study is the first to document spider fauna at the farm. The biosphere programme has added the Achanakmar-Amarkanatak biosphere reserve in India to the World Network of Biosphere Reserves (WNBR). The reserve, which is a part of the biogeographic zone of tropical dry and moist deciduous forests on the Deccan Peninsula, is less developed, least disturbed, and has a varied range of ecosystems. It sustains a variety of flora and fauna, with 1738 recognized floral varieties, 184 plant species, 389 faunal species, and supporting creatures like tigers, bison, bears, and more. It is home to 27 tribal and non-tribal groups.

This study explores the relationship between tropical birds, their environment, food habits, and diversity in the Chhattisgarh Plain regions, revealing 79 species from 41 families and 16 orders. Human activities, such as soil sealing, agricultural land-use intensification, and biological invasions, have significantly altered soil biodiversity. Climate change and abiotic conditions have also impacted soil biodiversity. These changes can alter ecosystem functions, affecting soil biodiversity and ecosystem services. Protecting soil biodiversity is crucial for soil sustainability and human society's sustainability. Understanding the determinants of soil biodiversity and restoring it is essential to prevent further losses. The research study was conducted in two locations, the research field and the farmer's field, during kharif rice cropping seasons in District Jabalpur, Madhya Pradesh. The study collected 37 hemipteran phototactic insect fauna species from the rice ecosystem, with *Pentatomidae* being the dominant family. Farmer's field had more species, while research field had more. Lakes, also known as brackish or salty lakes, are unique due to their water fluctuations influenced by sea tides. This study aimed to study the biodiversity of flora and fauna in Siombak Lake, Medan City, North Sumatra Province. Data collected included 7 species of mangroves, 5 species of coastal plants, and 2 species of aquatic plants, along with 14 species of fish, gastropods, bivalves, shrimp, and crabs.

Globalization and resource consumption in the 21st century have led to environmental issues. Turkey's Saros Bay Environmental Protection Area, one of 16 special protection areas, protects 552

marine and terrestrial species, attracting 1 million visitors during tourist season. Biodiversity is vital for ecosystems and human civilization, but its loss is at its highest rate since *Homo sapiens'* arrival. Tropical forests and oceans are depleting at 0.8% per annum, causing oxygen depletion and endangering life forms. Human activities, habitat loss, greenhouse gas emissions, overexploitation, disease spread, and invasive species contribute to biodiversity decline. Conserving microbial diversity is crucial for ecosystem sustainability and the planet's overall well-being, as it is difficult to estimate due to current tools and techniques. Todua, V. The document provides a comprehensive overview of Georgian endemic flora and fauna, focusing on the diversity of plants, animals, and birds, as well as their ecological conditions. It discusses Georgia's location, culture, and indigenous people, who lived there around 15,000 years ago. The research mainly focuses on wheat species, with 14 species found in Racha-Lechkhumi. Georgia is also known for its rich variety of vine species, with over 437 preserved, including the oldest known species, "*Usakhelauri*". The document also discusses the most prominent endemic species of coniferous and flowering plants, including 67 *Campanula s*pecies.

By establishing habitats and an urban green network, rooftop farming increases urban biodiversity. It draws pollinators and domestic bees, as well as wild animals and flora. By establishing greenways in anthropogenized areas, green roofs counteract the fragmentation of habitat brought on by urban growth. Urban biodiversity is enhanced by various degrees of green roof management, which take into account rooftop fauna and agrobiodiversity. Weeks, threats to New Zealand's freshwater ecosystems include invasive species, urbanization, climate change, intensification of agriculture, and water abstraction. Six steps are suggested to protect native fish: create recovery plans, alter laws, safeguard habitats, include river habitats, and create optimal management practices. The study, conducted from February 2015 to September 2016, documented 8 mammalian species, 166 avian species, 45 herpetofauna species, 9 fish species, and 143 invertebrate species at Ameenpur Lake, Medak district, Telangana state, India. The data highlights the need for conservation efforts.

