National River Conservation Directorate
Ministry of Jal Shakti,
Department of Water Resources,
River Development and Ganga Rejuvenation
Government of India

Assessment of Biological Status of Cauvery River and its Potentially Perennial River Streams

April 2026

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National River Conservation Directorate (NRCD)

The National River Conservation Directorate, functioning under the Department of Water Resources, River Development and Ganga Rejuvenation, and Ministry of Jal Shakti providing financial assistance to the State Government for conservation of rivers under the Centrally Sponsored Schemes of 'National River Conservation Plan (NRCP)'. National River Conservation Plan to the State Governments/ local bodies to set up infrastructure for pollution abatement of rivers in identified polluted river stretches based on proposals received from the State Governments/ local bodies.

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Centres for CRB Management and Studies (cCauvery)

The Centre for CRB Management and Studies (cCauvery) is a Brain Trust dedicated to River Science and River Basin Management. Established in 2024 by IISc Bengaluru and NIT Tiruchirappalli, under the supervision of cGanga at IIT Kanpur, the centre serves as a knowledge wing of the National River Conservation Directorate (NRCD). cCauvery is committed to restoring and conserving the Cauvery River and its resources through the collation of information and knowledge, research and development, planning, monitoring, education, advocacy, and stakeholder engagement.

www.ccauvery.org

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cGanga is a think tank formed under the aegis of NMCG, and one of its stated objectives is to make India a world leader in river and water science. The Centre is headquartered at IIT Kanpur and has representation from most leading science and technological institutes of the country. cGanga's mandate is to serve as think-tank in implementation and dynamic evolution of Ganga River Basin Management Plan (GRBMP) prepared by the Consortium of 7 IITs. In addition to this, it is also responsible for introducing new technologies, innovations, and solutions into India.

www.cganga.org

Acknowledgment

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Preface

In an era of unprecedented environmental change, understanding our rivers and their ecosystems has never been more critical. This report aims to provide a comprehensive overview of our rivers, highlighting their importance, current health, and the challenges they face. As we explore the various facets of river systems, we aim to equip readers with the knowledge necessary to appreciate and protect these vital waterways.

Throughout the following pages, you will find an in-depth analysis of the principles and practices that support healthy river ecosystems. Our team of experts has meticulously compiled data, case studies, and testimonials to illustrate the significant impact of rivers on both natural environments and human communities. By sharing these insights, we hope to inspire and empower our readers to engage in river conservation efforts.

This report is not merely a collection of statistics and theories; it is a call to action. We urge all stakeholders to recognize the value of our rivers and to take proactive steps to ensure their preservation. Whether you are an environmental professional, a policy maker, or simply someone who cares about our planet, this guide is designed to support you in your efforts to protect our rivers.

We extend our heartfelt gratitude to the numerous contributors who have generously shared their stories and expertise. Their invaluable input has enriched this report, making it a beacon of knowledge and a practical resource for all who read it. It is our hope that this report will serve as a catalyst for positive environmental action, fostering a culture of stewardship that benefits both current and future generations.

As you delve into this overview of our rivers, we invite you to embrace the opportunities and challenges that lie ahead. Together, we can ensure that our rivers continue to thrive and sustain life for generations to come.

Centres for Cauvery River Basin
Management and Studies (cCauvery)
IISc Bengaluru (Lead Institute), NIT Tiruchirappalli (Fellow Institute)

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Abbreviations and Acronyms

<	Less than
>	Greater than
+	Present
-	Absent
%	Percentage
CRB	Cauvery River Basin
CWC	Central Water Commission
dams/km^2	Number of dams per square kilometer
DCI	Dendritic Connectivity Index
DEM	Digital Elevation Model
DoR	Degree of Regulation
e-flow	Environmental flow
EPT	Ephemeroptera, Plecoptera, and Trichoptera
FLD	Fragment Length Distribution
GIS	Geographic Information System
IBI	Index of Biotic Integrity
km	Kilometer
km^2	Square kilometer
KRS	Krishnarajasagar Dam
m	Meter
mm	Millimeter
RFI	River Fragmentation Index
sp.	Species (singular)
spp.	Species (plural)
SRTM	Shuttle Radar Topography Mission

1. Introduction

The Cauvery River Basin (CRB) is one of the most ecologically significant and hydrologically complex river systems in peninsular India. It supports diverse ecosystems ranging from montane forests in the Western Ghats to semi-arid plains and deltaic wetlands along the eastern coast. The basin plays a crucial role in sustaining biodiversity, agriculture, drinking water supply, and cultural heritage across the states of Karnataka, Tamil Nadu, Kerala, and the Union Territory of Puducherry.

Biologically, the CRB hosts a wide range of aquatic and riparian habitats, including headwater streams, forested river stretches, floodplains, wetlands, and estuarine ecosystems. These habitats support rich assemblages of phytoplankton, zooplankton, benthic macroinvertebrates, fish, amphibians, reptiles, and avifauna. However, increasing anthropogenic pressures such as urbanization, dam construction, pollution, land use change, and climate variability have altered the ecological integrity and biological functioning of the river system.

A comprehensive biological profile of the CRB is therefore essential to understand ecosystem structure, biodiversity distribution, ecological health, and conservation priorities. This section presents the salient hydrological and geomorphological features of the Cauvery River and its tributaries, which form the foundation for biological assessment.

2. Salient Features of the Cauvery River

2.1. Origin and Course

The Cauvery River originates at Talakaveri in the Brahmagiri Hills of the Western Ghats in Kodagu district, Karnataka, at an elevation of approximately 1,341 m above mean sea level (Fig. 1). The river flows in a generally southeasterly direction across Karnataka and Tamil Nadu before draining into the Bay of Bengal. The total length of the river is approximately 800 km. Along its course, it traverses diverse physiographic regions including mountainous terrains, plateaus, gorges, and alluvial plains. The river forms several important geomorphic features such as waterfalls (e.g., Shivanasamudra), islands (e.g., Srirangapatna), and an extensive delta system in Tamil Nadu.

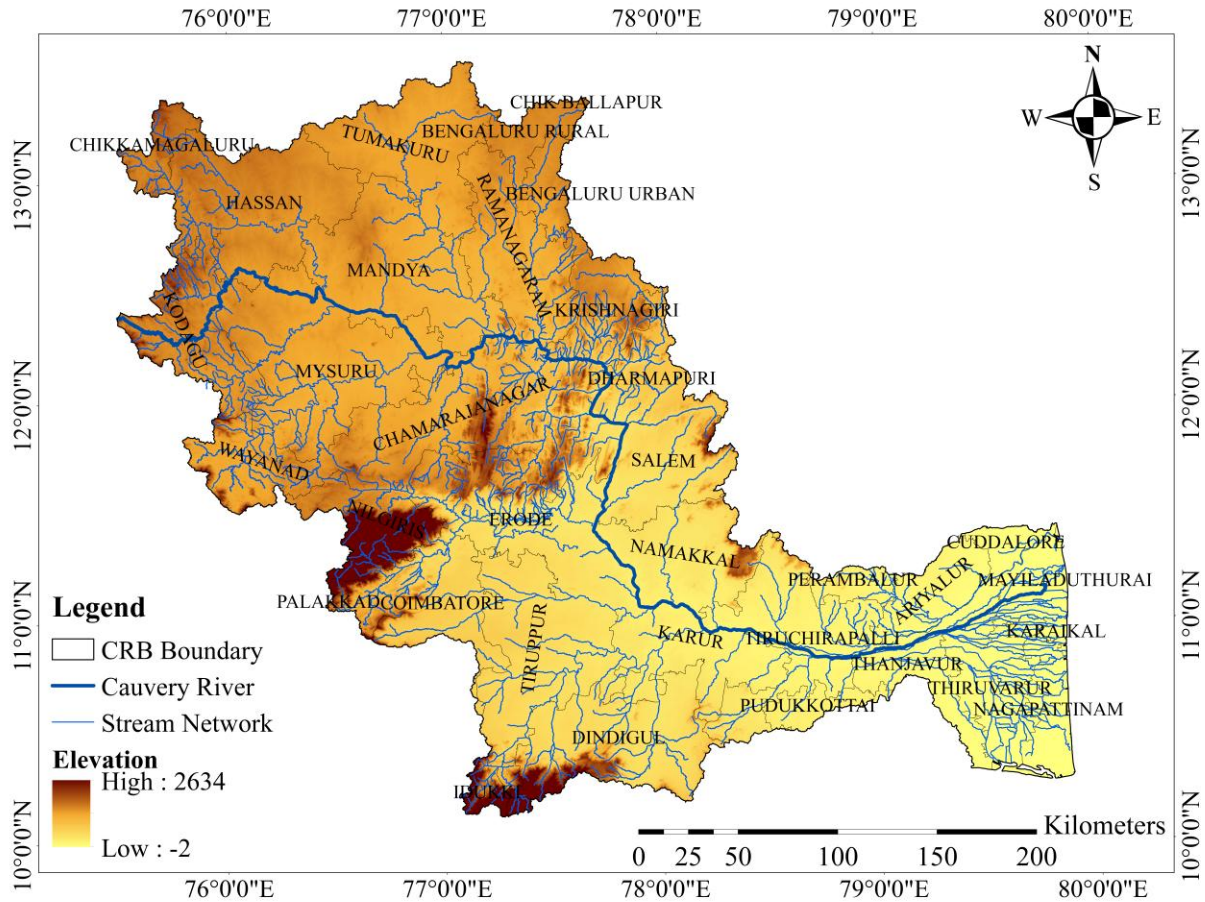


Fig.1. Origin and course of the Cauvery River
(Source: SRTM DEM)

2.2. Channel Characteristics

The channel morphology of the CRB exhibits pronounced spatial variability along its longitudinal gradient, reflecting strong controls of geology, topography, and hydrological regime. In the upper reaches originating in the Western Ghats, the river is characterized by steep gradients, confined V-shaped valleys, high energy flow conditions, and predominantly coarse bed material such as boulders and cobbles, indicative of active vertical erosion and limited lateral migration. As the river descends into the middle reaches across the Deccan Plateau (Karnataka region), the gradient decreases, leading to moderately sloping channels with wider cross-sections, mixed sediment composition (gravels, sands), and increasing meandering tendencies due to enhanced lateral erosion and deposition processes. In the lower reaches, particularly across the Tamil Nadu deltaic plains, the Cauvery transitions into a low-gradient, highly sinuous system with fine-grained sediments (sand, silt, and clay), extensive floodplain development, distributary networks, and significant alluvial deposition forming the fertile Cauvery delta. This downstream morphological transition is further influenced by strong seasonal flow variability governed by the Southwest and Northeast monsoons, which regulate discharge patterns, sediment transport dynamics, channel adjustments, and ecological habitat availability. Peak monsoonal flows enhance sediment mobilization and floodplain connectivity, while low-flow periods constrain habitat diversity and influence biological productivity, including macroinvertebrate assemblages and nutrient cycling within the basin (Jain et al., 2020; Jaiswal et al., 2022; Ramasamy et al., 2006).

2.3. Tributaries

The CRB comprises numerous tributaries, broadly categorized into left-bank and right-bank tributaries (Fig. 2).

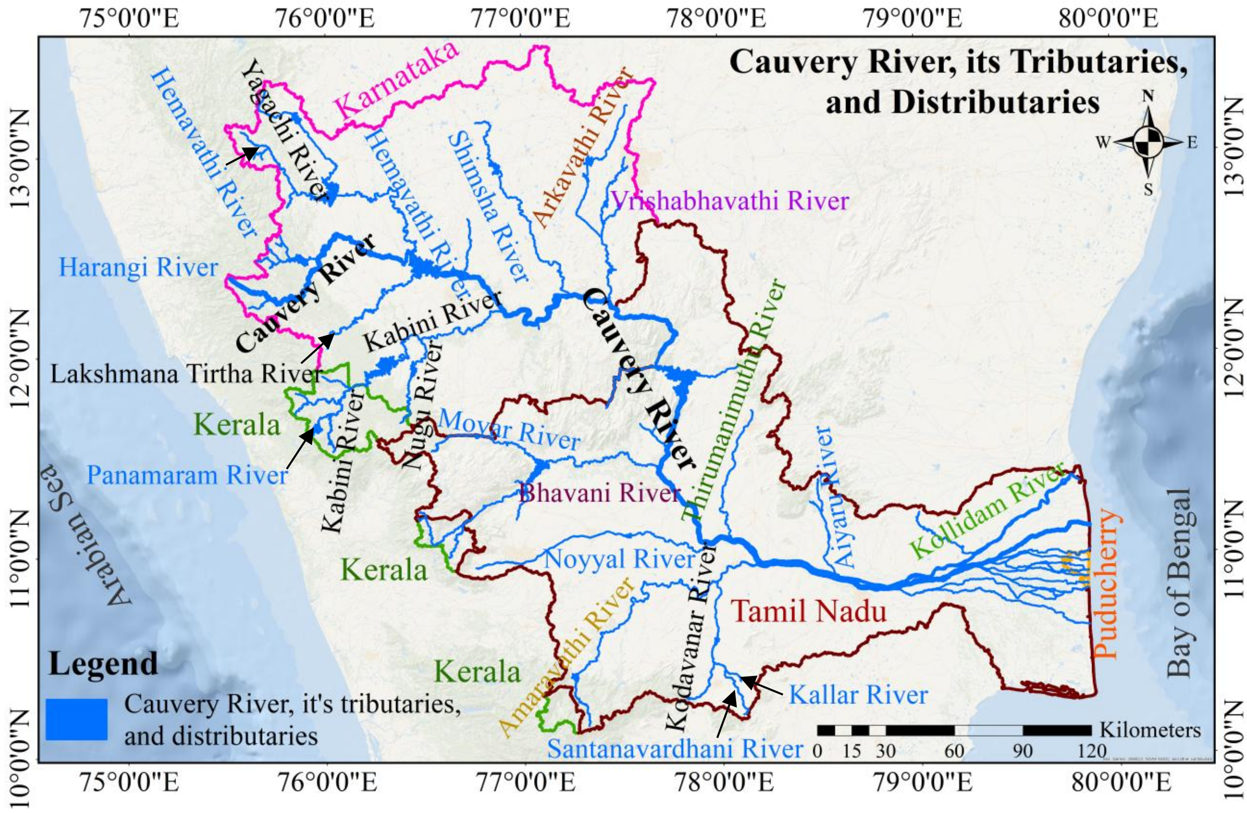


Fig. 2. Geographical location of the Cauvery River main course and its major left-bank and right-bank tributaries and distributaries

Table 1 presents a comprehensive description of the major left- and right-bank tributaries and distributaries of the CRB, highlighting their origin, course, and hydrological significance. The left-bank tributaries, primarily originating from the Western Ghats, contribute substantially to the basin's perennial flow due to high rainfall and forested catchments, whereas several right-bank tributaries arise from the Deccan Plateau and exhibit relatively seasonal flow regimes influenced by monsoonal variability and anthropogenic interventions. The table also reflects the spatial heterogeneity of the basin, with tributaries differing in length, catchment characteristics, and degree of regulation through reservoirs and diversion structures. Collectively, these tributaries play a critical role in sustaining river discharge, sediment transport, and ecological diversity across different segments of the Cauvery River system.

Table 1. Description of major left- and right-bank tributaries and distributaries
(Source: Cauvery River at a Glance, cCauvery)

Tributary	**Bank**	**Description**
Harangi River	Left	It is a significant tributary of the Cauvery River originating from the Western Ghats in the Kodagu (Coorg) district of Karnataka at an elevation of about 1000–1100 m. The river flows through the hilly terrain of Kodagu before joining the Cauvery River near Kushalnagar. It is relatively shorter in length (approximately 50 km) and is characterized by steep gradients in its upper reaches and moderate flow downstream. The Harangi Reservoir, constructed near Hudgur village in Kodagu district, is an important water resource structure used for irrigation and local water supply within the basin.
Hemavathi River	Left	Hemavati River is a major tributary of the Cauvery River. It originates in the Western Ghats near Ballalarayana Durga in the Chikkamagaluru district of Karnataka at an elevation of approximately 1,219 m above mean sea level. Flowing for about 245 km, the river traverses the districts of Chikkamagaluru, Hassan, and Mysuru before joining the Cauvery River near Krishnarajasagara. A major reservoir, the Gorur Reservoir (Hemavati Dam), has been constructed across the river in the Hassan district for irrigation, water supply, and hydropower generation.
Arkavathi River	Left	Arkavathi River is a 161 km long left-bank tributary of the Cauvery River. It originates from the Nandi Hills in Chikkaballapura district, Karnataka, and flows through Kolar

		and Bengaluru Rural districts before joining the Cauvery River at Sangama near Kanakapura. The river is impounded by the Hesaraghatta and Thippagondanahalli (T.G. Halli) reservoirs, which have historically served as important water sources for Bengaluru. The Chunchi Falls, located near Sangama on the Arkavathi River, is a well-known scenic and tourist destination.
Shimsha River	Left	Shimsha River originates from the Devarayanadurga Hills in Tumakuru District, Karnataka, at an elevation of approximately 914 m above mean sea level. The river flows through the town of Maddur before continuing downstream. The Markonahalli Dam, constructed across the Shimsha River in Kunigal Taluk of Tumakuru District, serves irrigation and water resource management purposes. Further downstream, the river forms the Shimsha Falls near Shimshapura in Malavalli Taluk, which is also the site of the Shimsha Hydroelectric Project, one of Karnataka's early hydroelectric power generation facilities.
Vrishabhavathi River	Left	Vrishabhavathi River is a minor tributary of the Arkavathy River that flows through the southern part of Bengaluru, India. Historically, it was known for its clean water, which served as a source of drinking water and supported religious activities at the historic Gali Anjaneya Temple. However, rapid urbanization and inadequate waste management have severely degraded its water quality.
Thirumanimuthu River	Left	Thirumanimutharu River originates in three reserved forest areas of the Shevaroy Hills in the Eastern Ghats of Salem district, Tamil Nadu. It flows for approximately 120 km through Namakkal district before merging with the Cauvery River near Paramathi Velur at Nanjai Edayar village, Tamil Nadu.
Aiyaru River	Left	Aiyaru River flows through the Namakkal district of Tamil Nadu. It is a seasonal river that plays an important role in supporting

		local irrigation and agricultural activities across the semi-arid regions within its catchment.
Kollidam River	Left	Kollidam River, located in southeastern India, is the northern distributary of the Cauvery River. It branches off from the main Cauvery channel at Srirangam Island and flows eastward across the deltaic plains of Thanjavur before discharging into the Bay of Bengal. The river's distributary system is regulated at the Lower Anaicut (Kallanai), a diversion structure situated on the Kollidam River. The historic town of Chidambaram is located along its banks. The Kollidam serves as an important distributary, facilitating flood regulation, irrigation, and water distribution across the northern part of the Cauvery Delta.
Lakshmana Tirtha River	Right	Lakshmana Tirtha River originates near Irupu Falls in the Brahmagiri Range of Kodagu district, Karnataka, close to the border with Wayanad district, Kerala. Flowing eastward, it eventually joins the Cauvery River at the Krishna Raja Sagara Reservoir. The Ramathirtha River is its principal tributary.
Kabini River	Right	Kabini River (Kabani), together with its major tributary, the Kapila River, originates in the Pakramthalam Hills of the Wayanad district in Kerala. It is formed by the confluence of the Panamaram and Mananthavady rivers. The backwaters of the Kabini Reservoir support a rich diversity of wildlife, particularly during the summer months when receding water levels expose extensive grassy meadows that provide important habitats for numerous species. Approximately 2 km downstream of the Panamaram River confluence, the Kabini River forms Kuruva Island, a 520-acre riverine island renowned for its rich biodiversity, supporting a wide variety of flora and fauna.
Bhavani River	Right	Bhavani River originates in the Nilgiri Hills of the Western Ghats and flows briefly through the Silent Valley National Park in Kerala before re-entering Tamil Nadu. It is a perennial river

		extending approximately 217 km, with its flow sustained primarily by the southwest monsoon and supplemented by rainfall from the northeast monsoon. The river is impounded by the Bhavanisagar Dam, which serves as a key infrastructure for irrigation and hydropower generation in the basin.
Noyyal River	Right	Originally known as Kanchinadi, the river was later renamed after the locality where it joins the Cauvery River. It originates in the Vellingiri Hills of the Western Ghats in Tamil Nadu and flows for approximately 173 km before merging with the Cauvery River at Kodumudi in Erode district. The confluence is located near the village of Noyyal, from which the river derives its present name. Historically, the Noyyal River sustained a network of 32 interconnected tanks that captured and stored its seasonal flows, playing a vital role in irrigation, groundwater recharge, and water resource management in the basin.
Amaravathi River	Right	Amaravathi River, also known as Pournami, is a 175 km long tributary that originates at the Kerala-Tamil Nadu border in the foothills of the Manjampatti Valley, situated between the Annamalai Hills and the Palni Hills within the Indira Gandhi Wildlife Sanctuary and National Park. Flowing northward, it passes through the Amaravathi Reservoir and the Amaravathi Dam at Amaravathinagar before traversing the plains of Tamil Nadu. The river plays a vital role in supporting agriculture, particularly in the Erode district. However, the Amaravathi River and its basin, especially around Karur, are extensively utilized for industrial water supply and wastewater disposal. Consequently, the river has experienced severe pollution, primarily due to the discharge of untreated effluents from numerous textile dyeing and bleaching industries.

Kodavanar River	Right	Originating in the Palni Hills of Tamil Nadu, the Kodavanar River is a hill stream and a significant tributary of the Amaravati River.
Moyar River	Right	Moyar River originates near the small settlement of Mayar, situated off the Masinagudi-Ooty Road in the Nilgiri Hills. It forms a natural boundary between the states of Karnataka and Tamil Nadu while separating the forests of Bandipur National Park in the north from the Mudumalai Wildlife Sanctuary in the south. Flowing eastward through a deep gorge, the river eventually joins the Bhavani River at the Bhavanisagar Reservoir on the plains of Tamil Nadu, near Sathyamangalam.

2.4. Biogeography

The CRB represents a complex biogeographic transition zone encompassing diverse ecological regions, climatic gradients, and evolutionary histories. It spans from the Western Ghats biodiversity hotspot to the Deccan Plateau and further into the Eastern Coastal Plains, creating pronounced spatial heterogeneity in biological communities and ecosystem processes.

2.4.1. Biogeographic Provinces

The CRB spans multiple ecological zones across peninsular India, reflecting strong gradients in climate, geomorphology, and biodiversity patterns.

2.4.1.1. Western Ghats Province (Malabar Biogeographic Zone)

The upper catchment of the CRB, including Kodagu and Wayanad, lies within the Western Ghats, a globally recognized biodiversity hotspot. This region exhibits high rainfall (>2000 mm), dense evergreen forests, and perennial river systems. The aquatic ecosystems support high levels of endemism, particularly among freshwater fishes and macroinvertebrates. Recent studies indicate that the CRB alone supports over 140 fish species across 50+ families, with a significant proportion being endemic to the Western Ghats (Pownkumar et al., 2022). Additionally, localized studies in tributaries (e.g., Kabini catchment) report high endemicity and presence of threatened species, emphasizing the conservation significance of headwater regions (Thampy et al., 2021).

2.4.1.2. Deccan Plateau (Semi-arid Zone)

The middle reaches of the basin, including Mandya, Bengaluru Rural, and interior Tamil Nadu, fall within the semi-arid Deccan Plateau. This region is characterized by moderate rainfall (~600–900 mm), seasonal flow regimes, and extensive anthropogenic modification. Hydrological alterations and land-use changes have significantly impacted ecological integrity, resulting in reduced biodiversity and increased dominance of tolerant species. Studies show that pollution, flow regulation, and habitat degradation have led to declining fish populations and altered assemblage structures in the Cauvery system (Vanham et al., 2011, Pownkumar et al., 2022).

2.4.1.3. Eastern Coastal Plains (Deltaic Zone)

The lower CRB forms a low-gradient alluvial delta before discharging into the Bay of Bengal. This region is dominated by depositional environments, fertile soils, and extensive irrigation networks. The transition from freshwater to estuarine conditions supports diverse aquatic communities, including plankton, estuarine fishes, and migratory species. Ecological studies highlight that species diversity peaks in transitional zones (e.g., Hogenakkal region) due to the convergence of upstream and downstream ecological characteristics (Roshith et al., 2022).

2.4.2. Longitudinal Ecological Gradients

The Cauvery River exhibits a clear upstream-downstream ecological gradient:

a) **Headwaters**
   High-gradient, well-oxygenated streams with endemic and sensitive taxa, particularly in Western Ghats tributaries.
b) **Mid-reaches**
   Transitional zones with moderate productivity and mixed ecological communities influenced by agriculture and regulation.
c) **Lower reaches**
   Nutrient-enriched conditions with higher biological productivity and dominance of tolerant taxa.

Recent basin-scale analyses confirm that species richness and assemblage structure vary significantly along the longitudinal gradient, influenced by hydrology, habitat heterogeneity, and anthropogenic stressors (Roshith et al., 2022).

2.4.3. Altitudinal and Climatic Influence

Elevation and monsoonal climate strongly influence ecological patterns:

- **High altitude (>1000 m)**

Supports endemic and specialized species in cool, oxygen-rich environments.

- **Mid altitude (300–1000 m)**

  Transitional ecosystems with mixed land use.

- **Low altitude (<300 m)**

  Warmer climates, reduced flow variability (due to regulation), and increased human pressure. Warmer, regulated systems with higher anthropogenic pressure.

