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Cover: Digital illustration of *Impatiens chamchumroonii* in Krita by Dupati Poojitha.

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ARTICLE

Assessing the tree diversity along the Dudhganga River in Kolhapur District of Maharashtra, India

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Abstract: Riparian vegetation is the buffer zone between the aquatic ecosystem of a river and the terrestrial ecosystem. Trees are a typical feature of many ecosystems. Understanding the diversity and geographic distribution of trees holds significant theoretical and practical value. This study highlights the rich diversity of tree species along the river Dudhganga with 80 species from 30 families identified through an extensive field survey from October 2021 to June 2024. The species-rich families are Fabaceae with 10 native species, contributing 18% of the total native tree diversity, Moraceae with eight species, and Malvaceae & Lamiaceae each with four species. Species-rich and diverse genus *Ficus* dominated with seven species. *Ficus racemosa* exhibits a widespread distribution across riparian habitats, which is the most evenly distributed species, while Pongamia pinnata stands out as the most dominant species among riparian tree taxa. Among the 80 tree species, two species are endemic to India, 55 are native and 25 are invasive. The altitudinal gradient exerts a substantial influence, as evidenced by research indicating that the diversity and density of riparian trees escalate with ascending altitudes. This study reveals a relatively diverse tree flora in riparian areas and aims to serve as a tool for managing the tree species diversity of the riparian land.

Keywords: Altitudinal gradient, conservation planning, dominance pattern, endemic tree species, family-level diversity, floristic composition, full census approach, riverine ecosystem, riparian ecology, species richness.

सारांश: नदीकाठावरील वनस्पती नदीच्या जलीय परिसंस्था आणि स्थल परिसंस्था यांमधील एक महत्त्वपूर्ण संरक्षक पट्टा म्हणून कार्य करतात. या पट्ट्यातील वृक्ष समुदाय परिसंस्थेच्या रचना, कार्य आणि स्थैर्यासाठी अत्यावश्यक घटक आहे. वृक्षांची प्रजाती विविधता, भौगोलिक प्रसार आणि वर्चस्व संरचना समजून घेणे हे सैद्धांतिक तसेच व्यावहारिक दृष्टिकोनातून महत्त्वाचे आहे. प्रस्तुत संशोधनामध्ये महाराष्ट्राच्या कोल्हापूर जिल्ह्यातील दूधगंगा नदीकाठावरील वृक्ष विविधतेचे सविस्तर मूल्यांकन करण्यात आले आहे. जानेवारी २०२१ ते जून २०२४ या कालावधीत केलेल्या विस्तृत क्षेत्रीय सर्वेक्षणातून नदीकाठावरील पट्ट्यात आढळणाऱ्या वृक्ष प्रजातींची नोंद करण्यात आली. कुळ-स्तरावर फॅबेसी हे सर्वाधिक प्रजातीसमृद्ध कुळ आढळले, त्याखालोखाल मोरेसी, माल्वेसी आणि लॅमियासी ही कुळे महत्त्वाची ठरली. वंश-स्तरावर फायकस हा सर्वाधिक वैविध्यपूर्ण वंश आढळून त्याचे लक्षणीय वर्चस्व दिसून आले. *उंबर (फायकस रॅसिमोसा)* ही प्रजाती नदीकाठावरील अधिवासांमध्ये व्यापक व समसमान रीतीने प्रसार झालेली आढळली, तर करंज *(पोंगामिया पिन्नाटा)* ही प्रजाती संख्यात्मक दृष्ट्या सर्वाधिक आढळून आली. नोंदविलेल्या वृक्ष प्रजातींपैकी काही प्रदेशनिष्ठ (एन्डेमिक) असून बहुसंख्य प्रजाती स्वदेशी आहेत; तथापि, काही परकीय व आक्रमक प्रजातींची उपस्थितीही आढळून आली आहे. समुद्र सपाटीपासून उंचीनुसार बदलणाऱ्या पर्यावरणीय उताराचा वृक्ष विविधता व भौगोलिक प्रसारावर लक्षणीय प्रभाव दिसून आला असून, अधिक उंचीच्या भागात तुलनेने अधिक प्रजाती समृद्धता आणि घनता आढळली. हा अभ्यास दूधगंगा नदीच्या नदीकाठावरील वृक्ष जैवविविधतेचे महत्त्व अधोरेखित करतो आणि या परिसंस्थेच्या शाश्वत व्यवस्थापन व संवर्धन नियोजनासाठी मूलभूत माहिती प्रदान करतो.

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Author contributions: SC—lead in conceptualisation, field surveys, data collection, data analysis, GIS mapping, manuscript drafting, and visualisation; contributed equally to manuscript review and editing. RVG—lead supervision, research design refinement, methodological guidance, taxonomic validation, and manuscript review and editing.

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INTRODUCTION

Riparian zones form transitional interfaces between aquatic and terrestrial ecosystems, encompassing stream channels and adjacent landscapes influenced by hydrological processes such as flooding, elevated water tables, and soil moisture regimes (Naiman & Décamps 1997). Vegetation within these zones comprises plant communities adapted to dynamic environmental conditions and provides critical ecosystem services, including provisioning, regulating, supporting, and cultural functions (Mohan & Joseph 2024). Acting as ecological buffers and ecotones, riparian ecosystems enhance watershed stability by regulating nutrient flow, sediment retention, and energy exchange between land and water (Sumarmi et al. 2022).

Globally, riparian ecosystems are among the most threatened landscapes due to river regulation, land-use change, invasive species, and increasing anthropogenic pressures. While vegetation structure along free-flowing rivers is relatively stable, regulated rivers often show altered species composition and spatial patterns owing to modified flow regimes (Nilsson et al. 1997). Biological invasions and shifts in species dominance further disrupt ecosystem structure and function (Richardson et al. 2007). Despite their ecological importance, riparian landscapes are inherently rare, occupying only a small fraction of the Earth's surface (Hynes 1970).

Riparian vegetation zones are recognised as highly species-rich and productive systems, playing a key role in maintaining water quality by acting as natural filters for sediments and pollutants (Naiman et al. 2005; Liunima et al. 2022). However, most vegetation studies have focused on forest ecosystems, with comparatively fewer investigations addressing riparian tree diversity and structure (Gregory et al. 1991; Nilsson et al. 1997). In India, studies from the Western Ghats report high riparian diversity (Korse & Krishnakumar 2006), but in Maharashtra, systematic information on riparian tree diversity remains limited, with only a few studies such as that along the Panchganga River (Mohite & Mane 2020).