The study analyzed the vascular plant species richness of the Fergusson College campus in Pune, comparing it with the past Flora documented in 1958. Data from secondary sources and intensive surveys from 2009–2014 revealed 812 species, with 65.8% remaining today. Arboreal species richness at the campus accounts for 40.7% of Pune City. Although 187 species have been lost, rare species like *Acacia greggii* remain. The study emphasizes the importance of the conservation of green spaces in the rapidly changing urban landscape. Using historical collections at Herbaria, a comprehensive biodiversity database of 937 plant taxa was created in Srinagar, Kashmir. Based on 45,000 specimens from the University of Kashmir's herbarium, the database reveals that 602 species are herbs, indicating a predominance of herbaceous growth forms. Twenty species are classified as threatened, whereas the majority of species have a permanent life span. The database can be used as a reference framework for tracking land use and the effects of climate change on the area, as well as a baseline for conservation and sustainable use [50].

A new species of *Rhabdochonidae*, *Rhabdochonatictaii*, has been discovered in the stomach of freshwater fish Barbus ticto, based on differences in body size, nerve ring location, caudal papillae arrangement, and tail shape. This unique work on ecosystem biodiversity, including flora, fauna, phytoplankton's, and zooplankton, provides quantified information for researchers in environmental economics, conservation, natural resource management, conservationists, and policymakers. The study examined the Flora and Faunistic patterns in Dahej, Bharuch District, Gujarat State. The area is mostly plain, with scattered shrubs and trees. The dominant shrub community includes *Prosopis juliflora*, *Calotropis procera*, *C. gigantea*, *Ipomoea fistulosa*, *Lawsonia inermis*, *Abutilon indicum*, and *Lantana camara*. The study also identified near-threatened birds like the peafowl, reptiles like the Indian cobra and common rat snake, mammals like the common jungle cat, mongoose, jackal, nilgai, hares, and five stripped squirrels.

The Indian Deccan plateau, which is renowned for its varied topography and ecosystems, has been overused by human activity. To protect and enhance biodiversity, Acharya N.G. Ranga, the agricultural

sector university in Hyderabad, founded the first agro-biodiversity park in 2008. The park, spread over hillocks and boulders, has removed invasive species, developed block plantations, and protected a rare species, *Ceropegia*, in 2009. Water ponds and bodies have been created to promote faunal genetic resources. The park currently records 24 insects, 5 fish, 8 reptile species, and 56 butterflies. India is a country with a diverse range of plant and animal species, with over 91,200 animal and 45,500 plant species spread across its ten bio-geographic regions. It is known as one of the eight Vavilovian centers, which are areas with a high diversity of crop plants. India is also considered one of the top ten countries in terms of species richness and is home to four global biodiversity hotspots. However, India's biodiversity is under threat due to population growth and various developmental activities. A new species of worm, *Capillaria striata*, was discovered in the intestine of the fish *Channa striatus*. It has a spiny covering on its surface and does not have raised valvular lips [23]. The study in Durg, Chhattisgarh, reveals a lack of knowledge among residents about common winter and summer illnesses. The most infectious diseases are viral infection, seasonal flu, and seasonal depression in winter, and heat stroke, sunburn urinary tract infection, and enteric fever in summer. Increased awareness and education are needed.

MATERIAL AND METHODS

I have collected data from different sources following the methodology for the review paper.

Studying the biodiversity of flora and fauna in Chhattisgarh requires a systematic approach. The literature survey was conducted using online resources such as PubMed, Science Direct, CAS, Google Scholar, Shodhganga, inflibnet, etc. Additionally, manual searches of books and journals were carried out. After collecting detailed information from all available sources, the material for this review was carefully compiled.

