

Biodiversity Assessment of Hemgir Forest Range, Sundargarh District, Odisha, India Emphasizing the Ecological and Conservation Significance of Species

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ABSTRACT

The tribal-dominated Sundargarh district of Odisha has historically supported extensive forest cover, high biological diversity, and significant mineral reserves, particularly coal. These characteristics have accelerated forest-based trade, mining, and industrial expansion, resulting in increasing anthropogenic pressure on natural ecosystems. The decline in forest cover from 50.06% in 1948 to 43% in 2018 (Ministry of Environment, Forest and Climate Change [MoEF&CC], 2018), and further to 41.07% at present indicates mounting pressure on biodiversity driven by intensified commercialization and land use change. The Hemgir Forest Range, representing a tropical dry mixed deciduous plateau ecosystem, is ecologically sensitive and increasingly associated with human wildlife conflict, yet remains insufficiently explored. This study presents a comprehensive biodiversity assessment using a combination of quantitative techniques including field surveys, photography, videography, audio documentation, footprint analysis, and microscopic examination and qualitative methods such as community-based interviews and secondary data review (Gadgil et al., 1993). A total of 444 species were recorded, including 428 taxonomically identified and 16 documented through local interviews. Ecological guild analysis revealed 261 producer species (~61%), 155 consumer species (~36%), and 12 decomposer species (~3%), indicating a producer-dominated ecosystem. Diversity indices (Magurran, 2004) further quantified biodiversity: Shannon–Wiener Index ($H^I \approx 2.35$) suggests high diversity, Simpson's Index ($1 - D \approx 0.867$) indicates strong biodiversity and Pielou's Evenness Index ($J \approx 0.38$) reflects moderate unevenness with dominance of trees, non-chordates, and avifauna. A total of 444 species were documented, of which 428 were taxonomically identified and 16 documented through local interviews indigenous knowledge systems. Functional guild classification revealed a dominance of producers (261 species; ~61%), followed by consumers (155 species; ~36%) and decomposers (12 species; ~3%), indicating a structurally producer-driven ecosystem. Biodiversity indices further support this pattern: the Shannon–Wiener Index ($H^I \approx 2.35$) indicates high species diversity, Simpson's Index ($1 - D \approx 0.867$) reflects strong diversity with low dominance concentration, and Pielou's Evenness Index ($J \approx 0.38$) suggests moderate unevenness, with ecological prominence of trees, non-chordates, and avifauna. The Hemgir Forest Range inventory recorded Odisha's first black panther (Barik, 2018; Mohanty, 2018). It also documented the large Indian Bullfrog (Surendran and Vasudevan, 2013), an adaptable, potentially invasive species (Mohanty et al., 2021), alongside 31 bioindicator, 70 biofertilizer-associated, and 6 water-purifying species. Additionally, locally extinct and conservation-priority species were identified (Costanza et al., 1997). These findings underscore the ecological significance and functional heterogeneity of the Hemgir landscape, highlighting the need for targeted, community-inclusive, and sustainable conservation strategies to safeguard ecosystem services such as bioindication, nutrient cycling, medicinal resources, and biological pest control. The natural boundary species may be used to save shrubs and herbs in tender stage from herbivores and reduce human-animal conflicts (Burudi et al., 2025).

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1. Introduction

Sundargarh is a northwestern district of Odisha accounting for about 6.23% of its area from 21° 36'N to 22° 32'N and from 83° 32'E to 85° 22'E. Hemgir is a plateau at an elevation of about 351 meters height approximately within coordinates 21.8889° N and 83.6081°E having hilly north and roughly flat south. Hemgir Forest Range is a tropical dry mixed deciduous forest ecosystem with a vast flora and fauna diversity dominated by Sal, Teak and Bamboo with a rich heritage of tribal dependence on forest resources. Its richness of coal, metals and minerals attracts variable extents of industrialization, habitat alteration and forest resource exploitation declining forest cover of the district from 50.06% during its formation to 43% in 2018 and 41.07% now. This ecologically significant and commercially valuable range is under-studied and often in news due to increasing instances of human-animal conflicts. Sustainability of its biodiversity needs a scientific, community inclusive and comprehensive study integrating quantitative and qualitative data to design a sustainable management strategies and conservation methods with careful and necessary human interventions. This survey was done in randomly selected regions of this range by direct observation, photography, footprint observation, audio and video recordings and microscopic observation of soil, water, bark and compost samples after qualitative data recorded rarely identifiable, missed or locally endangered and extinct species via structured interviews of local people, review of news and media. It provides a proper documentation of 444 species including 428 identified and 16 locally interviewed citing the ecological, medicinal, indicator, fertilizer, pest controller and other importance of recorded species emphasizing their conservation necessities. This study documented 3 locally extinct, 3 conservation seeking species, India's largest frog species and Odisha's first Black Panther (Barik, 2018; Mohanty, 2018) and one probable natural boundary vegetation (spiny, thick fast growing and resistant species) that may be used to reduce human-animal conflicts.

2. Ethical concern

The species were carefully handled and not harmed during the study.

3. Methodology

The biodiversity of Hemgir Forest Range in Sundargarh district, Odisha was studied using survey method in randomly selected variable and distant representative regions trying to cover entire range. Line transect methods and random observation methods were used to collect quantitative data by direct observation, photography, footprint observation, audio and video recorded by Nikon Z50 camera and smart phones. Samples were collected from different water bodies, lower soil by digging random parts, barks, leaves and roots of trees, composts, wetlands, cracks and ridges in rocks and soil, caves and bushes by digging tools, sample collection and handling materials, and traces were also observed under compound microscope for any identifiable species. Personal and group interviews were conducted with local people for qualitative data collection by recording any rarely identifiable, conservation seeking and locally extinct species might be missed by direct methods. The species were confirmed from flora and fauna taxonomy and nomenclature books. They were classified under producer, consumers and decomposers and the directly identified species were classified under 3 domain classification proposed by Woese et al. (1990) into 4 major groups such as Protista, Plantae, Fungi and Animalia. Species in Plantae were further tabulated under Trees, Shrubs, Herbs, Climbers, Grasses, Aquatic vegetation and Algae and those in Animalia under Nonchordates, Fishes, Amphibia, Lizards, Snakes, Birds and Mammals. The locally interviewed species were recorded separately. The scientific names, local names, common names and importance were recorded for all. The data was tabulated and properly analyzed using MS excel, word and spreadsheets. Shannon Wiener diversity Index (H^I), Simpson's diversity Index ($1 - D$) and Pielou's evenness Index were applied to determine extent of diversity.

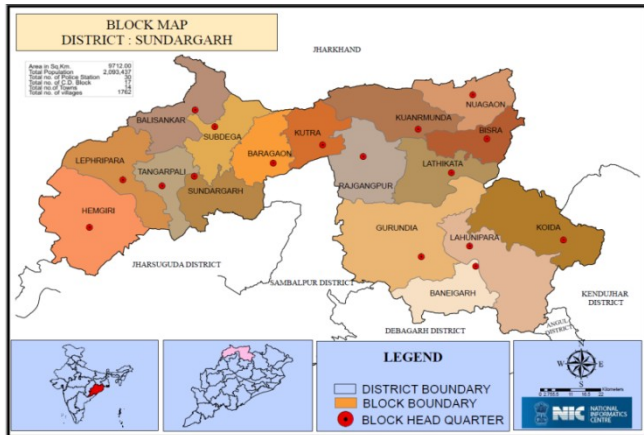


Fig. 1. Map of Sundargarh district, Odisha.

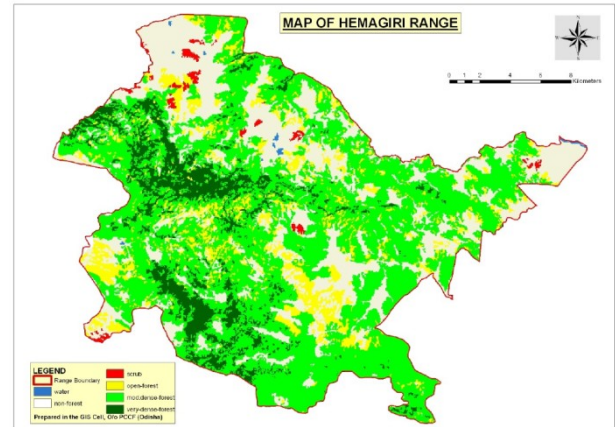


Fig. 2. Map of Hemgiri Forest Range.

4. Results

This study documented 444 species including 428 identified and 16 locally interviewed species. It includes 125 Trees, 38 Shrubs, 17 Herbs, 20 Climbers, 26 Grasses, 19 Aquatic vegetations, 16 Algae, 12 Fungi, 47 Non-chordates, 10 Fishes, 7 Amphibia, 4 Lizards, 14 Snakes, 42 Birds and 31 Mammals species. Number of species according to their importance also recorded into different groups as Medicinal, Bioindicator, Biofertilizer, Water purifier, Bioactive, Biopest controller, Ornamental, Edible, Timber, Natural boundary, Endangered and locally extinct heads. Odisha's first Black Panther was recorded from interview of locals and India's largest frog species, one GI tag species was identified. 3 conservation seeking, 3 locally extinct, 31 bioindicator indicating health of ecosystem and helping in tracking pollution and human interferences, 6 water purifier, 3 bioactive, 70 biofertilizer species were recorded. One natural boundary species (*Agave americana*) was also found that may be used at forest boundary to reduce human-animal conflicts and increasing the safety and security of humans, crops and to preserve this rich biodiversity.