The Western Ghats serve as a major watershed for peninsular rivers and are recognised globally as a biodiversity hotspot (Myers et al. 2000). The Dudhganga River, a tributary of the Krishna River, originates in the Western Ghats and flows through the Radhanagari forest, a UNESCO World Heritage Site (UNESCO 2012). Despite its ecological and socioeconomic importance, comprehensive data on riparian tree species diversity, distribution, and altitudinal variation along the Dudhganga River are lacking.

Information on riparian tree diversity, dominance, and spatial distribution along the Dudhganga River across different altitudinal zones is currently insufficient, limiting effective conservation and management planning. Riparian tree species diversity and composition along the Dudhganga River vary significantly with altitude, with higher elevations supporting greater species richness and structural diversity.

The present study aims to document the tree species composition of riparian vegetation along the Dudhganga River, assess species richness, dominance, and family-level patterns of riparian trees, analyse spatial variation in riparian tree diversity across upstream, midstream, and downstream sections of the river, and generate baseline data to support conservation and sustainable management of riparian ecosystems in the Dudhganga River basin.

STUDY AREA AND METHODS

The Dudhganga River originates in the Western Ghats and flows eastward, joining the Krishna River at Danwad. Based on the composition of the recorded species, the riparian zone of the Dudhganga River occupies a transitional ecotone, with southern moist mixed deciduous forests predominating, and a gradual shift toward southern tropical semi-evergreen forests in the upper catchment. This vegetation pattern corresponds well with the established classifications for the northern Western Ghats (Singh & Karthikeyan 2000; Gunaga et al. 2013). The study area spans 131 km of riparian vegetation on both sides of the river (Image 1), extending from Kalammawadi Dam (16.353° N, 74.010° E) to Sangam Math at Danwad (16.514° N, 74.635° E), forming an integral part of the Krishna River basin.

The Western Ghats biodiversity is influenced by altitudinal changes, which contribute to the variation in tree diversity along the river's course. The field survey has been carried out on upstream, midstream, and downstream riparian vegetation of the river Dudhganga based on elevation gradient, vegetation composition, and distance from the starting point, ensuring a systematic division reflecting slope, species distribution, and flow characteristics.

The upstream (higher elevation) area starts from Panori (16.367° N, 74.032° E) to Sulambi (16.414° N, 74.066 E), the midstream (middle altitude) area comprises area from the Bidri (16.434° N, 74.137° E) to Belawale Budruk (16.506° N, 74.156° E), while the downstream (lower elevation) area starts from Dattawad

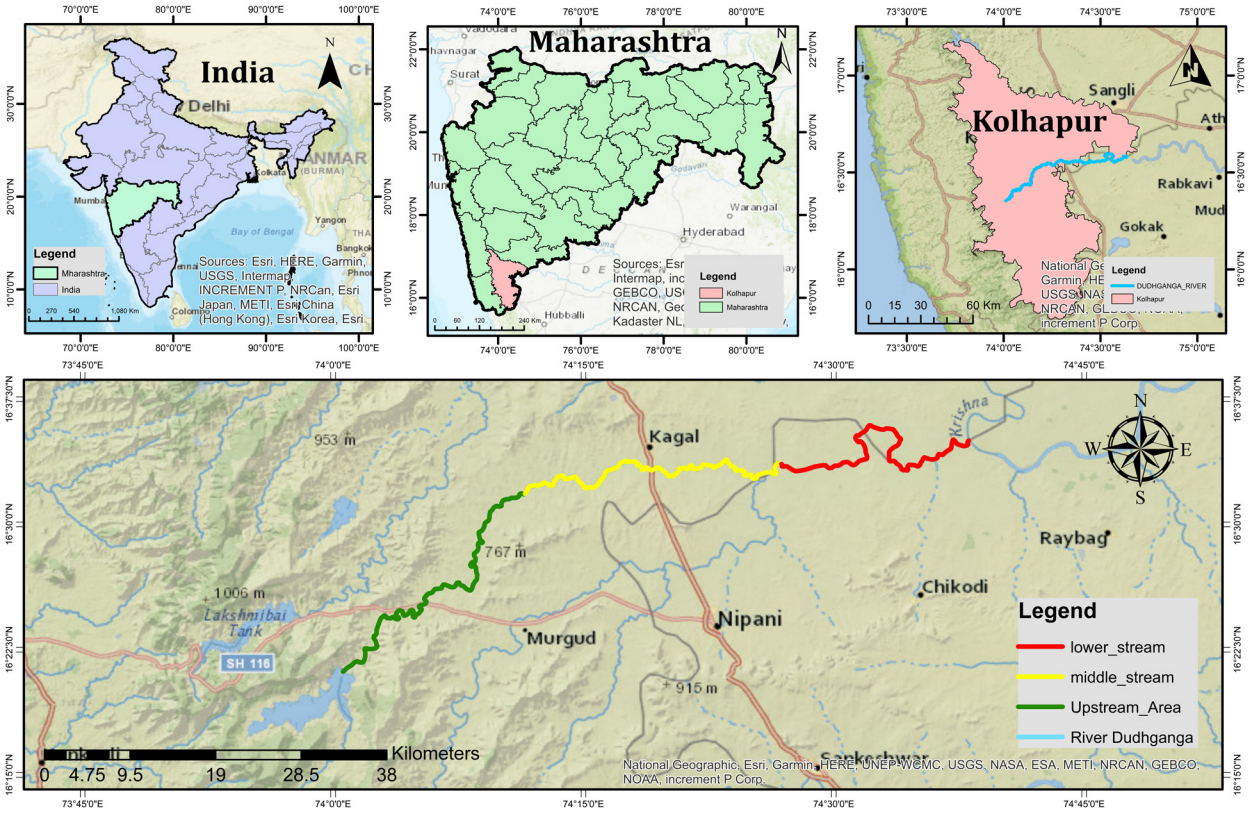

Figure 1. Map of the study area along the river Dudhganga in Maharashtra, India.

(16.584° N, 74.568° E) to Examba (16.564° N, 74.599° E) (Image 2 & 3).