1. *Study Area Selection:* Identifying the specific regions in Chhattisgarh that will be studied based on factors such as accessibility, biodiversity richness, and research objectives.
2. *Data Collection Methods*

Field Surveys

- Quadrat sampling
- Line transects.
- Camera trapping

3. *Species Identification*

- Plant identification
- Animal identification

OBSERVATION TABLE

Secondary data has been collected from various sources, including references from secondary data research papers. This data encompasses a wide range of plant as well as animal species, including birds, herbs, shrubs, animals, and the entire spectrum of flora and fauna [Table 1, Figure 2(a–r) and Figure 3(a–n)].

Table 1. Showing secondary data of flora and fauna of Chhattisgarh from different Sources.

Wrightia arborea	*Diospyros melanoxylon*	*Aegle quinces*
Shorea robusta	*Anogeissus latifolia,*	*Bridelia retusa*
Pterocarpus marsupium	*Buchanania throw*	*Chloxylon swietenia*
Terminalia tomentosa	*Gardenia gummifera*	*Gardenia turgida*
Madhuca latifolia	*Helicteresisora*	*Holarrhaena*
Elaeodendron	*Glaucous embelia*	*Antidysenterica*
Flacaurtiaramontana	*Lagerstroemia parviflora*	*Gardenia turgida*
Grewia tiliaefolia	*Miliusavelutina*	*Mitragyna parviflora*
Desmodium	*Phoenix acaulis*	*Phyllanthus emblica*

Kydiacalycina	*Tectona grandis*	*Pied myna*
Meytenusoleoides	*Brahminy myna*	*Blue jay*
Mitragyna parviflora	*Spotted dove*	*Cool*
Soymidafebrifuga	*Little Green Bee-Eater*	*Phakhta, Jangali War*
Commanmyna	*Phakhta, Jangali War*	*Crash (Grey Quail*
Black drongo	*Neelkanth*	*Red-whiskered bulbul*
Parakeet	*Peafowl*	*Sloth bear*
Cuckoo	*Jackal*	*Gilhari*
Tanya Tota	*Indian hare*	*fruit bat*
Basanti (Indian cuckoo)	*Chamgadad*	*Lomadi*
Besra Sparrow-Hawk	*Field rat*	*Neola*
Kharaha	*Monkey*	*Langoor*
Squirrel	*Hyaena,*	*Janglisuar*
Chooha	*Jungle cat,*	*owl*
Indian fox	*Porcupine*	*Adina cordifolia*
Mangoes	*Indian robin*	*Grey quill*
Spotted dear	*Boswellia serrata*	*Mitragyna parviflora*
Wild boar	*Indian robin*	*House crow*
Egret	*Duck*	*Labeo rohita*

Figure 2(a). *Chloxylon swietenia.*

Figure 2(b). *Desmodiumconcinnum.*

Figure 2(c). *Flacaurtiaramontana.*

Figure 2(d). *Gardenia gummifera.*

Figure 2(e). *Grewia tiliaefolia.*

Figure 2(f). *Helicteresisora.*

Figure 2(g). *Holarrhaena*.

Figure 2(h). *Lagerstroemia parviflora*.

Figure 2(i). *Madhuca latifolia*.

Figure 2(j). *Meytenusoleoides*.

Figure 2(k). *Miliusavelutina*.

Figure 2(l). *Mitragyna parviflora*.

Figure 2(m). *Phyllanthus emblica*.

Figure 2(n). *Shorea robusta*.

Figure 2(o) *Soymidafebrifuga*.

Figure 2(p). *Tectona grandis*.

Figure 2(q). *Tectona grandis*.

Figure 2(r). *Wrightia arborea*.

Figure 2(a–r). Diversity of flora found in Chhattisgarh.

Figure 3(a). Monkey.

Figure 3(b). Egret.

Figure 3(c). Black-headed ibis.

Figure 3(d). Mangoes.

Figure 3(e). Languor.

Figure 3(f). Crow.

Figure 3(g). Duck.

Figure 3(h). Muscovy duck.

Figure 3(i). Jungle cat.