Monsoon-driven hydrology governs seasonal discharge, sediment transport, and ecological processes such as spawning and productivity cycles in the basin (Pownkumar et al., 2022).

2.4.4. Aquatic Biodiversity Patterns

The CRB supports diverse trophic communities:

a) **Fish diversity**

   Over 146 species recorded, including endemic and threatened taxa (Pownkumar et al., 2022).

b) **Endemism**

   Up to 25% endemic species in certain stretches (e.g., Cauvery Wildlife Sanctuary) (Sreenivasan et al., 2021).

c) **Community variation**

   Assemblages differ significantly along environmental gradients and habitat conditions (Roshith et al., 2022).

Macroinvertebrates and plankton communities also show spatial variation linked to nutrient levels, flow conditions, and habitat quality.

2.4.5. Endemism and Conservation Significance

The CRB is a critical region for freshwater biodiversity conservation. Studies indicate:

a) Presence of critically endangered and endemic species in upper catchments (Thampy et al., 2021).

b) Basin-level importance for threatened freshwater biodiversity in India (Kulkarni, 2023).

However, biodiversity declines downstream due to pollution, habitat fragmentation, invasive species, and flow regulation.

2.4.6. Anthropogenic Influences on Biogeography

Human activities have significantly altered natural biogeographic patterns:

a) Pollution and urban discharge affecting water quality.
b) Flow regulation through dams altering ecological continuity.
c) Introduction of invasive species modifying native assemblages.

These pressures have resulted in declining fish diversity and ecological degradation in several stretches of the Cauvery River (Padmanabhan, 2023).

2.4.7. Implications for Biological Assessment

Understanding the CRB's biogeographic variability is essential for:

a) Designing stratified ecological sampling frameworks.
b) Developing region-specific biomonitoring indices.
c) Identifying reference conditions and conservation priorities.

Recent ecological studies emphasize the need for integrated basin-scale assessment approaches to effectively manage biodiversity and ecosystem health.

2.5. River Connectivity, Fragmentation, and Dam Density

2.5.1. River Connectivity

River connectivity in the CRB represents the multidimensional exchange of water, sediment, nutrients, energy, and biota across spatial and temporal scales, which is fundamental to maintaining ecological integrity and biodiversity (Grill et al., 2019; Harvey et al., 2019; Funk et al., 2023; Wohl, 2024). In a highly regulated basin like the Cauvery, connectivity must be understood through four primary dimensions: longitudinal, lateral, vertical, and temporal.

2.5.1.1. Longitudinal Connectivity (Upstream–Downstream Continuum)

Longitudinal connectivity defines the continuous upstream-downstream linkage that facilitates the transport of materials and movement of aquatic organisms. In its natural state, the Cauvery River functioned as a continuous ecological gradient from the Western Ghats to the Bay of Bengal, supporting migratory fish (e.g., *Tor* spp.), organic matter transformation, and progressive ecological transitions as described by the River Continuum Concept (Vannote et al., 1980).

At present, major reservoirs such as Krishnarajasagar (KRS), Kabini, Hemavathi, Harangi, and Mettur have fragmented this continuum into discrete segments. These structures significantly:

- Interrupt sediment transport, leading to upstream deposition and downstream sediment deficit.
- Alter thermal regimes and dissolved oxygen dynamics.
- Obstruct migratory pathways, affecting reproduction and genetic exchange.

Such fragmentation results in the conversion of lotic systems into lentic environments, causing a decline in rheophilic species and increasing dominance of tolerant and invasive taxa (Grill et al., 2019; Couto & Olden, 2018).

2.5.1.2. Lateral Connectivity (River–Floodplain Interaction)

Lateral connectivity refers to exchanges between the river channel and adjacent floodplains, wetlands, and riparian zones. Under natural conditions, seasonal flooding in the CRB enabled nutrient exchange, groundwater recharge, floodplain wetland formation, and fish spawning habitats.

Currently, floodplains-especially in the middle and lower basin-have been extensively modified due to agriculture, urbanization, and embankments, reducing overbank flooding. Flow regulation by dams further limits flood pulses.

This has led to:

- Loss of floodplain wetlands and associated biodiversity
- Reduced fisheries productivity
- Disruption of nutrient cycling and carbon exchange

Such impacts are consistent with global observations of floodplain disconnection in regulated rivers (Ward et al., 1999).

2.5.1.3. Vertical Connectivity (Surface Water–Groundwater Interaction)

Vertical connectivity describes the interaction between surface water and groundwater systems through the hyporheic zone. In alluvial stretches of the Cauvery delta, active exchange between river water and shallow aquifers historically supported ecological and biogeochemical processes.

However, excessive groundwater abstraction and channel modification have:

- Lowered groundwater tables.
- Reduced baseflow contributions.

- Limited hyporheic exchange due to sediment compaction.

This results in degradation of macroinvertebrate habitats, reduced pollutant buffering capacity, and altered thermal regimes (Wohl et al., 2024).

2.5.1.4. Temporal Connectivity (Flow Variability Over Time)

Temporal connectivity reflects natural flow variability driven by Southwest and Northeast monsoons, characterized by seasonal flood pulses and low-flow periods. These fluctuations regulate sediment transport, habitat availability, and biological processes such as fish spawning.

Flow regulation by reservoirs has:

- Dampened natural variability
- Altered timing and magnitude of peak flows
- Reduced frequency of flood pulses

Consequently, ecological processes dependent on flow cues are disrupted, reducing resilience to climatic variability (Chilton et al., 2021).

2.5.1.5. Connectivity in Tributary Networks

Tributaries play a critical role in maintaining basin-scale connectivity. Western Ghats tributaries (e.g., Kabini, Hemavathi) act as biodiversity refugia with relatively intact connectivity, whereas plateau and urban tributaries (e.g., Arkavathi, Vrishabhavathi) are highly fragmented due to check dams, pollution, and infrastructure barriers. This disruption weakens tributary–mainstem linkages, reducing ecological redundancy and limiting recolonization following disturbances (Grill et al., 2019).

2.5.1.6. Connectivity–Fragmentation Gradient in the CRB

The CRB exhibits a pronounced spatial gradient in river connectivity, reflecting increasing anthropogenic pressures from upstream to downstream. The upper reaches, particularly within the Western Ghats, maintain relatively higher connectivity and ecological integrity, although major reservoirs introduce localized fragmentation. In the middle reaches, connectivity is moderately disrupted due to irrigation infrastructure, urban expansion, and channel modifications, while the lower reaches and deltaic regions are highly regulated, characterized by intensive flow control, altered sediment regimes, and significant floodplain disconnection. This gradient is consistent with global observations showing that dam construction and water regulation progressively reduce river connectivity and transform natural river systems into fragmented segments (Grill et al., 2019; Wohl et al., 2024).

2.5.1.7. Implications for Biological Integrity

The progressive loss of connectivity in the CRB has significant ecological consequences for biological communities. Fragmentation disrupts migratory pathways and life-cycle processes, leading to declines in endemic and rheophilic species. A clear shift in community structure is observed, with sensitive taxa such as Ephemeroptera, Plecoptera, and Trichoptera (EPT) being replaced by more tolerant groups such as *Chironomidae* and *Oligochaeta*. Additionally, reduced habitat connectivity limits gene flow and ecosystem resilience, increasing vulnerability to environmental disturbances and promoting the spread of invasive species. These patterns are widely documented in regulated river systems, where connectivity loss directly affects biodiversity and ecological functioning (Couto & Olden, 2018; Dudgeon et al., 2019).

2.5.1.8. Relevance for Basin Management

Understanding connectivity–fragmentation dynamics is critical for effective river basin management and ecological restoration in the CRB. It provides a scientific basis for designing environmental flow (e-flow) regimes that restore aspects of natural hydrological variability and sustain ecological processes. Identifying priority stretches for restoration, implementing fish passage systems, and enhancing river–floodplain connectivity are key management strategies. Furthermore, integrating geospatial approaches such as GIS-based connectivity modelling and fragmentation indices can significantly improve decision-making and basin-scale planning. Such integrated approaches are essential for balancing water resource development with biodiversity conservation in highly regulated river systems (Chilton et al., 2021; Grill et al., 2019).

2.5.2. River fragmentation

River fragmentation in the CRB refers to the disruption of natural hydrological and ecological continuity caused by dams, barrages, anicuts, and other anthropogenic modifications. It is a major driver of ecological degradation in the basin, influencing biodiversity, sediment dynamics, and ecosystem functioning (Vörösmarty et al., 2010; Jain et al., 2020).

2.5.2.1. Concept of River Fragmentation

Fragmentation occurs when a continuous river system is divided into discrete segments by physical barriers, interrupting hydrological flow, sediment transport, nutrient fluxes, and biological movement. In the CRB, fragmentation extends across both the main stem and tributary networks, resulting in a highly regulated river system influenced by irrigation infrastructure and reservoir operations (Jain et al., 2020).

2.5.2.2. Types of Fragmentation in the CRB

a) Longitudinal Fragmentation

- Caused by major reservoirs such as KRS, Kabini, Hemavathi, Harangi, and Mettur
- Divides the river into isolated segments
- Converts natural lotic conditions into lentic systems (Ramasamy et al., 2006)

b) Lateral Fragmentation

- Due to embankments, levees, and floodplain encroachments
- Disconnects the river from wetlands and floodplains
- Prominent in deltaic and agricultural regions (Pownkumar et al., 2022)

c) Vertical Fragmentation

- Caused by groundwater over-extraction and riverbed alterations
- Reduces hyporheic exchange and baseflow contributions (CGWB, 2021)

d) Network Fragmentation

- Occurs due to independent fragmentation of tributaries
- Significant in urban systems such as Arkavathi and Vrishabhavathi (Lele et al., 2013)

2.5.2.3. Major Drivers of Fragmentation

River fragmentation in the CRB is driven by a combination of large reservoirs, dense tank/check-dam networks, urban–industrial pressures, and channel/sediment alterations. Major dams on the main stem and key tributaries, Krishnarajasagar (KRS), Kabini, Hemavathi (Gorur), Harangi, and Mettur (Stanley Reservoir), substantially modify natural flow regimes, interrupt sediment transport, and obstruct fish migration. In addition, the basin contains thousands of small tanks and diversion structures, especially across the Deccan Plateau, which cumulatively reduce downstream flows and alter seasonality. Urban and industrial discharges affect tributaries such as Arkavathi and Noyyal, while sand mining and channel modification further destabilize river morphology and habitats (CWC, 2017; Pownkumar et al., 2022; Jain, 2020).

2.5.2.4. Spatial Pattern of Fragmentation

Fragmentation in the CRB follows a clear upstream–downstream gradient. The upper reaches (Western Ghats: Kodagu, Wayanad) retain relatively higher ecological integrity, although interrupted by reservoirs on Kabini, Hemavathi, and Harangi. The middle reaches (Karnataka plateau) are highly fragmented due to irrigation networks, reservoirs, and tank systems, resulting in regulated and seasonally altered flows. The lower reaches and delta (Tamil Nadu) are extensively modified by barrages (e.g., Grand Anicut/Kallanai) and distributary systems, leading to strong hydrological regulation and floodplain disconnection. This gradient reflects increasing human intervention and water abstraction downstream (Ramasamy et al., 2006; CWC, 2017).

2.5.2.5. Ecological Impacts of Fragmentation

Fragmentation has significant ecological consequences across the basin. Aquatic biodiversity declines due to obstruction of migratory pathways, particularly affecting species such as Tor khudree (mahseer). Habitat transformation occurs through conversion of lotic reaches into lentic reservoirs, resulting in the loss of riffle–pool sequences and reduced habitat heterogeneity. Reservoirs trap sediments, causing downstream sediment deficits, channel incision, and impacts on delta stability. Water quality changes are also evident, with increased residence time in reservoirs promoting eutrophication and thermal stratification, while downstream reaches experience reduced self-purification capacity. These changes alter trophic dynamics, shifting systems from detritus-based to more algae-dominated regimes, influencing macroinvertebrate and plankton communities (Dudgeon et al., 2019; Ramasamy et al., 2006).

2.5.2.6. Fragmentation Metrics and Assessment Approaches

Fragmentation in the CRB can be quantified using indices such as the Dendritic Connectivity Index (DCI), Barrier Density, Degree of Regulation (DoR), Fragment Length Distribution (FLD), and River Fragmentation Index (RFI). These metrics can be integrated with geospatial techniques, including DEM-based river network extraction (e.g., SRTM/ASTER), remote sensing–based barrier mapping, and GIS-based connectivity modelling. Basin-scale assessments in India increasingly combine hydrological data with spatial analysis to evaluate connectivity loss and its ecological implications (Jain, 2020; CWC, 2017).

2.5.2.7. Tributary Fragmentation

Tributaries across the CRB show heterogeneous fragmentation patterns. Western Ghats tributaries such as Kabini, Hemavathi, and Harangi retain relatively higher ecological value but are fragmented by major reservoirs. Plateau tributaries (e.g., Shimsha, Arkavathi) are heavily modified due to irrigation systems and reduced baseflows, while industrially influenced tributaries such as Noyyal exhibit severe ecological degradation. In the delta, distributary networks are highly regulated for irrigation. This widespread tributary fragmentation reduces basin-scale resilience and limits recolonization potential following disturbances (Vaidyanathan, 2007; Jain, 2020).

2.5.2.8. Implications for Biological Assessment

Fragmentation strongly influences biomonitoring outcomes in the CRB. Reduced connectivity leads to declines in sensitive macroinvertebrate taxa (EPT) and increases in tolerant groups such as Chironomidae and Oligochaeta. Fish assemblages show reduced diversity and loss of migratory species, affecting ecological indices such as the Index of Biotic Integrity (IBI). Additionally, fragmentation disrupts natural longitudinal gradients, complicating the interpretation of ecological status across the basin (Dudgeon et al., 2019).

2.5.2.9. Management and Restoration Considerations

Addressing fragmentation in the CRB requires integrated, basin-scale strategies. Key measures include implementing environmental flows (e-flows) to restore natural hydrological variability, developing fish passage systems at major dams, and prioritizing barriers for modification or removal. Restoration of floodplain connectivity and riparian zones is essential for improving ecosystem productivity. Advanced tools such as GIS-based connectivity modelling and machine learning approaches can support decision-making and optimize restoration planning. Given the competing demands of irrigation, hydropower, and urban water supply, sustainable management must balance ecological integrity with socio-economic needs (CWC, 2017; Jain, 2020).

2.5.3. Dam density

Dam density is a critical indicator of hydrological regulation and river fragmentation, defined as the number of dams or hydraulic structures per unit river length or basin area. In the CRB, dam density is among the highest in peninsular India, reflecting intense water resource development for irrigation, hydropower, and urban supply.

2.5.3.1. Concept and Definition

Dam density serves as an important measure of the extent to which a river system is modified by human-made hydraulic infrastructure, reflecting the intensity of flow regulation and structural interruptions within the basin. It can be evaluated through different approaches depending on spatial scale, such as the number of dams per unit river length, per unit basin area, or by considering overall barrier intensity that includes both major reservoirs and smaller structures like check dams, anicuts, and traditional tanks (Jain, 2020; CWC, 2017). In the CRB, such an integrated perspective is essential because the widespread presence of small-scale water control systems, in addition to large dams, collectively exerts a significant influence on hydrological processes and connectivity (Vaidyanathan, 2007).

Available basin-scale information indicates that the CRB contains approximately 90–100 major dams, supplemented by numerous barrages and an extensive network of traditional tanks exceeding 30,000 in number (CWC, 2017; India Water Portal, 2022). Considering a river length of about 800 km, the density of major dams is approximately 0.1–0.12 dams/km², while at the basin scale it is around 0.001 dams/km² based on a total basin area of ~ 85,220.39 km². When smaller hydraulic structures are included, the overall barrier intensity increases substantially, highlighting the cumulative impact of distributed interventions across the basin. This high level of structural regulation underscores the altered hydrological regime and reduced ecological connectivity characteristic of the Cauvery system.

2.5.3.2. Spatial Distribution of Dam Density

Dam density in the CRB exhibits significant spatial variability driven by topography, rainfall patterns, and water resource development strategies. In the upper catchment (Western Ghats region), dam density is moderate to high, dominated by major reservoirs such as Harangi, Hemavathi, and Kabini, which are strategically located in high rainfall zones to maximize water storage and regulate downstream flows. Despite a relatively lower number of structures compared to downstream regions, their large storage capacities result in substantial hydrological and ecological impacts. The middle basin (Deccan Plateau) shows very high effective dam density due to the widespread presence of medium irrigation projects, check dams, and extensive traditional tank systems, particularly in sub-basins such as Shimsha and Arkavathi. This region represents a hotspot of cumulative fragmentation and flow regulation. In the lower basin and delta (Tamil Nadu), dam density is characterized by numerous barrages, diversion structures, and canal networks (e.g., Grand Anicut/Kallanai system), designed primarily for irrigation distribution rather than storage. This results in intensive flow diversion, altered sediment transport, and reduced connectivity between the river and its floodplain. The spatial pattern reflects increasing anthropogenic modification from upstream to downstream and highlights the cumulative impact of multi-scale water infrastructure across the basin (Ramasamy et al., 2006; Vaidyanathan, 2007; CWC, 2017).

2.5.3.3. Typology of Structures Contributing to Dam Density

Dam density in the CRB is influenced by a diverse range of hydraulic structures operating at different spatial scales. Large dams such as Krishnarajasagar (KRS), Kabini, Hemavathi, Harangi, and Mettur play a dominant role in regulating basin-scale hydrology by altering flow regimes and trapping sediments. In addition, medium and minor irrigation dams are widely distributed across sub-basins, particularly in Karnataka and Tamil Nadu, contributing to cumulative hydrological alterations. A defining feature of the basin is the extensive presence of check dams, anicuts, and diversion structures, especially in semi-arid plateau regions, which significantly modify local flow dynamics. Furthermore, the traditional tank irrigation systems, numbering in the thousands across the basin, historically supported water management but now contribute to fragmentation and interruption of natural flow continuity (CWC, 2017; Vaidyanathan, 2007).

2.5.3.4. Hydrological Implications of High Dam Density

High dam density in the CRB has led to substantial modifications in hydrological processes. Flow regulation by reservoirs reduces natural variability, altering seasonal discharge patterns and increasing dependence on regulated releases. Flood peaks are attenuated due to storage and controlled releases, resulting in reduced downstream floodplain inundation. Additionally, large-scale water diversion for irrigation and urban supply significantly reduces downstream water availability, particularly during dry seasons. Studies on dam-induced hydrological alterations in the CRB confirm that multiple reservoirs operating in series have significantly modified natural flow regimes and timing of discharge.

2.5.3.5. Sediment and Geomorphological Impacts

Reservoirs in the CRB act as major sediment traps, reducing sediment supply to downstream reaches. This sediment deficit leads to channel incision, bank instability, and loss of geomorphic features such as bars and riffles. In the lower basin and delta regions, reduced sediment delivery has been linked to delta shrinkage and coastal vulnerability. The cumulative effect of upstream dams has altered the natural sediment balance, impacting both river morphology and coastal processes (Ramasamy et al., 2006). Such geomorphological changes are widely observed in regulated river systems where sediment continuity is disrupted.

2.5.3.6. Ecological Consequences

High dam density significantly affects ecological integrity in the CRB. Barriers restrict fish migration and dispersal, particularly impacting species such as mahseer (*Tor* spp.), which depend on longitudinal connectivity for reproduction. Habitat transformation is evident as flowing riverine systems are converted into reservoir ecosystems, favouring lentic-adapted species over native rheophilic fauna. Additionally, increased water residence time in reservoirs promotes eutrophication, algal blooms, and thermal stratification, which can alter downstream water temperature and dissolved oxygen regimes. These ecological shifts have been documented in Cauvery systems where flow regulation and habitat modification influence aquatic biodiversity (India Water Portal, 2022).

2.5.3.7. Cumulative Impact and Threshold Effects

The cumulative impact of dam density in the CRB is more significant than the effect of individual structures. The presence of multiple dams and small barriers in series creates cascading regulation effects, where flow, sediment, and ecological processes are progressively altered along the river continuum. Even small structures, when densely distributed, can severely disrupt connectivity and reduce ecological resilience. Research indicates that increasing dam density in river basins leads to substantial alterations in hydrological regimes and associated ecosystem services. Beyond a certain threshold, river systems may lose functional connectivity, resulting in sharp declines in ecological integrity.

2.5.3.8. Quantification and Assessment Methods

Dam density in the CRB can be effectively quantified using geospatial and hydrological approaches. Data from national sources such as the Central Water Commission (CWC) and basin-scale datasets can be integrated with remote sensing to map both large and small barriers. Methodologically, this involves digitizing hydraulic structures, extracting river networks using DEMs (e.g., SRTM), and calculating metrics such as dams per unit river length or basin area. Advanced approaches include kernel density mapping, graph theory-based network analysis, and integration with connectivity indices (e.g., DCI). These methods enable spatial identification of fragmentation hotspots and support basin-scale planning (CWC, 2017; Jain, 2020).

2.5.3.9. Dam Density in Tributaries

Tributaries in the CRB often exhibit higher effective dam density than the main river due to the widespread presence of small irrigation structures. Western Ghats tributaries such as Kabini and Hemavathi, although regulated by major reservoirs, still retain ecological importance. In contrast, plateau tributaries (e.g., Shimsha, Arkavathi) and deltaic distributaries are heavily modified by tanks, check dams, and diversion systems. This results in reduced tributary contributions to the main river, loss of ecological connectivity, and decreased basin-scale resilience (CWC, 2017).

2.5.3.10. Implications for Basin Management

Managing high dam density in the CRB requires an integrated and basin-scale approach. Identifying critical fragmentation hotspots and prioritizing barriers for modification or removal are essential steps. Implementation of environmental flows (e-flows) can help restore aspects of natural hydrological variability. Enhancing tributary connectivity, improving sediment management, and restoring floodplain interactions are also key strategies. Advanced tools such as GIS-based modelling and machine learning approaches can further support decision-making and optimize sustainable water resource management in the basin (Jain, 2020).

2.5.3.11. Relevance to Biological Assessment

Dam density has direct implications for biological assessment in the CRB. Increased fragmentation and flow regulation lead to reduced species richness, altered fish assemblages, and shifts toward pollution-tolerant taxa. Macroinvertebrate communities show a decline in sensitive groups (e.g., EPT taxa), affecting biomonitoring indices such as the Index of Biotic Integrity (IBI). Furthermore, disruption of natural ecological gradients complicates the interpretation of biological indicators, emphasizing the need to incorporate hydrological and connectivity metrics in ecological assessments.

2.6. River Space

River space refers to the physical and functional area occupied by a river system, including the active channel, floodplains, riparian corridors, and associated wetlands. It represents the spatial domain within which hydrological, geomorphological, and ecological processes operate, such as flow conveyance, sediment transport, nutrient exchange, and habitat provision. In regulated river basins, river space is increasingly constrained due to human interventions, affecting ecosystem functioning and resilience (Ward et al., 2020; Wohl et al., 2024).

In the CRB, river space exhibits clear spatial variability along the longitudinal gradient. The upper reaches, particularly in the Western Ghats (Kodagu and adjoining regions), are characterized by confined river channels with limited floodplain development due to steep slopes and resistant geological formations. In the middle reaches across the Deccan Plateau, the river transitions into moderately sloping terrain, where floodplains are better developed and support agricultural activities, although they are increasingly modified by irrigation infrastructure and settlements. The lower reaches and deltaic regions in Tamil Nadu are characterized by extensive alluvial floodplains, distributary networks, and wetlands, which play a crucial role in supporting intensive agriculture and sustaining estuarine ecosystems (Ramasamy et al., 2006; CWC, 2017).

However, river space in the CRB has been significantly reduced due to encroachment, land-use change, and infrastructure development, including urban expansion, embankments, and canal systems. Floodplain encroachment and channel modification have limited lateral connectivity, reduced natural inundation processes, and degraded riparian habitats. These alterations have led to a decline in habitat availability, disruption of ecological processes, and increased vulnerability to floods and environmental stress. Similar patterns of river space reduction and ecological degradation have been documented in regulated river systems worldwide, emphasizing the need for integrated river–floodplain management (Vaidyanathan, 2007; Wohl et al., 2024).

2.7. River Zonation

The CRB exhibits a well-defined longitudinal zonation driven by variations in topography, hydrology, and land-use patterns, consistent with the River Continuum Concept (Vannote et al., 1980; Jain, 2020). The headwater zone, located in the Western Ghats (Kodagu region), is characterized by steep gradients, low temperatures, and well-oxygenated waters that support high biodiversity, including endemic and rheophilic species adapted to fast-flowing conditions (Nalina et al., 2025). Downstream, the transitional zone across the Deccan Plateau shows moderate slopes and flow velocities, with increasing nutrient inputs and anthropogenic influences due to agriculture, reservoirs, and urbanization; this results in mixed aquatic communities comprising both sensitive and tolerant taxa (CWC, 2017; Vaidyanathan, 2007). Further downstream, the floodplain zone in the lower basin is marked by low gradients, reduced flow velocities, and historically strong lateral connectivity, supporting fertile alluvial soils, wetlands, and high primary productivity; however, flow regulation and floodplain modification have altered natural inundation dynamics (Ramasamy et al., 2006). Finally, the delta and estuarine zone near the Bay of Bengal is influenced by tidal processes and saline intrusion, supporting brackish ecosystems and diverse estuarine biota, though increasingly impacted by reduced sediment supply and upstream flow regulation (Jain, 2020; Ramasamy et al., 2006). These zones collectively represent a continuum of ecological conditions, each contributing uniquely to basin-scale biodiversity, ecosystem functioning, and resource utilization.