5. Application of Diversity Index and Evenness Index

We have applied the Shannon–Wiener Index (H^I), Simpson's Diversity Index ($1 - D$) and Pielou's Evenness Index (J^I) for number of species under different groups to know the rate of diversity of different groups of living beings in the study area.

$$\begin{aligned} \text{Shannon–Wiener Index } (H^I) &= -\sum p_i \ln_{i=1}^s(p_i) \\ &= -(2.345) = 2.345 = 2.35 \text{ (approx)} \end{aligned}$$

5.1. Inference from Shannon–Wiener Index (H^I)

The maximum value of of Shannon–Wiener Index (H^I) for 15 groups is $\ln(15) \approx 2.71$ and the calculated value ≈ 2.35 . It indicates the study area has a high diversity and moderate unevenness dominated by trees followed by non-chordates and birds.

$$\begin{aligned} \text{Simpson's Index } (1 - D) &= -\sum p_i^2 = 1 - 0.133 \\ &= 0.867 \end{aligned}$$

5.2. Inference from Simpson's Index ($1 - D$)

The calculated value of Simpson's Index ($1 - D$) is 0.867, as it is less than 1; but very closed to 1. It indicates the study area has strong biodiversity but still dominated by trees trees followed by non-chordates and birds.

$$\begin{aligned} \text{Pielou's Evenness Index } (J^I) &= H^I / \ln N \\ &= 2.35 / \ln 428 = 2.35 / 6.06 = 0.38 \end{aligned}$$

5.3. Inference from Pielou's Evenness Index (J^I)

The calculated value of *Pielou's Evenness Index* (J^I) is 0.38, it indicates the study area has less evenness of species may be compensated by dominance of Trees, non-chordates and birds.

Table 1. Producers identified in Hemgir Forest Range of Sundargarh district, Odisha.

	Sl. No.	Botanical Name	Local Name	Importance
Trees	1	<i>Acacia auriculiformis</i>	Suna jhari	Timber, fuelwood, paper
	2	<i>Acacia catechu</i>	Khaira	Dye, medicinal for inflammation
	3	<i>Acacia leucophloea</i>	Gohira	Medicinal for diabetes, skin diseases, inflammation
	4	<i>Acacia nilotica</i>	Babool	Timber, fuel, fodder, dye, gum
	5	<i>Adina cordifolia</i>	Haldu	Medicinal for jaundice, stomach ache, cough, timberwood
	6	<i>Aegel marmelos</i>	Bel	Medicinal for inflammation, respiratory, diabetes, diarrhoea
	7	<i>Alangium lamarkii</i>	Ankul	Medicinal
	8	<i>Albeizia lebbeck</i>	Kala siris / Sersuan	Medicinal for inflammation, diarrhoea, cancer, allergy etc.
	9	<i>Albeizia procera</i>	Dhop siris / Panra siris	Fast growing timber
	10	<i>Alstonia scholaris</i>	Chhatian / Chhatin	Timber, ornamental, medicinal
	11	<i>Anacardium occidentale</i>	Kaju	Dry fruit, fruit, costly
	12	<i>Annona squamosa</i>	Sita phal	Medicinal, culinary, food
	13	<i>Annona reticulata</i>	Ram phal	Medicinal, antioxidant, fruit
	14	<i>Anogeissus acuminate</i>	Fasi	Fuel, tool making timber
	15	<i>Anogeissus latifolia</i>	Dhaura / Dahu	Medicinal, durable timber, dye
	16	<i>Anthocephalus cadamba</i>	Kadamba	Medicinal for inflammatory, analgesic, infection, wound healer
	17	<i>Artocarpus heterophyllus</i>	Panas	Versatile, medicinal, culinary
	18	<i>Artocarpus lakocha</i>	Jeuth	Fruit, fodder
	19	<i>Azadirachta indica</i>	Lim / Limba	Antioxidant, medicinal for inflammation and infection
	20	<i>Barringtonia acutangula</i>	Hinjal / Hijal	Medicinal
	21	<i>Bauhinia purpurea</i>	Kuiler	Medicinal
	22	<i>Bauhinia racenosa</i>	Aam lata	Medicinal
	23	<i>Bauhinia variegata</i>	Kanchan	Medicinal
	24	<i>Bixa orellana</i>	Jafr	Medicinal, cosmetic, dye, food
	25	<i>Bombax ceiba</i>	Semel	Medicinal, textile
	26	<i>Borassus fabellifer</i>	Tal	Food, medicinal
	27	<i>Bridellia retusa</i>	Kasi / Paen kasi	Medicinal, contraceptive
	28	<i>Buchanania lanzan</i>	Char	Medicinal, substitute for almond
	29	<i>Butea monosperma</i>	Phalsa	Medicinal
	30	<i>Callicarpa arborea</i>	Bado patri	Medicinal for rheumatism, fever
	31	<i>Caryota urens</i>	Salapo / Sag tal	Medicinal, jaggery, fibers
	32	<i>Casabala thevetia</i>	Kaniar / Champa	Medicinal for heart, menstruation
	33	<i>Casearia tomentosa</i>	Kuakada	Medicinal, fish poison
	34	<i>Cassia fistula</i>	Sunari / Sunori	Nutritious, medicinal, religious
	35	<i>Cassia siamea</i>	Kassood	Medicinal, nutritional, food
	36	<i>Chloroxylon swietenia</i>	Bheru	Medicinal, timber, decorative
	37	<i>Cleistanthus collinus</i>	Kardo	Toxic, biopesticide making
	38	<i>Cochlospermum gossipium</i>	Kanta phalsa / Goniari	Cosmetic, medicinal, gum
	39	<i>Crateva nurvala</i>	Barun / Baruna	Medicinal for liver, heart, kidney
	40	<i>Dalbergia latifolia</i>	Pahadi sisoo / Gai sisu /	Timber, medicinal,
	41	<i>Dalbergia sissoo</i>	Sisham / Kala Sisoo	Timber, fodder, medicinal
	42	<i>Dalbergia paniculata</i>	Babukila / Barahbakal	Timber, medicinal dysmenorrhea
	43	<i>Dellenia pentagyna</i>	Rai / Kirmila	Medicinal for cancer, diabetes
	44	<i>Delonix regia</i>	Krushna chuda	Beautiful ornamental flowers
	45	<i>Desmodium oojeinensis</i>	Banbhano / Tinsa	Timber, medicinal, fodder
	46	<i>Diospyros malabarica</i>	Makad kendu	Medicinal
	47	<i>Diospyros melanoxylon</i>	Kendu	Medicinal, timber, nutritional
	48	<i>Diospyros montana</i>	Jakai / Pita kalkha	Medicinal, anticancerous
	49	<i>Emblica officinalis</i>	Aenla / Amla	Medicinal
	50	<i>Erythrina suberosa</i>	Chal dua	Medicinal, fuel, dye
	51	<i>Eucalyptus globulus</i>	Patas / Viks gach	Cosmetic, medicinal, flavouring
	52	<i>Eucalyptus species</i>	Nilgiri / Patas	Cosmetic, medicinal, flavouring
	53	<i>Feronia elephantum</i>	Kaintha	Medicinal
	54	<i>Ficus bengalensis</i>	Bargach / Bat brukshya	National tree of India, medicinal
	55	<i>Ficus glomerata</i>	Jambua / Gularia	Medicinal
	56	<i>Ficus religiosa</i>	Pipal / Aswatha	Medicinal, sacred
	57	<i>Gardenia latifolia</i>	Kata ranga	Medicinal
	58	<i>Garuga pinnata</i>	Kath kusum	Medicinal
	59	<i>Gmelina arborea</i>	Gamhari / Gamher	Timber, medicinal
	60	<i>Grevillia robusta</i>	Silver oak	Ornamental, medicinal
	61	<i>Grewia tiliifolia</i>	Dhamni / Dhamur	Fruit, timber, medicinal
	62	<i>Helicteres isora</i>	Murmuria	medicinal
	63	<i>Holarrhena antidysenterica</i>	Kure	Medicinal
	64	<i>Holoptelia integrifolia</i>	Chil bil / Jangal cork	Medicinal
	65	<i>Hymenodictyon excelsum</i>	Ghuli / Kansa	Medicinal
	66	<i>Jacaranda mimosifolia</i>	Nupur / Blue jacaranda	Ornamental