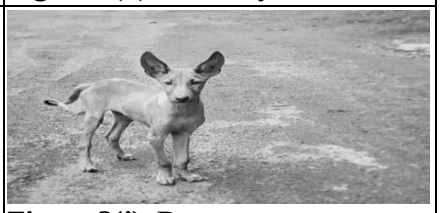

Figure 3(j). Dog.

Figure 3(k). Rat.

Figure 3(l). *Labeorohita*.

Figure 3(m). Neelkanth.

Figure 3(n). Spotted deer.

Figure 3(a–n). Diversity of different fauna found in Chhattisgarh.

RESULT AND DISCUSSION

In this review paper, we looked at why sacred groves, which are small patches of untouched nature protected by local communities for spiritual reasons, are so vital for preserving plant and animal life. We discussed how these groves face problems like being cut down or divided into smaller pieces, which threatens the variety of species living there. Despite these challenges, people are working hard to protect these special places.

The data collected from various sources presents a comprehensive overview of the flora and fauna diversity in Chhattisgarh, encompassing a wide array of plant species like *Wrightia dyes*, *Shorea robusta,* and *Boswellia serrata*, alongside diverse animal species including house crows, Bengal tigers, and sloth bears. This dataset serves as a valuable resource for understanding the biodiversity richness of the region.

The systematic methodology outlined for studying Chhattisgarh's flora and fauna biodiversity, including the selection of study areas and the implementation of data collection methods like field surveys and species identification, is fundamental for conducting effective research in this field. The challenges faced by sacred groves due to habitat fragmentation and reduced protection emphasize the urgent need for conservation efforts to preserve the region's rich biodiversity. The sustainable practices observed in zoos and protected forest areas in Chhattisgarh underscore a commitment to conserving natural resources and safeguarding endangered species. This review highlights the necessity for continued research and community engagement to protect Chhattisgarh's unique plants and animals.

We also talked about a specific sacred grove in Chhattisgarh, India, and how it's not just a home for various animals, including endangered ones like tigers and leopards, but also a place where animals can live out their natural lives. The zoo's careful approach to caring for these animals mirrors their natural behaviors, ensuring they stay healthy and content.

To understand more about the biodiversity in Chhattisgarh, we discussed different methods used to study plants and animals, like field surveys and species identification. By learning more about the plants and animals in this area, we can better protect them and their habitats. Overall, this paper highlights the importance of sacred groves in maintaining biodiversity and the ongoing efforts to study and protect these precious natural areas.

Key Findings from Literature Review

Biodiversity significance: Sacred groves serve as sanctuaries for plant and animal species, contributing significantly to the preservation of biodiversity. India, with its vast forest cover, is a biodiversity hotspot but faces challenges due to deforestation.

Threats to sacred groves: Fragmentation of these groves due to land-use changes has reduced their overall area and threatened the habitat of rare, endangered, and endemic species [6, 21].

The specific point highlighted in Sharma and Batish's (2022) research is the critical environmental issue of biodiversity loss. They highlight that the decline in biodiversity is mainly caused by human activities, including urbanization, habitat destruction, poaching, the introduction of invasive species, pollution, industrialization, and agricultural practices [32].

Scientists conducted a study in the Faridkot district spanning from 2012 to 2022, documenting a rich diversity of plant and animal species.

Efforts for conservation: Chhattisgarh, a state known for its plant diversity, has been the subject of extensive ethnobotanical research, highlighting the importance of plant conservation. The Maitri Bagh Zoo in Chhattisgarh exemplifies commitment to animal welfare through sustainable practices and species preservation programs.

The review highlights the critical role of sacred groves in biodiversity conservation. However, the decline in religious faith and habitat fragmentation due to human activities endanger these ecosystems. Further research is needed to understand the long-term effects of fragmentation on genetic diversity within these groves. The ongoing efforts in Chhattisgarh to conserve plant life and protect animal species in zoos offer a promising direction for future conservation initiatives.