3. Biological diversity of the river

The Cauvery River supports diverse biological communities across its longitudinal gradient and over time. The data derived from multiple studies conducted at different locations and periods shows the spatio-temporal heterogeneity and variability of the river ecosystem. Variations in hydrological regimes, nutrient levels, anthropogenic activities, and habitat conditions collectively influence the distribution of flora and fauna. The presence–absence patterns from various studies provide insight into ecological stability, species adaptability, and emerging shifts due to environmental changes. Moreover, they also provide an indication of the introduction of exotic species.

3.1. Cauvery River

3.1.1. Flora

The floral composition of the Cauvery River includes microscopic primary producers and higher vegetation associated with riverbanks and floodplains. These groups form the base of the aquatic food web and play significant role in shaping habitats and nutrient cycling.

3.1.1.1. Phytoplankton

Phytoplankton diversity in the Cauvery River is primarily represented by members of *Chlorophyceae, Cyanophyceae, Euglenophyceae, Fragilariophyceae, Mediophyceae, Trebouxiophyceae,* and *Zygnematophyceae*. The available data indicates a clear dominance of green algae (Chlorophyceae) and cyanobacteria (Cyanophyceae) with species like *Actinastrum aciculare, Ankistrodesmus falcatus*, *Askenasyella chlamydopus, Chlorococcum* sp., *Aphanothece* sp., and *Anabaena* sp. (Uthirasamy et al., 2021a). Venkatachalapathy and Karthikeyan (2013) in contrast reports the presence of taxa belonging to *Fragilariophyceae* and *Mediophyceae* with species like *Aulacoseira granulate, Ctenophora pulchella* and *Cyclotella* spp., suggesting the shift in phytoplankton composition. This variation underlines the spatial and temporal heterogeneity in phytoplankton distribution along the river. Further, the presence of *Euglena* spp. (Euglenophyceae) and *Closterium* spp. (Zygnematophyceae) reflect ecological variability associated with organic enrichment and changing water quality conditions (Delgado-Fernández et al., 2025). Additionally, absence of several taxa in one study and their presence in another suggests localized environmental differences, seasonal fluctuations/variations in sampling conditions. Table 2 provide the comprehensive overview of different phytoplankton recorded in Cauvery River.

Table 2. Phytoplankton diversity observed in Cauvery River

Class (Taxa)	Family	Species	Venkatachalapathy and Karthikeyan, 2013	Uthirasamy et al., 2021a
Chlorophyceae	*Scenedesmaceae*	*Actinastrum aciculare*	-	+
Chlorophyceae	*Selenastraceae*	*Ankistrodesmus falcatus*	-	+
Chlorophyceae	*Oocystaceae*	*Askenasyella chlamydopus*	-	+
Chlorophyceae	*Chlorococcaceae*	*Chlorococcum sp.*	-	+
Chlorophyceae	*Oocystaceae*	*Elakatothrix gelatinosa*	-	+
Cyanophyceae	*Nostocaceae*	*Anabaena sp.*	-	+
Cyanophyceae	*Aphanothecaceae*	*Aphanothece flos-aquae*	-	+
Cyanophyceae	*Aphanothecaceae*	*Aphanothece sp.*	-	+
Euglenophyceae	*Euglenaceae*	*Euglena spp.*	-	+
Fragilariophyceae	*Fragilariaceae*	*Asterionella formosa*	-	+
Fragilariophyceae	*Fragilariaceae*	*Ctenophora pulchella*	+	-
Mediophyceae	*Aulacoseiraceae*	*Aulacoseira granulata*	+	-
Mediophyceae	*Stephanodiscaceae*	*Cyclotella spp.*	+	-
Trebouxiophyceae	*Chlorellaceae*	*Chlorella vulgaris*	-	+
Zygnematophyceae	*Closteriaceae*	*Closterium spp.*	-	+

+: present; -: absent

3.1.1.2. Periphyton

Periphyton communities in the Cauvery River primarily consist of benthic and attached algae. Diatoms belonging to class *Bacillariophyceae* and *Fragilariophyceae* are dominantly found, followed by green algae (*Chlorophyceae, Ulvophyceae*) and cyanobacteria (*Cyanophyceae*). The data collected reveals a diverse periphytic community with common genera like *Achnanthes, Achnanthidium, Amphora, Caloneis, Cymbella, Eunotia, Gomphonema*, and *Fragilaria*, which are well-known indicators of substrate-associated growth in flowing water systems. Venkatachalapathy and Karthikeyan (2013) reported the higher abundance of diatom-rich taxa like *Achnanthes brevipes, Achnanthidium minutissimum, Amphora ovalis, Cymbella* spp., *Eunotia* spp., and *Gomphonema* spp., indicating the presence of favourable environmental conditions such as stable substrates and moderate flow regimes for proliferation of attached diatoms. Whereas, Uthirasamy et al. (2021a) reported the presence of taxa such as *Cladophora glomerata, Characium gracilipes, Gloeocapsa* sp., and *Frustulia rhomboides*, indicating the presence of mixed periphytic community along with filamentous algae and cyanobacteria.

The dominance of low-profile and attached diatoms (e.g., *Achnanthidium, Cocconeis, Gomphonema*) highlights their adaptation to shear stress and flowing water conditions. The attached diatoms demonstrate a strong ability to adhere to substrates which provides them with the ecological advantage (González-Paz et al., 2022). Additionally, the presence of filamentous forms such as *Cladophora* suggests localized nutrient enrichment and habitat heterogeneity. The available dataset exhibits the environmental and temporal influence on the periphyton diversity (Michalak and Messyasz, 2021). Further, the presence of certain taxa in one study and their absence in another suggests seasonal variability, differences in flow dynamics, and site-specific physicochemical conditions. For instance, the occurence of *Fragilaria* and *Diatoma* species, which can exhibit tychoplanktonic behaviour indicates possible resuspension during high-flow events (Zelnik et al., 2018). Table 3 provide the comprehensive overview of different periphyton recorded in Cauvery River.

Table 3. Periphyton diversity observed in Cauvery River

Class (Taxa)	**Family**	**Species**	**Venkatachalapathy and Karthikeyan, 2013**	**Uthirasamy et al., 2021a**
Bacillariophyceae	*Achnanthaceae*	*Achnanthes brevipes*	+	-
Bacillariophyceae	*Achnanthaceae*	*Achnanthes inflata*	+	-
Bacillariophyceae	*Achnanthidiaceae*	*Achnanthidium binodis*	+	-
Bacillariophyceae	*Achnanthidiaceae*	*Achnanthidium minutissimum*	+	-
Bacillariophyceae	*Amphoraceae*	*Amphora holsatica*	+	-
Bacillariophyceae	*Amphoraceae*	*Amphora ovalis*	+	-
Bacillariophyceae	*Anomoeoneidaceae*	*Anomoeoneis sphaerophora*	+	-
Bacillariophyceae	*Naviculaceae*	*Caloneis pulchra*	+	-
Bacillariophyceae	*Naviculaceae*	*Caloneis silicula*	+	-
Bacillariophyceae	*Cocconeidaceae*	*Cocconeis diminuta*	-	+
Bacillariophyceae	*Cocconeidaceae*	*Cocconeis placentula*	+	-
Bacillariophyceae	*Cymbellaceae*	*Cymbella aspera*	+	-
Bacillariophyceae	*Cymbellaceae*	*Cymbella cymbiformis*	+	-
Bacillariophyceae	*Cymbellaceae*	*Cymbella lanceolata*	+	-
Bacillariophyceae	*Cymbellaceae*	*Cymbella tumida*	+	-

Bacillariophyceae	*Cymbellaceae*	*Cymbella tumidula*	+	-
Bacillariophyceae	*Cymbellaceae*	*Cymbella turgida*	+	-
Bacillariophyceae	*Cymbellaceae*	*Cymbella ventricosa*	+	-
Bacillariophyceae	*Eunotiaceae*	*Eunotia curvata*	+	-
Bacillariophyceae	*Eunotiaceae*	*Eunotia fallax*	+	-
Bacillariophyceae	*Eunotiaceae*	*Eunotia pectinalis*	+	-
Bacillariophyceae	*Amphipleuraceae*	*Frustulia rhomboides*	-	+
Bacillariophyceae	*Gomphonemataceae*	*Gomphonema acuminatum*	-	+
Bacillariophyceae	*Gomphonemataceae*	*Gomphonema affine*	+	-
Bacillariophyceae	*Gomphonemataceae*	*Gomphonema clavatum*	+	-
Bacillariophyceae	*Gomphonemataceae*	*Gomphonema gracile*	+	-
Bacillariophyceae	*Gomphonemataceae*	*Gomphonema lanceolatum*	+	-
Bacillariophyceae	*Gomphonemataceae*	*Gomphonema olivaceum*	+	-
Bacillariophyceae	*Gomphonemataceae*	*Gomphonema parvulum*	+	-
Bacillariophyceae	*Gomphonemataceae*	*Gomphonema truncatum*	+	-

Charophyceae	*Characeae*	*Chara longifolia*	-	+
Chlorophyceae	*Characiaceae*	*Characium gracilipes*	-	+
Cyanophyceae	*Gloeocapsaceae*	*Gloeocapsa sp.*	-	+
Fragilariophyceae	*Fragilariaceae*	*Diatoma vulgare*	-	+
Fragilariophyceae	*Fragilariaceae*	*Fragilaria intermedia*	+	-
Fragilariophyceae	*Fragilariaceae*	*Fragilaria oceanica*	-	+
Ulvophyceae	*Ulotrichaceae*	*Characiosiphon rivularis*	-	+
Ulvophyceae	*Cladophoraceae*	*Cladophora glomerata*	-	+

+: present; -: absent

3.1.1.3. Riparian Vegetation

Riparian vegetation refers to plant communities growing along riverbanks and streams, forming a critical link between terrestrial and aquatic ecosystems. The collected data unveiled that the riparian zones have high plant diversity encompassing trees, shrubs, climbers, herbs, and ferns. This diversity reflects the dynamic environmental conditions like periodic flooding, soil moisture variability, and nutrient availability.

The vegetation was primarily composed of angiosperms belonging to diverse families like *Fabaceae, Euphorbiaceae, Rubiaceae, Asteraceae*, and *Lauraceae*, indicating a well-established and structurally complex riparian ecosystem (Sunil et al., 2010; 2019; Mani et al., 2020). Common tree species like *Terminalia arjuna, Syzygium cumini, Ficus benghalensis*, and *Mangifera indica* have been accorded as they play important role in canopy formation and stabilizing riverbanks. These species are known for their strong root systems that help in preventing soil erosion and maintaining integrity of the riverbank (Sunil et al., 2019; Shukla et al., 2025).

The understory vegetation includes shrubs and herbs like *Ageratum conyzoides*, *Centella asiatica*, *Euphorbia hirta*, and *Scoparia dulcis* which are well-known for growing in moist and disturbed habitats (Mani et al., 2020). The presence of climbers and lianas like *Cayratia, Smilax*, and *Tetrastigma* further indicates structural heterogeneity and ecological maturity of the riparian habitat (Mani et al., 2020). Additionally, the presence of ferns like *Adiantum, Pteris*, and *Cyclosorus* suggest humid and shaded conditions, which is the typical characteristic of riparian zones (Rekha and Krishnan, 2017). Aquatic and semi-aquatic plants like *Azolla pinnata, Monochoria vaginalis*, and *Nymphoides cristata* were also recorded, highlighting the transitional nature of riparian zones between aquatic and terrestrial environments. These species support nutrient cycling, productivity, and provide habitat for aquatic organisms (Mani et al., 2020). Variations in species composition in the dataset is likely due to anthropogenic activities, land-use changes, and seasonal water-flow fluctuations. Furthermore, the presence of invasive species like *Lantana camara* and *Parthenium hysterophorus* indicates ecological disturbance and highlights the need for proper management (Kohli et al., 2006). Table 4 provide the comprehensive list of different riparian vegetation recorded in Cauvery River and Fig. 3 present the Riparian Vegetation diversity in Cauvery River.


Abelmoschus moschatus


Abutilon indicum subsp. indicum


Actiniopteris radiata


Adiantum latifolium


Amorphophallus bulbifer


Ampelocissus latifolia


Ancistrocladus heyneanus


Anisochilus carnosus


Barleria courtallica


Begonia integrifolia


Bombax ceiba


Caesalpinia mimosoides


Callicarpa tomentosa


Carissa comgesta


Curcuma oligantha

Debregeasia longifolia

Dendrobium nutans

Desmodium heterocarpon

Dimocarpus longan

Diospyros sylvatica

Duranta repens

Endostemon viscosus

Entada pusaetha

Erythrina suberosa

Ficus exasperata

Ficus microcarpa

Firmiana colorata

Flacourtia indica

Ficus tinctoria subsp. gibbosa

Flacourtia montana


Girardinia diversifolia


Glochidion ellipticum


Gouania microcarpa


Gynura nitida


Haldina cordifolia


Gloriosa superba


Gmelina arborea


Gnetum ula


Haplanthodes nilgherrensis


Humboldtia brunonis


Impatiens dasysperma


Impatiens fasciculata


Justicia japonica


Lamprachaenium microcephalum


Malaxis versicolor


Mikania scandens


Naregamia alata


Osbeckia cupularis


Pavetta indica


Peperomia tetraphylla


Phyllanthus emblica


Plectranthus nilgherricus


Radermachera xylocarpa


Ruellia humilis


Satyrium nepalense

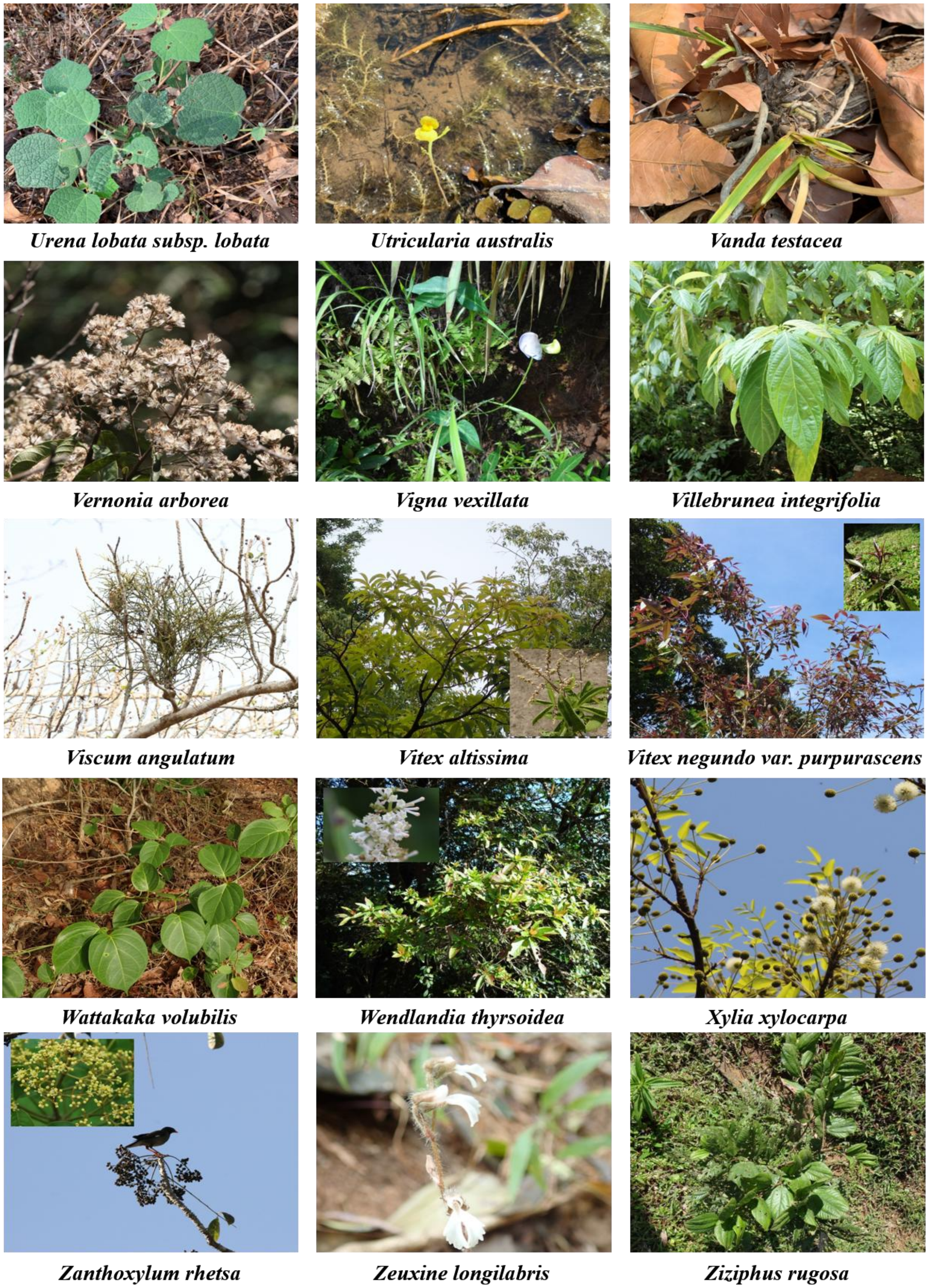

Selaginella delicatula


Sida rhomboidea


Solanum seaforthianum


Syzygium chavaran


Triumfetta pentandra



Urena lobata subsp. lobata | *Utricularia australis* | *Vanda testacea*

Vernonia arborea | *Vigna vexillata* | *Villebrunea integrifolia*

Viscum angulatum | *Vitex altissima* | *Vitex negundo var. purpurascens*

Wattakaka volubilis | *Wendlandia thyrsoidea* | *Xylia xylocarpa*

Zanthoxylum rhetsa | *Zeuxine longilabris* | *Ziziphus rugosa*

Fig. 3. Selective species photographs of riparian vegetation observed in Cauvery River (Image Source: Mani et al., 2020).

Table 4. Enlist of riparian vegetation observed across Cauvery River

Class (Taxa)	Family	Species	Sunil et al., 2010	Sunil et al., 2019	Mani et al., 2020
Cycadopsida	*Cycadaceae*	*Cycas circinalis*	-	-	+
Gnetopsida	*Gnetaceae*	*Gnetum ula*	-	-	+
Liliopsida	*Asparagaceae*	*Agave angustifolia*	-	-	+
Liliopsida	*Araceae*	*Amorphophallus bulbifer*	-	-	+
Liliopsida	*Aponogetonaceae*	*Aponogeton natans*	-	-	+
Liliopsida	*Arecaceae*	*Areca catechu*	+	-	-
Liliopsida	*Arecaceae*	*Arenga wightii*	-	-	+
Liliopsida	*Araceae*	*Arisaema tortuosum var. neglectum*	-	-	+
Liliopsida	*Asparagaceae*	*Asparagus gonoclados*	-	-	+
Liliopsida	*Asparagaceae*	*Asparagus racemosus*	-	-	+
Liliopsida	*Zingiberaceae*	*Boesenbergia tiliifolia*	-	-	+
Liliopsida	*Orchidaceae*	*Bulbophyllum mysorense*	-	-	+
Liliopsida	*Orchidaceae*	*Bulbophyllum sterile*	-	-	+
Liliopsida	*Arecaceae*	*Calamus metzianus*	-	-	+
Liliopsida	*Arecaceae*	*Caryota urens*	+	-	+
Liliopsida	*Poaceae*	*Centotheca latifolia*	-	-	+
Liliopsida	*Arecaceae*	*Cocos nucifera*	+	-	-

Liliopsida	*Orchidaceae*	*Coelogyne breviscapa*	-	-	+
Liliopsida	*Orchidaceae*	*Coelogyne nervosa*	-	-	+
Liliopsida	*Araceae*	*Colocasia affinis*	-	-	+
Liliopsida	*Araceae*	*Colocasia esculenta*	-	-	+
Liliopsida	*Commelinaceae*	*Commelina diffusa*	-	-	+
Liliopsida	*Commelinaceae*	*Commelina longifolia*	-	-	+
Liliopsida	*Orchidaceae*	*Cottonia peduncularis*	-	-	+
Liliopsida	*Hypoxidaceae*	*Curculigo orchioides*	-	-	+
Liliopsida	*Zingiberaceae*	*Curcuma oligantha*	-	-	+
Liliopsida	*Commelinaceae*	*Cyanotis cristata*	-	-	+
Liliopsida	*Commelinaceae*	*Cyanotis tuberosa*	-	-	+
Liliopsida	*Orchidaceae*	*Cymbidium aloifolium*	-	-	+
Liliopsida	*Orchidaceae*	*Dendrobium barbatulum*	-	-	+
Liliopsida	*Orchidaceae*	*Dendrobium herbaceum*	-	-	+
Liliopsida	*Orchidaceae*	*Dendrobium heterocarpum*	-	-	+
Liliopsida	*Orchidaceae*	*Dendrobium nodosum*	-	-	+
Liliopsida	*Orchidaceae*	*Dendrobium nutans*	-	-	+
Liliopsida	*Orchidaceae*	*Dendrobium ovatum*	-	-	+
Liliopsida	*Poaceae*	*Digitaria granularis*	-	-	+
Liliopsida	*Dioscoreaceae*	*Dioscorea bulbifera*	-	-	+

Liliopsida	*Dioscoreaceae*	*Dioscorea oppositifolia*	-	-	+
Liliopsida	*Asparagaceae*	*Dracaena fragrans*	-	-	+
Liliopsida	*Poaceae*	*Eleusine indica*	-	-	+
Liliopsida	*Poaceae*	*Eragrostis unioloides*	-	-	+
Liliopsida	*Orchidaceae*	*Eria exilis*	-	-	+
Liliopsida	*Eriocaulaceae*	*Eriocaulon cuspidatum*	-	-	+
Liliopsida	*Orchidaceae*	*Eulophia spectabilis*	-	-	+
Liliopsida	*Colchicaceae*	*Gloriosa superba*	-	-	+
Liliopsida	*Zingiberaceae*	*Hedychium coronarium*	-	-	+
Liliopsida	*Juncaceae*	*Juncus prismatocarpus*	-	-	+
Liliopsida	*Cyperaceae*	*Kyllinga bulbosa*	-	-	+
Liliopsida	*Cyperaceae*	*Kyllinga melanosperma*	-	-	+
Liliopsida	*Araceae*	*Lemna perpusilla*	-	-	+
Liliopsida	*Orchidaceae*	*Liparis viridiflora*	-	-	+
Liliopsida	*Orchidaceae*	*Malaxis versicolor.*	-	-	+
Liliopsida	*Pontederiaceae*	*Monochoria vaginalis*	-	-	+
Liliopsida	*Commelinaceae*	*Murdannia edulis*	-	-	+
Liliopsida	*Commelinaceae*	*Murdannia japonica*	-	-	+
Liliopsida	*Orchidaceae*	*Nervilia plicata*	-	-	+
Liliopsida	*Orchidaceae*	*Oberonia ensiformis*	-	-	+

Liliopsida	*Orchidaceae*	*Oberonia santapaui*	-	-	+
Liliopsida	*Asparagaceae*	*Ophiopogon intermedius*	-	-	+
Liliopsida	*Orchidaceae*	*Pholidota imbricata*	-	-	+
Liliopsida	*Arecaceae*	*Pritchardia grandis*	-	-	+
Liliopsida	*Araceae*	*Remusatia vivipara*	-	-	+
Liliopsida	*Orchidaceae*	*Satyrium nepalense*	-	-	+
Liliopsida	*Cyperaceae*	*Schoenoplectus mucronatus*	-	-	+
Liliopsida	*Marantaceae*	*Schumannianthus virgatus*	-	-	+
Liliopsida	*Asparagaceae*	*Scilla hyacinthina*	-	-	+
Liliopsida	*Smilacaceae*	*Smilax ovalifolia*	-	-	+
Liliopsida	*Smilacaceae*	*Smilax perfoliata*	-	-	+
Liliopsida	*Smilacaceae*	*Smilax wightii*	-	-	+
Liliopsida	*Smilacaceae*	*Smilax zeylanica*	-	-	+
Liliopsida	*Orchidaceae*	*Trias stocksii*	-	-	+
Liliopsida	*Orchidaceae*	*Vanda testacea*	-	-	+
Liliopsida	*Orchidaceae*	*Zeuxine longilabris*	-	-	+
Magnoliopsida	*Malvaceae*	*Abelmoschus moschatus*	-	-	+
Magnoliopsida	*Fabaceae*	*Abrus precatorius*	-	-	+
Magnoliopsida	*Malvaceae*	*Abutilon indicum* subsp. *indicum*	-	-	+
Magnoliopsida	*Fabaceae*	*Acacia catechu*	+	+	-

