RESEARCH ARTICLE

Floristic Quality Assessment Index of Plant Diversity Evaluation in Bolamanadoddi Hills Raichur District Karnataka India

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Abstract

The present study evaluates the floristic diversity and ecological quality of the Bolamanadoddi hilly area in Raichur District, Karnataka, utilizing the floristic quality index (FQI) as a key metric in an exhaustive survey, documented 74 families with 219 genera of 305 plant species. The research employed quantitative measures, including species richness, relative frequency, and the coefficient of conservatism (C-value), to assess the conservation value of the native plant communities. Results indicate significant pressures from anthropogenic activities such as agriculture and deforestation, leading to the proliferation of non-native species. A total of 259 native species (84.91%) and 46 are non-native species (15.08%). The highest species diversity is from the family Fabaceae 54 and Malvaceae has around 15 species. However, the FQI recorded for all the species in the study sample is 42.33, whereas the C-value index is 4.15.

Highlights

- FQI of 42.33 indicates moderate biodiversity and ecological degradation.
- 45.57% of species rank 1 to 3 in conservatism.
- High conservatism species include *Butea monosperma* and *Prosopis cineraria*.
- Invasive species like *Lantana camara* affect ecological quality.

Keywords: Floristic quality index, Biodiversity, Raichur, Coefficient of conservatism, Invasive species, Medicinal plants.

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Introduction

Biodiversity is the foundation of ecosystem stability, resilience, and health. It supports essential ecological processes and provides critical ecosystem services, such as air and water purification, climate regulation, and food security. A healthy ecosystem should be self-active and capable of self-sufficiency and self-regeneration (Shu, H. *et al.,* 2021). Critics point to ecological integrity's "bad fit as a value" for restoration ecology and conservation biology (James 2021). The overall stability of regional ecosystems has been shown to be greatly affected by native plant communities (Vecchio, S.D. *et al.,* 2015 & Vujanovi´c, D. *et al.,* 2022) and invasive alien plants (IAPs) (Rashid, I. *et al.,* 2021), which also change species diversity and ecosystem processes (Powell, K.I. *et al.,* 2011). Since plants are the foundation of the majority of terrestrial food webs, maintaining plant diversity in particular is essential to maintaining ecosystem integrity. The floristic quality assessment (FQA) Index is one of the numerous techniques used to measure plant diversity, and it has become a trustworthy way to gauge the ecological health of ecosystems (Zinnen J, 2021). In contrast to straightforward assessments of species richness, the FQA takes into account an area's conservation importance, ecological integrity, and vulnerability to perturbations in addition to the number of species found there (Taft, J.B. *et al.,* 1997). The coefficient of conservatism (C-value), a crucial parameter used by the FQA Index, is used to categorize plant species according to their tolerance for disturbance and fidelity to particular environments. In response to increased resource availability, invading species were almost always more adaptable than non-invasive ones, although this adaptability was only seldom linked to a fitness advantage (Davidson, 2011). Ladd DM (1993) created the idea of plant species conservatism for Missouri's flora. According to Andrew Gard *et al*., (2024), species that are limited to high-quality, undisturbed habitats are given higher C-values, while species that flourish in severely disturbed environments are given lower C-values. It is possible to compute the Floristic Quality Index (FQI) by combining these C-values with species richness. Specialist species are those that are limited to certain habitats, have evolved to use a limited variety of resources, or can withstand a limited range of environmental circumstances (Zelený D 2019). Greater ecological integrity and less disturbance are reflected in places with higher FQI scores, which act as a measure of a site's ecological health. This approach is a versatile technique for assessing biodiversity because it has shown success in temperate, tropical, and dry environments. The floristic quality index and the percentage of native species,

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two metrics used to evaluate the quality of recovered plant communities, rose with time but did not correlate with the number of species planted (Mattews J W., 2008).

These operations have changed natural environments, leading to the fragmentation of plant groups, the introduction of invasive species, and the loss of native biodiversity (Spyreas, G. 2019). This study aims to evaluate the floristic diversity and ecological quality of the Bolamanadoddi Hills in Raichur District, Karnataka, using the floristic quality index (FQI) as a key metric. By employing quantitative measures such as species richness, relative frequency, and the coefficient of conservatism (C-value), the research seeks to assess the conservation value of native plant communities. Additionally, the study investigates the impact of anthropogenic activities, such as agriculture and deforestation, on biodiversity, emphasizing the need for conservation strategies to preserve ecological integrity.

Materials and Methods

Study Area

The study was carried out in the hilly areas of Bolamanadoddi, which are situated between latitudes 16.1939° N and longitude 77.4018° E in the Raichur District of Karnataka. These areas included plains, agricultural fields, and a pond. A semi-arid environment with an average of 672.6 mm of annual rainfall—mostly during the monsoon season- defines this area. This area has temperatures ranging from 28°C in the winter to 42°C in the summer. According to Fig. 1A & B, the study site's height ranges from 393 to 404 m above sea level, and its varied topography, which includes small hillocks and rolling plains contributes to the region's natural richness.

Vegetation Survey and Data Collection

The floristic study was conducted between 2022 and 2023, and seasonal data was collected regularly. The randomized quadrants were used to sample the plant species. 20 x 20 m measurements were taken in each quadrant to guarantee thorough coverage of various environments. To confirm the species, the Flora of the Presidency of Madras (Gamble, 1934), Flora of Karnataka (Saldanha C. J., 1996), Flora of British India (Hooker J D 1872), Flora of Gulbarga (Seetharam *et al*., 2002), eFlora of India, for vernacular names of Kannada (Magadi R 2002) and other taxonomic keys were used to identify unknown plants. Specimens were collected and preserved. The identified species' photographs and voucher specimens were placed in Sunrise University's Herbarium, part of the Department of Botany in Alwar, Rajasthan (HSUR).

Coefficient of Conservatism (C-value) Assignment

According to Swink and Wilhelm's (1994) and Haq, S. M., Amjad *et al*., (2022) methodology, each native species was given a C-value between 0 and 10. The degree of fidelity a species has to intact, high-quality habitats is indicated by the C-value. A species that is restricted to pristine or undisturbed habitats is given a high C-value (7–10), whereas a species that is tolerant of disturbance and frequently found in degraded habitats is given a low C-value (0–3). The C-values in this study were carefully assigned after consulting with local floristic specialists and consulting literature on the habitat preferences of the species.