67	<i>Kydia calycina</i>	Kapasias / Barimo	Medicinal for cancer, inflammation	
68	<i>Lagerstroemia parviflora</i>	Sida	Hard, durable timber, medicinal	
69	<i>Lannea coromandelica</i>	Raji moi / Moyno	Food, gum, timber, medicinal	
70	<i>Limonia acidissima</i>	Kaitha	Fruit, medicinal	
71	<i>Macaranga peltata</i>	Jinka	Medicinal	
72	<i>Madhuca indica</i>	Mahul / Mahua	Edible, medicinal, oil	
73	<i>Mallotus phillippensis</i>	Sinduri	Dye, medicinal, bioactive product	
74	<i>Mangifera indica</i>	Aam / Aamba	Food, medicinal, national fruit of India	
75	<i>Michelia champaca</i>	Champa / Champak	Medicinal, religious	
76	<i>Miliusa velutina</i>	Dom sal	Edible, medicinal	
77	<i>Mitragyna parvifolia</i>	Dhara kadam / Mundi	Timber, medicinal	
78	<i>Moringa oleifera</i>	Munga / Sajna	Food, medicine, fuel, water purifier	
79	<i>Oroxylum indicum</i>	Bhut Gachha / Fanfana	Medicinal	
80	<i>Pletophorum ferrugineum</i>	Radha chuda	Dye, ornamental	
81	<i>Phoenix acaulis</i>	Ban khajur	Medicinal	
82	<i>Phonix sylvestris</i>	Khajur	Tadi, medicinal, religious, fibers	
83	<i>Pinus kesiya</i>	Khasi	Timber, resin, paper	
84	<i>Pithecellobium dulce</i>	Sima koina	Food, medicinal	
85	<i>Polyalthia longifolia</i>	Debdaru	Medicinal	
86	<i>Pongamia pinnata</i>	Karanj	Oil, biofuel, medicinal, fertilizer	
87	<i>Proteum serratum</i>	Dongsoradi / Limbru	Food, industrial, medicinal	
88	<i>Psidium guajava</i>	Mayaa / Taama	Economic, medicinal, nutritional	
89	<i>Pterocarpus marsupium</i>	Bija / Rengal / Sargi	Gum, medicinal, timber	
90	<i>Pterospermum heyneamum</i>	Giring	Food for wildlife	
91	<i>Pterospermum suaveolens</i>	Boro	Medicinal	
92	<i>Pterospermum xylocarpum</i>	Giring	Food for wildlife	
93	<i>Samanea saman</i>	Chakhda / Didi	Edible, timber, biofuel	
94	<i>Santalum album</i>	Chandan	Perefume, cosmetic, medicinal	
95	<i>Sapindus mukorosis</i>	Ritha	Medicinal, anti hairfall	
96	<i>Saraca asoca</i>	Ashok	Medicinal mainly for women	
97	<i>Schleichera oleosa</i>	Kusum	Medicinal	
98	<i>Schrebera swietenioides</i>	Mokka / Nemi bura	Medicinal	
99	<i>Semecarpus anacardium</i>	Bhalia	Medicinal	
100	<i>Sesbania grandiflora</i>	Agasti	Biofertilizer, medicinal	
101	<i>Shorea robusta</i>	Sal / Sargam	Diversity regulator, timber, cultural	
102	<i>Soymida febrifuga</i>	Rohini	Medicinal, timber	
103	<i>Spathodea campanulata</i>	Pichkari	Medicinal, fuel, ornamental, dye	
104	<i>Spondius mangifera</i>	Ambda	Fruit, medicinal	
105	<i>Sterculia urens</i>	Genduli / Kudalo	Medicinal, gum, textile, cosmetic	
106	<i>Streblus aspera</i>	Sahada	Medicinal, economic	
107	<i>Strychnos nuxvomica</i>	Kochila / Kora	Medicinal, anger regulator	
108	<i>Swietenia mahogani</i>	Maagoni	Timber, medicinal	
109	<i>Syzygium cumini</i>	Jamu / Jam	Medicinal	
110	<i>Syzygium operculata</i>	Satyam / Bawal	Nutritional, medicinal, ecological	
111	<i>Tamarindus indica</i>	Tetel	Medicinal, food, religious	
112	<i>Tamainadia uliginosa</i>	Thelko	Medicinal	
113	<i>Tectona grandis</i>	Saguan	Timber, aesthetic	
114	<i>Terminalia arjuna</i>	Arjun	Cardio medicinal, cultural, food	
115	<i>Terminalia bellirica</i>	Bahada	Medicinal	
116	<i>Terminilia chebula</i>	Harida / Hairda	King of medicinal	
117	<i>Terminalia tomentosa</i>	Asana / Kumbhir chhal	Medicinal, silkworm food	
118	<i>Toona ciliata</i>	Tooni	Timber, Musical instrument	
119	<i>Trewia nudiflora</i>	Mundu / Paani gambhari	Medicinal, host for rhino & insects	
120	<i>Vitex negundo</i>	Nirgun	Medicinal	
121	<i>Vitex peduncularis</i>	Charei god / Bhadu	Medicinal, anti-cancerous	
122	<i>Wendlandia tinctoria</i>	Tilei	Economic, medicinal	
123	<i>Wrightia tomentosa</i>	Pita karum	Medicinal, anti-cancerous	
124	<i>Xylia xylocarpa</i>	Kangda	Edible seed, timber, medicinal	
125	<i>Ziziphus mauritiana</i>	Buro	Fruit, medicinal	
Shrubs	1	<i>Agave sisalana</i>	Sisul	Fiber
	2	<i>Agave americana</i>	Murba / bara barsia	Fiber, natural boundary
	3	<i>Calotropis procera</i>	Arakh	Medicinal industrial
	4	<i>Chromolaena odorata</i>	Pok sungtha	Medicinal, religious
	5	<i>Clerodendron infortunatum</i>	Bhuasen	Medicinal
	6	<i>Datura stramonium</i>	Dudhra	Medicinal, religious
	7	<i>Euphorbia tirucalli</i>	Haad bhanga	Toxic, medicinal
	8	<i>Flemingia chappar</i>	Rani kathi	Medicinal
	9	<i>Gardenia gummifera</i>	Khurdu	Mediecinall, gum

	10	<i>Grewia hirsuta</i>	Sunar gadaa	Medicinal
	11	<i>Helicteres isora</i>	Murmuria	Medicinal
	12	<i>Hemidesmus indicus</i>	Anta mula	Medicinal
	13	<i>Indigofera cassioides</i>	Girel	Ornamental
	14	<i>Ipomea carnea</i>	Amari	Ornamental
	15	<i>Ixora parviflora</i>	Luha jharla	Medicinal, beauty
	16	<i>Jasminum humile</i>	Kudo phul	Ornamental
	17	<i>Jasminum arborescens</i>	Tara malli	Ornamental
	18	<i>Jasminum multiflorum</i>	Ban malli	Ornamental
	19	<i>Jasminum sambac</i>	Malli	Ornamental
	20	<i>Jatropha carcus</i>	Bai kujen	Biofuel
	21	<i>Jatropha gossypifolia</i>	Nili bai khujen	Medicinal, beautify
	22	<i>Justicia adhatoda</i>	Basang	Medicinal
	23	<i>Lantana camara</i>	Nag pheni	Ornamental
	24	<i>Lawsonia inermis</i>	Benjati / Mehendi	Beauty, medicinal
	25	<i>Murraya koenigii</i>	Mirsingha	Spice, medicinal
	26	<i>Murraya paniculata</i>	Kamini	Beauty, medicinal
	27	<i>Nerium indicum</i>	Kaniar	Beauty, medicinal
	28	<i>Nyctanthes arbor-triatis</i>	Ganga siuli	Beauty, medicinal
	29	<i>Plumbago indica</i>	Lal chita /rakat chita	Medicinal
	30	<i>Plumbago zeylanica</i>	Dhop chita	Medicinal
	31	<i>Premna herbacea</i>	Gud maari	Medicinal
	32	<i>Randia dumetorum</i>	Meena	Medicinal
	33	<i>Rauvolfia serpentina</i>	Patal garud	Medicinal
	34	<i>Ricinus communis</i>	Jadaa	Oil, medicinal
	35	<i>Sida cordifolia</i>	Bajra muli	Medicinal
	36	<i>Withania somnifera</i>	Ashwa gandha	Medicinal
	37	<i>Woodfordia fruticosa</i>	Dhatiki	Medicinal
	38	<i>Zizyphus oenopia</i>	Kantei koli	Fruit, medicinal
Herbs	1	<i>Achyranthes aspera</i>	Apamarga	Medicinal, religious
	2	<i>Andrographis paniculata</i>	Bhuin lim	Medicinal
	3	<i>Aristolochia bracteata</i>	Hansa lata / Isar mula	Medicinal
	4	<i>Boerhavia diffusa</i>	Punar navaa	Medicinal
	5	<i>Cassia tora</i>	Dhop chakhada	Medicinal
	6	<i>Centella asiatica</i>	Thal kudi	Medicinal
	7	<i>Coocasia esculenta</i>	Saru	Food, medicinal, culinary
	8	<i>Curcuma amada</i>	Aam adaa	Spice, medicinal, culinary
	9	<i>Curcuma aromatica</i>	Ban haldi	Spice, medicinal, culinary
	10	<i>Curium angustifolia</i>	Palaa gundi	Nutritional, healthy
	11	<i>Euphorbia hirta</i>	Chhel dudhi / Khir saag	Vegetable, medicinal
	12	<i>Ocimum basilicum</i>	Dhop tulsi / durlabha	Religious, medicinal
	13	<i>Ocimum gratissimum</i>	Ban tulsi	Medicinal
	14	<i>Ocimum sanctum</i>	Kala tulsi	Medicinal
	15	<i>Solanum xanthocarpu</i>	Ban baigan	Medicinal
	16	<i>Tribulus terrestris</i>	Gukhra	Medicinal, fruit, flower
	17	<i>Tridax procumbens</i>	Bisalya karani	Medicinal
Climbers	1	<i>Abrus precatorius</i>	Gunj	Highly toxic, medicinal
	2	<i>Acacia sinuata</i>	Lal kantia	Natural saponin,
	3	<i>Asperagus racemosus</i>	Satawari / Vari	Medicinal
	4	<i>Bauhinia vahlii</i>	Siali	Medicinal, economic
	5	<i>Butea superba</i>	Lata phalsa	Medicinal
	6	<i>Cassytha filiformis</i>	Nirmuli lata	Parasite, medicinal, bioactives
	7	<i>Combretum decandrum</i>	Atundi	Medicinal, religious
	8	<i>Cryptolepis buchananii</i>	Dudhi maal	Medicinal
	9	<i>Dioscorea bulbifera</i>	Ban alu	Food
	10	<i>Dioscorea deltoidea</i>	Ban alu	Food, Endangered
	11	<i>Dioscorea hispida</i>	Kulhia kandaa	Toxic, medicinal
	12	<i>Entada pursaetha</i>	Gilo	Medicinal, economic
	13	<i>Gloriosa superba</i>	Muhuria phul	Highly toxic, medicinal
	14	<i>Hiptage bengalensis</i>	Buro maali	Medicinal
	15	<i>Ipomea reptans</i>	Kalmi saag	Medicinal, culinary
	16	<i>Millettia auriculata</i>	Arkawala	Medicinal
	17	<i>Scurrula parasitica</i>	Madang	Medicinal
	18	<i>Smilax zeylanica</i>	Mutri	Food, medicinal
	19	<i>Ventilago denticulata</i>	Kanta maali	Medicinal
	20	<i>Ventilago madraspatana</i>	Rakat pita	Medicinal