Magnoliopsida	*Fabaceae*	*Acacia chundra*	+	+	-
Magnoliopsida	*Fabaceae*	*Acacia ferruginea*	+	+	-
Magnoliopsida	*Fabaceae*	*Acacia leucophloea*	+	+	-
Magnoliopsida	*Fabaceae*	*Acacia megaladena*	-	-	+
Magnoliopsida	*Fabaceae*	*Acacia nilotica*	+	+	-
Magnoliopsida	*Fabaceae*	*Acacia polyacantha*	+	+	-
Magnoliopsida	*Amaranthaceae*	*Achyranthes aspera*	-	-	+
Magnoliopsida	*Fabaceae*	*Acrocarpus fraxinifolius*	-	-	+
Magnoliopsida	*Lauraceae*	*Actinodaphne angustifolia*	-	-	+
Magnoliopsida	*Lauraceae*	*Actinodaphne wightiana*	-	-	+
Magnoliopsida	*Rubiaceae*	*Adenoon indicum*	-	-	+
Magnoliopsida	*Asteraceae*	*Adenostemma lavenia*	-	-	+
Magnoliopsida	*Acanthaceae*	*Adhatoda vasica*	-	-	+
Magnoliopsida	*Rutaceae*	*Aegle marmelos*	+	+	-
Magnoliopsida	*Gesneriaceae*	*Aeschynanthus perrottetii*	-	-	+
Magnoliopsida	*Apocynaceae*	*Aganosma cymosa*	-	-	+
Magnoliopsida	*Asteraceae*	*Ageratum conyzoides*	-	-	+
Magnoliopsida	*Meliaceae*	*Aglaia elaeagnoidea*	-	-	+
Magnoliopsida	*Meliaceae*	*Aglaia perviridis*	-	-	+
Magnoliopsida	*Meliaceae*	*Aglaia simplicifolia*	-	-	+

Magnoliopsida	*Euphorbiaceae*	*Agrostistachys borneensis*	-	-	+
Magnoliopsida	*Euphorbiaceae*	*Agrostistachys indica*	-	-	+
Magnoliopsida	*Simaroubaceae*	*Ailanthus excelsa*	+	+	-
Magnoliopsida	*Cornaceae*	*Alangium hexapetalum*	+	-	-
Magnoliopsida	*Cornaceae*	*Alangium salviifolium*	+	+	-
Magnoliopsida	*Fabaceae*	*Albizia chinensis*	+	+	-
Magnoliopsida	*Fabaceae*	*Albizia lebbeck*	+	-	-
Magnoliopsida	*Fabaceae*	*Albizia odoratissima*	+	+	+
Magnoliopsida	*Sapindaceae*	*Allophylus cobbe*	-	-	+
Magnoliopsida	*Lauraceae*	*Alseodaphne semecarpifolia*	-	-	+
Magnoliopsida	*Amaranthaceae*	*Alternanthera ficoidea*	-	-	+
Magnoliopsida	*Amaranthaceae*	*Alternanthera paronychioides*	-	-	+
Magnoliopsida	*Vitaceae*	*Ampelocissus latifolia*	-	-	+
Magnoliopsida	*Anacardiaceae*	*Anacardium occidentale*	+	-	-
Magnoliopsida	*Olacaceae*	*Anacolosa densiflora*	-	-	+
Magnoliopsida	*Asteraceae*	*Anaphalis beddomei*	-	-	+
Magnoliopsida	*Ancistrocladaceae*	*Ancistrocladus heyneanus*	-	-	+
Magnoliopsida	*Acanthaceae*	*Andrographis producta*	-	-	+
Magnoliopsida	*Lamiaceae*	*Anisochilus carnosus*	-	-	+
Magnoliopsida	*Annonaceae*	*Annona squamosa*	+	-	-

Magnoliopsida	*Combretaceae*	*Anogeissus latifolia*	-	+	+
Magnoliopsida	*Phyllanthaceae*	*Antidesma acidum*	-	-	+
Magnoliopsida	*Phyllanthaceae*	*Antidesma montanum*	-	-	+
Magnoliopsida	*Meliaceae*	*Aphanamixis polystachya*	-	-	+
Magnoliopsida	*Icacinaceae*	*Apodytes dimidiata*	-	-	+
Magnoliopsida	*Phyllanthaceae*	*Aporosa lindleyana*	-	-	+
Magnoliopsida	*Rubiaceae*	*Argostemma courtallense*	-	-	+
Magnoliopsida	*Convolvulaceae*	*Argyreia hirsuta*	-	-	+
Magnoliopsida	*Convolvulaceae*	*Argyreia sericea*	-	-	+
Magnoliopsida	*Asteraceae*	*Artemisia nilagirica*	-	-	+
Magnoliopsida	*Moraceae*	*Artocarpus heterophyllus*	+	-	+
Magnoliopsida	*Moraceae*	*Artocarpus hirsutus*	-	-	+
Magnoliopsida	*Acanthaceae*	*Asystasia variabilis*	-	-	+
Magnoliopsida	*Rutaceae*	*Atalantia monophylla*	-	-	+
Magnoliopsida	*Chrysobalanaceae*	*Atuna indica*	-	-	+
Magnoliopsida	*Meliaceae*	*Azadirachta indica*	+	-	-
Magnoliopsida	*Phyllanthaceae*	*Baccaurea courtallensis*	-	-	+
Magnoliopsida	*Plantaginaceae*	*Bacopa procumbens*	-	-	+
Magnoliopsida	*Balanophoraceae*	*Balanophora fungosa* subsp. *indica*	-	-	+
Magnoliopsida	*Acanthaceae*	*Barleria courtallica*	-	-	+

Magnoliopsida	*Acanthaceae*	*Barleria cristata*	-	-	+
Magnoliopsida	*Acanthaceae*	*Barleria involucrata* var. *elata*	-	-	+
Magnoliopsida	*Fabaceae*	*Bauhinia phoenicea*	-	-	+
Magnoliopsida	*Fabaceae*	*Bauhinia racemosa*	-	-	+
Magnoliopsida	*Begoniaceae*	*Begonia integrifolia*	-	-	+
Magnoliopsida	*Lauraceae*	*Beilschmiedia dalzellii*	-	-	+
Magnoliopsida	*Phyllanthaceae*	*Bischofia javanica*	-	-	+
Magnoliopsida	*Asteraceae*	*Blumea lanceolaria*	-	-	+
Magnoliopsida	*Asteraceae*	*Blumea neilgherrensis*	-	-	+
Magnoliopsida	*Asteraceae*	*Blumea oxyodonta*	-	-	+
Magnoliopsida	*Urticaceae*	*Boehmeria malabarica*	-	-	+
Magnoliopsida	*Urticaceae*	*Boehmeria platyphylla*	-	-	+
Magnoliopsida	*Malvaceae*	*Bombex ceiba*	+	-	+
Magnoliopsida	*Phyllanthaceae*	*Breynia retusa*	-	-	+
Magnoliopsida	*Phyllanthaceae*	*Breynia vitis-idaea*	-	-	+
Magnoliopsida	*Phyllanthaceae*	*Bridelia scandens*	+	+	-
Magnoliopsida	*Phyllanthaceae*	*Bridelia stipularis*	-	-	+
Magnoliopsida	*Fabaceae*	*Butea monosperma*	+	-	+
Magnoliopsida	*Fabaceae*	*Caesalpinia mimosoides*	-	-	+
Magnoliopsida	*Fabaceae*	*Cajanus lineatus*	-	-	+

Magnoliopsida	*Fabaceae*	*Calliandra calothyrsus*	-	-	+
Magnoliopsida	*Lamiaceae*	*Callicarpa tomentosa*	-	-	+
Magnoliopsida	*Calophyllaceae*	*Calophyllum apetalum*	-	-	+
Magnoliopsida	*Calophyllaceae*	*Calophyllum polyanthum*	-	-	+
Magnoliopsida	*Apocynaceae*	*Calotropis* sp.	+	-	-
Magnoliopsida	*Combretaceae*	*Calycopteris floribunda*	-	-	+
Magnoliopsida	*Burseraceae*	*Canarium strictum*	-	-	+
Magnoliopsida	*Gentianaceae*	*Canscora diffusa*	-	-	+
Magnoliopsida	*Rubiaceae*	*Canthium dicoccum*	+	+	-
Magnoliopsida	*Rubiaceae*	*Canthium didymum*	-	-	+
Magnoliopsida	*Rubiaceae*	*Canthium parviflorum*	-	+	-
Magnoliopsida	*Rubiaceae*	*Canthium umbellatum*	+	+	-
Magnoliopsida	*Lecythidaceae*	*Careya arborea*	-	-	+
Magnoliopsida	*Caricaceae*	*Caria papaya*	+	-	-
Magnoliopsida	*Apocynaceae*	*Carissa congesta*	-	-	+
Magnoliopsida	*Apocynaceae*	*Carissa inermis*	-	-	+
Magnoliopsida	*Salicaceae*	*Casearia ovata*	-	-	+
Magnoliopsida	*Salicaceae*	*Casearia rubescens*	-	-	+
Magnoliopsida	*Salicaceae*	*Casearia tomentosa*	-	-	+
Magnoliopsida	*Salicaceae*	*Casearia wynadensis*	-	-	+

Magnoliopsida	*Fabaceae*	*Cassia fistula*	-	-	+
Magnoliopsida	*Fabaceae*	*Cassia siama*	+	-	-
Magnoliopsida	*Celastraceae*	*Cassine glauca*	-	-	+
Magnoliopsida	*Casuarinaceae*	*Casuarina equisetifolia*	+	-	-
Magnoliopsida	*Vitaceae*	*Cayratia mollissima*	-	-	+
Magnoliopsida	*Vitaceae*	*Cayratia pedata*	-	-	+
Magnoliopsida	*Apiaceae*	*Centella asiatica*	-	-	+
Magnoliopsida	*Asteraceae*	*Centipeda minima*	-	-	+
Magnoliopsida	*Fabaceae*	*Centrosema molle*	-	-	+
Magnoliopsida	*Solanaceae*	*Cestrum nocturnum*	-	-	+
Magnoliopsida	*Rubiaceae*	*Chassalia curviflora* var. *ophioxyloides*	-	-	+
Magnoliopsida	*Oleaceae*	*Chionanthus courtallensis*	-	-	+
Magnoliopsida	*Oleaceae*	*Chionanthus mala-elengi* subsp. *linocieroides*	-	-	+
Magnoliopsida	*Rutaceae*	*Chloroxylon swietenia*	-	+	-
Magnoliopsida	*Asteraceae*	*Chromolaena odorata*	-	-	+
Magnoliopsida	*Euphorbiaceae*	*Chrozophora prostrata*	-	-	+
Magnoliopsida	*Meliaceae*	*Chukrasia tabularis*	-	-	+
Magnoliopsida	*Lauraceae*	*Cinnamomum malabatrum*	-	-	+
Magnoliopsida	*Lauraceae*	*Cinnamomum sulphuratum*	-	-	+

Magnoliopsida	*Meliaceae*	*Cipadessa baccifera*	-	-	+
Magnoliopsida	*Vitaceae*	*Cissus discolor*	-	-	+
Magnoliopsida	*Vitaceae*	*Cissus repanda*	-	-	+
Magnoliopsida	*Rutaceae*	*Citrus medica*	-	+	-
Magnoliopsida	*Rutaceae*	*Citrus* sp.	+	+	-
Magnoliopsida	*Rutaceae*	*Clausena indica*	-	-	+
Magnoliopsida	*Euphorbiaceae*	*Cleidion spiciflorum*	-	-	+
Magnoliopsida	*Phyllanthaceae*	*Cleistanthus travancorensis*	+	-	+
Magnoliopsida	*Lamiaceae*	*Clerodendrum serratum*	-	-	+
Magnoliopsida	*Lamiaceae*	*Clerodendrum viscosum*	-	-	+
Magnoliopsida	*Boraginaceae*	*Coldenia procumbens*	-	-	+
Magnoliopsida	*Lamiaceae*	*Colebrookea oppositifolia*	-	-	+
Magnoliopsida	*Burseraceae*	*Commiphora caudata*	-	+	-
Magnoliopsida	*Asteraceae*	*Conyza japonica*	-	-	+
Magnoliopsida	*Boraginaceae*	*Cordia dichotoma*	-	-	+
Magnoliopsida	*Boraginaceae*	*Cordia macleodii*	-	-	+
Magnoliopsida	*Boraginaceae*	*Cordia wallichii*	+	-	-
Magnoliopsida	*Fabaceae*	*Crotalaria notonii*	-	-	+
Magnoliopsida	*Euphorbiaceae*	*Croton bonplandianus*	-	-	+
Magnoliopsida	*Lauraceae*	*Cryptocarya wightiana*	-	-	+

Magnoliopsida	*Lythraceae*	*Cuphea hyssopifolia*	-	-	+
Magnoliopsida	*Menispermaceae*	*Cyclea peltata*	-	-	+
Magnoliopsida	*Fabaceae*	*Dalbergia lanceolaria*	-	-	+
Magnoliopsida	*Fabaceae*	*Dalbergia latifolia*	+	+	-
Magnoliopsida	*Urticaceae*	*Debregeasia longifolia*	-	-	+
Magnoliopsida	*Urticaceae*	*Dendrocnide sinuata*	-	-	+
Magnoliopsida	*Loranthaceae*	*Dendrophthoe falcata*	-	-	+
Magnoliopsida	*Rubiaceae*	*Dentella repens* var. *serpyllifolia*	-	-	+
Magnoliopsida	*Fabaceae*	*Desmodium heterocarpon*	-	-	+
Magnoliopsida	*Fabaceae*	*Desmodium pulchellum*	-	-	+
Magnoliopsida	*Fabaceae*	*Desmodium repandum*	-	-	+
Magnoliopsida	*Fabaceae*	*Desmodium triflorum*	-	-	+
Magnoliopsida	*Fabaceae*	*Desmodium triquetrum*	-	-	+
Magnoliopsida	*Dichapetalaceae*	*Dichapetalum gelonioides*	-	-	+
Magnoliopsida	*Dilleniaceae*	*Dillenia bracteata*	-	-	+
Magnoliopsida	*Dilleniaceae*	*Dillenia pentagyna*	-	-	+
Magnoliopsida	*Sapindaceae*	*Dimocarpus longan*	-	-	+
Magnoliopsida	*Ebenaceae*	*Diospyros buxifolia*	-	-	+
Magnoliopsida	*Ebenaceae*	*Diospyros candolleana*	+	-	-
Magnoliopsida	*Ebenaceae*	*Diospyros melanoxylon*	+	+	-

Magnoliopsida	*Ebenaceae*	*Diospyros montana*	+	+	-
Magnoliopsida	*Ebenaceae*	*Diospyros paniculata*	-	-	+
Magnoliopsida	*Ebenaceae*	*Diospyros sylvatica*	-	-	+
Magnoliopsida	*Dipterocarpaceae*	*Dipterocarpus indicus*	-	-	+
Magnoliopsida	*Apocynaceae*	*Dregea volubilis*	-	-	+
Magnoliopsida	*Putranjivaceae*	*Drypetes elata*	-	-	+
Magnoliopsida	*Putranjivaceae*	*Drypetes malabarica*	-	-	+
Magnoliopsida	*Lythraceae*	*Duabanga grandiflora*	-	-	+
Magnoliopsida	*Verbenaceae*	*Duranta repens*	-	-	+
Magnoliopsida	*Meliaceae*	*Dysoxylum malabaricum*	-	-	+
Magnoliopsida	*Elaeagnaceae*	*Elaeagnus latifolia*	-	-	+
Magnoliopsida	*Elaeocarpaceae*	*Elaeocarpus serratus*	-	-	+
Magnoliopsida	*Elaeocarpaceae*	*Elaeocarpus tuberculatus*	-	-	+
Magnoliopsida	*Urticaceae*	*Elatostema cuneatum*	-	-	+
Magnoliopsida	*Asteraceae*	*Elephantopus scaber*	-	-	+
Magnoliopsida	*Primulaceae*	*Embelia ribes*	-	-	+
Magnoliopsida	*Asteraceae*	*Emilia sonchifolia*	-	-	+
Magnoliopsida	*Lamiaceae*	*Endostemon viscosus*	-	-	+
Magnoliopsida	*Fabaceae*	*Entada rheedei*	-	-	+
Magnoliopsida	*Euphorbiaceae*	*Epiprinus mallotiformis*	-	-	+

Magnoliopsida	*Apocynaceae*	*Ervatamia heyneana*	-	-	+
Magnoliopsida	*Fabaceae*	*Erythrina stricta*	-	-	+
Magnoliopsida	*Fabaceae*	*Erythrina suberosa*	-	-	+
Magnoliopsida	*Erythroxylaceae*	*Erythroxylum monogynum*	-	+	-
Magnoliopsida	*Myrtaceae*	*Eucalyptus torticornis*	+	-	-
Magnoliopsida	*Myrtaceae*	*Eugenia cotinifolia*	-	-	+
Magnoliopsida	*Rutaceae*	*Euodia lunu-ankenda*	-	-	+
Magnoliopsida	*Celastraceae*	*Euonymus indicus*	-	-	+
Magnoliopsida	*Euphorbiaceae*	*Euphorbia hirta*	-	-	+
Magnoliopsida	*Euphorbiaceae*	*Euphorbia nivulia*	-	-	+
Magnoliopsida	*Euphorbiaceae*	*Euphorbia rothiana*	-	-	+
Magnoliopsida	*Euphorbiaceae*	*Euphorbia thymifolia*	-	-	+
Magnoliopsida	*Pentaphylacaceae*	*Eurya nitida*	-	-	+
Magnoliopsida	*Gentianaceae*	*Fagraea ceilanica*	-	-	+
Magnoliopsida	*Moraceae*	*Ficus arnottiana*	-	-	+
Magnoliopsida	*Moraceae*	*Ficus beddomei*	-	-	+
Magnoliopsida	*Moraceae*	*Ficus benghalensis*	+	-	+
Magnoliopsida	*Moraceae*	*Ficus exasperata*	-	-	+
Magnoliopsida	*Moraceae*	*Ficus glomerata*	+	-	-
Magnoliopsida	*Moraceae*	*Ficus hispida*	+	-	+

Magnoliopsida	*Moraceae*	*Ficus microcarpa*	-	-	+
Magnoliopsida	*Moraceae*	*Ficus mysorensis* var. *pubescens*	-	-	+
Magnoliopsida	*Moraceae*	*Ficus nervosa*	-	-	+
Magnoliopsida	*Moraceae*	*Ficus religiosa*	+	-	-
Magnoliopsida	*Moraceae*	*Ficus tinctoria* ssp. *parasitica*	-	-	+
Magnoliopsida	*Moraceae*	*Ficus tsjakela*	-	-	+
Magnoliopsida	*Malvaceae*	*Firmiana colorata*	-	-	+
Magnoliopsida	*Salicaceae*	*Flacourtia montana*	-	-	+
Magnoliopsida	*Salicaceae*	*Flacourtia ramontchi*	-	-	+
Magnoliopsida	*Fabaceae*	*Flemingia wightiana*	-	-	+
Magnoliopsida	*Clusiaceae*	*Garcinia gummi-gutta*	-	-	+
Magnoliopsida	*Clusiaceae*	*Garcinia morella*	-	-	+
Magnoliopsida	*Clusiaceae*	*Garcinia talbotii*	-	-	+
Magnoliopsida	*Burseraceae*	*Garuga pinnata*	-	-	+
Magnoliopsida	*Urticaceae*	*Girardinia diversifolia*	-	-	+
Magnoliopsida	*Molluginaceae*	*Glinus lotoides*	-	-	+
Magnoliopsida	*Molluginaceae*	*Glinus oppositifolius*	-	-	+
Magnoliopsida	*Fabaceae*	*Gliricidia sepium*	-	+	+
Magnoliopsida	*Fabaceae*	*Gliricidia* sp.	+	-	-
Magnoliopsida	*Phyllanthaceae*	*Glochidion ellipticum*	-	-	+

Magnoliopsida	*Phyllanthaceae*	*Glochidion zeylanicum*	-	-	+
Magnoliopsida	*Rutaceae*	*Glycosmis mauritiana*	+	-	-
Magnoliopsida	*Rutaceae*	*Glycosmis pentaphylla*	-	-	+
Magnoliopsida	*Celastraceae*	*Glyptopetalum grandiflorum*	-	-	+
Magnoliopsida	*Lamiaceae*	*Gmelina arborea*	-	-	+
Magnoliopsida	*Asteraceae*	*Gnaphalium polycaulon*	-	-	+
Magnoliopsida	*Stemonuraceae*	*Gomphandra tetrandra*	-	-	+
Magnoliopsida	*Lamiaceae*	*Gomphostemma heyneanum*	-	-	+
Magnoliopsida	*Annonaceae*	*Goniothalamus cardiopetalus*	-	-	+
Magnoliopsida	*Rhamnaceae*	*Gouania microcarpa*	-	-	+
Magnoliopsida	*Asteraceae*	*Grangea maderaspatana*	-	-	+
Magnoliopsida	*Malvaceae*	*Grewia* sp.	-	+	-
Magnoliopsida	*Malvaceae*	*Grewia tiliifolia*	-	-	+
Magnoliopsida	*Myristicaceae*	*Gymnacranthera farquhariana*	-	-	+
Magnoliopsida	*Asteraceae*	*Gynura nitida*	-	-	+
Magnoliopsida	*Rubiaceae*	*Haldina cordifolia*	-	-	+
Magnoliopsida	*Acanthaceae*	*Haplanthodes nilgherrensis*	-	-	+
Magnoliopsida	*Fabaceae*	*Hardwickia binata*	+	+	-
Magnoliopsida	*Sapindaceae*	*Harpullia arborea*	-	-	+
Magnoliopsida	*Malvaceae*	*Helicteres isora*	-	-	+

Magnoliopsida	*Boraginaceae*	*Heliotropium indicum*	-	-	+
Magnoliopsida	*Apocynaceae*	*Hemidesmus indicus* var. *indicus*	-	-	+
Magnoliopsida	*Acanthaceae*	*Hemigraphis latebrosa*	-	-	+
Magnoliopsida	*Apiaceae*	*Heracleum rigens*	-	-	+
Magnoliopsida	*Malvaceae*	*Heritiera papilio*	-	-	+
Magnoliopsida	*Malvaceae*	*Hibiscus surattensis*	-	-	+
Magnoliopsida	*Malpighiaceae*	*Hiptage benghalensis*	-	-	+
Magnoliopsida	*Apocynaceae*	*Holarrhena antidysenterica*	-	-	+
Magnoliopsida	*Anacardiaceae*	*Holigarna arnottiana*	-	-	+
Magnoliopsida	*Anacardiaceae*	*Holigarna ferruginea*	-	-	+
Magnoliopsida	*Anacardiaceae*	*Holigarna grahamii*	-	-	+
Magnoliopsida	*Salicaceae*	*Homalium zeylanicum*	-	-	+
Magnoliopsida	*Euphorbiaceae*	*Homonia riparia*	+	-	+
Magnoliopsida	*Dipterocarpaceae*	*Hopea parviflora*	-	-	+
Magnoliopsida	*Dipterocarpaceae*	*Hopea ponga*	-	-	+
Magnoliopsida	*Fabaceae*	*Humboldtia brunonis*	-	-	+
Magnoliopsida	*Araliaceae*	*Hydrocotyle javanica*	-	-	+
Magnoliopsida	*Acanthaceae*	*Hygrophila schulli*	-	-	+
Magnoliopsida	*Hypericaceae*	*Hypericum japonicum*	-	-	+
Magnoliopsida	*Balsaminaceae*	*Impatiens acaulis*	-	-	+

Magnoliopsida	*Balsaminaceae*	*Impatiens balsamina*	-	-	+
Magnoliopsida	*Balsaminaceae*	*Impatiens balsamina* var. *micrantha*	-	-	+
Magnoliopsida	*Balsaminaceae*	*Impatiens dasysperma*	-	-	+
Magnoliopsida	*Balsaminaceae*	*Impatiens fasciculata*	-	-	+
Magnoliopsida	*Balsaminaceae*	*Impatiens flaccida*	-	-	+
Magnoliopsida	*Balsaminaceae*	*Impatiens minor*	-	-	+
Magnoliopsida	*Fabaceae*	*Indigofera linnaei*	-	-	+
Magnoliopsida	*Fabaceae*	*Indigofera spicata*	-	-	+
Magnoliopsida	*Convolvulaceae*	*Ipomoea nil*	-	-	+
Magnoliopsida	*Convolvulaceae*	*Ipomoea obscura*	-	-	+
Magnoliopsida	*Convolvulaceae*	*Ipomoea parasitica*	-	-	+
Magnoliopsida	*Sapotaceae*	*Isonandra lanceolata*	-	-	+
Magnoliopsida	*Rubiaceae*	*Ixora arborea*	+	-	-
Magnoliopsida	*Rubiaceae*	*Ixora brachiata*	-	+	-
Magnoliopsida	*Rubiaceae*	*Ixora elongata*	-	-	+
Magnoliopsida	*Rubiaceae*	*Ixora nigricans*	-	-	+
Magnoliopsida	*Rubiaceae*	*Ixora polyantha*	-	-	+
Magnoliopsida	*Bignoniaceae*	*Jacaranda mimosifolia*	-	-	+
Magnoliopsida	*Oleaceae*	*Jasminum malabaricum*	-	-	+
Magnoliopsida	*Oleaceae*	*Jasminum multiflorum*	-	-	+