Mean Coefficient of Conservatism

The mean C value can be calculated by adding the C values of all native species and dividing that sum by the number of species (species richness = N), Narayanaswamy, K. (2020).

$$\text{Mean } C = \Sigma C / N$$

Calculation of Floristic Quality Index (FQI)

The mean coefficient of conservatism (C), which is determined for each species listed in a particular site inventory and forms the foundation of the FQI, represents the average conservatism of the plants observed. The FQI separates regions with similar mean C values but notable differences in total species abundance. As the mean C and FQI values rise, so does the floristic quality. A weighted estimate of species richness (N), the FQI is computed by multiplying the mean coefficient of conservatism by the square root of species richness (Tovar, E., & Matthews, J. W. 2023).

$$FQI = \text{mean } C \sqrt{N}$$

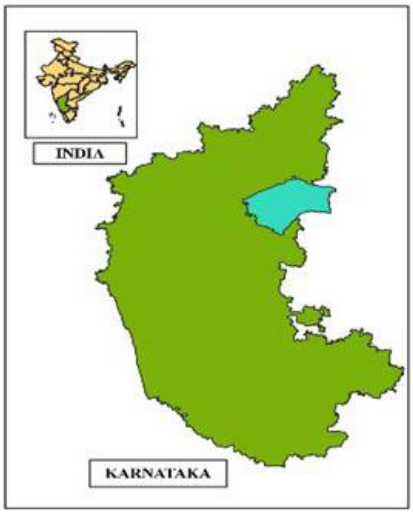

Fig. 1A: Location of Raichur District in Karnataka, India

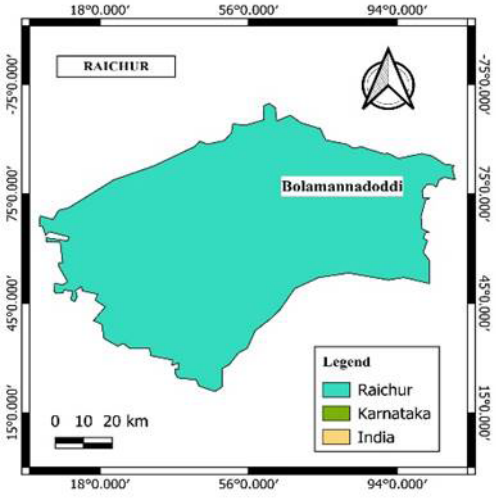

Fig. 1B: Geographical Representation of the Study Area - Bolamanadoddi Hills

Results and Discussion

Species Composition and Diversity

The present study highlights significant diversity among 74 plant families, belonging to 219 genera with 305 species, in this native plant species are 259 (84.91%) and non-native plant species 46 (15.08%). The different habits were recorded as herbs 168 (55%), shrubs 58 (19%), climbers 19 (6%), creepers 3 (1%), vines 15 (5%), and trees 42 (14%) depicted in (Fig. 2). From these species, the Fabaceae exhibits the highest diversity, comprising 54 species (17.70% of the total), indicative of its ecological adaptability and widespread distribution. Asteraceae, with 28 species (9.18%), and Poaceae, with 20 species (6.56%), also display considerable diversity, representing families that are globally dominant in various ecosystems. Families such as Malvaceae (15 species, 4.92%), Amaranthaceae (13 species, 4.26%), and Apocynaceae and Lamiaceae (12 species each, 3.93%) show moderate diversity, suggesting their significant but regionally specific ecological roles. Convolvulaceae (11 species, 3.61%), along with Acanthaceae and Euphorbiaceae (10 species each, 3.28%), contribute to the mid-level diversity. A sacred grove study at Chintanapalli, Yadgir revealed 60 tree species, 34 shrubs, 89 herbs, 21 twiner/climbers, 3 aquatic species, 3 parasitic species, and 1 liana (Pratima Mathad & Modi 2015).

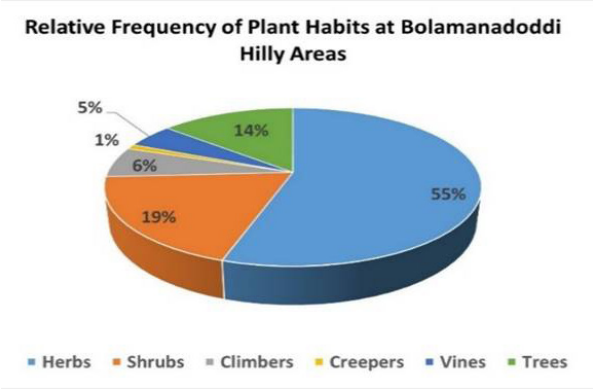

Fig. 2: Plant habits in the study area

Families with lower diversity, such as Boraginaceae, Cyperaceae, and Solanaceae (6 species each, 1.97%), as well as Cucurbitaceae and Rubiaceae (5 species each, 1.64%), indicate their more specialized ecological niches or restricted habitats. Asperagaceae, Commelinaceae, and Phyllanthaceae,

Table 1: Floristic composition and coefficient of conservatism (C) value of Bolamanadoddi Hilly area