Data Collection

The tree specimens were surveyed between October 2021 and June 2024. To ensure accurate estimation of tree diversity along the river Dudhganga, data was collected using the mobile GPS application, namely GPSWAYPOINT. Following the census approach described by Condit (1998), we conducted a systematic walk-through survey of the entire accessible riparian stretch and recorded all detectable individual trees. This approach represents the first application of a near-complete tree census method for riparian vegetation in this region and was adopted to minimise sampling bias commonly associated with plot-based methods. Although the survey was designed to maximise spatial coverage, complete access to all microhabitats was not always possible due to dense vegetation, steep slopes, and seasonally waterlogged sections typical of dynamic riparian environments. Consequently, a small proportion of individuals occurring in physically inaccessible or periodically inundated microhabitats may have been underrepresented. However, repeated surveys across multiple post-monsoon seasons and continuous riverbank coverage ensured robust documentation of dominant, common, and ecologically significant riparian tree species across the Dudhganga River. This approach allowed for capturing the true distribution of species across the landscape and reduced the chances of missing rare or scattered species, which is a common limitation of fixed-area sampling methods such as quadrats or transects (Chazdon et al. 1998; Gotelli & Colwell 2001). By mapping every tree systematically, a comprehensive dataset was obtained, capturing the true representation of riparian vegetation across different altitude zones.

The riparian trees within the study area were identified and recorded. All individual trees with a girth at breast height (GBH) greater than 20 cm were measured. The collected specimens were identified with the help of Flora of Bombay (Cooke 1903) and Kolhapur Flora (Yadav & Sardesai 2002). The dry method was used to prepare the herbarium specimens and deposited at the herbarium of the Department of Botany, Shivaji University, Kolhapur (SUK), following the protocol of Jain & Rao (1977). The nomenclature and classification followed the Angiosperm Phylogeny Group IV System (Stevens 2001). Nomenclature and

Image 1. Riparian habitat of river Dudhganga at upstream (higher altitude) showing dense vegetation area dominated by the native species of *Salix tetrasperma* & *Pandanus furcatus* and the invasive Acacia auriculiformis. © Sachin Chavan.

Image 2. Habitat of midstream (middle altitude) showing moderate vegetation area dominated by *Ficus racemosa*, *Pongamia pinnata*, *Bambusa bambos*, and *Crateva magna*. © Sachin Chavan.

Image 3. Showing downstream with sparse vegetation of *Bambusa bambos* and *Syzygium salicifolium*. © Sachin Chavan.

distribution information was verified using Plants of the World Online (POWO 2024) and India Flora Online (Rao & Kumar 2024). Vernacular names were referred from Flowers of India (2024).

RESULTS AND DISCUSSION

Tree diversity and distribution along the riparian continuum

A total of 80 angiosperm tree species, belonging to 66 genera and 30 families, were recorded from the riparian vegetation of the Dudhganga River (Table

1). Tree diversity was unevenly distributed along the longitudinal gradient of the river, with species richness and community composition varying distinctly across the upstream, midstream, and downstream sections. Overall, 55 species (68.8%) were native, while the remaining species were classified as non-native / invasive, indicating a predominance of indigenous flora with increasing invasion pressure downstream. Notably, 21 tree species were common to all three zones, reflecting their broad ecological tolerance and adaptability to varying riparian conditions.

Upstream zone

The upstream section supported the highest tree species richness (62 species), comprising 47 native and 15 non-native / invasive species. This zone is characterized by higher elevation, steeper gradients, well-drained rocky to sandy soils, and higher water flow velocity. Dominant species such as *Salix tetrasperma*, *Syzygium salicifolium*, *Vitex leucoxylon*, *Terminalia arjuna*, and *Syzygium cumini* were well adapted to seasonal water fluctuations, moderate water stress, and occasional flooding. The strong dominance of native species reflects relatively intact riparian habitats, greater connectivity with adjoining natural vegetation, and lower levels of anthropogenic disturbance, favoring the persistence and regeneration of indigenous tree taxa.

Midstream zone

The midstream section recorded 50 tree species, including 29 native and 21 non-native / invasive species, representing a transitional phase in both species composition and disturbance intensity. This zone is characterized by moderate water flow, wider floodplains, and nutrient-rich alluvial soils. Species such as *Ficus hispida*, *Pongamia pinnata*, *Ficus racemosa*, and *Mitragyna parvifolia* were prevalent, benefiting from periodic inundation and higher soil moisture availability. Compared to the upstream zone, the midstream section exhibited a noticeable increase in invasive species, suggesting moderate anthropogenic influence from agriculture, settlements, and riverbank modifications, which create favorable conditions for invasion.

Downstream zone

The downstream section exhibited the lowest species richness (30 species), comprising 17 native and 13 non-native / invasive species. This zone is characterized by lower elevation, reduced flow velocity, prolonged inundation, and greater accumulation of fine sediments and organic matter. Flood-tolerant and disturbance-adapted species such as *Neltuma juliflora*, *Bambusa bambos*, *Vachellia nilotica*, and *Syzygium salicifolium* were common. The relatively high proportion of invasive species in this zone reflects intensified human pressure, habitat fragmentation, and altered hydrological regimes, which collectively weaken native species dominance and facilitate invasive plant establishment.

Overall pattern

Across the riparian continuum, a clear longitudinal trend was observed, marked by a gradual decline in total tree species richness and native species dominance from upstream to downstream, accompanied by a proportional increase in invasive species. This zonation underscores the combined influence of hydrology, soil characteristics, elevation, flood frequency, and anthropogenic disturbance in structuring riparian tree communities along the river ecosystem.

Dominant families of the riparian region

Fabaceae was the most dominant family, contributing 10 species (18.2%) to the native riparian tree diversity of the Dudhganga River, followed by Moraceae with eight species (14.5%). Lamiaceae and Malvaceae were represented by four species each (7.3% each), while Rubiaceae contributed three species (5.5%). The remaining 20 families collectively accounted for 26 species (47.3%), indicating a broad but uneven distribution of native tree diversity across families (Figure 2).

Range-restricted taxa

A significant portion of the tree species was found to be restricted to specific sections of the riparian area. The upstream region has 28 unique species, representing 35.90% of the total restricted species. The midstream region had 19 restricted species, accounting for 24.34% of the total. Despite having a lower overall species richness, the downstream regions still contained three species exclusive to this area, comprising 11.11% of the restricted species. These findings emphasize the importance of conserving all three sections of the riparian ecosystem to maintain the overall biodiversity and protect unique genetic resources.