Magnoliopsida	*Euphorbiaceae*	*Jatropa* sp.	+	-	-
Magnoliopsida	*Onagraceae*	*Jussiaea repens*	-	-	+
Magnoliopsida	*Acanthaceae*	*Justicia diffusa*	-	-	+
Magnoliopsida	*Acanthaceae*	*Justicia japonica*	-	-	+
Magnoliopsida	*Acanthaceae*	*Justicia procumbens*	-	-	+
Magnoliopsida	*Fabaceae*	*Kingiodendron* sp.	+	-	-
Magnoliopsida	*Fabaceae*	*Kingiodendron pinnatum*	-	-	+
Magnoliopsida	*Myristicaceae*	*Knema attenuata*	-	-	+
Magnoliopsida	*Rubiaceae*	*Knoxia sumatrensis*	-	-	+
Magnoliopsida	*Lythraceae*	*Lagerstroemia lanceolata*	+	+	-
Magnoliopsida	*Lythraceae*	*Lagerstroemia microcarpa*	-	-	+
Magnoliopsida	*Asteraceae*	*Lamprachaenium microcephalum*	-	-	+
Magnoliopsida	*Anacardiaceae*	*Lannea coromandelica*	-	-	+
Magnoliopsida	*Verbenaceae*	*Lantana camara*	-	-	+
Magnoliopsida	*Urticaceae*	*Laportea interrupta*	-	-	+
Magnoliopsida	*Asteraceae*	*Launaea acaulis*	-	-	+
Magnoliopsida	*Vitaceae*	*Leea indica*	-	-	+
Magnoliopsida	*Piperaceae*	*Lepianthes umbellata*	-	-	+
Magnoliopsida	*Acanthaceae*	*Lepidagathis incurva*	-	-	+
Magnoliopsida	*Acanthaceae*	*Lepidagathis purpuricaulis Lepidagathis*	-	-	+

Magnoliopsida	*Sapindaceae*	*Lepisanthes deficiens*	-	-	+
Magnoliopsida	*Lamiaceae*	*Leucas ciliata*	-	-	+
Magnoliopsida	*Lamiaceae*	*Leucas eriostoma* var. *eriostoma*	-	-	+
Magnoliopsida	*Lamiaceae*	*Leucas marrubioides*	-	-	+
Magnoliopsida	*Lamiaceae*	*Leucas zeylanica*	-	-	+
Magnoliopsida	*Oleaceae*	*Ligustrum perrottetii*	-	-	+
Magnoliopsida	*Plantaginaceae*	*Limnophila heterophylla*	-	-	+
Magnoliopsida	*Linderniaceae*	*Lindernia antipoda*	-	-	+
Magnoliopsida	*Linderniaceae*	*Lindernia hyssopoides*	-	-	+
Magnoliopsida	*Linderniaceae*	*Lindernia parviflora*	-	-	+
Magnoliopsida	*Lauraceae*	*Litsea floribunda*	-	-	+
Magnoliopsida	*Lauraceae*	*Litsea glabrata*	-	-	+
Magnoliopsida	*Lauraceae*	*Litsea laevigata*	-	-	+
Magnoliopsida	*Campanulaceae*	*Lobelia nicotianifolia*	-	-	+
Magnoliopsida	*Onagraceae*	*Ludwigia perennis*	-	-	+
Magnoliopsida	*Euphorbiaceae*	*Macaranga peltata*	+	+	+
Magnoliopsida	*Sapotaceae*	*Madhuca latifolia*	-	+	-
Magnoliopsida	*Sapotaceae*	*Madhuca longifolia*	+	-	-
Magnoliopsida	*Sapotaceae*	*Madhuca longifolia* var. *longifolia*	-	-	+
Magnoliopsida	*Sapotaceae*	*Madhuca neriifolia*	+	+	-

Magnoliopsida	*Sapotaceae*	*Madhuca* sp.	+	-	-
Magnoliopsida	*Euphorbiaceae*	*Mallotus aureopunctatus*	-	-	+
Magnoliopsida	*Euphorbiaceae*	*Mallotus philippensis*	-	-	+
Magnoliopsida	*Euphorbiaceae*	*Mallotus rhamnifolius*	-	-	+
Magnoliopsida	*Euphorbiaceae*	*Mallotus tetracoccus*	-	-	+
Magnoliopsida	*Anacardiaceae*	*Mangifera indica*	+	-	+
Magnoliopsida	*Phyllanthaceae*	*Margaritaria indica*	-	-	+
Magnoliopsida	*Nyssaceae*	*Mastixia arborea*	-	-	+
Magnoliopsida	*Annonaceae*	*Meiogyne pannosa*	-	-	+
Magnoliopsida	*Annonaceae*	*Meiogyne ramarowii*	-	-	+
Magnoliopsida	*Meliaceae*	*Melia azedarach*	-	+	-
Magnoliopsida	*Meliaceae*	*Melia azadirachta*	+	-	-
Magnoliopsida	*Meliaceae*	*Melia dubia*	+	+	-
Magnoliopsida	*Sabiaceae*	*Meliosma pinnata*	-	-	+
Magnoliopsida	*Bignoniaceae*	*Millingtonia hortensis*	+	-	-
Magnoliopsida	*Rubiaceae*	*Mitragyna parviflora*	+	+	-
Magnoliopsida	*Melastomataceae*	*Memecylon malabaricum*	-	-	+
Magnoliopsida	*Melastomataceae*	*Memecylon randerianum*	-	-	+
Magnoliopsida	*Melastomataceae*	*Memecylon talbotianum*	-	-	+
Magnoliopsida	*Melastomataceae*	*Memecylon umbellatum*	-	-	+

Magnoliopsida	*Melastomataceae*	*Memecylon wightii*	-	-	+
Magnoliopsida	*Convolvulaceae*	*Merremia umbellata*	-	-	+
Magnoliopsida	*Calophyllaceae*	*Mesua ferrea*	-	-	+
Magnoliopsida	*Rubiaceae*	*Meyna laxiflora*	-	-	+
Magnoliopsida	*Magnoliaceae*	*Michelia alba*	-	-	+
Magnoliopsida	*Celastraceae*	*Microtropis wallichiana*	-	-	+
Magnoliopsida	*Asteraceae*	*Mikania scandens*	-	-	+
Magnoliopsida	*Fabaceae*	*Mimosa pudica*	-	-	+
Magnoliopsida	*Rubiaceae*	*Mitracarpus hirtus*	-	-	+
Magnoliopsida	*Rubiaceae*	*Mitragyna parvifolia*	-	-	+
Magnoliopsida	*Fabaceae*	*Moullava spicata*	-	-	+
Magnoliopsida	*Fabaceae*	*Mucuna monosperma*	-	-	+
Magnoliopsida	*Rubiaceae*	*Mussaenda tomentosa*	-	-	+
Magnoliopsida	*Myristicaceae*	*Myristica dactyloides*	-	-	+
Magnoliopsida	*Ranunculaceae*	*Naravelia zeylanica*	-	-	+
Magnoliopsida	*Meliaceae*	*Naregamia alata*	-	-	+
Magnoliopsida	*Rubiaceae*	*Neanotis rheedei*	-	-	+
Magnoliopsida	*Icacinaceae*	*Nothapodytes nimmoniana*	-	-	+
Magnoliopsida	*Anacardiaceae*	*Nothopegia beddomei*	-	-	+
Magnoliopsida	*Anacardiaceae*	*Nothopegia racemosa*	-	-	+

Magnoliopsida	*Anacardiaceae*	*Nothopegia travancorica*	-	-	+
Magnoliopsida	*Menyanthaceae*	*Nymphoides cristata*	-	-	+
Magnoliopsida	*Oleaceae*	*Olea dioica*	+	+	+
Magnoliopsida	*Rubiaceae*	*Ophiorrhiza mungos*	-	-	+
Magnoliopsida	*Rubiaceae*	*Ophiorrhiza rugosa* var. *decumbens*	-	-	+
Magnoliopsida	*Rubiaceae*	*Ophiorrhiza rugosa* var. *prostata*	-	-	+
Magnoliopsida	*Urticaceae*	*Oreocnide integrifolia*	-	-	+
Magnoliopsida	*Bignoniaceae*	*Oroxylum indicum*	-	-	+
Magnoliopsida	*Melastomataceae*	*Osbeckia cupularis*	-	-	+
Magnoliopsida	*Santalaceae*	*Osyris quadripartita*	-	-	+
Magnoliopsida	*Sapindaceae*	*Otonephelium stipulaceum*	-	-	+
Magnoliopsida	*Bignoniaceae*	*Pajanelia longifolia*	-	-	+
Magnoliopsida	*Sapotaceae*	*Palaquium ellipticum*	-	-	+
Magnoliopsida	*Boraginaceae*	*Paracaryopsis coelestina*	-	-	+
Magnoliopsida	*Euphorbiaceae*	*Paracroton pendulus* subsp. *Zeylanicus*	-	-	+
Magnoliopsida	*Asteraceae*	*Parthenium hysterophorus*	-	-	+
Magnoliopsida	*Rubiaceae*	*Pavetta breviflora*	-	-	+
Magnoliopsida	*Rubiaceae*	*Pavetta indica*	-	-	+
Magnoliopsida	*Piperaceae*	*Peperomia pellucida*	-	-	+
Magnoliopsida	*Piperaceae*	*Peperomia tetraphylla*	-	-	+

Magnoliopsida	*Lauraceae*	*Persea macrantha*	-	-	+
Magnoliopsida	*Petiveriaceae*	*Petiveria alliacea*	-	-	+
Magnoliopsida	*Acanthaceae*	*Phaulopsis imbricata*	-	-	+
Magnoliopsida	*Lauraceae*	*Phoebe lanceolata*	-	-	+
Magnoliopsida	*Phyllanthaceae*	*Phyllanthus debilis*	-	-	+
Magnoliopsida	*Phyllanthaceae*	*Phyllanthus emblica*	-	-	+
Magnoliopsida	*Phyllanthaceae*	*Phyllanthus gardnerianus*	-	-	+
Magnoliopsida	*Phyllanthaceae*	*Phyllanthus kozhikodianus*	-	-	+
Magnoliopsida	*Phyllanthaceae*	*Phyllanthus simplex*	-	-	+
Magnoliopsida	*Phyllanthaceae*	*Phyllanthus urinaria*	-	-	+
Magnoliopsida	*Asteraceae*	*Phyllocephalum scabridum*	-	-	+
Magnoliopsida	*Urticaceae*	*Pilea pumila*	-	-	+
Magnoliopsida	*Fabaceae*	*Pithecellobium dulce*	+	-	-
Magnoliopsida	*Pittosporaceae*	*Pittosporum dasycaulon*	-	-	+
Magnoliopsida	*Pittosporaceae*	*Pittosporum floribundum*	-	-	+
Magnoliopsida	*Lamiaceae*	*Plectranthus mollis*	-	-	+
Magnoliopsida	*Lamiaceae*	*Plectranthus nilgherricus*	-	-	+
Magnoliopsida	*Lamiaceae*	*Pogostemon benghalensis*	-	-	+
Magnoliopsida	*Lamiaceae*	*Pogostemon heyneanus*	-	-	+
Magnoliopsida	*Lamiaceae*	*Pogostemon mollis*	-	-	+

Magnoliopsida	*Annonaceae*	*Polyalthia coffeoides*	-	-	+
Magnoliopsida	*Annonaceae*	*Polyalthia fragrans*	-	-	+
Magnoliopsida	*Caryophyllaceae*	*Polycarpon prostratum*	-	-	+
Magnoliopsida	*Polygalaceae*	*Polygala arillata*	-	-	+
Magnoliopsida	*Fabaceae*	*Pongamia pinnata*	-	+	-
Magnoliopsida	*Fabaceae*	*Millettia pinnata*	+	-	-
Magnoliopsida	*Urticaceae*	*Pouzolzia cymosa*	-	-	+
Magnoliopsida	*Urticaceae*	*Pouzolzia wightii*	-	-	+
Magnoliopsida	*Lamiaceae*	*Premna tomentosa*	-	+	-
Magnoliopsida	*Rubiaceae*	*Psychotria flavida*	-	-	+
Magnoliopsida	*Rubiaceae*	*Psychotria macrocarpa*	-	-	+
Magnoliopsida	*Rubiaceae*	*Psychotria nigra*	-	-	+
Magnoliopsida	*Rubiaceae*	*Psychotria octosulcata*	-	-	+
Magnoliopsida	*Fabaceae*	*Pterocarpus marsupium*	+	-	+
Magnoliopsida	*Malvaceae*	*Pterocymbium tinctorium*	-	-	+
Magnoliopsida	*Fabaceae*	*Pterolobium hexapetalum*	-	-	+
Magnoliopsida	*Malvaceae*	*Pterygota alata*	-	-	+
Magnoliopsida	*Bignoniaceae*	*Radermachera xylocarpa*	-	+	+
Magnoliopsida	*Rubiaceae*	*Randia dumetorum*	-	+	-
Magnoliopsida	*Rubiaceae*	*Randia regulosa*	+	-	-

Magnoliopsida	*Rubiaceae*	*Randia* sp.	+	-	-
Magnoliopsida	*Rubiaceae*	*Randia uliginosa*	-	-	+
Magnoliopsida	*Clusiaceae*	*Reinwardtiodendron anamalaiense*	-	-	+
Magnoliopsida	*Acanthaceae*	*Rhinacanthus nasutus*	-	-	+
Magnoliopsida	*Gesneriaceae*	*Rhynchoglossum obliquum*	-	-	+
Magnoliopsida	*Violaceae*	*Rinorea bengalensis*	-	-	+
Magnoliopsida	*Brassicaceae*	*Rorippa indica*	-	-	+
Magnoliopsida	*Lythraceae*	*Rotala mexicana*	-	-	+
Magnoliopsida	*Lythraceae*	*Rotala rotundifolia*	-	-	+
Magnoliopsida	*Rubiaceae*	*Rubia cordifolia*	-	-	+
Magnoliopsida	*Acanthaceae*	*Ruellia humilis*	-	-	+
Magnoliopsida	*Acanthaceae*	*Rungia repens*	-	-	+
Magnoliopsida	*Celastraceae*	*Salacia oblonga*	-	-	+
Magnoliopsida	*Salicaceae*	*Salix tetrasperma*	+	-	-
Magnoliopsida	*Fabaceae*	*Samanea saman*	+	-	-
Magnoliopsida	*Santalaceae*	*Santalum album*	+	-	-
Magnoliopsida	*Sapindaceae*	*Sapindus emarginatus*	+	+	-
Magnoliopsida	*Sapindaceae*	*Schleichera oleosa*	-	+	-
Magnoliopsida	*Salicaceae*	*Scolopia crenata*	-	-	+
Magnoliopsida	*Plantaginaceae*	*Scoparia dulcis*	-	-	+

Magnoliopsida	*Lamiaceae*	*Scutellaria discolor*	-	-	+
Magnoliopsida	*Rhamnaceae*	*Scutia myrtina*	-	-	+
Magnoliopsida	*Phyllanthaceae*	*Securinega virosa*	-	-	+
Magnoliopsida	*Asteraceae*	*Senecio wightii*	-	-	+
Magnoliopsida	*Fabaceae*	*Senna occidentalis*	-	-	+
Magnoliopsida	*Fabaceae*	*Senna tora*	-	-	+
Magnoliopsida	*Malvaceae*	*Sida acuta*	-	-	+
Magnoliopsida	*Malvaceae*	*Sida rhombifolia* subsp. *retusa*	-	-	+
Magnoliopsida	*Malvaceae*	*Sida rhombifolia* subsp. *rhombifolia*	-	-	+
Magnoliopsida	*Malvaceae*	*Sida rhombifolia* subsp. *rhombifolia* var. *scabrida*	-	-	+
Magnoliopsida	*Malvaceae*	*Sida rhomboidea*	-	-	+
Magnoliopsida	*Asteraceae*	*Sirhookera lanceolata*	-	-	+
Magnoliopsida	*Fabaceae*	*Smithia blanda*	-	-	+
Magnoliopsida	*Fabaceae*	*Smithia conferta*	-	-	+
Magnoliopsida	*Fabaceae*	*Smithia hirsuta*	-	-	+
Magnoliopsida	*Fabaceae*	*Smithia setulosa*	-	-	+
Magnoliopsida	*Solanaceae*	*Solanum indicum*	-	-	+
Magnoliopsida	*Solanaceae*	*Solanum pimpinellifolium*	-	-	+
Magnoliopsida	*Solanaceae*	*Solanum seaforthianum*	-	-	+

Magnoliopsida	*Solanaceae*	*Solanum stramoniifolium*	-	-	+
Magnoliopsida	*Solanaceae*	*Solanum viarum*	-	-	+
Magnoliopsida	*Solanaceae*	*Solanum violaceum*	-	-	+
Magnoliopsida	*Melastomataceae*	*Sonerila rheedei*	-	-	+
Magnoliopsida	*Melastomataceae*	*Sonerila wallichii*	-	-	+
Magnoliopsida	*Rubiaceae*	*Spermacoce alata*	-	-	+
Magnoliopsida	*Asteraceae*	*Sphaeranthus indicus*	-	-	+
Magnoliopsida	*Asteraceae*	*Spilanthes radicans*	-	-	+
Magnoliopsida	*Anacardiaceae*	*Spondias pinnata*	-	-	+
Magnoliopsida	*Verbenaceae*	*Stachytarpheta indica*	-	-	+
Magnoliopsida	*Menispermaceae*	*Stephania japonica*	-	-	+
Magnoliopsida	*Malvaceae*	*Sterculia guttata*	-	-	+
Magnoliopsida	*Bignoniaceae*	*Stereospermum colais*	-	-	+
Magnoliopsida	*Acanthaceae*	*Strobilanthes aurita*	-	-	+
Magnoliopsida	*Acanthaceae*	*Strobilanthes barbatus*	-	-	+
Magnoliopsida	*Acanthaceae*	*Strobilanthes heyneanus*	-	-	+
Magnoliopsida	*Acanthaceae*	*Strobilanthes neoaspera*	-	-	+
Magnoliopsida	*Strombosiaceae*	*Strombosia ceylanica*	-	-	+
Magnoliopsida	*Loganiaceae*	*Strychnos colubrina*	+	+	-
Magnoliopsida	*Loganiaceae*	*Strychnos nux vomica*	+	+	-

Magnoliopsida	*Gentianaceae*	*Swertia corymbosa*	-	-	+
Magnoliopsida	*Lamiaceae*	*Symphorema involucratum*	-	-	+
Magnoliopsida	*Symplocaceae*	*Symplocos cochinchinensis*	-	-	+
Magnoliopsida	*Symplocaceae*	*Symplocos macrocarpa*	-	-	+
Magnoliopsida	*Symplocaceae*	*Symplocos racemosa*	-	-	+
Magnoliopsida	*Myrtaceae*	*Syzygium australe*	-	-	+
Magnoliopsida	*Myrtaceae*	*Syzygium caryophyllatum*	+	-	-
Magnoliopsida	*Myrtaceae*	*Syzygium chavaran*	-	-	+
Magnoliopsida	*Myrtaceae*	*Syzygium cumini*	+	+	+
Magnoliopsida	*Myrtaceae*	*Syzygium gardneri*	-	-	+
Magnoliopsida	*Myrtaceae*	*Syzygium hemisphericum*	-	-	+
Magnoliopsida	*Myrtaceae*	*Syzygium jambos*	+	+	-
Magnoliopsida	*Myrtaceae*	*Syzygium laetum*	-	-	+
Magnoliopsida	*Myrtaceae*	*Syzygium montanum*	+	-	-
Magnoliopsida	*Myrtaceae*	*Syzygium munronii*	-	-	+
Magnoliopsida	*Myrtaceae*	*Syzygium tamilnadensis*	-	-	+
Magnoliopsida	*Myrtaceae*	*Syzygium zeylanicum*	+	-	-
Magnoliopsida	*Fabaceae*	*Tamarindus indica*	+	+	-
Magnoliopsida	*Lamiaceae*	*Tectona grandis*	-	-	+
Magnoliopsida	*Combretaceae*	*Terminalia arjuna*	+	+	-

Magnoliopsida	*Combretaceae*	*Terminalia bellirica*	-	-	+
Magnoliopsida	*Combretaceae*	*Terminalia gella*	-	-	+
Magnoliopsida	*Combretaceae*	*Terminalia tomentosa*	+	-	+
Magnoliopsida	*Tetramelaceae*	*Tetrameles nudiflora*	-	-	+
Magnoliopsida	*Vitaceae*	*Tetrastigma bracteolatum*	-	-	+
Magnoliopsida	*Theaceae*	*Thea sinensis*	-	-	+
Magnoliopsida	*Meliaceae*	*Toona ciliata*	-	-	+
Magnoliopsida	*Linderniaceae*	*Torenia bicolor*	-	-	+
Magnoliopsida	*Linderniaceae*	*Torenia lindernioides*	-	-	+
Magnoliopsida	*Euphorbiaceae*	*Tragia hispida*	-	-	+
Magnoliopsida	*Lythraceae*	*Trapa natans*	-	-	+
Magnoliopsida	*Euphorbiaceae*	*Trewia nudiflora*	-	-	+
Magnoliopsida	*Meliaceae*	*Trichilia connaroides*	-	-	+
Magnoliopsida	*Cucurbitaceae*	*Trichosanthes tricuspidata*	-	-	+
Magnoliopsida	*Malvaceae*	*Triumfetta pentandra*	-	-	+
Magnoliopsida	*Staphyleaceae*	*Turpinia malabarica*	-	-	+
Magnoliopsida	*Apocynaceae*	*Tylophora dalzellii*	-	-	+
Magnoliopsida	*Malvaceae*	*Urena lobata* subsp. *lobata*	-	-	+
Magnoliopsida	*Lentibulariaceae*	*Utricularia australis*	-	-	+
Magnoliopsida	*Asteraceae*	*Vernonia arborea*	-	-	+

Magnoliopsida	*Fabaceae*	*Vigna vexillata*	-	-	+
Magnoliopsida	*Santalaceae*	*Viscum angulatum*	-	-	+
Magnoliopsida	*Lamiaceae*	*Vitex altissima*	+	+	+
Magnoliopsida	*Lamiaceae*	*Vitex amplirima*	+	-	-
Magnoliopsida	*Lamiaceae*	*Vitex negundo*	+	-	-
Magnoliopsida	*Lamiaceae*	*Vitex negundo* var. *purpurascens*	-	-	+
Magnoliopsida	*Rubiaceae*	*Wendlandia thyrsoidea*	-	-	+
Magnoliopsida	*Apocynaceae*	*Wrightia tinctoria*	+	+	-
Magnoliopsida	*Asteraceae*	*Xanthium* sp.	+	-	-
Magnoliopsida	*Polygalaceae*	*Xanthophyllum arnottianum*	-	-	+
Magnoliopsida	*Rubiaceae*	*Xeromphis spinosa*	-	-	+
Magnoliopsida	*Fabaceae*	*Xylia xylocarpa*	-	-	+
Magnoliopsida	*Rutaceae*	*Zanthoxylum rhetsa*	-	-	+
Magnoliopsida	*Rhamnaceae*	*Ziziphus jujuba*	+	-	-
Magnoliopsida	*Rhamnaceae*	*Ziziphus rugosa*	-	-	+
Magnoliopsida	*Rhamnaceae*	*Ziziphus* sp.	-	+	-
Marchantiopsida	*Ricciaceae*	*Riccia fluitans*	-	-	+
Marchantiopsida	*Ricciaceae*	*Ricciocarpos natans*	-	-	+
Polypodiopsida	*Pteridaceae*	*Actiniopteris radiata*	-	-	+
Polypodiopsida	*Pteridaceae*	*Adiantum capillus-veneris*	-	-	+

Polypodiopsida	*Pteridaceae*	*Adiantum latifolium*	-	-	+
Polypodiopsida	*Pteridaceae*	*Aleuritopteris bicolor*	-	-	+
Polypodiopsida	*Salviniaceae*	*Azolla pinnata*	-	-	+
Polypodiopsida	*Blechnaceae*	*Blechnum orientale*	-	-	+
Polypodiopsida	*Dryopteridaceae*	*Bolbitis appendiculata*	-	-	+
Polypodiopsida	*Dryopteridaceae*	*Bolbitis semicordata*	-	-	+
Polypodiopsida	*Pteridaceae*	*Ceratopteris thalictroides*	-	-	+
Polypodiopsida	*Cyatheaceae*	*Cyathea nilgirensis*	-	-	+
Polypodiopsida	*Thelypteridaceae*	*Cyclosorus papilio*	-	-	+
Polypodiopsida	*Thelypteridaceae*	*Cyclosorus parasiticus*	-	-	+
Polypodiopsida	*Gleicheniaceae*	*Dicranopteris linearis*	-	-	+
Polypodiopsida	*Pteridaceae*	*Doryopteris concolor*	-	-	+
Polypodiopsida	*Polypodiaceae*	*Drynaria quercifolia*	-	-	+
Polypodiopsida	*Dryopteridaceae*	*Dryopteris austro-indica*	-	-	+
Polypodiopsida	*Pteridaceae*	*Hemionitis cordata*	-	-	+
Polypodiopsida	*Polypodiaceae*	*Lepisorus nudus*	-	-	+
Polypodiopsida	*Lindsaeaceae*	*Odontosoria chinensis* subsp. *tenuifolia*	-	-	+
Polypodiopsida	*Osmundaceae*	*Osmunda hilsenbergii*	-	-	+
Polypodiopsida	*Pteridaceae*	*Pityrogramma calomelanos*	-	-	+
Polypodiopsida	*Dennstaedtiaceae*	*Pteridium revolutum*	-	-	+

Polypodiopsida	*Pteridaceae*	*Pteris arisanensis*	-	-	+
Polypodiopsida	*Pteridaceae*	*Pteris biaurita* subsp. *walkeriana*	-	-	+
Polypodiopsida	*Pteridaceae*	*Pteris blumeana*	-	-	+
Polypodiopsida	*Pteridaceae*	*Pteris vittata*	-	-	+
Polypodiopsida	*Polypodiaceae*	*Pyrrosia porosa*	-	-	+
Polypodiopsida	*Salviniaceae*	*Salvinia adnata*	-	-	+
Polypodiopsida	*Tectariaceae*	*Tectaria gemmifera*	-	-	+
Polypodiopsida	*Tectariaceae*	*Tectaria gemmifera auct non*	-	-	+
Polypodiopsida	*Tectariaceae*	*Tectaria polymorpha*	-	-	+
Selaginellopsida	*Selaginellaceae*	*Selaginella delicatula*	-	-	+
Selaginellopsida	*Selaginellaceae*	*Selaginella tenera*	-	-	+

+: present; -: absent

3.1.1.4. Floodplain Vegetation

Floodplain vegetation represents plant communities adapted to thrive in periodically flooded environments along riverbanks and nearby low-lying areas. According to collected data, the floodplain is mainly dominated by herbaceous plants belonging to family *Cyperaceae* and *Polygonaceae*. This reflects their adaptation to fluctuating hydrological regimes and sediment deposition (Mani et al., 2020). Species of the genus *Cyperus* (e.g., *C. kyllingia*, *C. pubisquama* and *C. rotundus*) were highly recorded, indicating moist, nutrient-rich, and often disturbed habitats. These plants are well-known for their tolerance to waterlogged conditions and play a significant role in soil stabilization, sediment trapping, and nutrient cycling within floodplain ecosystems (Devi et al., 2025). Likewise, the presence of *Polygonum* species (*P. chinense, P. glabrum*, and *P. plebeium*) highlights the ecological plasticity of the family *Polygonaceae* in flood-prone areas. These species are typically fast-growing and capable of colonizing on freshly deposited alluvial soils. This attribute of this plant species makes it the pioneer species in floodplain succession (Dagar, 2018). Moreover, the variation in presence and absence of species in dataset suggests shifts in vegetation composition over time. This may be due to variations in flooding patterns, sediment movement, and anthropogenic disturbances. Such changes indicate increasing habitat heterogeneity or recent colonization after flood events. Table 5 provide the comprehensive list of different floodplain vegetation recorded in Cauvery River and Fig. 4 present the Floodplain vegetation diversity in Cauvery River.