Grasses	1	<i>Aristida setacea</i>	Badhun / Jhadu	Broom making
	2	<i>Arundinela setosa</i>	Ghaas lataa	Fodder, indicator of grassland
	3	<i>Bambusa arundinacea</i>	Kanta bauns	Medicinal, cultural, furniture
	4	<i>Bambusa nutans</i>	Bauns	Furniture, food etc.
	5	<i>Bambusa tulda</i>	Telda bauns	Construction, craft
	6	<i>Bambusa vulgaris</i>	Sundarkani bauns	Construction, craft
	7	<i>Bothriochloa pertma</i>	Nili ghaas	Ecological
	8	<i>Bothriochloa bladhii</i>	Ganda bena	Grazing
	9	<i>Chrysopogon gryllus</i>	Atar Ghaas / Atar lataa	Fodder, ecological stabilizer
	10	<i>Chrysopogon zizanioides</i>	Bena cher / Biren cher	Fiber to cool
	11	<i>Cymbopogon citratus</i>	Dhanantari, lembu lataa	Medicinal, culinary, fragrance
	12	<i>Cymbopogon flexuosus</i>	Dhanwantari	Medicinal
	13	<i>Cymbopogon martinii</i>	Hare hullu	Medicinal
	14	<i>Cyanodon dactylon</i>	Dub lataa	Medicinal, religious
	15	<i>Dendricalamus strictus</i>	Lathi bauns	Commercial bamboo
	16	<i>Eragrostis unioloides</i>	Khir sag	Bioactive, medicinal
	17	<i>Eulaliopsis binata</i>	Sabai ghash	Craft, cultural
	18	<i>Heteropogon contortus</i>	Kala teer lataa	Religious
	19	<i>Imperata arundinacea</i>	Kush	Religious, purifier, Medicinal
	20	<i>Imperata cylindrica</i>	Siriali lataa	Soil stabilization, invasion
	21	<i>Ischaemum rugosum</i>	Dhaan lataa	Rice field weed, fodder
	22	<i>Oryza rufipogon</i>	Jharaa dhaan	Substitute to rice
	23	<i>Phragmites karka</i>	Nalaa daal	Ecological invasive stabilizer
	24	<i>Saccharum spontaneum</i>	Kasia phul	Religious
	25	<i>Thysanolaena maxima</i>	Bagh bauns	Broom, craft
	26	<i>Vetiveria zizanioides</i>	Suna lataa	Craft
Aquatic plants	1	<i>Alternanthera sessilis</i>	Madraanga saag	Nutritious, medicinal
	2	<i>Aponogeton natans</i>	Ghechu	Culinary, medicinal
	3	<i>Azolla pinnata</i>	Patlaa Jagal	Biofertilizer
	4	<i>Bacopa monnieri</i>	Paen kundi	Medicinal
	5	<i>Centella asiatica</i>	Thalkuni	Nutritious, medicinal
	6	<i>Commelina benghalensis</i>	Khet papra	Nutritious, medicinal
	7	<i>Commelina paludosa</i>	Ransiri	Nutritious, medicinal
	8	<i>Drosera burmannii</i>	Pok khai	Medicinal, indicate poor soil
	9	<i>Eichhornia crassipes</i>	Bilati daal	Negative impact by prolific growth
	10	<i>Hydrilla verticillata</i>	Chingri daal	Keystone species, water purifier,
	11	<i>Ipomoea aquatica</i>	Tuti saag	Culinary, food, medicinal
	12	<i>Ludwigia adscendens</i>	Jagal	Medicinal
	13	<i>Nelumbo nucifera</i>	Padma	Religious, Medicinal
	14	<i>Nymphaea nouchali</i>	Kain / nil kain	Beuty, medicinal
	15	<i>Pistia stratiotes</i>	Bara jhanji	Water purifier, medicinal, fodder
	16	<i>Polygonum plebium</i>	Muthi saag	Nutritious, medicinal, Cultural
	17	<i>Trapa natans</i>	Pani singhrha	Food, medicinal
	18	<i>Typha angustata</i>	Hangla	Medicinal, phytoremediation
	19	<i>Utricularia stellaris</i>	Bhatdia daal	Food, medicinal, Endangered
Algae	1	<i>Anabaena</i>		Biofertilizer
	2	<i>Chlamydomonas</i>		Waste water treatment
	3	<i>Chlorella</i>		Sustainable aquaculture
	4	<i>Desmid</i>		Bioindicator
	5	<i>Desmococcus olivaceus</i>		Biodeterioration indicator
	6	<i>Dictyococcus varians</i>		Bioactive
	7	<i>Gloeocapsa</i>		Nutrient cycles, bioindicator
	8	<i>Gomphonema</i>		Water quality indicator
	9	<i>Leptolyngbya</i>		Ecological balance
	10	<i>Navicula</i>		Bioindicator
	11	<i>Nostoc</i>		Biofertilizer
	12	<i>Oscillatoria</i>		Antioxidant
	13	<i>Pinularia</i>		Bioindicator
	14	<i>Scytonema</i>		Biofertilizer
	15	<i>Spirogyra</i>		Bioremediation, medicinal
	16	<i>Volvox</i>		Food

Table 2. Consumers identified in Hemgir Forest Range of Sundargarh district, Odisha.

	Sl. No.	Zoological Name	Local Name	Common Name	Importance
Nonchordates	1	<i>Aedes albopictus</i>	Dengu masa	Yellow fever mosquito	Cause dengue
	2	<i>Amoeba proteus</i>			Non pathogenic
	3	<i>Anomala blanchardi</i>			Minor pest
	4	<i>Anopheles culicifacies</i>	Masa	Malaria mosquito	Malaria vector in rural area
	5	<i>Anopheles fluviatilis</i>	Masa		Malaria vector
	6	<i>Antheraea mylitta</i>	Tasar pok	Tasar silk worm	Silk production
	7	<i>Apis floria</i>	Mahu machhi	Honey bee	Honey production
	8	<i>Apis cerana indica</i>	Mahu machhi	Honey bee	Honey production
	9	<i>Apis dorsata</i>	Bagh mahua	Honey bee	Honey production
	10	<i>Apis mellifera</i>	Bideshi mahua	Honey bee	Honey production
	11	<i>Batocera rufomaculata</i>	Aam pok	Mango stem borer	Destroy fruit and tree
	12	<i>Camponotus species</i>	Jandaa	Carpenter ant	carpenter ant
	13	<i>Crocothemis servilia</i>	Phir phiri	Scarlet skimmer	Biopest control, indicate good water quality
	14	<i>Cryptozona semirugata</i>	Ghuli	Land snail	Pest
	15	<i>Culex quinquefasciatus</i>	Masha	House mosquito	Malaria vector
	16	<i>Delta conoideum</i>	Masan pok	Masson wasp	Biopest controller
	17	<i>Euglena viridis</i>		Euglenoid	Indicate good freshwater body
	18	<i>Hirudinaria granulosa</i>	Jank	Indian cattle leech	Blood sucker
	19	<i>Hydra vulgaris</i>		Common hydra	Indicate pollution in water
	20	<i>Lasius niger</i>	Kala chaanti	Small black ant	Black garden ants
	21	<i>Lymantria mathura</i>	Gulapi pok	Sal defoliator	Timber loss
	22	<i>Macronellicoccus hirsutus</i>	Mandar maraa	Pink hibiscus mealybug	Pest of flowers & crop
	23	<i>Macrobrochis gigas</i>	Bagh kida	Tiger moth	Prey, feed on lichens
	24	<i>Microtermes gilvus</i>	Uee	Termite	White ant
	25	<i>Myllocerus viridanus</i>	Aalu pok	Weevil	Pest
	26	<i>Odontotermis heimi</i>	Uee	Termite	White ant
	27	<i>Odontotermis feae</i>	Uee	Termite	White ant
	28	<i>Odontotermis obesus</i>	Uee	Termite	White ant
	29	<i>Odontotermis redemanni</i>	Uee	Termite	White ant
	30	<i>Oecophylla smaragdina</i>	Kaai	Weaver ant	Food, medicine, biopest controller, GI tag for Odisha
	31	<i>Ortherum sabina</i>	Phir phiri	Slender skimmer	Indicate human interference
	32	<i>Palaemon malcolmsonii</i>	Chingri	Freshwater prawn	Food
	33	<i>Pantala flavescens</i>	Rani phir phiri	Wandering glider	Indicate low pollution
	34	<i>Paramecium caudatum</i>		Slipper animalcule	Water purifier, Decomposer
	35	<i>Paraponera calvata</i>	Chhot Jandaa	Bullet ant	Bullet ant
	36	<i>Periplaneta americana</i>	Jhurla	Cockroach	Pest, disease carrier
	37	<i>Pheretima posthuma</i>	Kenchua	Earthworm	Farmer's friend
	38	<i>Phocodermis velutina</i>	Bisan pok	Giant slug caterpillar	Toxic stinger
	39	<i>Pila globosa</i>	Bad ghuli	Apple snail	Food, pest
	40	<i>Samia ricini</i>	Tasar pok	Eri silkworm	Silk production
	41	<i>Solenopsis species</i>	Laal chaanti	Fire ant	Fire ants
	42	<i>Spilarctia obliqua</i>	Baal kira	Hairy caterpillar	Pest
	43	<i>Triclistona picea</i>	Laal tasar pok	Red beetle	Pest, silk production
	44	<i>Trigona iridipennis</i>	Shant mahua	Indian stingless bee	Honey production
	45	<i>Trioza fletcheri</i>	Degu pok	Jumping plant louse	Pest
	46	<i>Unio species</i>	Samkol		Indicate good ecosystem
	47	<i>Verticella species</i>		Bell animalcule	Indicate nutrient rich water
Fishes	1	<i>Labeo rohita</i>	Rohi	Rohi	Nutritional
	2	<i>Catla catla</i>	Bhakur	Bhakur	Nutritional
	3	<i>Cirrhinus mrigala</i>	Mirkali	Mirkali	Nutritional
	4	<i>Channa punctatus</i>	Gorissa	Gorissa	Nutritional
	5	<i>Wallago attu</i>	Tengni	Tengni	Nutritional
	6	<i>Mystus cavasius</i>	Tengra	Tengra	Nutritional
	7	<i>Puntius sophore</i>	Putia kerundi	Pool barb	Nutritional
	8	<i>Pethia ticto</i>	Kudgi kerundi	Two spot barb	Nutritional
	9	<i>Paraambassis lala</i>	Lala maachh	Highfin glassy perchlet	Nutritional
	10	<i>Mastacembalus armatus</i>	Baami	Zig zag eel	Nutritional
Amphibia	1	<i>Bufo melanostictus</i>	Benga	Toad	Biopest controller, Medicinal,
	2	<i>Euphlyctis cyanophlyctis</i>	Kirlau bengal	Indian skipper frog	Biopest controller, bioindicator
	3	<i>Hoplobatrachus crassus</i>	Ghass bengal	South indian bull frog	Biopest controller, Food, aggressively feeder
	4	<i>Hoplobatrachus tigerinus</i>	Bad bengal	Indian bull frog, Largest frog of India	Biopest controller, eat mosquito larvae, prolific breeding, aggressive feeding