Sl. No.	*Scientific name*	*Vernacular name*	*Family*	*Habit*	***C-value***
1	*Abrus precatorius L.*	Gulaganji	Fabaceae	Climber	3
2	*Abutilon hirtum (Lam.) Sweet*	Thuthi	Malvaceae	Shrub	4
3	*Abutilon indicum (L.) Sweet*	Pettigegida	Malvaceae	Shrub	2
4	Acalypha indica L.	Kuppigida	Euphorbiaceae	Herb	0
5	*Acanthospermum hispidum DC.*	Kadlemullu	Asteraceae	Herb	1
6	*Achyranthes aspera L.*	Uttarani	Amaranthaceae	Herb	1
7	*Actiniopteris radiata (J. Koenig ex Sw.) Link*	Mayura shikhey	Pteridaceae	Herb	9
8	*Aegle marmelos (L.) Correa.*	Bilvapatre	Rutaceae	Tree	9
9	*Aerva lanata (L.) Juss.*	Bili Hindigida	Amaranthaceae	Herb	4
10	*Agave Americana L.*	Aanekithale	Asperagaceae	Herb	5
11	*Ageratum conyzoides L.*	Uralagida	Asteraceae	Herb	2
12	*Ailanthus excelsa Roxb.*	Doddabevu	Simaroubaceae	Tree	4
13	*Albizia amara (Roxb.) Boivin*	Chujjalu	Fabaceae	Tree	8
14	Albizia lebbeck (L.) Benthem	Bagemara	Fabaceae	Tree	9
15	*Albizia procera (Roxb.) Bentham*	Bilibage	Fabaceae	Tree	9
16	*Allmania nodiflora (L.) R. Br.*	Kandu Buddegida	Amaranthaceae	Herb	7
17	*Aloe vera (L.) Burm. f.*	Lolisara	Asphodelaceae	Herb	8
18	*Alternanthera pungens Kunth*	Mirzamullu	Amaranthaceae	Herb	1
19	*Alternanthera sessilis (L.) R. Br. Ex A. DC.*	Honagoney Soppu	Amaranthaceae	Herb	0
20	*Alysicarphus moniliform (L.) DC.*	Kallunamada Soppu	Fabaceae	Herb	5
21	*Alysicarpus hamosus Edg.*	Kadunamada Soppu	Fabaceae	Herb	6
22	*Alysicarpus vaginalis DC.*	Namada Soppu	Fabaceae	Herb	4
23	*Amaranthus graecizans L.*	Mullu Dantu	Amaranthaceae	Herb	3
24	Amaranthus spinosus L.	Mullu Harevesoppu	Amaranthaceae	Herb	2
25	*Amaranthus viridis L.*	Keresoppu	Amaranthaceae	Herb	1

26	*Ammania baccifera L.*	Karisannigida	Lythraceae	Herb	6
27	*Anisomeles malabarica (L.) R.Br. ex Sims*	Karithumbey	Lamiaceae	Herb	5
28	*Annona squamosa L.*	Sitaphala	Annonaceae	Tree	8
29	*Apluda mutica L.*	Akkuhullu	Poaceae	Herb	2
30	*Aponogeton natans (L.)*	Nirukasa	Aponogetonaceae	Herb	4
31	*Argemone mexicana L.*	Arashina Ummathi	Papavaraceaea	Herb	7
32	*Aristida adscensionsis L.*	Kadunoseyhullu	Poaceae	Herb	3
33	*Aristida hystrix L.*	Bilivunugada Hullu	Poaceae	Herb	1
34	Aristida setacea Retz.	Nayihanchi Hullu	Poaceae	Herb	2
35	*Aristolochia bracteolata Lam.*	Katheykirubana Gida	Aristolochiaceae	Climber	4
36	*Aristolochia indica L.*	Eshwari Balli	Aristolochiaceae	Climber	6
37	*Asparagus racemosus Willd.*	Shathavari	Asperagaceae	Climber	8
38	*Azadirachta indica A Juss.*	Bevinamara	Meliaceae	Tree	9
39	*Azolla pinnata R.Br.*	Nerinavelvet	Salviniaceae	Herb/Fern	4
40	*Balanites roxburghii Planchon.*	Ingalada Mara	Zygophyllaceae	Tree	9
41	*Barleria prionitis L.*	Mullu Goratey	Acanthaceae	Shrub	3
42	*Basella alba L.*	Basaleysoppu	Basellaceae	Vine	4
43	*Bauhinia racemosa Lam.*	Aralumandara	Fabaceae	Tree	6
44	Bergia ammananiodes Roxb. Ex Roth.	Nandikallusoppu	Elatinaceae	Herb	4
45	*Bidens bipinnata L.*	Spanish soogi	Asteraceae	Herb	2
46	*Bidens biterneta (Lour). Merr. & Scherif.*	Achirchitta	Asteraceae	Herb	3
47	*Blainvillae acmella (L.) Philipson*	Hommugali	Asteraceae	Herb	4
48	*Blepharis integrifolia (L.f.) E. Mey. & Drege ex Schinz*	Gadimaddu	Acanthaceae	Herb	2
49	*Blepharis maderaspatensis (L.) Roth*	Kodalisoppu	Acanthaceae	Herb	3
50	*Blumea axillaris (Lam.) Dc.*	Gabbusoppu	Asteraceae	Herb	4
51	*Blumea eriantha DC.*	Jangali Tambaku	Asteraceae	Herb	1
52	*Blumea lacera (Burm.f.) DC.*	Gandharigida	Asteraceae	Herb	2
53	*Blumea malcolmii Hook. f.*	Kukuradru	Asteraceae	Herb	2
54	Blumea obliqua (L.) Druce	Bettadavana	Asteraceae	Herb	3
55	*Boehravia diffusa L.*	Raktapunarnava	Nyctaginaceae	Herb	4
56	*Boerhavia erecta L.*	Madanikey	Nyctaginaceae	Herb	3
57	*Borassus fiabellifer L.*	Taleymara	Aracaceae	Tree	10
58	*Butea monosperma (Lam.) Taubert.*	Bhramavriksha	Fabaceae	Tree	10
59	*Cadaba fruticosa (L.) Druce*	Maragadey	Capparaceae	Shrub	4
60	*Caesulia axillaris Roxb.*	Kempugobbi	Asteraceae	Herb	3
61	*Calotropis gigantean (L.) W.T.Aiton*	Kariyekkey	Apocynaceae	Shrub	2
62	*Calotropis procera (Aiton) W.T.Aiton*	Biliyekkey	Apocynaceae	Shrub	3
63	*Canthium coromandelicum (N.Burman). Alston*	Kareymullu	Rubiaceae	Shrub	6
64	Capparis divaricata Lamk	Thottala	Capparaceae	Shrub	7
65	*Capparis sepiara L.*	Kattarimullu	Capparaceae	Shrub	6
66	*Caralluma adscendens var. fimbriata (Wall.) Grav. & Mayur*	Manganakodu	Apocynaceae	Shrub	8
67	*Cardiospermum halicacabum L.*	Agniballi	Sapindaceae	Vine	7
68	*Carissa spinarum L.*	Kavali	Apocynaceae	Tree	8
69	*Cassia fistula L.*	Kakkeymara	Fabaceae	Tree	7
70	*Cassytha filiformis L.*	Akashaballi	Lauraceae	Vine	8