Polygonum chinense ***Polygonum glabrum*** ***Polygonum plebeium***

Fig. 4. Selective species photographs of floodplain vegetation observed in Cauvery River (Image Source: Mani et al., 2020).

Table 5. List of floodplain vegetation observed across Cauvery River

Class (Taxa)	Family	Species	Mani et al., 2020
Liliopsida	*Cyperaceae*	*Cyperus kyllingia* Endl.	+
Liliopsida	*Cyperaceae*	*Cyperus pubisquama* Steud.	+
Liliopsida	*Cyperaceae*	*Cyperus rotundus* L.	+

Magnoliopsida	*Polygonaceae*	*Polygonum chinense* L.	+
Magnoliopsida	*Polygonaceae*	*Polygonum glabrum* Willd.	+
Magnoliopsida	*Polygonaceae*	*Polygonum plebeium* R.Br.	+

+: present

3.1.2. Fauna

3.1.2.1. Zooplankton

The considerable diversity of zooplankton community has been accorded in Cauvery River, primarily dominated by members of the class *Monogononta*, followed by taxa belonging to *Branchiopoda* and *Maxillopoda* (Uthirasamy et al., 2021a). The family *Brachionidae* emerged as the most dominant group with multiple species of *Brachionus* and *Keratella,* suggesting nutrient-enriched conditions and high reproductive capacity (Silva et al., 2003; Razak and Sharip, 2019). Further, the prevalence of families like *Lecanidae, Philodinidae,* and *Trichocercidae* confirm the dominance of rotifers, which are well-known indicators of organic enrichment and dynamic aquatic environments (John and Kumar 2021; Kuczyńska-Kippen et al., 2025). Cladocerans were mainly represented by families like *Bosminidae, Daphniidae, Moinidae*, and *Sididae*. These organisms are typically considered as the filter feeders as they play crucial role in regulating phytoplankton population and maintaining trophic balance (Odigie et al., 2025). Moreover, copepods were represented by families like *Cyclopidae*, *Diaptomidae,* and *Oithonidae,* representing both cyclopoid and calanoid forms. Their presence suggests relatively stable water conditions and highlights their significant contribution in energy transfer within aquatic food web (Hołyńska, 2008; Wang et al., 2017). Additionally, the presence of protozoans under the family *Prorodontidae* highlights the occurrence of microzooplankton components, suggesting active microbial interactions within the ecosystem (Liu et al., 2021; Yi et al., 2023). Table 6 provide the comprehensive overview of different zooplankton recorded in Cauvery River.

Table 6. Zooplankton diversity observed in Cauvery River

Class (Taxa)	Family	Species	Uthirasamy et al., 2021b
Bdelloidea	*Philodinidae*	*Diacranophorus* sp.	+
Bdelloidea	*Philodinidae*	*Philodina* sp.	+
Branchiopoda	*Bosminidae*	*Bosmina longirostris*	+
Branchiopoda	*Daphniidae*	*Daphnia carinata*	+
Branchiopoda	*Daphniidae*	*Daphnia similis*	+

Branchiopoda	*Sididae*	*Diaphanosoma* sp.	+
Branchiopoda	*Moinidae*	*Moina daphnia*	+
Branchiopoda	*Moinidae*	*Moina* sp.	+
Maxillopoda	*Diaptomidae*	*Diaptomus* sp.	+
Maxillopoda	*Diaptomidae*	*Heliodiaptomus viduus*	+
Maxillopoda	*Cyclopidae*	*Mesocyclops hyalinus*	+
Maxillopoda	*Oithonidae*	*Oithona brevicornis*	+
Maxillopoda	*Cyclopidae*	*Thermocyclops* sp.	+
Monogononta	*Ascomorphidae*	*Ascomorpha* sp.	+
Monogononta	*Asplanchnidae*	*Asplanchna brightwellii*	+
Monogononta	*Brachionidae*	*Brachionus angularis*	+
Monogononta	*Brachionidae*	*Brachionus calyciflorus*	+
Monogononta	*Brachionidae*	*Brachionus caudatus*	+
Monogononta	*Brachionidae*	*Brachionus rubens*	+
Monogononta	*Brachionidae*	*Brachionus* sp.	+
Monogononta	*Brachionidae*	*Keratella tropica*	+
Monogononta	*Brachionidae*	*Keratella cochlearis*	+
Monogononta	*Lecanidae*	*Lecane lunaris*	+
Monogononta	*Lepadellidae*	*Lepadella* sp.	+
Monogononta	*Lecanidae*	*Monostyla quadridentata*	+
Monogononta	*Mytilinidae*	*Mytilina* sp.	+
Monogononta	*Brachionidae*	*Notholca* sp.	+
Monogononta	*Synchaetidae*	*Synchaeta* sp.	+
Monogononta	*Trichocercidae*	*Trichocerca rattus*	+
Monogononta	*Testudinellidae*	*Testudinella patina*	+
Prostomatea	*Prorodontidae*	*Prorodon* sp.	+

+: present

3.1.2.2. Zoobenthos

The dataset on zoobenthic community showed good diversity, including class like *Ostracoda, Branchiopoda,* and protozoans like *Tubulinea* and *Oligohymenophorea* (Uthirasamy et al., 2021b). This diversity reflects heterogenous nature of benthic habitats and the availability of different ecological niches within aquatic system (Altınsaçlı et al., 2015; Gueriau et al., 2016). The presence of *Cypris* sp., and *Stenocypris* sp. belonging to family *Cyprididae* indicate the stable conditions with sufficient organic matter and sediment-rich environment (Schmitz et al., 2025). Similarly, *Horaella* and *Leydigia* are generally found near substrates and vegetation, suggesting the presence of structured microhabitats (Whiteside et al., 1978; Halse et al., 2000). The presence of *Sida* sp. belonging to family *Sididae* highlights the importance of littoral zones, as these organisms are commonly associated with macrophytes and submerged substrates (Fairchild, 1981). Protozoans from families such as *Difflugiidae, Euglyphidae*, and *Vorticellidae* indicate active microbial processes within the benthic ecosystem. These organisms play a crucial role in organic matter decomposition and nutrient recycling (Nisbet, 1984; Radhakrishnan and Jayaprakas, 2015; Bonkowski et al., 2019). The presence of both free-moving and sessile forms like *Vorticella*, suggests the coexistence of periphytic and benthic communities, linking surface-associated communities with the broader benthic food web (Müller, 1989). Table 7 provide the comprehensive overview of different zoobenthos recorded in Cauvery River.

Table 7. Zoobenthos diversity observed in Cauvery River

Class (Taxa)	Family	Species	Uthirasamy et al., 2021b
Ostracoda	*Cyprididae*	*Cypris* sp.	+
Tubulinea	*Difflugiidae*	*Difflugia* sp.	+
Thecofilosea	*Euglyphidae*	*Euglypha* sp.	+
Branchiopoda	*Chydoridae*	*Horaella brehmi*	+
Branchiopoda	*Chydoridae*	*Leydigia* sp.	+
Branchiopoda	*Sididae*	*Sida* sp.	+
Ostracoda	*Cyprididae*	*Stenocypris malcolmsoni*	+
Oligohymenophorea	*Vorticellidae*	*Vorticella* sp.	+

+: present

3.1.2.3. Fishes

The fish community documented in this report comprises species belonging to the class *Actinopterygii*, involving different order and families represents varied ecological niches and habitat preferences. This classification approach provides the brief structured understanding of species distribution and ecological organization within the aquatic ecosystem (Arunkumar et al., 2015; Mani et al., 2020; Roshith et al., 2022**;** Salim et al., 2024; Shereena et al., 2025). Among the identified groups, the family *Cyprinidae* was determined to be dominant due to the presence of species like *Barilius*, *Puntius*, *Labeo*, *Garra*, *Devario*, and *Rasbora* contributing significantly to species richness. The prevalence of *Cyprinidae* species is typically associated with freshwater riverine systems characterized by moderate flow, good oxygenation, and diverse feeding niches indicating favourable environmental conditions (Arunkumar et al., 2015; Dhakal, 2015; Roshith et al., 2022; Anusha et al., 2024). Other notable families recorded include *Cichlidae, Bagridae*, and *Channidae,* each representing distinct ecological adaptations (Song et al., 2013; Carleton and Yourick, 2020; Shao et al., 2021). Members of family *Cichlidae* are generally associated with slow-flowing or lentic environments, while *Bagridae* species are predominantly associated with benthic and adapted to bottom-dwelling habitats (Carleton and Yourick, 2020; Shao et al., 2021). Species belonging to *Channidae* are known for their air-breathing ability and tolerance to low dissolved oxygen, highlighting their contribution towards ecological resilience and ability to adapt to fluctuating environmental conditions (Song et al., 2013). Additionally, the presence of families such as *Ambassidae, Mugilidae, Gerreidae,* and *Leiognathidae* suggests influences of brackish or transitional habitats, indicating toward hydrological connectivity within the system (Ikejima et al., 2003; Benjamin et al., 2023; Wantania et al., 2025). The occurrence of *Anguillidae* highlights migratory behaviour and ecological connectivity between freshwater and marine environments (Jacoby et al., 2015). Further, recurring presence of species like *Oreochromis mossambicus* and *Oreochromis niloticus* suggest wide distribution and adaptive potential, whereas other native species showed restricted occurrence indicating specific habitat preferences or localized distribution (Russell et al., 2012; Ahamed and Dharmaretnam, 2015; Sajina et al., 2026). The comparative analysis of the compiled dataset in the Table 8 reveals both consistencies and variations in fish species occurrence and Fig. 5 present the fish diversity in Cauvery River.

Fig. 5. Selective species photographs of fishes observed in Cauvery River (Image Source: Mani et al., 2020).

Table 8. Fishes diversity observed in Cauvery River

Class (Taxa)	Family	Species	Arunkumar et al., 2015	Mani et al., 2020	Roshith et al., 2022	Salim et al., 2024	Shereena et al., 2025
Actinopterygii	*Ambassidae*	*Ambassis miops*	-	-	+	-	-
Actinopterygii	*Ambassidae*	*Parambassis ranga*	+	-	-	-	-
Actinopterygii	*Anguillidae*	*Anguilla bengalensis Gray*	-	-	-	+	-
Actinopterygii	*Aplocheilidae*	*Aplocheilus lineatus*	-	+	-	-	-
Actinopterygii	*Bagridae*	*Hemibagrus punctatus*	-	-	+	-	-
Actinopterygii	*Bagridae*	*Mystus cavasius*	+	-	+	+	-
Actinopterygii	*Bagridae*	*Mystus punctatus*	+	-	-	-	-
Actinopterygii	*Bagridae*	*Mystus spp.*	-	-	-	+	-
Actinopterygii	*Belonidae*	*Xenentodon cancila*	+	-	-	-	-
Actinopterygii	*Chanidae*	*Chanos chanos*	-	-	-	+	-
Actinopterygii	*Channidae*	*Channa punctatus*	+	-	-	-	+
Actinopterygii	*Channidae*	*Channa sp.*	-	-	-	+	-
Actinopterygii	*Channidae*	*Channa spp.*	-	-	-	+	-
Actinopterygii	*Cichlidae*	*Etroplus maculatus*	+	-	-	+	+
Actinopterygii	*Cichlidae*	*Etroplus suratensis*	+	-	-	+	+
Actinopterygii	*Cichlidae*	*Oreochromis mossambicus*	-	+	-	+	+
Actinopterygii	*Cichlidae*	*Oreochromis niloticus*	-	-	+	+	+
Actinopterygii	*Cichlidae*	*Oreochromis spp.*	-	-	-	+	-

Actinopterygii	*Cobitidae*	*Lepidocephalichthys thermalis*	+	-	-	-	+
Actinopterygii	*Cyprinidae*	*Barbodes bovanicus*	-	-	+	-	-
Actinopterygii	*Cyprinidae*	*Barilius bakeri*	-	+	-	-	-
Actinopterygii	*Cyprinidae*	*Barilius bendelisis*	+	-	-	-	+
Actinopterygii	*Cyprinidae*	*Catla catla*	+	-	-	+	+
Actinopterygii	*Cyprinidae*	*Cirrhinus cirrhosus*	+	-	-	-	-
Actinopterygii	*Cyprinidae*	*Cirrhinus mrigala*	+	-	-	+	+
Actinopterygii	*Cyprinidae*	*Cirrhinus reba*	-	-	+	+	-
Actinopterygii	*Cyprinidae*	*Cyprinus carpio Linnaeus*	-	-	-	+	-
Actinopterygii	*Cyprinidae*	*Dawkinsia arulius*	-	-	+	-	-
Actinopterygii	*Cyprinidae*	*Dawkinsia filamentosa*	-	+	-	-	-
Actinopterygii	*Cyprinidae*	*Devario aequipinnatus*	+	+	-	-	-
Actinopterygii	*Cyprinidae*	*Devario malabaricus*	-	+	-	-	-
Actinopterygii	*Cyprinidae*	*Garra gotyla stenorhynchus*	+	-	-	-	-
Actinopterygii	*Cyprinidae*	*Garra mcclellandi*	-	-	+	-	-
Actinopterygii	*Cyprinidae*	*Garra mullya*	+	+	-	-	+
Actinopterygii	*Cyprinidae*	*Garra spp.*	-	-	-	+	-
Actinopterygii	*Cyprinidae*	*Haludaria fasciata*	-	+	-	-	-
Actinopterygii	*Cyprinidae*	*Hypselobarbus curmuca*	-	-	+	-	-
Actinopterygii	*Cyprinidae*	*Hypselobarbus dubius*	+	-	-	-	+
Actinopterygii	*Cyprinidae*	*Hypselobarbus kolus*	-	-	+	-	-

Actinopterygii	*Cyprinidae*	*Hypselobarbus micropogon*	-	-	+	-	-
Actinopterygii	*Cyprinidae*	*Hypselobarbus mussullah*	-	-	+	-	-
Actinopterygii	*Cyprinidae*	*Labeo ariza*	+	-	-	-	+
Actinopterygii	*Cyprinidae*	*Labeo bata*	-	-	+	-	-
Actinopterygii	*Cyprinidae*	*Labeo boggut*	+	-	+	-	-
Actinopterygii	*Cyprinidae*	*Labeo calbasu*	+	-	+	+	-
Actinopterygii	*Cyprinidae*	*Labeo kontius*	+	-	-	-	-
Actinopterygii	*Cyprinidae*	*Labeo rohita*	-	-	-	+	-
Actinopterygii	*Cyprinidae*	*Pethia conchonius*	-	-	+	-	-
Actinopterygii	*Cyprinidae*	*Puntius amphibius*	+	-	-	-	-
Actinopterygii	*Cyprinidae*	*Puntius carnaticus*	+	-	-	-	-
Actinopterygii	*Cyprinidae*	*Puntius chola*	-	-	+	-	-
Actinopterygii	*Cyprinidae*	*Puntius conchonius*	+	-	-	-	+
Actinopterygii	*Cyprinidae*	*Puntius filamentosus*	+	-	-	-	+
Actinopterygii	*Cyprinidae*	*Puntius mahecola*	+	-	-	-	+
Actinopterygii	*Cyprinidae*	*Puntius sarana sarana*	+	-	-	-	-
Actinopterygii	*Cyprinidae*	*Puntius sp.*	-	-	-	+	-
Actinopterygii	*Cyprinidae*	*Rasbora daniconius*	+	+	-	-	-
Actinopterygii	*Cyprinidae*	*Salmostoma acinaces*	+	-	+	-	-
Actinopterygii	*Cyprinidae*	*Tor khudree*	+	-	-	-	-
Actinopterygii	*Cyprinidae*	*Tor malabaricus*	+	-	-	-	-

Actinopterygii	*Elopidae*	*Elops machnata*	-	-	-	+	-
Actinopterygii	*Gerreidae*	*Gerres filamentosus Cuvier*	-	-	-	+	-
Actinopterygii	*Gobiidae*	*Glossogobius giuris*	+	-	-	-	-
Actinopterygii	*Hemiramphidae*	*Hyporhamphus limbatus*	+	-	-	-	-
Actinopterygii	*Hemiramphidae*	*Hyporhamphus xanthopterus*	-	-	+	-	-
Actinopterygii	*Leiognathidae*	*Photopectoralis bindus*	-	-	+	-	-
Actinopterygii	*Mastacembelidae*	*Macrognathus pancalus*	+	-	-	-	-
Actinopterygii	*Mastacembelidae*	*Mastacembelus armatus*	+	-	-	+	-
Actinopterygii	*Mastacembelidae*	*Mastacembelus sp.*	-	-	-	+	-
Actinopterygii	*Megalopidae*	*Megalops cyprinoides*	-	-	-	+	-
Actinopterygii	*Mugilidae*	*Crenimugil buchanani*	-	-	+	-	-
Actinopterygii	*Mugilidae*	*Mugil cephalus Linnaeus*	-	-	+	+	-
Actinopterygii	*Nemacheilidae*	*Nemacheilus nukta*	+	-	-	-	-
Actinopterygii	*Nemacheilidae*	*Nemacheilus pulchellus*	-	-	+	-	-
Actinopterygii	*Nemacheilidae*	*Nemacheilus cf. semiarmatus*	-	+	-	-	-
Actinopterygii	*Nemacheilidae*	*Schistura spp.*	-	+	-	-	-
Actinopterygii	*Notopteridae*	*Notopterus notopterus*	+	-	-	-	-
Actinopterygii	*Pristolepididae*	*Pristolepis spp.*	-	+	-	-	-
Actinopterygii	*Scatophagidae*	*Scatophagus spp.*	-	-	-	+	-
Actinopterygii	*Sillaginidae*	*Sillago sihama*	-	-	-	+	-
Actinopterygii	*Siluridae*	*Ompok bimaculatus*	-	-	-	+	-

Actinopterygii	*Siluridae*	*Wallago attu*	+	-	+	+	-
Actinopterygii	*Terapontidae*	*Terapon spp.*	-	-	-	+	-

+: present; -: absent

3.1.2.4. Higher Aquatic Vertebrates

The data available on higher aquatic vertebrates showed the dominance of two major classes i.e., *Amphibia* and *Mammalia*. Among amphibians, the families *Dicroglossidae* and *Rhacophoridae* were accorded to have higher species richness compared to other families. The presence of species belonging to genus *Minervarya* like *M. agricola*, *M. caperata*, *M. kudremukhensis*, *M. mudduraja*, and *M. sahyadris* in the river system indicates the strong adaptation to these native environmental conditions (Mani et al., 2020; Garg and Biju, 2021). Similarly, the genus *Raorchestes* showed notable diversity with multiple species like *R. akroparallagi*, *R. charius*, *R. chromosynchysi*, *R. glandulosus*, *R. luteolus*, *R. ochlandrae*, *R. ponmudi*, and *R. tuberohumerus*, indicating the microhabitat heterogenicity, especially in forested and riparian zones (Mani et al., 2020; Priti et al., 2016; Garg et al., 2021). The family *Bufonidae* was represented by genera like *Duttaphrynus*, *Ghatophryne*, and *Pedostibes*. Whereas, the family *Ranidae* and *Ranixalidae* was represented by species like *Hydrophylax malabaricus* and *Indirana tysoni*, respectively (Mani et al., 2020). Other families like *Micrixalidae, Microhylidae*, and *Nyctibatrachidae* were also recorded, indicating the presence of both stream-associated and terrestrial breeding amphibians (Vijayakumar et al., 2019). The presence of genera like *Nyctibatrachus* and *Micrixalus*, suggests the ecological integrity of lotic habitats as these species are associated with fast-flowing streams (Rajiv et al., 2025; Aravind et al., 2026).

In contrast to amphibians, mammalian representation was comparatively less but ecologically significant. The recorded mammalian taxa belonged to diverse families such as *Bovidae* (*Bos gaurus*), *Cervidae* (*Axis axis*, *Rusa unicolor*), and *Elephantidae* (*Elephas maximus*) suggests the presence of large herbivores that depend on aquatic and riparian habitats for water and forage (Mani et al., 2020; Mallick, 2019). Carnivorous mammals from families *Felidae* (*Panthera tigris tigris*, *Panthera pardus*), *Canidae* (*Cuon alpinus*), *Ursidae* (*Melursus ursinus*), and *Viverridae* (*Viverricula indica*) highlight the trophic complexity and predator presence in the ecosystem (Mani et al., 2020). Table 9 provide the comprehensive overview of different higher aquatic vertebrates recorded in Cauvery River and Fig. 6 present the Higher Aquatic Vertebrates diversity in Cauvery River.

Clinotarsus curtipes

Duttaphrynus melanostictus

Minervarya caperata

Hoplobatrachus tigerinus

Indirana tysoni

Indosylvirana indica

Micrixalus kottigeharensis

Micrixalus saxicola

Polypedates occidentalis

Pseudophylautus waynadensis

Raorchestes ponmudi

Rhacophorus malabaricus

Rusa unicolor

Semnopithecus dussumieri

Panthera tigris tigris

Elephas maximus ***Ratufa indica*** ***Macaca radiata***

Fig. 6. Selective species photographs of higher aquatic vertebrates observed in Cauvery River (Image Source: Mani et al., 2020).