Lizards	5	<i>Microhyla ornata</i>	Jharna bengal	Ornamented frog	Biopest controller, bioindicator
	6	<i>Polypedates maculatus</i>	Kath bengal	Indian tree frog	Biopest controller, bioindicator
	7	<i>Sphaerotheca breviceps</i>	Dhuda bengal	Indian burrow frog	Biopest controller
	1	<i>Calotes versicolor</i>	Tengta	Garden lizard	Biopest controller
	2	<i>Hamidactylus leschenaultii</i>	Pathar jhitpiti	Tree lizard	Medicinal, Biopest controller
	3	<i>Varanus bengalensis</i>	Godhi	Bengal monitor	Medicinal, Biopest controller
	4	<i>Varanus salvator</i>	Pani godhi	Common water monitor	Medicinal, Biopest controller, economic
Snakes	1	<i>Ahaetulla naustus</i>	Gachh sanp	Tree snake	Biopestcontroller
	2	<i>Amphiesma stolatum</i>	Bahmni sanp	Buff stripped keelback	Biopestcontroller
	3	<i>Bungarus caeruleus</i>	Chiti	Common krait	Biopestcontroller, venomous
	4	<i>Bungarus candidus</i>	Rana	Banded krait	Biopestcontroller, venomous
	5	<i>Echis carinatus</i>	Dhuli naag	Saw viper	Biopestcontroller
	6	<i>Eryx conicus</i>	Sand boa	Lal futkaa	Biopestcontroller
	7	<i>Eryx johnei</i>	Futkaa sanp	Boa / Futka	Biopest controller, medicinal
	8	<i>Indotyphlops braminus</i>	Teli	Blind snake	Indicator of a healthy ecosystem
	9	<i>Naja naja</i>	Gokhar naag	Common cobra	Biopestcontroller, venomous, medicinal
Birds	10	<i>Natrix piscator</i>	Dendu	Chekered keel	Biopestcontroller
	11	<i>Ophiophagus hannah</i>	Ahiraj naag	King cobra	Biopestcontroller, venomous
	12	<i>Ptyas mucosus</i>	Dhamna	Rat snake	Biopestcontroller, medicinal
	13	<i>Python molurus</i>	Ajgar	Indian python	Biopestcontroller
	14	<i>Vipera russelli</i>	Dendu buda	Russel viper	Biopestcontroller, venomous
	1	<i>Acridotheres tristis</i>	Maena	Indian myna	Biopest controller
	2	<i>Anas crecca</i>	Batak	Common Teal	Biopest controller, migratory
	3	<i>Anas poecilorhyncha</i>	Hansa	Geese	Biopest controller, bioindicator
	4	<i>Anastomus oscitans</i>	Gendalia	Open billed strok	Biopest controller
	5	<i>Anthraceroceros coronatus</i>	Kuchila khaai	Hornbilled pied	Biopest controller, bioindicator
	6	<i>Apus affinis</i>	Liti	House swift	Biopest controller
	7	<i>Ardeola grayii</i>	Kantia baga	Peddy bird	Biopest controller
	8	<i>Athene brama</i>	Pecha	Spotted owlet	Biopest controller
	9	<i>Bubulcus ibis</i>	Baga / Bank	Egret cattle	Biopest controller, eat insects on cattles, pollution tracking
	10	<i>Calinator jacobinus</i>	Chaatak	Cuckoo pied	Biopest controller, brood parasite, indicate climate change
	11	<i>Casarca ferruginea</i>	Chakha chakhi	Ruddy duck	Biopest controller, indicate ecosystem health
	12	<i>Ceryle rudis</i>	Machh khai	King fishe pied	Biopest controller, indicate healthy aquatic ecosystem
	13	<i>Columba livia</i>	Paara	Pigeon	Biopest controller, research
	14	<i>Copsychus saularis</i>	Tihaa	Robin	Biopest controller, singer
	15	<i>Coracias bengalensis</i>	Bhad bhadia	Roller	Biopest controller
	16	<i>Corvus macrorhynchos</i>	Damra kua	Jangle crow	Biopest controller
	17	<i>Corvus splendens</i>	Kua	Crow	Biopest controller, religious
	18	<i>Cuculus micropterus</i>	Kuili	Cuckoo	Biopest controller
	19	<i>Cuculus varius</i>	Kuili	Common cuckoo	Biopest controller, indicate diversity
	20	<i>Dicrurus macrocercus</i>	Kajal paati	Black drongo	Biopest controller
	21	<i>Dicrurus paradiseus</i>	Bhrung raj	Rocket tailed drongo	Biopest controller, alarm other species
	22	<i>Dinopium bengalensis</i>	Thukku badhei	Golden backed wood-pecker	Biopest controller, bioengineer
	23	<i>Gallus gallus</i>	Ban kukda	Jangle fowl	Biopest controller, pultry
	24	<i>Gallus sonneratii</i>	Chhot ban kukra	Grey jangle fowl	Biopest controller, pultry
	25	<i>Gracula religiosa</i>	Saari	Hill myna	Biopest controller, mimic man
	26	<i>Haliastur indus</i>	Sankh chil	Kite	Biopest controller
	27	<i>Milvus migrans</i>	Chil	Common pariak	Biopest controller, scavenger, urban adapted
	28	<i>Oriolus xanthornus</i>	Haldi basanta	Oriole	Biopest controller, indicator of healthy ecosystem
	29	<i>Orthotomus sutorius</i>	Tun tuni	Tailor bird	Biopest controller
	30	<i>Passer domesticus</i>	Ghar chhantia	house sparrow	Biopest controller, near humans, need conservation
	31	<i>Pavo cristatus</i>	Mayur	Peacock	Biopest controller, beauty, sacred, Indian national bird
	32	<i>Phalacrocora niger</i>	Paen kua	Little cormorant	Biopest controller, indicator of healthy ecosystem
	33	<i>Picoides nanus</i>	Thukku badhei	Woodpecker	Biopest controller

	34	<i>Ploceus philippinus</i>	Bai chadei	Weaver bird	Biopest controller, bioengineer
	35	<i>Podiceps ruficollis</i>	Hansrail	Grebe	Biopest controller, indicator of healthy ecosystem
	36	<i>Psittacula eupatria</i>	Mitu	Large indian parakeet	Biopest controller, mimic humans
	37	<i>Pycnonotus cafer</i>	Gubra chadei	Bulbul	Biopest controller
	38	<i>Pycnonotus jocosus</i>	Jangli kuili	Red whiskered bulbul	Biopest controller, singer
	39	<i>Streptopelia chinensis</i>	Pankaa	Spotted dove	Biopest controller, cultural
	40	<i>Sturnus contra</i>	Dhop maena	Myna pied	Biopest controller
	41	<i>Tockus birostris</i>	Balia khai	Grey hornbill	Biopest controller, cultural
	42	<i>Turnix suscitator</i>	Gundri	Quail	Biopest controller, indicate healthy grassland ecosystem
Mammals	1	<i>Anthana ellioti</i>	Ban chhuchhu	Chhuchhu	Eco-balance
	2	<i>Axis axis</i>	Harin	Hiran	Eco-balance
	3	<i>Canis aureus</i>	Bilua	Jackal	Eco-balance, scavenger,
	4	<i>Canis lupus</i>	Kulhia	Wolf	Eco-balance, scavenger,
	5	<i>Cervus unicolor</i>	Sambar	Sambar	Eco-balance
	6	<i>Cuon alpinus</i>	Jangli kukur	Wild dog	Eco-balance
	7	<i>Cynopterus sphinx</i>	Baadli	Shortnosed fruit bat	Eco-balance, polinator
	8	<i>Elephas maximus</i>	Haati	Elephant	Eco-balance, polinator, create path for others, dig for water
	9	<i>Felis bengalensis</i>	Bhaau bilei	Leopard cat	Eco-balance
	10	<i>Felis chaus</i>	Ban bilei	Jangle cat	Eco-balance
	11	<i>Funambulus palmarom</i>	Gunchi	3 stripped squirrel	Eco-balance, cultural, polinator
	12	<i>Funambulus pennantii</i>	Guncha	5 stripped squirrel	Eco-balance, cultural, polinator
	13	<i>Herpestes auropunctatus</i>	Neul	Indian mongoose	Eco-balance
	14	<i>Hyaena hyaena</i>	Hunaar	Hyaena	Eco-balance, scavenger
	15	<i>Hystrix indica</i>	Jhinka	Porcupine	Eco-balance, polinator
	16	<i>Lepus nigricollis</i>	Kherha	Hare	Eco-balance, polinator
	17	<i>Lutra perspicillata</i>	Odha	Indian otter	Indicate healthy ecosystem
	18	<i>Macaca mulatta</i>	Paati makad	Rhesus monkey	Eco-balance, polinator, human re-searches, alarm for others
	19	<i>Madromys blanfordi</i>	Ban musa	Wood rat	Indicate health of ecosystem
	20	<i>Manis crassicaudata</i>	Bajra kaptaa	Pangolin	Eco-balance
	21	<i>Mellivora capensis</i>	Gaad bhaalu	Ratel	Eco-balance, cultural, historic
	22	<i>Msntiacus muntjak</i>	Bhuku harin	Barking deer	Eco-balance
	23	<i>Panthera pardus</i>	Karlapatria	Leopard	Eco-balance
	24	<i>Panthera tigris</i>	Baagh	Tiger	Eco-balance
	25	<i>Presbytis entellus</i>	Hanu makad	Monkey	Eco-balance, polinator, human re-searches, alarm for others
	26	<i>Rattus rattus</i>	Musa	House rat	Eco-balance
	27	<i>Ratufa indica</i>	Nepali musa	Giant Indian squirrel	Eco-balance
	28	<i>Sus scrofa</i>	Barhaa	Wild boar	Eco-balance, religious
	29	<i>Syncus murinus</i>	Chhuchhu	Musk srew	Eco-balance
	30	<i>Tetracerus quadricornis</i>	Chausingha	4 horned antelope	Eco-balance
	31	<i>Vulpes bengalensis</i>	Koki siali	Fox	Eco-balance

Table 3. Fungi identified in Hemgir Forest Range of Sundargarh district, Odisha.