71	*Catheranthus pussilus (Murr) G. Don*	Sannakasikannigalu	Apocynaceae	Herb	5
72	*Catunaregam spinosa (Thumb.) Tirveng.*	Karikareymullu	Rubiaceae	Shrub	6
73	*Celosia argentea L.*	Kolijuttinagida	Amaranthaceae	Herb	2
74	Chamaecrista absus (L.) Irwin & Barneby	Kaduhuliga	Fabaceae	Shrub	2
75	*Chamaecrista pumila Lam.*	Nelathagache	Fabaceae	Shrub	3
76	*Chenopodium album L.*	Hulichikka	Amaranthaceae	Herb	4
77	*Chloris virgata Sw.*	Ganjalihullu	Poaceae	Herb	1
78	*Chromolaena odorata (L.) R. M. King & H. Rob*	Communistkaley	Asteraceae	Shrub	3
79	*Cissus repanda (Wight & Arn.) Vahl*	Yeleykombuballi	Vitaceae	Climber	8
80	*Cleome gynandra L.*	Narambeley	Cleomaceae	Herb	1
81	*Cleome viscosa L.*	Nayisasivey	Cleomaceae	Herb	0
82	*Clerodendrum phlomidis L.*	Madrasmalligey	Lamiaceae	Shrub	5
83	*Clitoria ternetea L.*	Shankapushpi	Fabaceae	Climber	4
84	Coccinia grandis (L.) Voigt	Thondeykayi	Cucurbitaceae	Vine	3
85	*Cocculus hirsutus (L.) W. Theob.*	Dagadihambu	Menispermaceae	Creeper	4
86	*Coldenia procumbens L.*	Hamsapaadi	Boraginaceae	Herb	3
87	*Coleus strobilifer (Roxb.) A.J. Paton*	Doddapatre	Lamiaceae	Herb	5
88	*Commelina benghalensis L.*	Kanneysoppu	Commelinaceae	Creeper	2
89	*Convolulus arvensis L.*	Hasuraniballi	Convolvulaceae	Vine	3
90	*Corchorus aestuans L.*	Chunchu	Malvaceae	Herb	4
91	*Corchorus olitorius L.*	Kadusenabu	Malvaceae	Herb	1
92	*Cordia myxa L.*	Challeyhannu	Boraginaceae	Tree	9
93	*Crinum bulbispermum (Burm.f.) Milne-Redh.& Schweick*	Naagadaligida	Amaryllidaceae	Herb	4
94	Crotalaria pusilla Heyne ex DC.	Dingala	Fabaceae	Herb	3
95	*Crotolaria hebecarpa (DC.) Rudd.*	Godadhai	Fabaceae	Herb	2
96	*Croton bonplandianus Bail.*	Nelabedisoppu	Euphorbiaceae	Herb	1
97	*Cryptolepis buchanani R. Br. Ex Roem. & Sch.*	Metegulihambu	Apocynaceae	Climber	3
98	*Cryptostegia grandiflora Roxb. ex R.Br.*	Hamburubbergida	Apocynaceae	Vine	4
99	*Cullen corylifolium (L.) Medick*	Bavanchi	Fabaceae	Herb	3
100	*Cuscuta chinensis Lam.*	Dodder	Convolvulaceae	Vine	2
101	*Cuscuta reflexa Roxb.*	Amaruballi	Convolvulaceae	Vine	3
102	*Cyanotis arachnoidea Clarke.*	Ibbaninegalukanne	Commelinaceae	Herb	2
103	*Cyanotis axillaris (L.) D. Don ex Sweet*	Negalukannesoppu	Commelinaceae	Herb	4
104	Cyanotis fasciculata (B.Heyne ex Roth) Schult. & Schult.f.	Chingalimara	Commelinaceae	Herb	3
105	*Cymbopogon coloratus (Nees) Stapf.*	Nibehullu	Poaceae	Herb	6
106	*Cynodon dactylon (L.) Pers*	Garikeyhullu	Poaceae	Herb	1
107	*Cyperus compressus L.*	Vasumanihullu	Cyperaceae	Herb	3
108	*Cyperus difformis L.*	Karisannajambu	Cyperaceae	Herb	2
109	*Cyperus haspan L.*	Chikkathungeyhullu	Cyperaceae	Herb	3
110	*Cyperus iria L.*	Doddajambuhullu	Cyperaceae	Herb	2
111	*Dactyolectnium aegypticum (L.) Willd.*	Kaduragihullu	Poaceae	Herb	1
112	*Datura Innoxia Mill.*	Umbey	Solanaceae	Shrub	2
113	*Datura stramonium L.*	Ummatti	Solanaceae	Shrub	5
114	Delonix elata (L.) Gamble	Sunkathimara	Fabaceae	Tree	7