At-risk taxa

Out of the 80 tree species recorded in the riparian zone of the river Dudhganga, 20 species have a limited presence, with only a few individuals found in a single locality. Currently, two species, *Santalum album* and *Dalbergia latifolia*, are classified as 'Vulnerable'

Table 1. Checklist of tree species recorded in the riparian vegetation of the Dudhganga River.

	Riparian tree species	Family	Vernacular name	IUCN Red List status	Biogeographic status	Regional distribution
1	*Acacia auriculiformis* A.Cunn. ex Benth.	Fabaceae	Australian Babul	--	I	U, M, D
2	*Albizia lebbeck* (L.) Benth.	Fabaceae	Siris Tree	LC	N	M, D
3	*Albizia procera* (Roxb.) Benth.	Fabaceae	Pandhra Shirish	LC	N	U
4	*Alstonia scholaris* (L.) R.Br.	Apocynaceae	Saptaparni, Satvin	LC	N	M
5	*Annona reticulata* L.	Annonaceae	Ram-Phal	--	I	M
6	*Artocarpus heterophyllus* Lam.	Moraceae	Phans	NA	N	U, M
7	*Azadirachta indica* A.Juss.	Meliaceae	Kadu Limb	--	I	D
8	*Bambusa bambos* (L.) Voss	Poaceae	Kashti	NA	N	U, M, D
9	*Bambusa multiplex* (Lour.) Raeusch. ex Schult.f.	Poaceae	Bet	NA	N	U, M
10	*Bambusa vulgaris* Schrad. ex J.C.Wendl.	Poaceae	Bet	--	I	U
11	*Bauhinia purpurea* L	Fabaceae	Rakta Kanchan	LC	N	U
12	*Bergera koenigii* L.	Rutaceae	Kadipatta	NA	N	U
13	*Bombax ceiba* L.	Malvaceae	Kate-Saver	LC	N	U, M
14	*Caryota urens* L.	Arecaceae	Fish-Tail Palm	LC	N	U
15	*Cassia fistula* L.	Fabaceae	Bahava	LC	N	U
16	*Ceiba pentandra* (L.) Gaertn.	Malvaceae	Safed Simal	--	I	U
17	*Citrus × limon* (L.) Osbeck	Rutaceae	Limbu	--	I	U, M
18	*Cocos nucifera* L.	Arecaceae	Narel	--	I	U, M,
19	*Cordia dichotoma* G.Forst.	Boraginaceae	Bhokar	LC	N	U, M, D
20	*Crateva magna* (Lour.) DC.	Capparaceae	Katarlingad	NA	N	U, M, D
21	*Dalbergia latifolia* Roxb.	Fabaceae	Biti, Sissu	VU	N	U, M
22	*Diospyros montana* Roxb.	Ebenaceae	Lohari	NA	N	U
23	*Erythrina variegata* L.	Fabaceae	Pangira	LC	N	U
24	*Eucalyptus rudis* Endl.	Myrtaceae	Nilgir	--	I	U, M, D
25	*Eucalyptus tereticornis* Sm.	Myrtaceae	Nilgir	--	I	U, M
26	*Ficus benghalensis* L.	Moraceae	Wad	NA	N	U, M
27	*Ficus hispida* L.f.	Moraceae	Bokeda, Kala-Umber	LC	N	U, M,
28	*Ficus microcarpa* L.f.	Moraceae	Kamarup	LC	N	M
29	*Ficus racemosa* L.	Moraceae	Umber	LC	N	U, M, D
30	*Ficus religiosa* L.	Moraceae	Pimpal	LC	N	U, M
31	*Ficus tinctoria* G.Forst.	Moraceae	Datir	LC	N	U
32	*Ficus virens* Aiton	Moraceae	Bassari, Gandhaumbara	LC	N	M
33	*Gliricidia sepium* (Jacq.) Kunth	Fabaceae	Undirmari	--	I	M
34	*Glochidion ellipticum* Wight	Phyllanthaceae	Bhoma	NA	N	U
35	*Gmelina arborea* Roxb. ex Sm.	Lamiaceae	Sivan	NA	N	U
36	*Grewia serrulata* DC.	Malvaceae	Kawri	NA	N	U
37	*Grewia tiliifolia* Vahl	Malvaceae	Dhaman	NA	N	U
38	*Holarrhena pubescens* Wall. ex G.Don	Apocynaceae	Indrajav	LC	N	U
39	*Jatropha integerrima* Jacq.	Euphorbiaceae	Jangli Erand	--	I	M, D
40	*Kydia calycina* Roxb.	Malvaceae	Warang	NA	N	U
41	*Lasiosiphon glaucus* Fresen.	Thymelaeaceae	Datpadi, Rametha	--	I	U
42	*Leucaena leucocephala* (Lam.) de Wit	Fabaceae	Subabul	--	I	U, M, D
43	*Macaranga peltata* (Roxb.) Müll.Arg.	Euphorbiaceae	Chandwar	NA	N	U