Sl. No.	Botanical Name	Local Name	Importance
1	<i>Amantia caesarea</i>	Bhaun chhati	Edible
2	<i>Amantia egregia</i>	Mada chhati	Edible
3	<i>Astraeus hygometricus</i>	Rugda chhati	Edible
4	<i>Auricularia sp.</i>	Kath kaan	Medicinal
5	<i>Ganoderma sp.</i>	Bhodo maula chhati	Medicinal
6	<i>Pholita microspora</i>	Bihiden chhati	Edible
7	<i>Pleurotus pulmonarius</i>	Bauns chhati	Edible
8	<i>Pleurotus species</i>	Dashra maula / Bhodo maula	Edible
9	<i>Rassula rosea</i>	Patar chhati	Edible
10	<i>Termitomyces</i>	Binua chhati	Poisonous
11	<i>Termitomyces species</i>	Bali chhati	Edible
12	<i>Trametes sp.</i>	Gachh chhati	Wound healing

Table 4. Locally interviewed in Hemgir Forest Range of Sundargarh district, Odisha.

Sl. No.	Zoological Name	Local Name	Common name	Importance
1	<i>Acinonyx jubatus venaticus</i>	Chita bagh	Asiatic cheetah	Extinct
2	<i>Bubalus arnee</i>	Jangle bhains	Wild water buffalo	Rarely found
3	<i>Canis lupus pallipes</i>	Heta bagh	Indian grey wolf	Reported in 2018
4	<i>Chamaeleo zeylanicus</i>	Bahurupi tengta	Chamelion	Extinct locally
5	<i>Columba puicea</i>	Para	Pale caped pigeon	Rarely found
6	<i>Galloperdix spadicea</i>	Laal ban kukda	Red fowl	
7	<i>Gazella bennettii</i>	Harin	Chinkara	
8	<i>Glaucidium radiatum</i>	Jangli pechaa	Jangle owl	
9	<i>Gyps bengalensis</i>	Raaban	Vulture	Extinct locally
10	<i>Lalage melaschistos</i>	Champa chadhei	Black winged cucko	Rarely found
11	<i>Lutra lutra</i>	Odha	Eurasian otter	Reported in 2021
12	<i>Panthera pardus</i>	Kala bagha	Black panther	Odisha's 1st
13	<i>Pitta brachyura</i>	Naba rangaa	Indian pittta	Rarely found
14	<i>Rucervus duvaucelii</i>	Bara singhaa	Swamp deer	
15	<i>Sitta frontalis</i>	Ban maali chadei	Velvet front nuthatch	
16	<i>Threskiornis smelanocephalus</i>	Dhop kaunria	Black headed ibis	

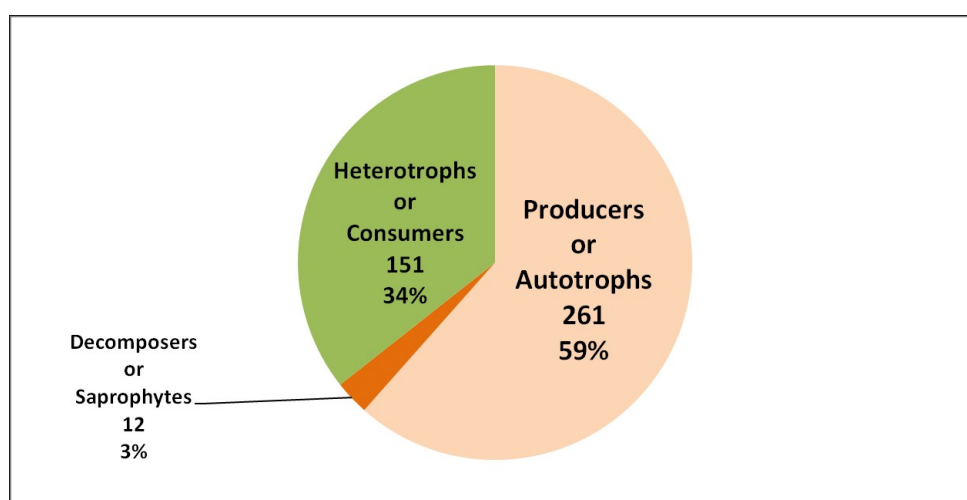


Fig. 3. Chart showing number of species in different ecological Guilds.

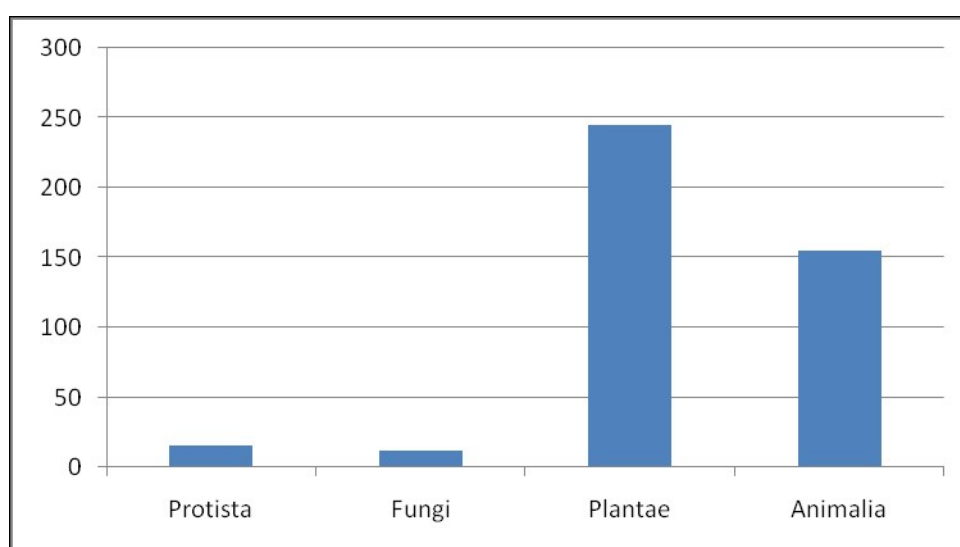


Fig. 4. Chart showing number of species under 4 Groups as per Woese et al. (1990).

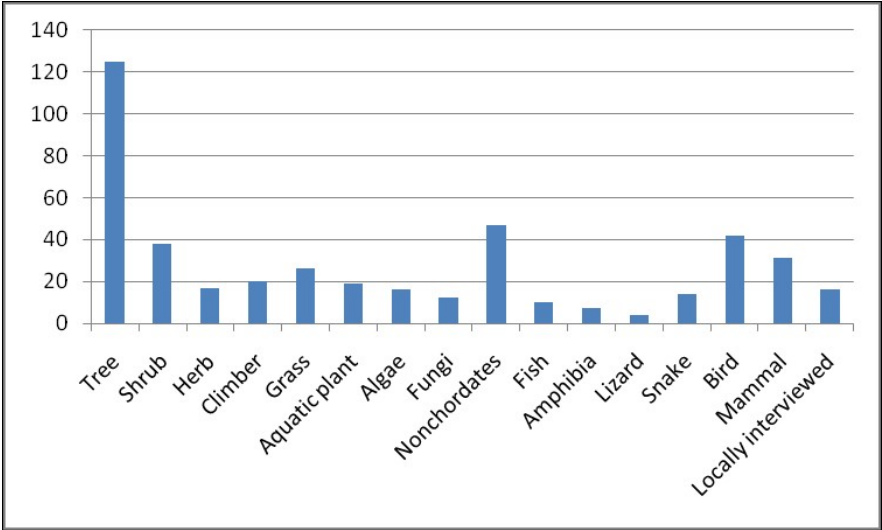


Fig. 5. Chart showing number of species under different Taxonomic groups.

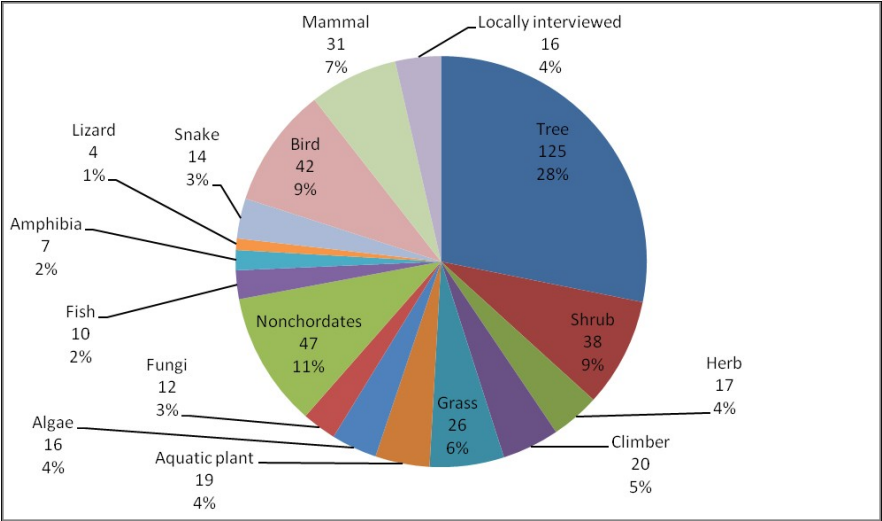


Fig. 6. Pie chart showing number of species under different Taxonomic groups.