115	*Delonix regia (Boj. ex Hook.f.) Raf.*	Gulmohar	Fabaceae	Tree	8
116	*Dichanthium pertusum (L.) Clayton*	Parihullu	Poaceae	Herb	3
117	*Dichrostachys cineria (L.) Wight & Arn.*	Vadavaaradagida	Fabaceae	Tree	9
118	*Dicliptera paniculata (Forssk.) I.*	Cheebeegida	Acanthaceae	Herb	4
119	*Dicoma tomentosa Cass.*	Navanangi	Asteraceae	Shrub	5
120	*Digera muricata (L.) Mart.*	Gorajipallya	Amaranthaceae	Herb	3
121	*Digitaria ciliaris (Retz.) Koeler.*	Akkabuhullu	Poaceae	Herb	5
122	*Dinebra chinensis (L.) P.M.Peterson & N.Snow*	Chunchalisoppu	Poaceae	Herb	6
123	*Diplocyclos palmatus (L.) Jeffrey*	Lingathondeyballi	Cucurbitaceae	Climber	5
124	Drimia indica (Roxb.) Jessop	Kaadirulli	Asperagaceae	Herb	7
125	*Echinops echinatus Roxb.*	Brahmadandey	Asteraceae	Herb	3
126	*Eclipta prostrata (L.) L.*	Keshavardhana	Asteraceae	Herb	2
127	*Enicostemma axillare (Por.ex Lam.) A. Raynal*	Chikkachiraayitha	Fabaceae	Herb	7
128	*Eragrostis pilosa (L.) P. Beauv.*	Kodusannasameyhullu	Poaceae	Herb	2
129	*Eragrostis viscosa (Retz.) Trin.*	Antupuraleyhullu	Poaceae	Herb	1
130	*Eriocaulon quinquangulare L.*	Neeragundutaleyhullu	Eriocaulaceae	Herb	4
131	*Eucalyptus globulus Labill.*	Neelagirimara	Myrtaceae	Tree	9
132	*Euphorbia heyneana Spreng.*	Sannalegida	Euphorbiaceae	Herb	4
133	*Euphorbia hirta L.*	Kempuneneakkigida	Euphorbiaceae	Herb	2
134	Euphorbia parviflora L.	Haluballi	Euphorbiaceae	Herb	4
135	*Euphorbia tirucalli L.*	Kolugalli	Euphorbiaceae	Shrub	6
136	*Evolvulus alsinoides (L.) L.*	Vishnukrantisoppu	Convolvulaceae	Herb	6
137	*Ficus benghalensis L.*	Aladamara	Moraceae	Tree	9
138	*Ficus religiosa L.*	Aralimara	Moraceae	Tree	9
139	*Fimbristylis dichotoma (L.) Vahl*	Neerusabbasigey	Cyperaceae	Herb	3
140	*Gliricidia sepium (Jacq.) Steud.*	Gobbaradagliricidia	Fabaceae	Tree	5
141	*Gomphrena celosioides Mart L.*	Nelarudrakshihu	Amaranthaceae	Herb	1
142	*Grangea maderaspatana (L.) Poir.*	Panchapatrey	Asteraceae	Herb	3
143	*Grewia damine Gaertn.*	Udippeymara	Malvaceae	Shrub	4
144	Grewia tenax (Forsk.) Fiori	Gundukadeera	Malvaceae	Shrub	5
145	*Guilandina bonduc L.*	Gajegekayi	Fabaceae	Climber	6
146	*Hardwickia binata Roxb.*	Asagagurgi	Fabaceae	Tree	8
147	*Heliotropium europaeum L.*	Paradesichelumanigida	Boraginaceae	Herb	1
148	*Heliotropium marifolium Retz.*	Chelubaladagida	Boraginaceae	Herb	2
149	*Hemidesmous indicus (L.) R.BR.*	Sogadeberu	Apocynaceae	Climber	8
150	*Heteropogon contortus (L.) P. Beauv. ex Roem. & Schult.*	Sunkarihullu	Poaceae	Herb	3
151	*Hibiscus lobatus (Murray) Kuntze*	Dasavala	Malvaceae	Herb	5
152	*Hibiscus ovalifolius (Forsk) Vahl.*	Sannadasavala	Malvaceae	Shrub	4
153	*Hibiscus vitifolius L.*	Kadupundi soppu	Malvaceae	Shrub	6
154	Holoptelia integrifolia (Roxb.) Planchon	Tapasimara	Ulmaceae	Tree	9
155	*Hybanthus enneaspermus (L.) F.Muell.*	Purusharatna	Violaceae	Herb	5
156	*Hygrophila auriculata (K.Schmach.) Heine*	Kolavalikey	Acanthaceae	Herb	4
157	*Indigofera caerulea Roxb.*	Suratneeligida	Fabaceae	Shrub	2
158	*Indigofera cordifolia Heyne ex Roth*	Kirineggilu	Fabaceae	Herb	3
159	*Indigofera coultea (Burm.f.) Merr.*	Auntukogey	Fabaceae	Shrub	2

160	*Indigofera glandulosa J.C. Wendl.*	Adavimenthe	Fabaceae	Shrub	1
161	*Indigofera hirsuta L.*	Kappukesha	Fabaceae	Shrub	2
162	*Indigofera linifolia (L.f.) Retzius.*	Ganjikasa	Fabaceae	Herb	3
163	*Indigofera linifolia var. cambelli Wight ex Baker*	Ganjikasa	Fabaceae	Shrub	4
164	Indigofera linnaei Ali.	Kineygillu	Fabaceae	Herb	3
165	*Indigofera trifoliata L.*	Toremanta	Fabaceae	Shrub	4
166	*Indoneesiella echioides (L.) Sreem*	Godhibarsana	Acanthaceae	Herb	4
167	*Ipomea aquatica Forssk.*	Neerubiligeddey	Convolvulaceae	Shrub	2
168	*Ipomea obscura (L.) Ker.-Gawl*	Belichitabogari	Convolvulaceae	Vine	3
169	*Ipomoea eriocarpa R. Br.*	Mulliballi	Convolvulaceae	Climber	2
170	*Ipomoea nil (L.) Roth*	Kollibeeja	Convolvulaceae	Climber	1
171	*Ipomoea pes-tigris L.*	Kaamalatey	Convolvulaceae	Climber	2
172	*Ipomoea quamoclit L.*	Kamanaballi	Convolvulaceae	Vine	3
173	*Isoetes coromandelina L.f.*	Not recorded	Isoetaceae	Herb	9
174	Jasminum arborescens Roxb.	Kadumalligey	Olacaceae	Shrub	6
175	*Jasminum auriculatum Vahl*	Kadarumalligey	Olacaceae	Climber	7
176	*Jatropha glandulifera Roxb.*	Seemeyharalu	Euphorbiaceae	Shrub	4
177	*Jatropha gossipifolia L.*	Hattiyeleyvishaharalu	Euphorbiaceae	Shrub	3
178	*Justicia betonica L.*	Kadukanakambara	Acanthaceae	Shrub	3
179	*Justicia diffusa Willd*	Chikkaneykisoppu	Acanthaceae	Herb	4
180	*Kyllinga brevifolia Rottb.*	Nervishamasthey	Cyperaceae	Herb	2
181	*Lagascea mollis Cav.*	Vibhuthisoppu	Asteraceae	Shrub	3
182	*Lagenaria siceraria (Molina) Standl.*	Kahisorey	Cucurbitaceae	Vine	7
183	*Lantana camara L.*	Chitrangihu	Verbinaceae	Shrub	0
184	Ledebouria revoluta (L.f.) Jessop	Kadubeylulli	Asperagaceae	Herb	3
185	*Lemna minor L.*	Hasiruneerapatrey	Araceae	Herb	1
186	*Leonotis nepetiifolia (L.) R. Br.*	Gantuthumbey	Lamiaceae	Shrub	5
187	*Lepidogathis cristata Willd.*	Gantukaalugaddey	Acanthaceae	Shrub	3
188	*Leucas aspera (Willd.) Link.*	Thumbegida	Lamiaceae	Herb	2
189	*Leucas martinicensis (Jacq.) R.Br.*	Gantubilithumbey	Lamiaceae	Herb	4
190	*Ludwigia perennis L.*	Kerebendu	Onagaraceae	Herb	5
191	*Mangifera indica L.*	Mavinamara	Anacardiaceae	Tree	9
192	*Marselia minuta L.*	Sannanerhurali	Marsilleaceae	Herb	6
193	*Marselia quadrifolia L.*	Nerhurali	Marsilleaceae	Herb	7
194	Martynia annua L.	Huliyuguru	Martyniaceae	Shrub	3
195	*Melanocenchris jacquemontii Jaub. & Spach.*	Paradesiharka	Poaceae	Herb	2
196	*Merremia emarginata Hallier*	Elikivisoppu	Convolvulaceae	Herb	4
197	*Mesosphaerum suaveolens (L.) Kuntze.*	Gangatulasi	Lamiaceae	Herb	1
198	*Microstachy chamaelea (L.) Muell-Arg*	Nelaharalu	Euphorbiaceae	Herb	2
199	*Mimosa hamata Willd.*	Sagareymullinagida	Fabaceae	Shrub	4
200	*Mimosa pudica L.*	Muttidareymuniva	Fabaceae	Shrub	6
201	*Momordica cymbalaria Fenzel ex Naudin*	Kadavanchi	Cucurbitaceae	Vine	4
202	*Moringa oleifera Lam.*	Nuggeymara	Moringaceae	Tree	8
203	*Mukia madaraspatana (L.) Roemer.*	Manithondey	Cucurbitaceae	Climber	4
204	Muntingia calabura L.	Gasagasey Hanninamara	Muntunginaceae	Tree	7
205	*Nelumbo nucifera Gaertn.*	Kamala	Nelumbonaceae	Herb	5