CONCLUSION

In conclusion, Chhattisgarh's sacred groves play an essential role in preserving the state's rich biodiversity, serving as critical habitats for various endemic and endangered species. However, increasing anthropogenic pressures have led to habitat fragmentation, threatening the integrity of these groves and the species they protect. The review highlights the importance of a comprehensive conservation strategy that not only focuses on protected areas and sustainable practices but also revitalizes traditional conservation methods, such as community-led preservation of sacred groves. To ensure the long-term survival of Chhattisgarh's unique flora and fauna, it is crucial to promote scientific research, strengthen policy interventions, and foster greater community participation. By combining these efforts, Chhattisgarh can mitigate the effects of habitat loss, protect genetic diversity, and preserve its natural heritage for future generations. Additionally, increased public awareness and engagement will be key in safeguarding the state's biodiversity amidst evolving socio-cultural and environmental challenges.

REFERENCES

1. Do'stbekovich ATL, Kalboyevna SG. Importance of flora and fauna biodiversity protection in the development of ecological Tashkent region. Agr Biotechnol Vet Med Sci J. 2024;3(3):54–62.
2. Cerri F, Louis YD, Fallati L, Siena F, Mazumdar A, Nicolai R, et al. Mangroves of the Maldives: a review of their distribution, diversity, ecological importance, and biodiversity of associated flora and fauna. Aquat Sci. 2024;86(2):44. doi:10.1007/s00027-024-01061-2.
3. Siddiqui S. Microorganism studies from various aquatic areas in Bhilai, Chhattisgarh. Int J Futur Innov Eng Sci Technol. 2023;2(2):1–7. doi:10.59367/nyvmt353.
4. Siddiqui S, Singh S. Studies of some free-living protozoans from different ponds of Bhilai (Chhattisgarh). Int J Innov Res Multidiscip Field. 2020;(S3):182–183.
5. Nwaogu C, Diagi BE, Agidi VA, Okweche SI. Climate change and other environmental factors as drivers of fauna and flora biodiversity in Africa. In: Izah SC, Ogwu MC, editors. Sustainable Utilization and Conservation of Africa's Biological Resources and Environment. Singapore: Springer Nature Singapore; 2023. 441–467. doi:10.1007/978-981-19-6974-4_16.
6. Nair KP. Biodiversity in Agriculture: Sustainability of Soil, Soil Fauna and Soil Flora. Cham, Switzerland: Springer Nature; 2023.
7. Kakati R, Borah KJ. Status of threatened biodiversity in Behali reserved forest, Assam, India. In: Conference proceedings: impacts & consequences of environmental degradation on animal health and human wellbeing at Assam. 2023.
8. Bhatia GS, Siddiqui S. The study focused on investigating the diversity of bird species in the Paniyajob area of Dongargarh, located in the Rajnandgaon District of Chhattisgarh, India. Int J Futur Innov Eng Sci Technol. 2023;2(3):1–9.
9. Dikshit D, Siddiqui S. Study of some butterfly diversity at the Maitri Garden in Durg District in Chhattisgarh, India. Int J Futur Innov Eng Sci Technol. 2023;2(2):344–354.
10. Chandrakar L, Siddiqui S. An investigation of the types of butterflies that could inhabit a certain area of Khapparwada, Durg, Chhattisgarh, India. Int J Futur Innov Eng Sci Technol. 2023;2(2):295–301.
11. Balakrishnan V, Sudheesh NP, Nilayangode P. Microbial diversity and conservation of local biodiversity heritage sites in Western Ghats with community participation—a novel conservation effort of Kerala. In: Aguilar CN, Abdulhameed S, Rodriguez-Herrera R, Sugathan S, editors. Microbial Biodiversity, Biotechnology and Ecosystem Sustainability. Singapore: Springer Nature Singapore; 2023. 57–71. doi:10.1007/978-981-19-4336-2_4.