	Riparian tree species	Family	Vernacular name	IUCN Red List status	Biogeographic status	Regional distribution
44	*Mallotus philippensis* (Lam.) Müll.Arg.	Euphorbiaceae	Shendri	NA	N	U, M, D
45	*Mappia nimmoniana* (J.Graham) Byng & Stull	Icacinaceae	Amrita	NA	N	U
46	*Memecylon umbellatum* Burm.f.	Melastomataceae	Anjani	LC	N	U
47	*Mangifera indica* L.	Anacardiaceae	Amba	DD	N	U, M, D
48	*Mitragyna parvifolia* (Roxb.) Korth.	Rubiaceae	Kalam	NA	N	U, M
49	*Monoon longifolium* (Spreng.) Kosterm.	Annonaceae	Devdar	NA	N	M, D
50	*Moringa oleifera* Lam.	Moringaceae	Shevga	NA	N	U
51	*Morus alba* L.	Moraceae	Tuti	--	I	M
52	*Musa × paradisiaca* L.	Musaceae	Kel	--	I	U, M
53	*Neltuma juliflora* (Sw.) Raf.	Fabaceae	Vilayati Babul	--	I	D
54	*Neolamarckia cadamba* (Roxb.) Bosser	Rubiaceae	Kadamba	NA	N	U
55	*Oroxylum indicum* (L.) Kurz	Bignoniaceae	Broken Bones Tree	NA	N	U
56	*Pandanus furcatus* Roxb.	Pandanaceae	Bongi	NA	N	U
57	*Peltophorum pterocarpum* (DC.) Backer ex K.Heyne	Fabaceae	Peela Gulmohar	--	I	M
58	*Pithecellobium dulce* (Roxb.) Benth.	Fabaceae	Vilayatichinch	--	I	U, M, D
59	*Pongamia pinnata* (L.) Pierre	Fabaceae	Karanj	LC	N	U, M, D
60	*Psidium guajava* L.	Myrtaceae	Peru	--	I	U, M, D
61	*Ricinus communis* L.	Euphorbiaceae	Yerand	--	I	U, M, D
62	*Salix tetrasperma* Roxb.	Salicaceae	Walunj	NA	N	U, M, D
63	*Samanea saman* (Jacq.) Merr.	Fabaceae	Gulabi Siris	--	I	U, M, D
64	*Santalum album* L.	Santalaceae	Chandan	--	I	M
65	*Senegalia rugata* (Lam.) Britton & Rose	Fabaceae	Shikakai	NA	N	U
66	*Senna siamea* (Lam.) H.S.Irwin & Barneby	Fabaceae	Kassod	--	I	U, M, D
67	*Sesbania sesban* (L.) Merr.	Fabaceae	shewarie	LC	N	M, D
68	*Swietenia macrophylla* King	Meliaceae	Mahogany	--	I	M
69	*Syzygium cumini* (L.) Skeels	Myrtaceae	Jambhul	NA	N	U, M, D
70	*Syzygium salicifolium* J.Graham	Myrtaceae	Pan Jambhul	NA	N	U, M, D
71	*Tamarindus indica* L.	Fabaceae	Chinch	--	I	M, D
72	*Tamarix ericoides* Rottler & Willd.	Tamaricaceae	Kadsherni	NA	N	D
73	*Tectona grandis* L.f.	Lamiaceae	Sagwan	NA	N	U, M
74	*Terminalia arjuna* (Roxb. ex DC.) Wight & Arn.	Combretaceae	Arjun	NA	N	U, M, D
75	*Terminalia paniculata* B.Heyne ex Roth	Combretaceae	Kinjal	NA	N	U
76	*Vachellia nilotica* (L.) P.J.H.Hurter & Mabb.	Fabaceae	Babhal	NA	N	U, M, D
77	*Vitex leucoxylon* L.f.	Lamiaceae	Sheras Songarbi	NA	N	U, M
78	*Vitex negundo* L.	Lamiaceae	Nirgundi	NA	N	U, M, D
79	*Wendlandia heynei* (Schult.) Santapau & Merchant	Rubiaceae	Til	NA	N	U
80	*Woodfordia fruticosa* (L.) Kurz	*Lythraceae*	Dhayati, Dowari	LC	N	U

DD—Data Deficient | EN—Endangered | NA—Not Assessed | LC—Least Concern | NT—Near Threatened | VU—Vulnerable | U—Upstream | M—Midstream | D—Downstream | I—Invasive | N—Native.

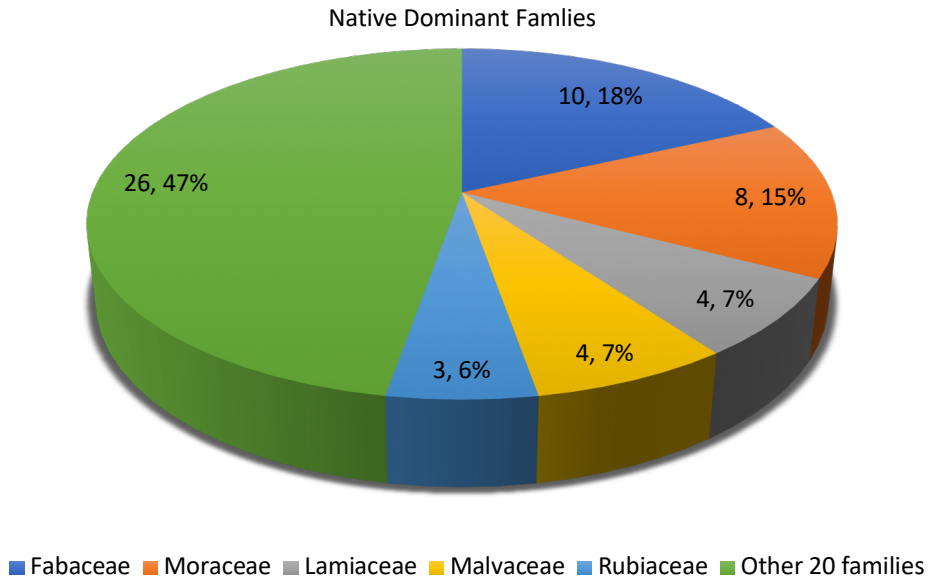

Figure 2. Native species per family in the tree flora.

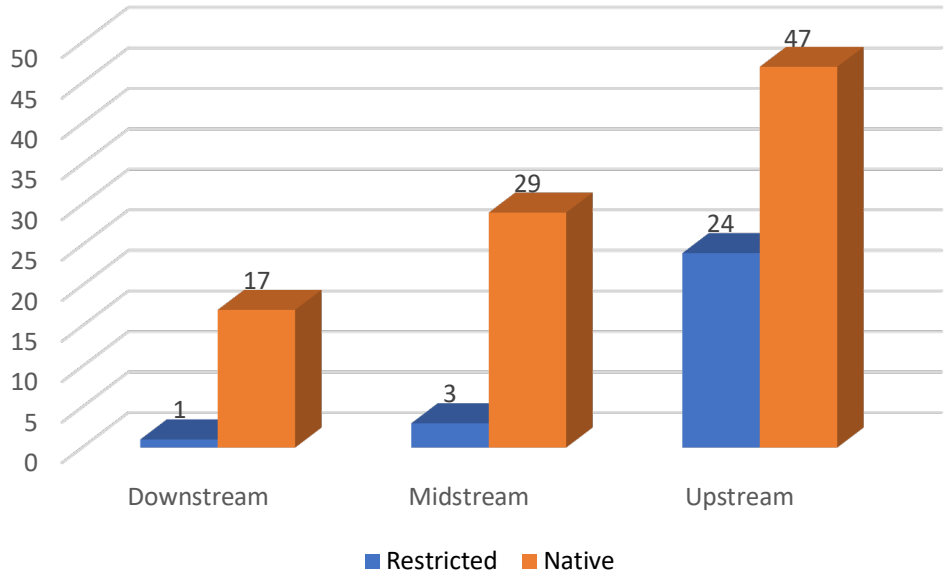

Figure 3. Zonal distribution of restricted tree species.