206	*Nymphaea pubescens Willd.*	Kannaidile	Nymphaceae	Herb	6
207	*Ocimum basilicum L.*	Kamakasthuri	Lamiaceae	Herb	3
208	*Ocimum filamentosum Forssk.*	Maratulasi	Lamiaceae	Herb	4
209	*Ocimum sanctum L.*	Vishnutulasi	Lamiaceae	Herb	3
210	*Oldenlandia corymbose L.*	Parpatahullu	Rubiaceae	Herb	2
211	*Oplismenus burmanii (Retz) Pal-Beauv*	Bidiruhullu	Poaceae	Creeper	2
212	*Opuntia stricta (Haw.) Haw.*	Paapaasukalli	Cactaceae	Shrub	5
213	*Orthosiphon thymiflorus (Roth) V. D. Sleesen*	Kadusannapatrigida	Lamiaceae	Shrub	2
214	Ottelia alismoides (L.) Pers.	Hasiruneerapatrey	Hydrocharitaceae	Herb	8
215	*Oxystelma esculentum (L.f.) R. Br.*	Doodiballi	Apocynaceae	Climber	3
216	*Parthenium hysterophorus L.*	Congresshullu	Asteraceae	Herb	1
217	*Paspalum vaginatum Sw.*	Harikey	Poaceae	Herb	1
218	*Passiflora foetida L.*	Kukkeyballi	Passifloraceae	Climber	3
219	*Pavonia odorata Willd.*	Balarakaksigida	Malvaceae	Shrub	5
220	*Pavonia zeylanica (L.) Cav.*	Shivanakadle	Malvaceae	Shrub	4
221	*Pedalium murex L.*	Aanenegillu	Pedaliaceae	Herb	4
222	*Peltophorum pterocarpum (DC.) K. Heyne*	Bettadahunisey	Fabaceae	Tree	7
223	*Pergularia daemia (Forsk.) Chiov.*	Ugurusuttinaballi	Apocynaceae	Vine	4
224	Phoenix sylvestris (L.) Roxb.	Echalumara	Aracaceae	Tree	8
225	*Phyllanthus amarus Schum. & Thonn.*	Bhunelli	Phyllanthaceae	Herb	1
226	*Phyllanthus maderapatensis L.*	Kirunelli	Phyllanthaceae	Herb	3
227	*Phyllanthus reticulata Poir*	Sannakageysoppu	Phyllanthaceae	Shrub	4
228	*Physalis minima L.*	Sannaguppategida	Solanaceae	Herb	4
229	*Physalis peruviana L.*	Doddaguppategida	Solanaceae	Herb	3
230	*Pithecellobium dulce (Roxb.) Benth*	Seemeyhunisey	Fabaceae	Tree	8
231	*Platostoma menthoides (L.) A.J.Paton*	Bhootulasi	Lamiaceae	Herb	3
232	*Plumbago zeylanica L.*	Bilichitramula	Plumbaginaceae	Shrub	4
233	*Polycarpea corymbosa (L.) Lam.*	Poudemullugida	Caryophyllaceae	Herb	4
234	Pongamia pinnata (L.) Pierre	Hongeymara	Fabaceae	Herb	7
235	*Pontederia crassipes Mart.*	Antharagangey	Pontederiaceae	Herb	1
236	*Portulaca oleracea L.*	Gonisoppu	Portulacaceae	Herb	4
237	*Portulaca pilosa L.*	Geddeygonisoppu	Portulacaceae	Herb	3
238	*Priva cordifolia (L.f.) Druce*	Sirantugida	Verbinaceae	Shrub	5
239	*Prosopis cineraria (L.) Druce*	Bannimara	Fabaceae	Tree	9
240	*Prosopis juliflora (Sw.) DC.*	Bellaryjali	Fabaceae	Tree	1
241	*Pseudognaphalium luteoalbum (L.)Hillard & B. L. Burtt.*	Balraksha	Asteraceae	Herb	3
242	*Pulicaria wightiana (DC.) Clarke*	Sonela	Asteraceae	Herb	4
243	*Pupalia lappacea (L.) Juss.*	Auntupuraleygida	Amaranthaceae	Herb	3
244	Riccia dichotoma L.	Not recorded	Ricciaceae	Herb/Thallus	10
245	*Ricinus communis L.*	Oudala	Euphorbiaceae	Shrub	3
246	*Rostellularia procumbens (L.) Nees*	Hucchunelabevu	Acanthaceae	Herb	2
247	*Salvadora persica L.*	Karigonimara	Salvodaraceae	Tree	6
248	*Samanea saman (Jacq.) Merr.*	Tugumangimara	Fabaceae	Tree	7
249	*Securinega leucopyrus (Willd.) Muell.-Arg.*	Bilisuli	Phyllanthaceae	Shrub	8
250	*Selaginella bryopteris (L.) Baker*	Sanjeevanigida	Selaginellaceae	Herb	10