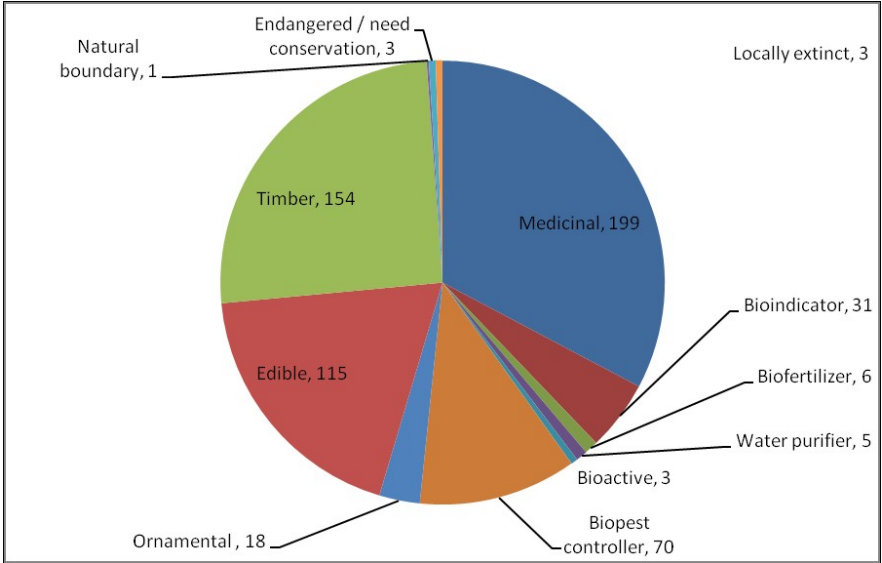


Fig. 7. Pie chart showing number of species under different importance.

Table 5. Calculation of Diversity Index to different number of species in each group.

Ecological Guild	Sl. No.	Type of Species	No. of Species (n_i)	$p_i = n_i/N$	$\ln(p_i)$	$-p_i \ln(p_i)$	p_i^2
Producer or Autotroph	1	Tree	125	0.292	-1.232	0.359	0.085
	2	Shrub	38	0.089	-2.419	0.215	0.008
	3	Herb	17	0.040	-3.219	0.129	0.002
	4	Climber	20	0.047	-3.058	0.144	0.002
	5	Grass	26	0.061	-2.797	0.171	0.004
	6	Aquatic plant	19	0.044	-3.124	0.137	0.002
	7	Algae	16	0.037	-3.297	0.122	0.001
Decomposer	8	Fungi	12	0.028	-3.567	0.100	0.001
Consumer or Heterotrophy	9	Nonchordates	47	0.110	-2.207	0.243	0.012
	10	Fish	10	0.023	-3.772	0.087	0.001
	11	Amphibia	7	0.016	-4.135	0.066	0.000
	12	Lizard	4	0.009	-4.711	0.042	0.000
	13	Snake	14	0.033	-3.411	0.113	0.001
	14	Bird	42	0.098	-2.323	0.228	0.010
	15	Mammal	31	0.072	-2.631	0.189	0.005
Total			N = 428	$\sum = 1.00$	$\sum = -45.910$	$\sum = 2.345$	$\sum = 0.133$

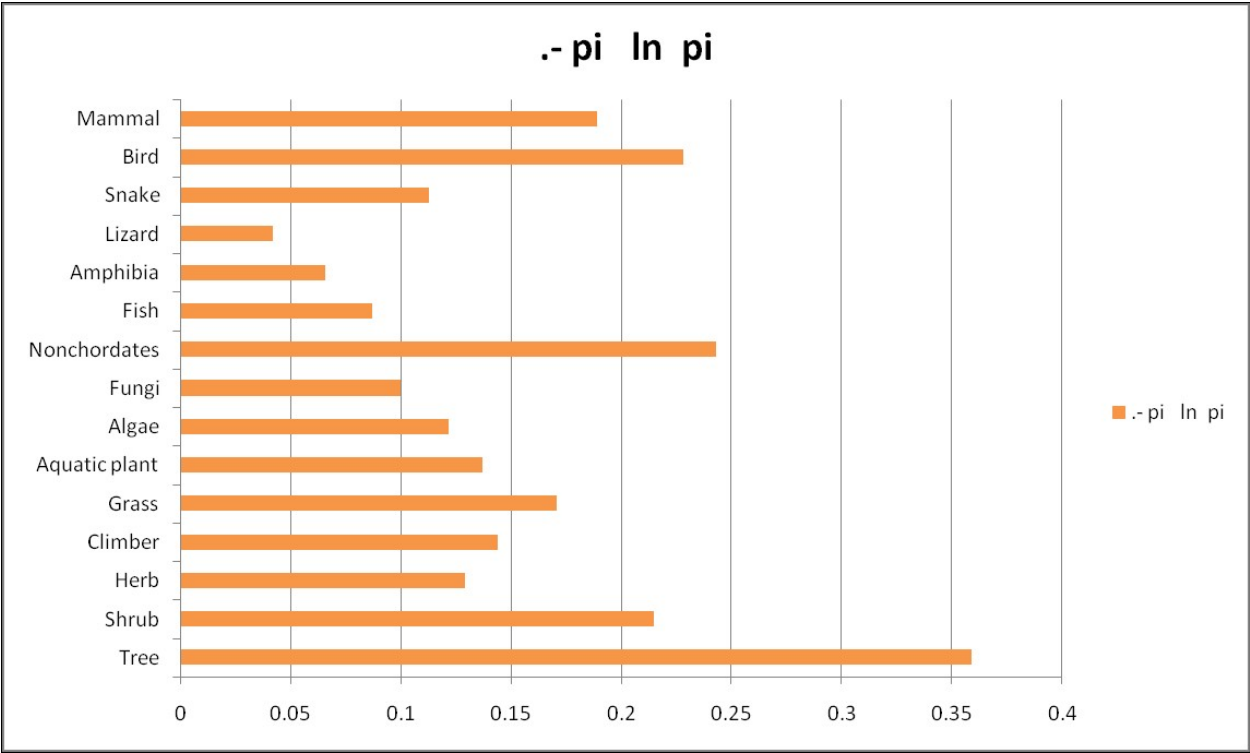


Fig. 8. Bar chart showing Shannon–Wiener Index (H^I).

6. Discussion of Results

6.1. Ecological Guild Analysis

The biodiversity assessment of the Hemgir Forest Range reveals a structurally complex and functionally active ecosystem supported by significant species richness (428 identified species). The ecological guild composition shows a strong dominance of producers (61%), followed by consumers (36%) and decomposers (3%), reflecting a trophically stratified system typical of tropical dry deciduous forests.

6.1.1. Producers (Autotrophs)

The Hemgir Forest Range exhibits a strong dominance of producers, accounting for 261 species (~61%) of the total recorded biodiversity. This group includes trees, shrubs, herbs, climbers, grasses, aquatic plants, and algae, representing a wide range of photosynthetic life forms adapted to both terrestrial and aquatic habitats. Such diversity within autotrophs reflects the structural complexity of the forest, where multiple vegetation layers from canopy to ground cover support varied ecological niches. The

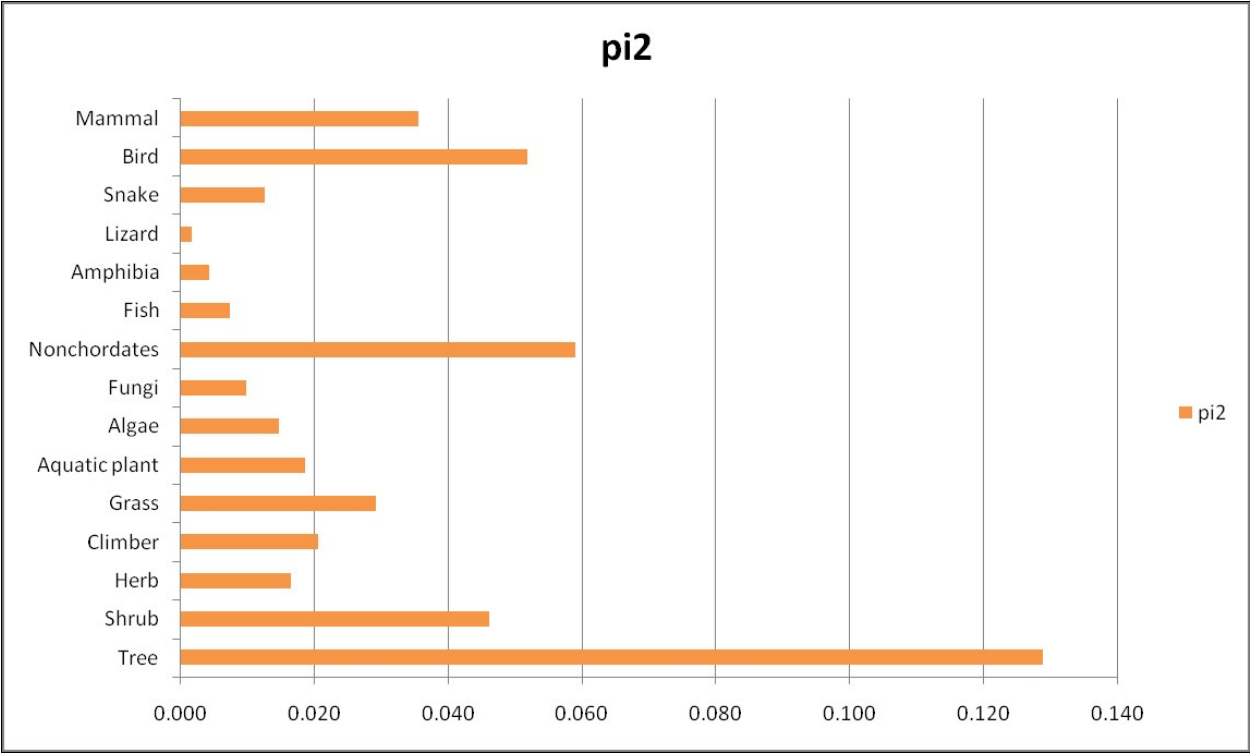


Fig. 9. Bar chart showing Simpson Index (H^I).