12. Sharma V, Sharma R, Singh R. Flora and fauna of Beers of District Faridkot, Punjab, India. J Med Plant Stud. 2023;11(2):21–30.
13. Sharma AK, Tripathi AK. Biodiversity loss and its conservation and management efforts. Int J Multidiscp Res. 2023;1(2):50–60.
14. Banerjee S, Siddiqui S. Studies on the social behaviour and communication in stray cats on Raipur (CG). Int J Futur Innov Eng Sci Technol. 2023;2(2):282–288. doi:10.59367/4gqjpv41.
15. Afsana C. Ethnomedicinal plants survey among the population of Bagicha Block in Jashpur District, (CG). Int J Futur Innov Eng Sci Technol. 2023;2(2):120–138. doi:10.59367/n30mey55.
16. Dar SA, Dar SA, Nabi M. Conservation of biodiversity in India: Current status and future strategies. In: Rani M, Chaudhary BS, Jamal S, Kumar P, editors. Towards Sustainable Natural Resources: Monitoring and Managing Ecosystem Biodiversity. Cham: Springer International Publishing; 2022. 195–214. doi:10.1007/978-3-031-06443-2_11.
17. Sharma LK, Joshi BD, Thakur M, Chandra K. Status, issues, and challenges of biodiversity: Wild animals. In: Kaur S, Batish D, Singh H, Kohli R, editors. Biodiversity in India: Status, Issues and Challenges. Singapore: Springer Nature Singapore; 2022. 149–173. doi:10.1007/978-981-16-9777-7_8.
18. Chandra A, Verma PK, Lepcha P. Biodiversity of India—with special emphasis on hotspots. Ecological Environment: A New Perspective. 2022;8:73.
19. Sharma P, Batish DR. Reasons of biodiversity loss in India. In: Kaur S, Batish D, Singh H, Kohli R, editors. Biodiversity in India: Status, Issues and Challenges. Singapore: Springer Nature Singapore; 2022. 555–567. doi:10.1007/978-981-16-9777-7_21.
20. Ghosh M, Roy A, Mondal KC. Analysis of Indian estuarine data of flora & fauna. In: Saraswat M, Roy S, Chowdhury C, Gandomi AH, editors. Proceedings of International Conference on Data Science and Applications. Lecture Notes in Networks and Systems. Singapore: Springer; 2022. 393–410. doi:10.1007/978-981-16-5348-3_31.
21. Siddiqui S, Bajaj S, Mathew C. Exploring biodiversity: Flora and fauna in Maitri Bagh, Bhilai, Chhattisgarh, India. NeuroQuantol. 2021;19(12):705–712. doi:10.48047/nq.2021.19.12.NQ21273.
22. Singh R. Faunal biodiversity of Tetragnathidae (Araneomorphae: Araneae: Arachnida) in India. Int J Biol Innov. 2021;3(1):92–119.
23. Das M, Gan S, Sen M, Mukherjee M, Jha B. Observation on diversity and species richness of butterfly (Insecta: Lepidoptera) fauna in Kaziranga National Orchid and Biodiversity Park, Assam, India. Int J Entomol Res. 2024;9(3):13–22.
24. Pati PK, Kaushik P, Khan ML, Khare PK. Biodiversity and ecosystem services of trees outside forests: A case study from Dr. Harisingh Gour Vishwavidyalaya, Sagar, Central India. Indian J Ecol. 2022;49(2):608–615. doi:10.55362/IJF/2022/3568.
25. Wani SA, Ahmad R, Gulzar R, Rashid I, Malik AH, Khuroo AA. Diversity, distribution, and drivers of alien flora in the Indian Himalayan region. Global Ecol Conserv. 2022;38:e02246. doi:10.1016/j.gecco.2022.e02246.
26. Prasad C, Sharma RC, Kumar R. Faunal diversity: Status, threats, and management of Kedarnath Valley, Garhwal Himalaya, India. Int J Conserv Sci. 2021;12(3).
27. Venkataraman K, Sharma G, Banerjee D. Faunal diversity of India. In: Dar G, Khuroo A, editors. Biodiversity of the Himalaya: Jammu and Kashmir State. Topics in Biodiversity and Conservation. Singapore: Springer; 2020. 71–92. doi:10.1007/978-981-32-9174-4_4.
28. Kapoor L, Usha S. Biodiversity and conservation: India's panoramic view. In: Roy N, Roychoudhury S, Nautiyal S, Agarwal S, Baksi S, editors. Socio-economic and Eco-biological Dimensions in Resource Use and Conservation: Strategies for Sustainability. Environmental Science and Engineering. Cham: Springer; 2020. 313–332. doi:10.1007/978-3-030-32463-6_16.
29. Dar GH, Khuroo AA. An introduction to biodiversity of the Himalaya: Jammu and Kashmir state. In: Dar GH, Khuroo AA, editors. Biodiversity of the Himalaya: Jammu and Kashmir State. Topics in Biodiversity and Conservation. Singapore: Springer; 2020. 3–26. doi:10.1007/978-981-32-9174-4_1.
30. Nand M, Maiti P, Joshi HC. Use of flora and fauna in state symbols of Indian Himalayan Region. ENVIS Bull Himal Ecol. 2020;28:86–91.