251	*Senna auriculata (L.) Roxb.*	Thangadi	Fabaceae	Shrub	3
252	*Senna occidentalis (L.) Link.*	Kolutagasey	Fabaceae	Herb	4
253	*Senna uniflora (Mill.) H. S. Irwin & Baeneby*	Nelavarike	Fabaceae	Herb	2
254	Sesamum alatum Thonn.	Kadeyllu	Pedaliaceae	Herb	4
255	*Sesamum indicum L.*	Achellu	Pedaliaceae	Herb	3
256	*Sesbania bispinosa (Jacquin) W.F. Wight*	Mullujinangi	Fabaceae	Shrub	5
257	*Sida acuta Burm.f.*	Doddabindigeygida	Malvaceae	Shrub	2
258	*Sida cordata (N.Burman) Borssum*	Bekkinataleygida	Malvaceae	Shrub	3
259	*Sida rhombifolia L.*	Gubeytaleygida	Malvaceae	Shrub	4
260	*Sida spinosa L.*	Kadumenthya	Malvaceae	Herb	2
261	*Solanum nigrum L.*	Ganikeyhannu	Solanaceae	Herb	6
262	*Solanum trilobatum L.*	Ambusundeyballi	Solanaceae	Climber	5
263	*Soncus aspera L.*	Dudhi	Asteraceae	Herb	2
264	Sopubia delphinifolia (L.) G.Don.	Dudhali	Orobanchaceae	Herb	3
265	*Spermacoce articularis L.*	Daarebotu	Rubiaceae	Herb	4
266	*Spermacoce pusilla Wall*	Madanagnati	Rubiaceae	Herb	4
267	*Sphaeranthus indicus L.*	Bodukadaleysoppu	Asteraceae	Herb	3
268	*Stachyterpeta jamaicensis (L.) Vahl*	Kariuttarani	Verbinaceae	Herb	5
269	*Stephanotis volubilis (L.f.) S. Reuss*	Hegalasappu	Apocynaceae	Climber	4
270	*Striga angustifolia (D.Don) Sald.*	Bilikasa	Orobanchaceae	Herb	6
271	*Striga gesnerioides (Willd.) Vatke*	Bilichigan	Orobanchaceae	Herb	7
272	*Synedrella nodiflora (L.) Gaertn.*	Thotahalugida	Asteraceae	Herb	4
273	*Syzygium cumini (L.) Skeels*	Jambuneraley	Myrtaceae	Tree	9
274	Tamarindus indica L.	Hunaseymara	Fabaceae	Tree	9
275	*Taverniera cuneifolia (Roth) Arnott*	Jethmad	Fabaceae	Shrub	3
276	*Tephrosia pumila (Lam.) Pers.*	Empali	Fabaceae	Herb	2
277	*Tephrosia purpurea (L.) Pers.*	Adavineeli	Fabaceae	Shrub	1
278	*Tephrosia strigose (Dalz) Santapau & Mahesh.*	Tanakali	Fabaceae	Herb	3
279	*Tephrosia villosa (L.) Pers.*	Kadutogari	Fabaceae	Herb	4
280	*Themeda tremula (Steudel) Hachekl*	Gantugachihullu	Poaceae	Herb	3
281	*Tinospora cordifolia (Willd) Hook.f. & Thomson*	Amruthaballi	Menispermaceae	Vine	2
282	*Trachys muricata (L.) Pers. ex Trin.*	Parangiakkihullu	Poaceae	Herb	1
283	*Trianthema portulacastrum L.*	Neelibelladakilu	Aizoaceae	Herb	2
284	Trianthema triquetrum Rottl.ex Willd.	Nayisoppu	Aizoaceae	Shrub	3
285	*Tribulus terrestris L.*	Neygillamullu	Zygophyllaceae	Herb	4
286	*Trichodesma indicum (L.) R. Br.*	Katheythumbeysoppu	Boraginaceae	Herb	3
287	*Trichodesma zeylanicum (burm. F.) R Prodr.*	Ethinanaligeygida	Boraginaceae	Herb	4
288	*Tricholepis amplexicaule Clarke*	Chappali Chendu	Asteraceae	Herb	3
289	*Tricholepis radicans (Roxb.) DC.*	Mandakubaseegida	Asteraceae	Herb	3
290	*Tridex procumbens L.*	Addikeysoppu	Asteraceae	Herb	1
291	*Typha angustifolia L.*	Aaneyjondu	Typhaceae	Herb	3
292	*Urochloa panicoides P. Beauv.*	Kadubilisameyhullu	Poaceae	Herb	1
293	*Vachellia farnesiana (L.) Wight & Arn*	Kasthurijali	Fabaceae	Tree	7
294	Vachellia leucophloea (Roxb.) Maslin	Subabul	Fabaceae	Tree	8
295	*Vachellia nilotica (L.) P.J.H.Hurter & Mabb.*	Karijali	Fabaceae	Tree	9
296	*Verbascum coromandelianum (Vahl) Hub.-Mor.*	Kaduhogeysoppu	Scrophulariaceae	Shrub	2