(IUCN 2024), while *Swietenia macrophylla* is listed as 'Endangered' according to IUCN conservation status (IUCN 2024). Twenty-four species are categorized as 'Least Concern', and *Mangifera indica* L. is classified as 'Data Deficient' (Table 1). The flagship species of the Western Ghats, *Memecylon umbellatum*, is also present in the study area and found to be restricted to the upstream area. The zonation of riparian vegetation along the river belt was evident, with distinct species distributions observed across all three sections.

Non-native trees

Non-native species such as *Eucalyptus rudis, Neltuma juliflora, Pithecellobium dulce*, and *Senna siamea* are prevalent in the riparian vegetation of the river Dudhganga. Twenty-five non-native tree species, including several invasive taxa, were recorded along the Dudhganga River. Although riparian zones are typically characterised by rapid successional dynamics, the proliferation of invasive species can disrupt natural regeneration processes by suppressing native species establishment, thereby posing a potential long-term

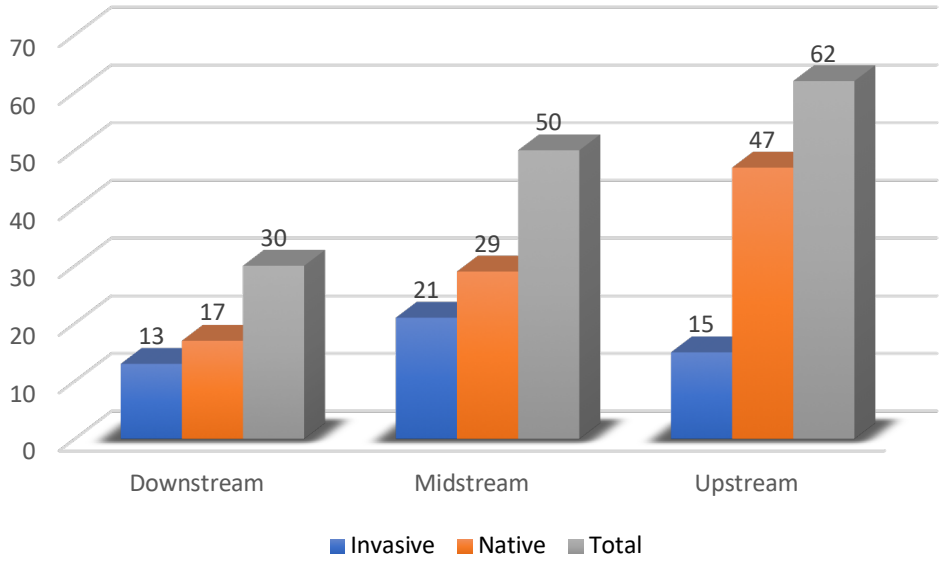

Figure 4. Zonal distribution of native and invasive species.

threat to riparian forest structure and stability. These invasive species can also disrupt watershed hydrology and riparian ecosystems (Richardson et al. 2007). Many researchers have reported that the riparian zone has served as a corridor for the introduction and spread of invasive species, primarily due to long-term human activities (Johansson et al. 1996; Hood & Naiman 2000; Tockner & Stanford 2002). Invasive tree species pose a significant threat to the ecological balance of riparian vegetation, often outcompeting native flora and altering habitat dynamics. Along the river Dudhganga, species such as *Neltuma juliflora*, *Pithecellobium dulce*, *Leucaena leucocephala*, and *Acacia auriculiformis* have established small but dominant micro populations. Among these, *Pithecellobium dulce* and *Neltuma juliflora* exhibit particularly aggressive invasion patterns, forming multiple micro populations that dominate certain localities. Notably, a large patch of *Pithecellobium dulce* is present at the confluence of the river Dudhganga and the river Krishna near Sangam Math, June Danwad. Their rapid spread can impact native biodiversity, water availability, and soil composition, making their management crucial for maintaining the ecological integrity of the riparian ecosystem.

Threats

Riparian vegetation is experiencing gradual degradation due to factors such as deforestation, soil erosion, mining and construction activities. Areas with intensive agriculture and other human activities, including water extraction, logging, grazing by cattle, and recreation are particularly vulnerable to vegetation loss. Studies have demonstrated that the loss of riparian vegetation can have significant ecological consequences, including a reduction in biodiversity. Riparian corridors serve as vital habitats for numerous animal species and breeding grounds for many migratory birds. Anthropogenic disturbances can significantly alter the structure and composition of these plant communities (Mohan & Joseph 2024).

The study identified several anthropogenic and natural threats along the Dudhganga River, varying across the upper, mid, and lower courses.

Upstream—located in the higher altitudes with relatively undisturbed forested areas, the primary threats include deforestation due to agricultural expansion, encroachment, and soil erosion on steep slopes. Occasional illegal logging and grazing pressures also impact vegetation stability.

Midstream—this zone experiences moderate human interference, with threats such as sand and gravel mining, habitat fragmentation due to infrastructure development, and pollution from agricultural runoff. The conversion of riparian land for settlements and farming is gradually altering species composition.

Downstream—the most impacted zone, facing severe threats from industrial pollution, urban expansion, and intensive agricultural activities. Unregulated wastewater discharge, sand dredging, and invasive species proliferation have significantly degraded riparian vegetation, leading to biodiversity loss and altered hydrological patterns.