31. Ghosh-Harihar M, An R, Athreya R, Borthakur U, Chanchani P, Chetry D, et al. Protected areas and biodiversity conservation in India. Biol Conserv. 2019;237:114–124. doi:10.1016/j.biocon.2019.06.024.
32. Gopi M, Kumar MP, Jeevamani JJJ, Raja S, Muruganandam R, Samuel VD, et al. Distribution and biodiversity of tropical saltmarshes: Tamil Nadu and Puducherry, Southeast coast of India. Estuar Coast Shelf Sci. 2019;229:106393. doi:10.1016/j.ecss.2019.106393.
33. Kumar PAA, Shazia Q, Sree L, Uniyal VP. Spider fauna of Navdanya Biodiversity Farm, Uttarakhand, India. Indian Forest. 2019;145(4):392–397.
34. Roychoudhury N, Sharma R, Mishra RK. Scope and challenges of biodiversity conservation and management in Achanakmar-Amarkantak biosphere reserve. Plants Environ. 2019;1(1):46–54.
35. Dwivedi K, Tiwari A, Parmar K, Mishra MK, Tripathi R. Avifaunal biodiversity in Chhattisgarh Plain Region of Madhya Pradesh. Sci Technol Deve. 2021;10(4):131–146.
36. Geisen S, Wall DH, van der Putten WH. Challenges and opportunities for soil biodiversity in the Anthropocene. Curr Biol. 2019;29(19):1036–1046. doi:10.1016/j.cub.2019.08.007.
37. Kurmi A, Pachori R, Bhowmick A, Sharma A, Thomas M, Sharma H. Bio-diversity of photo-tactic hemipteran insects in the rice ecosystems Jabalpur district, Madhya Pradesh, India. J Entomol Zool Stud. 2019;7(3):1359–1362.
38. Leidonald R, Lesmana I, Muhtadi A. Biodiversity flora and fauna in tropical tidal lake. IOP Conf Ser Earth Environ Sci. 2019;260(1):012105. doi:10.1088/1755-1315/260/1/012105.
39. Ilgar R. Fauna and flora biodiversity in Saros Bay. Eur Geogr Studies. 2018;(5):42–49.
40. Arora NK. Biodiversity conservation for sustainable future. Environ Sustain. 2018;1(2):109–111. doi:10.1007/s42398-018-0023-1.
41. Couvreur TLP, Dauby G, Blach-Overgaard A, Deblauwe V, Dessein S, Droissart V, et al. Tectonics, climate and the diversification of the tropical African terrestrial flora and fauna. Biol Rev. 2021;96(1):16–51. doi:10.1111/brv.12644.
42. Todua V. Endemic flora and fauna of Georgia, biodiversity, peculiarities, and ecology. Adv Ecol Environ Res. 2019;108–120.
43. Bretzel F, Vannucchi F, Benvenuti S, Rumble H. Biodiversity of flora and fauna. In: Orsini F, Dubbeling M, de Zeeuw H, Gianquinto G, editors. Rooftop Urban Agriculture. Urban Agriculture. Cham: Springer; 2017. 235–252. doi:10.1007/978-3-319-57720-3_14.
44. Weeks ES, Death RG, Foote K, Anderson-Lederer R, Joy MK, Boyce P. Conservation science statement. The demise of New Zealand's freshwater flora and fauna: a forgotten treasure. Pac Conserv Biol. 2016;22(2):110–115. doi:10.1071/PC15038.