presence of dominant tree species alongside under-story vegetation and aquatic flora highlights the ecological richness and vertical stratification typical of tropical dry deciduous forests. Producers form the foundational base of the ecosystem by driving primary productivity through photosynthesis and carbon fixation. They convert solar energy into chemical energy, sustaining all higher trophic levels. Additionally, they play a critical role in habitat formation by providing shelter, nesting sites, and food resources for numerous faunal species. Aquatic plants and algae contribute to oxygenation and nutrient cycling in water bodies, while terrestrial vegetation stabilizes soil and regulates microclimatic conditions. Collectively, these functions ensure the continuity of ecological processes and energy flow within the forest ecosystem.

6.1.2. Consumers (Heterotrophs)

Consumers constitute 155 species (~36%) and include nonchordates (such as insects and worms), fishes, amphibians, reptiles, birds, and mammals. This diverse assemblage reflects a well-developed trophic structure encompassing herbivores, carnivores, omnivores, and decomposer-associated fauna. These organisms facilitate energy transfer across trophic levels by feeding on producers and other con-

sumers. They also contribute significantly to pol-
ination, seed dispersal, and population regulation, thereby maintaining ecological balance. The high di-
versity among consumers indicates the presence of complex food webs and strong interspecific interac-
tions essential for ecosystem functioning.

6.1.3. Decomposers (Saprophytes)

Decomposers are represented by 12 species (~3%), primarily fungi, which play a crucial role in nutrient recycling and organic matter decomposition. They break down dead plant and animal material, re-
turning essential nutrients to the soil and sustaining the productivity of the ecosystem. However, their re-
latively low representation in the dataset may not re-
flect their true ecological abundance. Instead, it may indicate under-sampling, seasonal limitations during data collection, or the presence of a large but un-
recorded microbial diversity. This highlights the need for more focused studies on soil microbiota and fungal communities.

6.2. Habitat level Interpretation

The habitat-level interpretation shows a strongly balanced ecosystem dominated by producers, with plants and algae accounting for 261 species (~61%),

forming a robust base for primary productivity. Consumers, including various animal groups, contribute 155 species (~36%), reflecting healthy trophic interactions and ecological complexity. Decomposers, represented by 12 fungal species (~3%), appear relatively low, which may suggest either under-sampling or seasonal variation in data collection. Overall, the ecosystem demonstrates stability through its strong producer foundation and diverse consumer network, though further investigation into decomposer diversity could provide a more complete ecological picture.

6.3. Trophic Dynamics

Trophic dynamics refers to the flow of energy and nutrients through different feeding levels (trophic levels) in an ecosystem, from primary producers to consumers and decomposers. In a diverse community, energy is transferred through complex food chains and food webs, with plants capturing solar energy and herbivores, carnivores, and decomposers successively utilizing it. Although energy transfer is efficient at lower levels, it decreases at higher trophic levels due to losses as heat, which limits the number of organisms supported at the top. The observed high diversity suggests a stable trophic structure, but some dominance (e.g., by trees at the producer level) can influence energy availability and interactions across the ecosystem.

6.4. Spatial Heterogeneity

Spatial heterogeneity refers to the uneven distribution of species, resources, and environmental conditions across different areas of an ecosystem. In the studied community, this variability may arise from differences in factors such as light availability, soil composition, moisture, and vegetation structure. Such heterogeneity creates a range of microhabitats that support diverse species and ecological guilds, thereby enhancing overall biodiversity. However, dominance by certain groups, like trees, can influence spatial patterns by creating shaded or resource-rich zones, leading to patchiness in species distribution and contributing to ecological complexity and stability.

6.5. Ecosystem Health and Stability

Ecosystem health and stability refer to the ability of an ecosystem to maintain its structure, function, and resilience in the face of disturbances. The

Shannon–Wiener Index ($H^I \approx 2.35$), close to the theoretical maximum (~2.71 for 15 groups), confirms high species diversity, while Simpson's Index (0.867) indicates a high probability of interspecific variation, signifying ecosystem robustness. However, the relatively low Pielou's Evenness Index (0.38) suggests uneven species distribution, with dominance by trees, non-chordates, and birds. This unevenness may influence resource allocation, niche occupancy, and trophic interactions. Despite this, the presence of multiple species and ecological guilds supports functional redundancy and adaptability, helping the ecosystem remains stable over time while sustaining its ecological processes.

6.6. Biodiversity Pattern Analysis of the Study Area

The biodiversity pattern observed in the Hemgir Forest Range reflects a producer-dominated ecosystem with high trophic complexity, which is characteristic of relatively intact tropical dry deciduous forests. However, the decline in forest cover and increasing anthropogenic pressures indicate ongoing land-use change, a major global driver of biodiversity loss as highlighted in the landmark study on global biodiversity scenarios (Sala et al., 2000). The conversion of forest land for mining, industrial expansion, and associated infrastructure likely contributes to habitat fragmentation, altered species composition, and reduced ecological connectivity in the study area.

Mining activities in and around Sundargarh district have been identified as a critical threat to biodiversity, consistent with the findings of Sonter et al. (2015), who reported that mining results in forest loss, habitat degradation, and biodiversity decline in tropical landscapes. In the Hemgir Forest Range, the presence of indicator species alongside reports of locally extinct and conservation-seeking species suggests a transitional ecosystem under stress. Habitat degradation, noise pollution, and disruption of wildlife movement corridors may contribute to increasing human–wildlife conflicts and the decline of sensitive species.

From an ecosystem functioning perspective, the high proportion of producers (61%) supports strong primary productivity and carbon sequestration, while the diverse consumer base (36%) ensures efficient energy transfer and trophic regulation. These findings align with the ecosystem services framework proposed by the Millennium Ecosystem Assessment

(Millennium Ecosystem Assessment [MEA], 2005), which emphasizes the role of biodiversity in sustaining provisioning, regulating, supporting, and cultural services. In this context, the Hemgir ecosystem provides essential services such as food resources, medicinal plants, pollination, water purification, and climate regulation.

Despite these strengths, the relatively low representation of decomposers (3%) may indicate gaps in sampling or underlying ecological imbalances. Since decomposers are critical for nutrient cycling and soil fertility, their underrepresentation could affect long-term ecosystem sustainability. This highlights the need for more detailed studies on soil biodiversity and microbial communities, which are often overlooked but are fundamental to ecosystem resilience and productivity.

7. Discussion

Functionally, the ecosystem demonstrates high ecological value with 31 bioindicator species aiding environmental monitoring, 70 biofertilizer species supporting nutrient cycling, and 6 water-purifying species contributing to ecosystem regulation. The presence of locally extinct (3) and conservation-seeking species (3) indicates ecological stress and transitional dynamics under anthropogenic pressure.

The declining forest cover (from 50.06% to 41.07%) combined with biodiversity patterns suggests habitat fragmentation and ecological disturbance, likely driven by mining and industrial expansion. Despite high diversity indices, increasing human–animal conflict and species vulnerability point toward an ecosystem under stress but not yet critically degraded.

Overall, the statistical findings confirm that Hemgir represents a high-diversity yet moderately uneven ecosystem, where strong producer dominance supports ecological stability, but anthropogenic pressures are altering biodiversity structure and function.

8. Conclusion

This study provides a comprehensive, community-inclusive documentation of biodiversity in the ecologically significant yet under-studied Hemgir Forest Range. The recording of 444 species (428 identified) and the application of diversity

indices establish a scientifically robust baseline for biodiversity assessment in the region.

The Shannon–Wiener Index (2.35) and Simpson's Index (0.867) confirm high biodiversity and ecological stability, while the low evenness (0.38) highlights species dominance patterns, particularly of trees, non-chordates, and birds. The ecological guild distribution (61% producers, 36% consumers, 3% decomposers) further emphasizes a producer-driven ecosystem with strong trophic interactions but potential gaps in decomposer representation.

Despite this richness, declining forest cover and increasing anthropogenic pressures indicate ongoing ecological stress, reflected in the presence of locally extinct and conservation-priority species. The identification of bioindicator, biofertilizer, and water-purifying species underscores the ecosystem's functional importance and its role in sustaining ecological services.

These findings highlight the urgent need for targeted, community-inclusive, and science-based conservation strategies. Sustainable management practices, restoration of degraded habitats, and innovative approaches such as bio-fencing using species like *Agave americana* may help mitigate human–animal conflicts while preserving biodiversity.

Overall, the integration of statistical analysis with field-based observations demonstrates that Hemgir is a biologically rich but increasingly vulnerable ecosystem, requiring immediate and coordinated conservation efforts to ensure longterm ecological stability and sustainable resource use.

CRedit statement

S.K.P: Investigation, Writing Original draft, Data analysis and Editing

S. B: Editing and Supervision

Declaration of competing interests

The authors declare that they have no known competing financial interests or personal relationships that could influence the work reported in this paper.

AI-use disclosure statement

During the preparation of this manuscript, the authors used AI tools to improve the language and readability. After using this tool, the authors reviewed

the content and made changes wherever necessary. The authors take full responsibility for the contents of this publication.

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