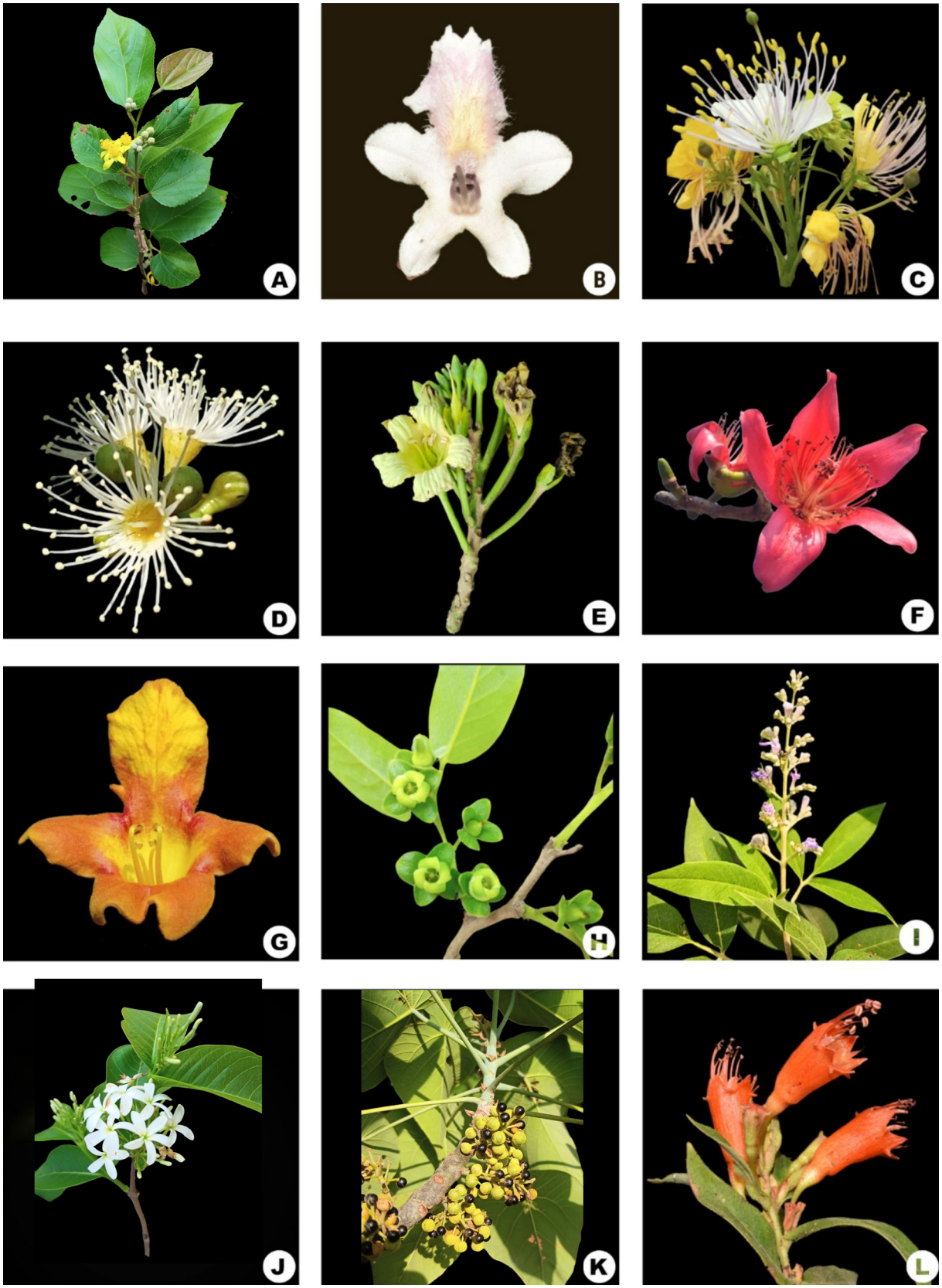

Image 4. Flowering diversity: A—*Grewia tiliifolia*| B—Vitex leucoxylon | C—Crateva magna | D—Syzygium salicifolium | E—*Oroxylum indicum* | F—*Bombax ceiba* | G—*Gmelina arborea* | H—*Diospyros montana* | I—*Vitex negundo* | J—*Holarrhena pubescens*| K— *Macaranga peltata*| L—*Woodfordia fruticosa*. © Sachin Chavan.

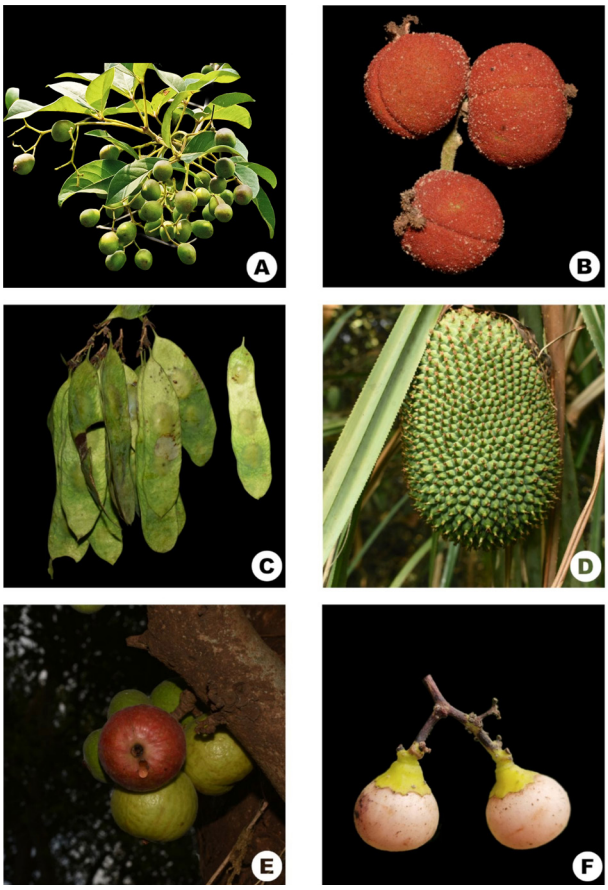

Image 5. Fruit diversity: A—*Vitex leucoxylon* | B—*Mallotus philippensis* | C—*Dalbergia latifolia* | D—*Pandanus furcatus* | E—*Ficus racemosa* | F—*Cordia dichotoma*. © Sachin Chavan.

CONCLUSION

These findings highlight the rich arboreal diversity of the Dudhganga riparian zone, with notable economically valuable species, including *Mappia nimmoniana* and *Pongamia pinnata*, underscoring its ecological significance and the need for continued conservation efforts. Notably, the Fabaceae family emerged as the most predominant, with *Ficus* standing out as the most diverse genus within the study area. Therefore, it is imperative to prioritize conservation efforts to safeguard this rich biodiversity along the river Dudhganga by encouraging local communities to participate in afforestation, especially planting native species, sustainable water management, and riparian conservation efforts including regulating anthropogenic activities.