Table 9. List of higher aquatic vertebrates observed in Cauvery River

Class (Taxa)	Family	Species	Mani et al., 2020
Amphibia	*Bufonidae*	*Duttaphrynus melanostictus*	+
Amphibia	*Bufonidae*	*Duttaphrynus scaber*	+
Amphibia	*Bufonidae*	*Ghatophryne ornata*	+
Amphibia	*Bufonidae*	*Pedostibes tuberculosus*	+
Amphibia	*Dicroglossidae*	*Euphlyctis cyanophlyctis*	+
Amphibia	*Dicroglossidae*	*Euphlyctis hexadactylus*	+
Amphibia	*Dicroglossidae*	*Euphlyctis mudigere*	+
Amphibia	*Dicroglossidae*	*Hoplobatrachus tigerinus*	+
Amphibia	*Dicroglossidae*	*Minervarya agricola*	+
Amphibia	*Dicroglossidae*	*Minervarya caperata*	+
Amphibia	*Dicroglossidae*	*Minervarya kudremukhensis*	+
Amphibia	*Dicroglossidae*	*Minervarya mudduraja*	+
Amphibia	*Dicroglossidae*	*Minervarya sahyadris*	+
Amphibia	*Ranidae*	*Clinotarsus curtipes*	+
Amphibia	*Ranidae*	*Hydrophylax malabaricus*	+
Amphibia	*Ranixalidae*	*Indirana tysoni*	+
Amphibia	*Ranidae*	*Indosylvirana indica*	+
Amphibia	*Ranidae*	*Indosylvirana intermedius*	+
Amphibia	*Micrixalidae*	*Micrixalus kottigeharensis*	+
Amphibia	*Micrixalidae*	*Micrixalus saxicola*	+
Amphibia	*Microhylidae*	*Microhyla Rubra*	+
Amphibia	*Microhylidae*	*Uperodon triangularis*	+

Amphibia	*Nyctibatrachidae*	*Nyctibatrachus kempholehensis*	+
Amphibia	*Nyctibatrachidae*	*Nyctibatrachus grandis*	+
Amphibia	*Nyctibatrachidae*	*Nyctibatrachus sanctipalustris*	+
Amphibia	*Rhacophoridae*	*Polypedates occidentalis*	+
Amphibia	*Rhacophoridae*	*Pseudophilautus wynadensis*	+
Amphibia	*Rhacophoridae*	*Raorchestes akroparallagi*	+
Amphibia	*Rhacophoridae*	*Raorchestes charius*	+
Amphibia	*Rhacophoridae*	*Raorchestes chromosynchysi*	+
Amphibia	*Rhacophoridae*	*Raorchestes glandulosus*	+
Amphibia	*Rhacophoridae*	*Raorchestes luteolus*	+
Amphibia	*Rhacophoridae*	*Raorchestes ochlandrae*	+
Amphibia	*Rhacophoridae*	*Raorchestes ponmudi*	+
Amphibia	*Rhacophoridae*	*Raorchestes tuberohumerus*	+
Amphibia	*Rhacophoridae*	*Rhacophorus lateralis*	+
Amphibia	*Rhacophoridae*	*Rhacophorus malabaricus*	+
Mammalia	*Cervidae*	*Axis axis*	+
Mammalia	*Cervidae*	*Rusa Unicolor*	+
Mammalia	*Herpestidae*	*Herpestes edwardsi*	+
Mammalia	*Cercopithecidae*	*Semnopithecus dussumieri*	+
Mammalia	*Suidae*	*Sus scrofa cristatus*	+
Mammalia	*Felidae*	*Panthera tigris tigris*	+
Mammalia	*Elephantidae*	*Elephas maximus*	+
Mammalia	*Ursidae*	*Melursus ursinus*	+
Mammalia	*Cercopithecidae*	*Macaca radiata*	+
Mammalia	*Sciuridae*	*Ratufa indica*	+
Mammalia	*Bovidae*	*Bos gaurus*	+
Mammalia	*Canidae*	*Cuon alpinus*	+
Mammalia	*Felidae*	*Panthera pardus*	+
Mammalia	*Viverridae*	*Viverricula indica*	+
Mammalia	*Hystricidae*	*Hystrix indica*	+

3.1.2.5. Aquatic Aves

The Aves community recorded showed the high degree of taxonomic richness, encompassing numerous species distributed among wide range of families. The Class *Aves* were recorded with diverse families like *Accipitridae, Ardeidae, Muscicapidae, Sturnidae, Columbidae, Picidae, Cuculidae, Anatidae, Phalacrocoracidae*, and *Rallidae* (Menon et al., 2015; Mani et al., 2020). Among all, the family *Accipitridae* was accorded for diverse species like *Accipiter badius, Aquila fasciata, Gyps bengalensis, Milvus migrans,* and *Spilornis cheela.* The presence of these species indicates the presence of top predators (Mani et al., 2020; Kumar et al., 2022). The family *Ardeidae* also showed the notable diversity of species like *Ardea alba, A. cinerea, A. purpurea, Ardeola grayii, Bubulcus ibis,* and *Egretta garzetta*. The presence of these species suggests the stable wetland bird population (Sossou and Adjakpa, 2020). The occurrence of species like *Anas poecilorhyncha, Amaurornis phoenicurus, Actitis hypoleucos,* and *Threskiornis melanocephalus* highlight the importance of aquatic habitats (Mani et al., 2020**)**. The presence of common Aves species like *Copsychus saularis, Pycnonotus cafer, Cinnyris asiaticus, Orthotomus sutorius,* and *Dicrurus macrocercus* signifies the rich terrestrial and shrubland bird community (Mahanta et al., 2025). Furthermore, the occurrence of the forest and woodland species represented by families like *Picidae* (*Dinopium benghalense, Dryocopus javensis*), *Bucerotidae* (*Ocyceros birostris, O. griseus*), and *Trogonidae* (*Harpactes fasciatus*) implies the presence of well-developed vegetation (Mani et al., 2020**)**. The dataset used in the study unveils the consistent presence of wetland birds like *Actitis hypoleucos, Alcedo atthis, Amaurornis phoenicurus, Ardea spp., Bubulcus ibis, Egretta garzetta, Nycticorax nycticorax,* and *Tachybaptus ruficollis.* Whereas*,* the presence and absence of certain species in the dataset highlights the temporal and habitat-based variation. Table 10 provide the comprehensive list of different aquatic aves recorded in Cauvery River and Fig. 7 present the aquatic aves diversity in Cauvery River.

Fig. 7. Selective species photographs of aquatic aves observed in Cauvery River (Image Source: Mani et al., 2020).

Table 10. List of aquatic aves observed in Cauvery River

Class (Taxa)	Family	Species	Menon et al., 2015	Mani et al., 2020
Aves	*Accipitridae*	*Accipiter badius*	-	+
Aves	*Accipitridae*	*Aquila fasciata*	-	+
Aves	*Accipitridae*	*Aviceda jerdoni*	-	+
Aves	*Accipitridae*	*Aviceda leuphotes*	-	+
Aves	*Accipitridae*	*Circaetus gallicus*	-	+
Aves	*Accipitridae*	*Elanus caeruleus*	-	+
Aves	*Accipitridae*	*Gyps bengalensis*	-	+
Aves	*Accipitridae*	*Haliastur indus*	-	+
Aves	*Accipitridae*	*Hieraaetus pennatus*	-	+
Aves	*Accipitridae*	*Ictinaetus malaiensis*	-	+
Aves	*Accipitridae*	*Milvus migrans*	-	+
Aves	*Accipitridae*	*Nisaetus chirrhatus*	-	+
Aves	*Accipitridae*	*Pernis ptilorhynchus*	-	+
Aves	*Accipitridae*	*Sarcogyps calvus*	-	+
Aves	*Accipitridae*	*Spilornis cheela*	-	+
Aves	*Acrocephalidae*	*Acrocephalus stentoreus*	-	+
Aves	*Acrocephalidae*	*Acrocephalus dumetorum*	-	+
Aves	*Aegithinidae*	*Aegithina tiphia*	-	+
Aves	*Alcedinidae*	*Alcedo atthis*	+	+
Aves	*Alcedinidae*	*Ceryle rudis*	+	-
Aves	*Alcedinidae*	*Halcyon smyrnensis*	+	+
Aves	*Anatidae*	*Anas poecilorhyncha*	+	-
Aves	*Anatidae*	*Anas querquedula*	+	-
Aves	*Anatidae*	*Dendrocygna javanica*	+	+
Aves	*Anatidae*	*Nettapus coromandelianus*	-	+
Aves	*Anhingidae*	*Anhinga melanogaster*	-	+
Aves	*Apodidae*	*Apus affinis*	-	+
Aves	*Apodidae*	*Cypsiurus balasiensis*	-	+
Aves	*Ardeidae*	*Ardea alba*	+	+
Aves	*Ardeidae*	*Ardea cinerea*	+	+

Aves	*Ardeidae*	*Ardea intermedia*	+	+
Aves	*Ardeidae*	*Ardea purpurea*	+	+
Aves	*Ardeidae*	*Ardeola grayii*	+	+
Aves	*Ardeidae*	*Bubulcus ibis*	+	+
Aves	*Ardeidae*	*Butorides striata*	-	+
Aves	*Ardeidae*	*Egretta garzetta*	+	+
Aves	*Ardeidae*	*Nycticorax nycticorax*	+	+
Aves	*Artamidae*	*Artamus fuscus*	-	+
Aves	*Bucerotidae*	*Ocyceros birostris*	-	+
Aves	*Bucerotidae*	*Ocyceros griseus*	-	+
Aves	*Campephagidae*	*Coracina macei*	-	+
Aves	*Campephagidae*	*Lalage melanoptera*	-	+
Aves	*Campephagidae*	*Pericrocotus cinnamomeus*	-	+
Aves	*Campephagidae*	*Pericrocotus flammeus*	-	+
Aves	*Caprimulgidae*	*Caprimulgus asiaticus*	-	+
Aves	*Caprimulgidae*	*Caprimulgus atripennis*	-	+
Aves	*Caprimulgidae*	*Caprimulgus indicus*	-	+
Aves	*Charadriidae*	*Vanellus indicus*	+	+
Aves	*Charadriidae*	*Vanellus malabaricus*	+	-
Aves	*Chloropseidae*	*Chloropsis aurifrons*	-	+
Aves	*Ciconiidae*	*Anastomus oscitans*	+	+
Aves	*Ciconiidae*	*Ciconia episcopus*	+	+
Aves	*Ciconiidae*	*Ciconia nigra*	-	+
Aves	*Ciconiidae*	*Mycteria leucocephala*	+	-
Aves	*Cisticolidae*	*Orthotomus sutorius*	-	+
Aves	*Cisticolidae*	*Prinia socialis*	-	+
Aves	*Columbidae*	*Chalcophaps indica*	-	+
Aves	*Columbidae*	*Columba livia*	-	+
Aves	*Columbidae*	*Spilopelia chinensis*	-	+
Aves	*Columbidae*	*Spilopelia senegalensis*	-	+
Aves	*Columbidae*	*Streptopelia orientalis*	-	+
Aves	*Columbidae*	*Treron affinis*	-	+

Aves	*Columbidae*	*Treron phoenicopterus*	-	+
Aves	*Coraciidae*	*Coracias benghalensis*	-	+
Aves	*Coraciidae*	*Eurystomus orientalis*	-	+
Aves	*Corvidae*	*Corvus culminatus*	-	+
Aves	*Corvidae*	*Corvus splendens*	-	+
Aves	*Corvidae*	*Dendrocitta vagabunda*	-	+
Aves	*Cuculidae*	*Centropus sinensis*	-	+
Aves	*Cuculidae*	*Eudynamys scolopaceus*	-	+
Aves	*Cuculidae*	*Hierococcyx varius*	-	+
Aves	*Cuculidae*	*Phaenicophaeus viridirostris*	-	+
Aves	*Dicaeidae*	*Dicaeum concolor*	-	+
Aves	*Dicaeidae*	*Dicaeum erythrorhynchos*	-	+
Aves	*Dicruridae*	*Dicrurus leucophaeus*	-	+
Aves	*Dicruridae*	*Dicrurus aeneus*	-	+
Aves	*Dicruridae*	*Dicrurus macrocercus*	-	+
Aves	*Dicruridae*	*Dicrurus paradiseus*	-	+
Aves	*Estrildidae*	*Euodice malabarica*	-	+
Aves	*Estrildidae*	*Lonchura striata*	-	+
Aves	*Falconidae*	*Falco chicquera*	-	+
Aves	*Falconidae*	*Falco peregrinus*	-	+
Aves	*Falconidae*	*Falco tinnunculus*	-	+
Aves	*Hirundinidae*	*Cecropis daurica*	-	+
Aves	*Hirundinidae*	*Hirundo rustica*	-	+
Aves	*Hirundinidae*	*Hirundo smithii*	-	+
Aves	*Jacanidae*	*Hydrophasianus chirurgus*	+	-
Aves	*Jacanidae*	*Metopidius indicus*	-	+
Aves	*Laniidae*	*Lanius schach*	-	+
Aves	*Laniidae*	*Lanius excubitor*	-	+
Aves	*Laniidae*	*Lanius vittatus*	-	+
Aves	*Laridae*	*Chlidonias hybrida*	+	-
Aves	*Laridae*	*Gelochelidon nilotica*	+	-

Aves	*Leiothrichidae*	*Argya malcolmi*	-	+
Aves	*Leiothrichidae*	*Turdiodes striata*	-	+
Aves	*Leiothrichidae*	*Turdoides subrufus (Blyth)*	-	-
Aves	*Megalaimidae*	*Psilopogon haemacephalus*	-	+
Aves	*Megalaimidae*	*Psilopogon malabaricus*	-	+
Aves	*Megalaimidae*	*Psilopogon viridis*	-	+
Aves	*Meropidae*	*Merops leschenaulti*	-	+
Aves	*Meropidae*	*Merops orientalis*	-	+
Aves	*Meropidae*	*Nyctyornis athertoni*	-	+
Aves	*Monarchidae*	*Terpsiphone paradisi*	-	+
Aves	*Motacillidae*	*Motacilla cinerea*	-	+
Aves	*Motacillidae*	*Motacilla maderaspatensis*	-	+
Aves	*Muscicapidae*	*Copsychus malabaricus*	-	+
Aves	*Muscicapidae*	*Copsychus saularis*	-	+
Aves	*Muscicapidae*	*Cyornis pallidipes*	-	+
Aves	*Muscicapidae*	*Cyornis tickelliae*	-	+
Aves	*Muscicapidae*	*Eumyias thalassinus*	-	+
Aves	*Muscicapidae*	*Larvivora brunnea*	-	+
Aves	*Muscicapidae*	*Monticola cinclorhyncha*	-	+
Aves	*Muscicapidae*	*Muscicapa dauurica*	-	+
Aves	*Muscicapidae*	*Muscicapa muttui*	-	+
Aves	*Muscicapidae*	*Myophonus horsfieldii*	-	+
Aves	*Muscicapidae*	*Saxicola caprata*	-	+
Aves	*Nectariniidae*	*Arachnothera longirostra*	-	+
Aves	*Nectariniidae*	*Cinnyris asiaticus*	-	+
Aves	*Nectariniidae*	*Cinnyris lotenius*	-	+
Aves	*Nectariniidae*	*Leptocoma minima*	-	+
Aves	*Nectariniidae*	*Leptocoma zeylonica*	-	+
Aves	*Oriolidae*	*Oriolus chinensis*	-	+
Aves	*Oriolidae*	*Oriolus kundoo*	-	+
Aves	*Oriolidae*	*Oriolus xanthornus*	-	+
Aves	*Paridae*	*Machlolophus aplonotus*	-	+

Aves	*Paridae*	*Parus major*	-	+
Aves	*Passeridae*	*Gymnoris xanthocollis*	-	+
Aves	*Passeridae*	*Passer domesticus*	-	+
Aves	*Pellorneidae*	*Pellorneum ruficeps*	-	+
Aves	*Phalacrocoracidae*	*Microcarbo niger*	-	+
Aves	*Phalacrocoracidae*	*Phalacrocorax carbo*	+	-
Aves	*Phalacrocoracidae*	*Phalacrocorax fuscicollis*	+	+
Aves	*Phalacrocoracidae*	*Phalacrocorax niger*	+	-
Aves	*Phasianidae*	*Ortygornis pondicerianus*	-	+
Aves	*Phasianidae*	*Gallus sonneratii*	-	+
Aves	*Phasianidae*	*Pavo cristatus*	-	+
Aves	*Phasianidae*	*Perdicula asiatica*	-	+
Aves	*Phylloscopidae*	*Phylloscopus nitidus*	-	+
Aves	*Phylloscopidae*	*Phylloscopus trochiloides*	-	+
Aves	*Picidae*	*Chrysocolaptes guttacristatus*	-	+
Aves	*Picidae*	*Yungipicus nanus*	-	+
Aves	*Picidae*	*Dinopium benghalense*	-	+
Aves	*Picidae*	*Dinopium javanense*	-	+
Aves	*Picidae*	*Dryocopus javensis*	-	+
Aves	*Picidae*	*Hemicircus canente*	-	+
Aves	*Picidae*	*Leiopicus mahrattensis*	-	+
Aves	*Picidae*	*Micropternus brachyurus*	-	+
Aves	*Picidae*	*Picus chlorolophus*	-	+
Aves	*Podicipedidae*	*Tachybaptus ruficollis*	+	+
Aves	*Psittaculidae*	*Loriculus vernalis*	-	+
Aves	*Psittaculidae*	*Psittacula columboides*	-	+
Aves	*Psittaculidae*	*Psittacula cyanocephala*	-	+
Aves	*Psittaculidae*	*Psittacula krameri*	-	+
Aves	*Pycnonotidae*	*Acritillas indica*	-	+
Aves	*Pycnonotidae*	*Pycnonotus cafer*	-	+
Aves	*Pycnonotidae*	*Pycnonotus jocosus*	-	+

Aves	*Pycnonotidae*	*Rubigula gularis*	-	+
Aves	*Rallidae*	*Amaurornis phoenicurus*	+	+
Aves	*Rallidae*	*Fulica atra*	+	+
Aves	*Rallidae*	*Gallinula chloropus*	+	-
Aves	*Rallidae*	*Metopidius indicus*	+	-
Aves	*Rallidae*	*Porphyrio porphyrio*	+	-
Aves	*Recurvirostridae*	*Himantopus himantopus*	+	+
Aves	*Scolopacidae*	*Actitis hypoleucos*	+	+
Aves	*Scolopacidae*	*Tringa glareola*	-	+
Aves	*Scolopacidae*	*Tringa stagnatilis*	+	-
Aves	*Sittidae*	*Sitta castanea*	-	+
Aves	*Sittidae*	*Sitta frontalis*	-	+
Aves	*Strigidae*	*Athene brama*	-	+
Aves	*Strigidae*	*Glaucidium radiatum*	-	+
Aves	*Strigidae*	*Ketupa zeylonensis*	-	+
Aves	*Sturnidae*	*Acridotheres fuscus*	-	+
Aves	*Sturnidae*	*Acridotheres tristis*	-	+
Aves	*Sturnidae*	*Gracula indica*	-	+
Aves	*Sturnidae*	*Pastor roseus*	-	+
Aves	*Sturnidae*	*Sturnia malabarica*	-	+
Aves	*Sturnidae*	*Sturnia pagodarum*	-	+
Aves	*Threskiornithidae*	*Plegadis falcinellus*	+	-
Aves	*Threskiornithidae*	*Pseudibis papillosa*	+	+
Aves	*Threskiornithidae*	*Threskiornis melanocephalus*	+	+
Aves	*Timaliidae*	*Pomatorhinus horsfieldii*	-	+
Aves	*Timaliidae*	*Dumetia atriceps*	-	+
Aves	*Trogonidae*	*Harpactes fasciatus*	-	+
Aves	*Turdidae*	*Geokichla citrina*	-	+
Aves	*Turdidae*	*Turdus merula*	-	+
Aves	*Upupidae*	*Upupa epops*	-	+
Aves	*Vangidae*	*Tephrodornis pondicerianus*	-	+

Aves	*Vangidae*	*Tephrodornis sylvicola*	-	+
Aves	*Zosteropidae*	*Zosterops palpebrosus*	-	+

+: present; -: absent

3.2. Tributaries

3.2.1. Flora

3.2.1.1. Phytoplankton

The phytoplankton community across the Cauvery River tributaries exhibited high diversity, with representatives from class like *Chlorophyceae, Cyanophyceae, Bacillariophyceae, Zygnematophyceae, Euglenophyceae, Trebouxiophyceae, Dinophyceae*, and *Ulvophyceae*. This diversity suggests varying environmental conditions as well as nutrient levels in the aquatic system (Ramakrishniah et al., 2000; Komala et al., 2013; Mahadevaswamy, 2020).

Chlorophyceae (green algae) was determined to be the dominant group with families like *Scenedesmaceae, Selenastraceae, Oedogoniaceae, Hydrodictyaceae*, and *Volvocaceae*. Common genera included *Actinastrum, Ankistrodesmus, Coelastrum, Pediastrum, Scenedesmus, Oedogonium, Chlorococcum, Chlamydomonas*, and *Eudorina*. The abundance of these species indicates good nutrient availability and favourable conditions for primary productivity (Ali et al., 2011; Dahiya et al., 2021). The substantial diversity of the members belonging to the class *Zygnematophyceae* was recorded in cauvery river tributaries with genera like *Closterium, Cosmarium, Micrasterias, Staurastrum, Spirogyra,* and *Zygnema*. These occurrence of these species are often associated with relatively stable and clean freshwater conditions (Akter et al., 2022). Moreover, the presence of species like *Microcystis, Anabaena, Oscillatoria*, and *Spirulina*, suggest nutrient enrichment and possible eutrophic conditions within those areas (Kuczyńska-Kippen et al., 2024). Whereas, the occurrence of species like *Cyclotella, Melosira*, and *Surirella* highlight the importance of flowing water conditions (Mitrovic et al., 2008; Arumugham et al., 2023). Furthermore, the presence of species like *Euglena, Phacus*, *Chlorella, Oocystis*, Ceratium, and *Ulothrix* enhances the overall diversity and suggests varying environmental conditions (Ramakrishniah et al., 2000, Komala et al., 2013, Mahadevaswamy, 2020).

The composition of phytoplankton varied across tributaries such as Hemavathi, Harangi, Kabini, Nugu, Arkavathi, and Lakshmanatirtha (Ramakrishniah et al., 2000, Komala et al., 2013, Mahadevaswamy, 2020). Some genera like *Actinastrum, Ankistrodesmus, Closterium, Cosmarium, Pediastrum, Oedogonium*, and *Ulothrix* were consistently recorded in the dataset highlighting ecological stability. On contrary, others showed site-specificity reflecting differences in local environmental conditions. Table 11 provide the phytoplankton species composition in the tributaries of CRB.

Table 11. Phytoplankton species composition in selected tributaries of the CRB

Tributary/ Tributaries	Class (Taxa)	Family	Species	Reference
Hemavathi, Harangi, Kabini, Nugu, and Arkavathi	Chlorophyceae	*Scenedesmaceae*	*Actinastrum sp.*	Ramakrishniah et al., 2000
	Chlorophyceae	*Selenastraceae*	*Ankistrodesmus sp.*	
	Zygnematophyceae	*Desmidiaceae*	*Arthrodesmus spp.*	
	Dinophyceae	*Ceratiaceae*	*Ceratium spp.*	
	Zygnematophyceae	*Closteriaceae*	*Closterium spp.*	
	Chlorophyceae	*Scenedesmaceae*	*Coelastrum sp.*	
	Zygnematophyceae	*Desmidiaceae*	*Cosmarium sp.*	
	Zygnematophyceae	*Desmidiaceae*	*Desmidium sp.*	
	Zygnematophyceae	*Gonatozygaceae*	*Gonatozygon spp.*	
	Zygnematophyceae	*Desmidiaceae*	*Micrasterias spp.*	
	Cyanophyceae	*Microcystaceae*	*Microcystis spp.*	
	Chlorophyceae	*Scenedesmaceae*	*Nephrocystium spp.*	
	Chlorophyceae	*Oedogoniaceae*	*Oedogonium sp.*	
	Chlorophyceae	*Hydrodictyaceae*	*Pediastrum sp.*	
	Zygnematophyceae	*Desmidiaceae*	*Staurastrum spp.*	
	Ulvophyceae	*Ulotrichaceae*	*Ulothrix sp.*	
Arkavathi River	Bacillariophyceae	—	*Bacillariophyceae (Diatoms)*	Komala et al., 2013
	Chlorophyceae	—	*Chlorococcales (Green algae)*	

	Zygnematophyceae	*Desmidaceae*	*Desmidaceae (Desmids)*	
	Euglenophyceae	—	*Euglenophyceae (Euglenoids)*	
	Cyanophyceae	—	*Myxophyceae / Cyanophyceae (Blue-green algae)*	
Lakshmanatirtha, Harangi, Lokapavani, Hemavathi, and Cauvery	Chlorophyceae	*Scenedesmaceae*	*Actinastrum sp.*	Mahadevaswamy, 2020
	Cyanophyceae	*Nostocaceae*	*Anabaena sp.*	
	Chlorophyceae	*Selenastraceae*	*Ankistrodesmus sp.*	
	Cyanophyceae	*Merismopediaceae*	*Aphanocapsa sp.*	
	Chlorophyceae	*Chlamydomonadaceae*	*Chlamydomonas sp.*	
	Trebouxiophyceae	*Chlorellaceae*	*Chlorella sp.*	
	Chlorophyceae	*Chlorococcaceae*	*Chlorococcum sp.*	
	Chlorophyceae	*Chlorococcaceae*	*Chlorococcus sp.*	
	Zygnematophyceae	*Closteriaceae*	*Closterium sp.*	
	Chlorophyceae	*Scenedesmaceae*	*Coelastrum sp.*	
	Zygnematophyceae	*Desmidiaceae*	*Cosmarium sp.*	
	Chlorophyceae	*Scenedesmaceae*	*Crucigenia sp.*	
	Bacillariophyceae	*Stephanodiscaceae*	*Cyclotella sp.*	
	Zygnematophyceae	*Desmidiaceae*	*Desmidium sp.*	
	Chlorophyceae	*Volvocaceae*	*Eudorina sp.*	
	Euglenophyceae	*Euglenaceae*	*Euglena sp.*	
	Chlorophyceae	*Palmellaceae*	*Gloeocystis sp.*	

	Chlorophyceae	*Radiococcaceae*	*Golenkinia sp.*	
	Chlorophyceae	*Selenastraceae*	*Kirchneriella sp.*	
	Cyanophyceae	*Oscillatoriaceae*	*Lyngbya sp.*	
	Bacillariophyceae	*Melosiraceae*	*Melosira sp.*	
	Cyanophyceae	*Merismopediaceae*	*Merismopedia sp.*	
	Chlorophyceae	*Oedogoniaceae*	*Oedogonium sp.*	
	Trebouxiophyceae	*Oocystaceae*	*Oocystis sp.*	
	Cyanophyceae	*Oscillatoriaceae*	*Oscillatoria sp.*	
	Chlorophyceae	*Palmellaceae*	*Palmella sp.*	
	Chlorophyceae	*Hydrodictyaceae*	*Pediastrum sp.*	
	Euglenophyceae	*Euglenaceae*	*Phacus sp.*	
	Cyanophyceae	*Oscillatoriaceae*	*Phormidium sp.*	
	Cyanophyceae	*Nostocaceae*	*Raphidiopsis sp.*	
	Chlorophyceae	*Scenedesmaceae*	*Scenedesmus sp.*	
	Zygnematophyceae	*Zygnemataceae*	*Spirogyra sp.*	
	Cyanophyceae	*Oscillatoriaceae*	*Spirulina sp.*	
	Bacillariophyceae	*Surirellaceae*	*Surirella sp.*	
	Euglenophyceae	*Euglenaceae*	*Trachelomonas sp.*	
	Ulvophyceae	*Ulotrichaceae*	*Ulothrix sp.*	
	Zygnematophyceae	*Zygnemataceae*	*Zygnema sp.*	

Table 12. Periphyton species composition in selected tributaries of the CRB

Tributary/ Tributaries	Class (Taxa)	Family	Species	References
Hemavathi, Harangi, Kabini, Nugu, and Arkavathi	Bacillariophyceae	*Naviculaceae*	*Navicula sp.*	Ramakrishniah et al., 2000
	Bacillariophyceae	*Pinnulariaceae*	*Pinnularia sp.*	
	Bacillariophyceae	*Fragilariaceae*	*Synedra sp.*	
Kabini	Bacillariophyceae	*Amphoraceae*	*Amphora ovalis*	Maishale and Ulavi, 2015
	Bacillariophyceae	*Cocconeidaceae*	*Cocconeis placentula*	
	Bacillariophyceae	*Cymbellaceae*	*Cymbella cymbiformis*	
	Bacillariophyceae	*Fragilariaceae*	*Fragilaria capucina*	
	Bacillariophyceae	*Gomphonemataceae*	*Gomphonema parvulum*	
	Bacillariophyceae	*Naviculaceae*	*Navicula rhombica*	
	Bacillariophyceae	*Bacillariaceae*	*Nitzschia palea*	
	Bacillariophyceae	*Pinnulariaceae*	*Pinnularia gibba*	
	Bacillariophyceae	*Pleurosigmataceae*	*Pleurosigma hippocampus*	
	Bacillariophyceae	*Fragilariaceae*	*Synedra acus*	
	Bacillariophyceae	*Fragilariaceae*	*Synedra ulna*	
Lakshmanatirtha, Harangi, Lokapavani, Hemavathi, and Cauvery	Bacillariophyceae	*Amphoraceae*	*Amphora sp.*	Mahadevaswamy, 2020
	Bacillariophyceae	*Cocconeidaceae*	*Cocconeis sp.*	
	Bacillariophyceae	*Cymbellaceae*	*Cymbella sp.*	
	Bacillariophyceae	*Fragilariaceae*	*Fragilaria sp.*	
	Bacillariophyceae	*Gomphonemataceae*	*Gomphonema sp.*	

	Bacillariophyceae	*Pleurosigmataceae*	*Gyrosigma sp.*	
	Bacillariophyceae	*Naviculaceae*	*Navicula sp.*	
	Bacillariophyceae	*Bacillariaceae*	*Nitzschia sp.*	
	Bacillariophyceae	*Pinnulariaceae*	*Pinnularia sp.*	
	Bacillariophyceae	*Fragilariaceae*	*Synedra sp.*	

3.2.1.2. Periphyton

The periphyton community across the tributaries of the Cauvery River is mainly dominated by class Bacillariophyceae, indicating their importance in attached and bottom habitats. These communities are found across tributaries like Hemavathi, Harangi, Kabini, Nugu, Arkavathi, Lakshmanatirtha, Lokapavani, and the main channel of Cauvery signifying a well-developed periphytic assemblage (Ramakrishniah et al., 2000, Maishale and Ulavi, 2015, Mahadevaswamy, 2020).