45. Sailu G, Narayana BL, Ramaiyan D, Naresh B, Rao VV, Adepu H, et al. Faunal diversity of Ameenpur Lake, Telangana state, India: A biodiversity heritage site. J Entomol Zool Stud. 2017;5(1):512–526.
46. Nerlekar AN, Lapalikar SA, Onkar AA, Laware SL, Mahajan MC. Flora of Fergusson College campus, Pune, India: monitoring changes over half a century. J Threat Taxa. 2016;8(2):8452–8487. doi:10.11609/jott.1950.8.2.8452-8487.
47. Mehraj G, Khuroo AA, Muzafar I, Rashid I, Malik AH. An updated taxonomic inventory of flora of Srinagar City (Kashmir Himalaya) India, using herbarium reconstruction approach. Proc Natl Acad Sci India Sect B Biol Sci. 2018;88:1017–1023. doi:10.1007/s40011-017-0840-5.
48. Siddiqui S. On a new nematode, Rhabdochona tictaii n. sp. from fresh water fish Barbus ticto (Gunther). IOSR J Environ Sci Toxicol Food Technol. 2015;1(3):73–75.
49. Nautiyal S, Bhaskar K, Khan YI. Biodiversity of Semiarid Landscape. Switzerland: Springer International Publishing; 2015.
50. Varma V, Ratnam J, Viswanathan V, Osuri AM, Biesmeijer JC, Madhusudan MD, et al. Perceptions of priority issues in the conservation of biodiversity and ecosystems in India. Biol Conserv. 2015;187:201–211. doi:10.1016/j.biocon.2015.04.031.
51. Roy A, Das SK, Tripathi AK, Singh NU, Barman HK. Biodiversity in North East India and their conservation. Prog Agric. 2015;15(2):182–189.
52. Kumar A, Eledath M. Baseline status for flora and fauna with aquatic biodiversity in Dahej area, district Bharuch Gujarat. Octa J Environ Res. 2015;3(1):80–93.

53. Khan MA, Prabhavathi K, Krishna A, Rao VV. Conservation of native flora and fauna of Agro-Biodiversity Park in ANGRAU, Hyderabad, Andhra Pradesh, India. Int J Bioresour Stress Manag. 2014;5(Mar, 1):143–147.
54. Chauhan SS. Status of biodiversity in India: issues and challenges. Indian J Plant Sci. 2014;3(2):52–63.
55. Chandrakar K, Verma DK, Sharma D, Yadav KC. A study on the role of sacred groves in conserving the genetic diversity of the rare, endangered, and threatened species of flora & fauna of Chhattisgarh State (India). Int J Sci Res Publ. 2014;4(1):271–275.
56. Siddiqui S. Economic and business aspects of agroforestry system. Sr. No. Chapter/Title Page No. 2021;161(178):83.
57. Chandrakar N, Siddiqui S, Lone NG. Survey on epidemiological investigation and seasonal patterns of infectious diseases in Durg, Chhattisgarh. J Adv Zool. 2023;44(S7):1316–1322. doi:10.53555/jaz.v44iS7.3182.
58. Alba E, Dodake P, Pal M. Flora and fauna. Flora. 2017;23(1):119–123. doi:10.33451/florafauna.v23i1pp119-123.