REFERENCES

Chazdon, R.L., R.K. Colwell, J.S. Denslow & M.R. Guariguata (1998). Statistical methods for estimating species richness of woody regeneration in primary and secondary rain forests of NE Costa Rica. *Forest Ecology and Management* 112: 1–10.

Condit, R. (1998). *Tropical Forest Census Plots: Methods and Results from Barro Colorado Island, Panama and a Comparison with Other Plots*. Springer-Verlag, Berlin, 211 pp.

Cooke, T. (1903). *The Flora of the Presidency of Bombay: Vol. 1*. Taylor and Francis, London, 645 pp. https://www.biodiversitylibrary.org/item/42327

Flowers of India (2024). http://www.flowersofindia.net. Downloaded on 23.viii.2024.

Gotelli, N.J. & R.K. Colwell (2001). Quantifying biodiversity: procedures and pitfalls in the measurement and comparison of species richness. *Ecology Letters* 4: 379–391.

Gregory, S.V., F.J. Swanson, W.A. McKee & K.W. Cummins (1991). An ecosystem perspective of riparian zones. *BioScience* 41(8): 540–551.

Gunaga, S., N. Rajeshwari & R. Vasudeva (2013). Tree diversity and disturbance of kaan forests: relics of a community-protected climax vegetation in the Central Western Ghats. *Tropical Ecology* 54(1): 117–131.

Hood, W.G. & R.J. Naiman (2000). Vulnerability of riparian zones to invasion by exotic vascular plants. *Plant Ecology* 148: 105–114.

Hynes, H.B.N. (1970). *The Ecology of Running Waters*. University of Toronto Press, Toronto, 555 pp.

IUCN (2024). The IUCN Red List of Threatened Species (Version 2022-1). https://www.iucnredlist.org. Downloaded on 01.viii.2024.

Jain, S.K. & R.R. Rao (1977). *A Handbook of Field and Herbarium Methods*. Scholarly Publications, New Delhi, 157 pp.

Johansson, M.E., C. Nilsson & E. Nilsson (1996). Do rivers function as corridors for plant dispersal? *Journal of Vegetation Science* 7(5): 593–598. https://doi.org/10.2307/3236309

Korse, K.H. & G. Krishnakumar (2006). Riparian flora of perennial rivers in the Western Ghats: floristic diversity, ecological uniqueness and conservation strategies. *Proceedings of Lake 2006*. Indian Institute of Science, Bengaluru, 12 pp.

Lacerda, A.V.D., N. Nordi, F.M. Barbosa & T. Watanabe (2005). Levantamento florístico do componente arbustivo-arbóreo da vegetação ciliar na bacia do rio Taperoá, PB, Brasil. *Acta Botanica Brasilica* 19(3): 647–656. https://doi.org/10.1590/S0102-33062005000300027

Liunima, V., L. Banilodu & C.G. Semiun (2022). Composition and diversity of riparian vegetation of the Talau river, Belu Regency. *Edubiotik: Jurnal Pendidikan, Biologi dan Terapan* 7(02): 167–176. https://doi.org/10.33503/ebio.v7i02.1934

Mohan, S.N. & S. Joseph (2024). Disturbances on riparian vegetation: a comprehensive review. *International Journal of Research and Review* 11(4): 200–208. https://doi.org/10.52403/ijrr.20240422

Mohite, S. & S.A. Mane (2020). Phytosociological study of riparian trees in the Panchganga River system at Kolhapur District, Maharashtra, India. *Journal of Aquatic Biology & Fisheries* 8 (Special Issue): 62–67.

Myers, N., R.A. Mittermeier, C.G. Mittermeier, G.A.B. da Fonseca & J. Kent (2000). Biodiversity hotspots for conservation priorities. *Nature* 403: 853–858. https://doi.org/10.1038/35002501

Naiman, R.J. & H. Décamps (1997). The ecology of interfaces: Riparian zones. *Annual Review of Ecology and Systematics* 28(1): 621–658. https://doi.org/10.1146/annurev.ecolsys.28.1.621

Naiman, R.J., H. Décamps & M. McClain (2005). *Riparia: Ecology, Conservation, and Management of Streamside Communities*. Academic Press, Burlington, MA, 448 pp. https://doi.org/10.1016/B978-012663315-3/50003-4

Nilsson, C., R. Jansson & U. Zinko (1997). Long-term responses of river-margin vegetation to water-level regulation. *Science* 276(5313): 798–800. https://doi.org/10.1126/science.276.5313.798

POWO (2024). Plants of the World Online. Royal Botanic Gardens, Kew. https://www.plantsoftheworldonline.org. Downloaded on

01.viii.2024.

Rao, K.S. & D. Kumar (2024). India Flora Online. https://indiaflora-ces.iisc.ac.in/herbsheet.php?id=3517&cat=13. Downloaded on 01.viii.2024.

Richardson, D.M., P.M. Holmes, K.J. Esler, S.M. Galatowitsch, J.C. Stromberg, S.P. Kirkman, P. Pyšek & R.J. Hobbs (2007). Riparian vegetation: degradation, alien plant invasions, and restoration prospects. *Diversity and Distributions* 13(1): 126–139. https://doi.org/10.1111/j.1366-9516.2006.00314.x

Singh, N.P. & S. Karthikeyan (eds.) (2000). *Flora of Maharashtra State: Dicotyledones – Vol. 1*. Botanical Survey of India, Calcutta, 898 pp.

Stevens, P.F. (2001 onwards). Angiosperm Phylogeny Website (Version 14, July 2017). http://www.mobot.org/MOBOT/research/APweb/. Downloaded on 01.viii.2024.

Sumarmi, S., T.I. Pakarti, L.F.P. Destari, N. Aini & A. Tanjung (2022). Preservation of vegetation diversity to maintain the riparian ecosystem of the Sampean watershed. *KnE Social Sciences* 7(16): 140–151. https://doi.org/10.18502/kss.v7i16.12168

Tockner, K. & J.A. Stanford (2002). Riverine flood plains: present state and future trends. *Environmental Conservation* 29: 308–330.

UNESCO (2012). Western Ghats (India) (No. 1342rev). UNESCO World Heritage Centre. https://whc.unesco.org/en/list/1342/ Downloaded on 07.viii.2024.

Yadav, S.R. & M.M. Sardesai (2002). *Flora of Kolhapur District*. Shivaji University, Kolhapur, India, 680 pp.

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