297	*Vernonia cinerea (L.) Less.*	Arapukaney	Asteraceae	Herb	1
298	*Vigna aconitifolia (Jacq.) Marechal*	Turukahesaru	Fabaceae	Herb	3
299	*Wirightia tinctoria R.Br.*	Beppaleymara	Apocynaceae	Tree	4
300	*Wolffia globosa (Roxb.) Hartog & Plas*	Hasiruneerapatrey	Araceae	Herb	2
301	*Xanthium indicum Koen.*	Maralummathi	Asteraceae	Herb	5
302	*Zaleya decandra (L.) N.Burman*	Bilikommey	Aizoaceae	Herb	4
303	*Ziziphus mauritiana Lam*	Barehannu	Rhamnaceae	Tree	7
304	*Ziziphus nummularia (Burm.f.) Wt.*	Parangikanta	Rhamnaceae	Tree	8
305	*Zizipus oenophila (L.) Mill*	Kannerigida	Rhamnaceae	Tree	7

represented by 4 species each (1.31%), reflect limited diversity, possibly influenced by specific environmental or ecological constraints. Families such as Aizoaceae, Capparaceae, and Verbenaceae, each with 3 species (0.98%), also demonstrate restricted representation in the dataset. Neither species detection levels over 65% detection nor plot size appeared to have an impact on mean C, the average floristic quality level for a region. Only when the substituted species were chosen at random from the larger county-wide species pool could simulated species misidentifications impact mean C values at higher than 10% in big plots (Spyreas G 2016). A study collected and recorded 158 plant species from Raichur Fort's rocks, fort walls, and ponds, including 39 Angiosperm families, 4 Pteridophytes, 3 Bryophytes, and 4 Algae (HC Shrishail, *et al*., 2020). According to Dr. Prashant Kumar (2020), the flora variety of the Kolanki hills of Raichur includes 39 species and 38 genera from 26 families. Additionally, the floristic diversity of the Maraladinni village woodland reveals 252 Angiosperm species from 186 taxa and 56 families (Savita R, Kotresha K. 2022).

Further emphasizing the diversity, 13 families—including Araceae, Aristolochiaceae, and Nyctaginaceae are represented by 2 species each (0.66%), while a majority of the families (36 in total) are represented by a single species (0.33%), such as Amaryllidaceae, Lauraceae, and Violaceae shown in (Table 1). These single-species families highlight the presence of unique or rare taxa, which could be critical for conservation efforts. Overall, the data underscore a clear pattern of dominance by a few highly diverse families, with a long tail of families exhibiting lower diversity, reflecting the heterogeneity of plant taxa in the sampled region. Some of the selected plant species are depicted in (Plate 1).

Analysis of Mean Coefficient of Conservatism and Floristic Quality Index

The total number of conservatism coefficients in Bolamanadoddi hills was 305 species which was calculated for the floristic quality index (FQI) for the studied plant species was 42.33, indicating a moderate level of biodiversity and ecological integrity according to the established scale. This suggests that while the region retains significant biodiversity, there are evident signs of environmental degradation, particularly in areas adjacent to agricultural fields and urban centers. According to the FQI, 139 (45.57%) of the plant species that grew in the area were ranked 1 to 3, 103 (33.77%) were ranked 4 to 6, 37 (12.13%) were ranked 7 to 8, and 22 (7.21%) were ranked 9 to 10. Of these, 4 (1.31%) were ranked 0. In one research, we conducted a thorough floristic survey of a suburban wetland complex in northeast Ohio and gradually eliminated species at random. According to Suneeti K. Jog (2024), bootstrapping mean conservatism at each removal stage showed that accuracy barely declined

Plate 1: Some of the selected plant species from the Bolamanadoddi Hilly area

Hybanthus enneaspermus (L.) F. Muell.

Stachyterpeta jamaicensis (L.) Vahl

Phoenix sylvestris (L.) Roxb.

Phyllanthus reticulata Poir

Capparis divaricata Lamk

Mesosphaerum suaveolens (L.) Kuntze.

Clitoria ternetea L.

Lantana camera L.

with 10 to 30% species loss, becoming obvious only when around 50% or fewer species remained. The mean C-value was 4.15, reflecting the presence of species with moderate to high conservatism, such as *Butea monosperma, Prosopis cineraria*, *and Riccia dichotoma*, which exhibited the highest C-value in the study. Mycorrhizal fungal mutualisms were more sensitive to plants with slow life histories and high C values (Bauer J T 2017). However, invasive species, particularly *Alternanthera sessilis*, *Mesophaerum suaveolens*, *Urochloa panicoides*, and *Lantana camara*, have expanded, which has led to a reduction in the area's overall ecological quality. A similar result was in the study of Kaanjaathumalai Reserve Forest, Puudukkottai District, Tamilnadu (Narayanaswamy, K. 2020), and other States and Regions (Herman, K. D. 1997, Swink F and Wilhelm G 1994; Wilhelm G and Ladd D 1988). This study presents a novel application of the floristic quality index (FQI) and coefficient of conservatism (C-value) to assess the ecological health of the Bolamanadoddi Hills in Raichur District, Karnataka, making it the first systematic evaluation of floristic quality in the region. The study highlights the region's rich biodiversity by documenting 305 plant species across 74 families, with Fabaceae as the most dominant family. A key contribution is the analysis of anthropogenic pressures, such as agricultural expansion and deforestation, which have led to the proliferation of invasive species. Identifying high-conservatism species like *B. monosperma* and *P. cineraria* provides critical insights for conservation efforts in semi-arid ecosystems. Additionally, by contextualizing its findings with other regional and global studies, this research strengthens the role of FQI as a valuable tool for ecological monitoring and underscores the urgent need for targeted conservation strategies to mitigate biodiversity loss.

Conclusion

Raichur District, Karnataka's Bolamanadoddi Hills' floristic diversity and ecological quality assessment highlights the area's remarkable biodiversity as well as the serious environmental stresses it faces. With native species making up 84.91% of the entire flora, the survey identified 305 plant species in 74 families and 219 genera. The ecological health of the site was thoroughly assessed through the use of the FQI and C-value. A considerable degree of biodiversity and ecological integrity is indicated by the FQI score of 42.33 and mean C-value of 4.15. Species with high C-values, which show their vulnerability to habitat disturbance, such *B. monosperma* and *P. cineraria*, have critical conservation significance. The general ecological quality of the area has been adversely affected by the introduction of invasive species, such as *Mesophaerum suaveolens* and *L. camara*. The findings emphasize how crucial it is to protect native plant species and manage invasive ones in order to preserve the ecological equilibrium. This work highlights the necessity of focused conservation measures to protect the biodiversity of semi-arid habitats and adds to the expanding body of information on floristic quality evaluation.

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Contribution of Authors

Both authors made contributions, with Theophilus Deenadayal helping to organize the study, survey, data analysis, and article. The manuscript was reviewed and revised by Khursheed Aalum.

Conflict of Interest

No conflicts of interest are disclosed by the authors.

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