The composition is mainly represented by families like *Naviculaceae, Pinnulariaceae, Fragilariaceae, Amphoraceae, Cocconeidaceae, Cymbellaceae, Gomphonemataceae*, *Bacillariaceae*, and *Pleurosigmataceae*. These species belonging to these families have the ability to grow on submerged surfaces like rocks, sediments, and aquatic plants (Maishale and Ulavi, 2015, Krivosheia, 2020; Mahadevaswamy, 2020; Sukhanova and Gaysina, 2024). The occurrence of species like *Navicula sp., Navicula rhombica, Pinnularia sp.,* and *Pinnularia gibba* highlights the wide distribution of the members belonging to *Naviculaceae* and *Pinnulariaceae* family (Ramakrishniah et al., 2000, Maishale and Ulavi, 2015, Mahadevaswamy, 2020). The consistent occurrence of genera *Synedra* and *Fragilaria* highlights their adaptability to flowing water (Zepernick et al., 2024; Phuyal et al., 2025). The presence of species like *Amphora ovalis*, *Cocconeis placentula*, *Cymbella cymbiformis* and *Gomphonema parvulum* suggests stable substrate conditions as these are firmly attached forms of diatoms (Rimet et al., 2009; Çelekli et al., 2018). Further, the occurrence of species like *Nitzschia palea* and *Pleurosigma hippocampus* suggest variations in nutrient levels and possible organic enrichment across different tributaries (Marshall et al., 2005; Han et al., 2016). The diversity of species in the tributaries of Cauvery River implies both spatial variation and temporal changes in environmental conditions across the tributaries. Table 12 provide the periphyton species composition in the tributaries of CRB.

3.2.1.3. Riparian Vegetation

The riparian vegetation community recorded across the tributaries of Cauvery River is represented by the members of class Liliopsida and Magnoliopsida. The occurrence of species of this class across the different tributaries like Hemavathi, Harangi, Kabini, Nugu, and Arkavathi highlights the presence of well-developed submerged and terrestrial members of the riparian vegetation (Ramakrishniah et al., 2000; Ravi et al., 2016; Moun et al., 2024). In the upstream tributaries involving Hemavathi, Harangi, Kabini, Nugu, and Arkavathi, riparian vegetation is represented by submerged macrophytes belonging to the family

Hydrocharitaceae. *Hydrilla spp.* and *Vallisneria spp.,* are well-known submerged macrophytes that are typically rooted in the sediment and form dense underwater meadows (Ramakrishniah et al., 2000; Sousa, 2011; Liao et al., 2024). The formation of these dense meadows plays crucial role in maintaining ecological balance (Hauxwell et al., 2007; Yin et al., 2019). On contrary, the Bhavani River riparian zone showed the dominant presence of terrestrial and semi-aquatic vegetation. The species like C*alotropis gigantea, Ficus benghalensis, Ficus racemosa, Tamarindus indica,* and *Vitex negundo* were found in the Bhavani rivers belonging families like *Apocynaceae, Moraceae, Fabaceae*, and *Lamiaceae* (Ravi et al., 2016). These species are generally found on the riverbank and known to play crucial role in reducing erosion, stabilizing soil and providing organic input to the river system (Jha et al., 2023). Similarly, the Bhavani–Noyyal River region reported about the presence of families like *Fabaceae, Myrtaceae*, and *Combretaceae* represented by species such as *Pongamia pinnata, Syzygium cumini,* and *Terminalia arjuna.* These species are well-known for their establishment on riparian corridors (Moun et al., 2024). Moreover, these species are stated to be of ecological importance in supporting fauna diversity, regulating microclimatic conditions and maintaining bank stability (Nagaraja et al., 2014; Moun et al., 2024; Dwivedi et al., 2025). The variation in riparian vegetation in different tributaries highlights spatial heterogeneity in environmental conditions like anthropogenic influence, flow regime, soil type and moisture. Table 13 provide the list of different riparian vegetation recorded in the different tributaries of the Cauvery River.

Table 13. Enlist of riparian vegetation found in the different tributaries of the CRB

Tributary/ Tributaries	Class (Taxa)	Family	Species	References
Hemavathi, Harangi, Kabini, Nugu, and Arkavathi	Liliopsida	*Hydrocharitaceae*	*Hydrilla spp.*	Ramakrishniah et al., 2000
	Liliopsida	*Hydrocharitaceae*	*Vallisneria spp.*	
Bhavani River	Magnoliopsida	*Apocynaceae*	*Calotropis gigantea*	Ravi et al., 2016
	Magnoliopsida	*Moraceae*	*Ficus benghalensis*	
	Magnoliopsida	*Moraceae*	*Ficus racemosa*	
	Magnoliopsida	*Fabaceae*	*Tamarindus indica*	
	Magnoliopsida	*Lamiaceae*	*Vitex negundo*	

Bhavani-Noyyal River	Magnoliopsida	*Fabaceae*	*Pongamia pinnata*	Moun et al., 2024
	Magnoliopsida	*Myrtaceae*	*Syzygium cumini*	
	Magnoliopsida	*Combretaceae*	*Terminalia arjuna*	

3.2.1.4. Floodplain Vegetation

The floodplain vegetation associated with the tributaries of the Cauvery River showed considerable diversity. The distribution of species across tributaries like Hemavathi, Harangi, Kabini, Nugu, Arkavathi, Bhavani River, Kollidam river, and Bhavani–Noyyal River suggests variations in nutrient variability, hydrological regimes and soil within floodplain environment. *Potamogeton spp.,* has been accorded to present in the tributaries like Hemavathi, Harangi, Kabini, Nugu, and Arkavathi (Ramakrishniah et al., 2000). These species are typically rooted, submerged macrophytes that inhabit freshwater environments with moderate flow and sufficient light penetration. Thus, occurrence of these species reflects the favourable conditions like stable substrates and balanced nutrient availability (Khapare et al., 2025). The Bhavani River supports herbaceous and semi-aquatic vegetation belonging to families like *Amaranthaceae, Commelinaceae*, and *Cyperaceae* encompassing species like *Alternanthera sessilis, Commelina benghalensis,* and *Cyperus difformis* (Ravi et al., 2016). The plant species well-known for their adaptability to periodically inundated soil. Moreover, they are also known to play substantial role in bank stabilization and nutrient retention (Sarkar et al., 2021; Rao et al., 2024). The Kollidam river reported the presence of floating macrophytes named *Eichhornia crassipes* belonging to family Pontederiaceae. The presence of this species indicates the nutrient rich condition and reduced flow regimes (Coetzee et al., 2014; Jayasurya et al., 2023). Further, Bhavani–Noyyal River accorded the presence of families like *Cyperaceae, Pontederiaceae, Araceae*, and *Typhaceae* represented by the species like *Cyperus difformis, Eichhornia crassipes, Pistia stratiotes,* and *Typha angustifolia* (Moun et al., 2024). The occurrence of the species highlights their adaptability to slow-flowing and waterlogged environment, which eventually contributes to habitat formation, nutrient cycling and sediment trapping (Bhat et al., 2017; Maranho and Gomes, 2024). The variation in floodplain vegetation across tributaries indicates spatial heterogeneity in environmental factors like anthropogenic influences, flooding frequency, and sediment deposition. Table 14 provide the list of different floodplain vegetation recorded in the different tributaries and distributaries of the Cauvery River.

Table 14. Enlist of floodplain vegetation found in the different tributaries and distributaries of the CRB

Tributary/ Tributaries/ Distributaries	Class (Taxa)	Family	Species	References
Hemavathi, Harangi, Kabini, Nugu, and Arkavathi	Liliopsida	*Potamogetonaceae*	*Potamogeton spp.*	Ramakrishniah et al., 2000
Bhavani River	Magnoliopsida	*Amaranthaceae*	*Alternanthera sessilis*	Ravi et al., 2016
	Liliopsida	*Commelinaceae*	*Commelina benghalensis*	
	Liliopsida	*Cyperaceae*	*Cyperus difformis*	
Kollidam River	Liliopsida	*Pontederiaceae*	*Eichhornia crassipes*	Jayasurya et al., 2023
Bhavani-Noyyal River	Liliopsida	*Cyperaceae*	*Cyperus difformis*	Moun et al., 2024
	Liliopsida	*Pontederiaceae*	*Eichhornia crassipes*	
	Liliopsida	*Araceae*	*Pistia stratiotes*	
	Liliopsida	*Typhaceae*	*Typha angustifolia*	

3.2.2. Fauna

3.2.2.1. Zooplankton

The zooplankton community recorded across the tributaries of the Cauvery River like Hemavathi, Harangi, Kabini, Nugu, and Arkavathi showed considerable taxonomic diversity. The diversity of zooplankton reflects variation in ecological interactions, hydrological conditions and nutrient availability. Ramakrishniah et al. (2000) reported the occurrence of species from the class Branchiopoda, Monogononta, Copepoda, and Tubulinea. The wide distribution of species like *Alona* spp., *Bosmina* spp., *Ceriodaphnia* spp., *Daphnia* spp., *Diaphanosoma* spp., *Moina* spp., and *Polyphemus* spp. belonging to class Branchiopoda were accorded by Ramakrishniah et al. (2000). The presence of these species highlights their role as primary grazers linking phytoplankton to higher trophic levels (Cottingham and Schindler, 2000; Bhavna et al., 2021). Likewise, the presence of species *Cyclops spp.* and *Diaptomus spp.* suggest the stable aquatic conditions and active trophic dynamics (Karmakar et al., 2022). Further, the occurrence of *Brachionus spp., Keratella spp., Filinia spp., Pompholyx spp.,* and

Diplois spp. have also been reported in dataset across tributaries (Ramakrishniah et al., 2000). These species are known for their rapid population turnover and sensitivity to environmental changes. Thus, these species serve as indicator of water quality and nutrient availability (Oh et al., 2017; Kuczyńska-Kippen et al., 2025). Moreover, *Arcella spp., Centropyxis spp.,* and *Difflugia spp.* were also recorded indicating the presence of organic matter and active microbial food webs (Ramakrishniah et al., 2000; Koenig et al., 2018; Tran et al., 2022).

In particular, Arkavathi river was accorded to have more diverse and specialized zooplanktons. Other than common species, the presence of other species like *Asplanchna spp., Brachionus caudatus, Keratella quadrata, Lecane spp., Epiphanes macrourus,* and *Microcodon spp.* was also reported (Komala et al., 2013). The presence of *Paramecium aurelia, Paramecium caudatum,* and *Carchesium polypinum* along with copepod larvae and zoea crustacean larvae signifies enhanced microbial activity and dynamic reproductive cycles within this tributaryn (Komala et al., 2013; Pereira et al., 2014; Long et al., 2023). This variation in zooplankton composition across tributaries underlines the difference in anthropogenic influences, flow regimes, nutrient inputs and organic content. The table 15 provide the comprehensive overview of different zooplankton recorded in the different tributaries of the Cauvery River.

Table 15. Zooplankton diversity observed in the different tributaries of the CRB

Tributary/ Tributaries	**Class (Taxa)**	**Family**	**Species**	**References**
Hemavathi, Harangi, Kabini, Nugu, and Arkavathi	Branchiopoda	*Chydoridae*	*Alona* spp.	Ramakrishniah et al., 2000
	Tubulinea	*Arcellidae*	*Arcella* spp.	
	Branchiopoda	*Bosminidae*	*Bosmina* spp.	
	Monogononta	*Brachionidae*	*Brachionus* spp.	
	Tubulinea	*Centropyxidae*	*Centropyxis* spp.	
	Branchiopoda	*Daphniidae*	*Ceriodaphnia* spp.	
	Insecta	*Chaoboridae*	*Chaoborus* spp.	
	Copepoda	*Cyclopidae*	*Cyclops* spp.	
	Branchiopoda	*Daphniidae*	*Daphnia* spp.	

	Branchiopoda	*Sididae*	*Diaphanosoma* spp.	
	Copepoda	*Diaptomidae*	*Diaptomus* spp.	
	Tubulinea	*Difflugiidae*	*Difflugia* spp.	
	Monogononta	*Lecanidae*	*Diplois* spp.	
	Monogononta	*Testudinellidae*	*Filinia* spp.	
	Monogononta	*Brachionidae*	*Keratella* spp.	
	Branchiopoda	*Moinidae*	*Moina* spp.	
	Branchiopoda	*Polyphemidae*	*Polyphemus* spp.	
	Monogononta	*Testudinellidae*	*Pompholyx* spp.	
Arkavathi River	Tubulinea	*Amoebidae*	*Amoeba* spp.	Komala et al., 2013
	Tubulinea	*Arcellidae*	*Arcella* spp.	
	Monogononta	*Asplanchnidae*	*Asplanchna* spp.	
	Monogononta	*Brachionidae*	*Brachionus caudatus*	
	Oligohymenophorea	*Vorticellidae*	*Carchesium polypinum*	
	Insecta	*Chaoboridae*	*Chaoborus* spp.	
	Copepoda	*Cyclopidae*	*Cyclops* spp.	
	Branchiopoda	*Daphniidae*	*Daphnia* spp.	
	Branchiopoda	*Sididae*	*Diaphanosoma* spp.	
	Monogononta	*Lepadellidae*	*Diurella* spp.	
	Monogononta	*Epiphanidae*	*Epiphanes macrourus*	
	Monogononta	*Gastropodidae*	*Gastropus hyptopus*	
	Monogononta	*Brachionidae*	*Keratella quadrata*	
	Monogononta	*Lecanidae*	*Lecane* spp.	

	Copepoda	*Cyclopidae*	*Macrocyclops* spp.	
	Copepoda	*Cyclopidae*	*Mesocyclops* spp.	
	Monogononta	*Notommatidae*	*Microcodon* spp.	
	Copepoda	—	*Nauplius stage*	
	Oligohymenophorea	*Parameciidae*	*Paramecium aurelia*	
	Oligohymenophorea	*Parameciidae*	*Paramecium caudatum*	
	Oligohymenophorea	—	*Sphaerophysa* spp.	
	Malacostraca	—	*Zoea stage*	

3.2.2.2. Zoobenthos

The zoobenthic community of the Arkavathi River encompasses the class Insecta which include families like *Culicidae, Chironomidae, Siphlonuridae*, and *Tipulidae*. These families represent the *Anopheles* spp., *Chironomus* spp., *Siphlonurus* spp., and *Tipula* spp. (Komala et al., 2013). The presence of *Chironomus spp.* is the indication of organic rich environment and low-oxygen conditions (Manfrin et al., 2018; Nath, 2018). Whereas, the occurrence of *Anopheles spp.* is associated with stagnant waters (Panigrahi and Mahapatra, 2013). On contrary, the presence of *Siphlonurus spp.* suggest well-oxygenated and relatively cleaner conditions (Turley et al., 2016; Vilenica et al., 2017). Moreover, the *Tipula spp.* is commonly found in detritus-rich sediments as they contribute in the decomposition process (Cook et al., 2007; Komala et al., 2013; Halvorson et al., 2017**).** The co-existence of these tolerant as well as sensitive taxa in Arkavathi River indicates heterogenous environmental conditions. Table 16 provide the comprehensive overview of different zoobenthos recorded in the different tributaries of the Cauvery River.

Table 16. Zoobenthos diversity observed in the different tributaries of the CRB

Tributary/ Tributaries	Class (Taxa)	Family	Species	References

Arkavathi River	Insecta	*Culicidae*	*Anopheles* spp.	Komala et al., 2013
	Insecta	*Chironomidae*	*Chironomus* spp.	
	Insecta	*Siphlonuridae*	*Siphlonurus* spp.	
	Insecta	*Tipulidae*	*Tipula* spp.	

3.2.2.3. Fishes

The fish diversity recorded across the Cauvery River tributaries reveals a rich and taxonomically diverse assemblage represented entirely by the class Actinopterygii encompassing wide range of families as well as species across multiple tributaries. This diversity signifies both native diversity and the presence of introduced species indicating anthropogenic influence and ecological variability. Among the recorded families, *Cyprinidae* emerged as the most dominant and widely distributed family across all tributaries. Economically and ecologically important species like *Catla catla, Cirrhinus mrigala, Labeo rohita, Cyprinus carpio, Tor* spp.*, Puntius* spp.*, Pethia* spp.*, Garra* spp., and *Hypselobarbus* spp. are recorded to be present in all the tributaries. The prevalent occurrence of family *Cyprinidae* across tributaries such as Hemavathi, Kabini, Bhavani, Arkavathi, and Cauvery highlights their adaptability to diverse flow regimes and habitat conditions (Ramakrishniah et al., 2000; Arunkumar and Manimekalan, 2018, Arunkumar et al., 2018; Pownkumar et al., 2022).

The presence of other significant species like *Oreochromis mossambicus*, *Oreochromis niloticus*, *Etroplus spp.* highlights the presence of both native and introduced species that are generally associated with aquaculture and reservoir systems (Russell et al., 2012; Ahamed and Dharmaretnam, 2015; Kumar et al., 2021; Sajina et al., 2026). The occurrence of *Mystus spp.*, *Wallago attu*, and *Ompok bimaculatus* which belong to family *Bagridae* and *Siluridae* present the importance of catfish groups adapted to benthic habitat (Ramachandra et al., 2012). Whereas, the presence of *Channa* spp. belonging to family *Channidae* is indicative of hardy species that are capable of surviving in limited-oxygen environments (Ly et al., 2024).

The occurrence of species like *Mastacembelus armatus*, *Macrognathus pancalus* belonging to family *Mastacembelidae, Lepidocephalichthys spp.* belonging to family *Cobitidae* and *Schistura spp.*, *Mesonoemacheilus spp.* belonging to family *Nemacheilidae* represent bottom-dwelling and hill-stream adapted fishes indicating habitat heterogeneity, especially in upstream and fast-flowing tributaries (Anoop et al., 2018a; Chattopadhyay et al., 2024; Bandara and Gunawardena, 2026). Additionally, the presence of families like *Notopteridae, Ambassidae, Gobiidae, Belonidae*, and *Hemiramphidae* contributes to ecological diversity, representing pelagic, littoral, and surface-dwelling niches.

Tributaries like Kabini, Bhavani, and Moyar were determined to have high species richness encompassing endemic and conservation-significant species like Sahyadria *denisonii*, *Tor remadevii*, and *Neolissochilus spp.* These species are well-known for their ecological importance (Pinder et al., 2018; Jacob and Kandambeth, 2022). On contrary, reservoir and modified systems like Mettur and Krishnaraja Sagara reported the presence of exotic and cultured species like *Ctenopharyngodon idella*, *Clarias gariepinus*, and *Pterygoplichthys spp.*, suggesting the anthropogenic influence (Escalera-Vázquez et al., 2019; Low et al., 2022; Hossain et al., 2024). The diversity of these fish species underlines the ecological significance of the tributary network in sustaining freshwater biodiversity while also highlighting the influence of environmental gradients and human interventions on fish community. Table 17 provides the comprehensive detail of fish species present in the different tributaries, distributaries and associated water bodies of the Cauvery River.

Table 17. Fishes diversity observed in the different tributaries, distributaries and associated water bodies of the CRB

Tributary/ Tributaries	Class (Taxa)	Family	Species	References
Hemavathi, Harangi, Kabini, Nugu, and Arkavathi	Actinopterygii	*Cyprinidae*	*Catla catla*	Ramakrishniah et al., 2000
	Actinopterygii	*Cyprinidae*	*Cirrhinus mrigala*	
	Actinopterygii	*Cyprinidae*	*Cyprinus carpio*	
	Actinopterygii	*Cyprinidae*	*Labeo rohita*	
	Actinopterygii	*Mastacembelidae*	*Mastacembelus armatus*	
	Actinopterygii	*Bagridae*	*Mystus cavasius*	
	Actinopterygii	*Notopteridae*	*Notopterus notopterus*	
	Actinopterygii	*Siluridae*	*Ompok bimaculatus*	
	Actinopterygii	*Cichlidae*	*Oreochromis mossambicus*	
	Actinopterygii	*Siluridae*	*Wallago attu*	
Moyar River, Pambar River	Actinopterygii	*Cyprinidae*	*Neolissochilus hexagonolepis*	Pinder et al., 2018
	Actinopterygii	*Cyprinidae*	*Neolissochilus hexastichus*	
	Actinopterygii	*Cyprinidae*	*Neolissochilus wynaadensis*	
	Actinopterygii	*Cyprinidae*	*Tor khudree*	
	Actinopterygii	*Cyprinidae*	*Tor malabaricus*	
	Actinopterygii	*Cyprinidae*	*Tor putitora*	
	Actinopterygii	*Cyprinidae*	*Tor remadevii*	
	Actinopterygii	*Cyprinidae*	*Dawkinsia filamentosa*	Arunkumar and Manimekalan, 2018
	Actinopterygii	*Cyprinidae*	*Haludaria fasciata*	

Bhavani River, Moyar River, Cauvery River, Nugu River	Actinopterygii	*Cyprinidae*	*Haludaria melanampyx*	
	Actinopterygii	*Cyprinidae*	*Hypselobarbus carnaticus*	
	Actinopterygii	*Cyprinidae*	*Hypselobarbus ophicephalus*	
	Actinopterygii	*Cyprinidae*	*Pethia bimaculata*	
	Actinopterygii	*Cyprinidae*	*Pethia conchonius*	
	Actinopterygii	*Cyprinidae*	*Pethia ticto*	
	Actinopterygii	*Cyprinidae*	*Puntius amphibius*	
	Actinopterygii	*Cyprinidae*	*Puntius chola*	
	Actinopterygii	*Cyprinidae*	*Puntius dorsalis*	
	Actinopterygii	*Cyprinidae*	*Puntius mahecola*	
	Actinopterygii	*Cyprinidae*	*Puntius sarana*	
	Actinopterygii	*Cyprinidae*	*Puntius sophore*	
	Actinopterygii	*Cyprinidae*	*Sahyadria denisonii*	
Bhavani River, Cauvery River, Moyar River, Nugu River	Actinopterygii	*Aplocheilidae*	*Aplocheilus lineatus*	Arunkumar et al., 2018
	Actinopterygii	*Cyprinidae*	*Barilius bakeri*	
	Actinopterygii	*Cyprinidae*	*Barilius barana*	
	Actinopterygii	*Cyprinidae*	*Barilius bendelisis*	
	Actinopterygii	*Cyprinidae*	*Barilius gatensis*	
	Actinopterygii	*Cyprinidae*	*Cirrhinus mrigala*	
	Actinopterygii	*Cyprinidae*	*Crossocheilus latius*	
	Actinopterygii	*Cyprinidae*	*Dawkinsia filamentosa*	

	Actinopterygii	*Cyprinidae*	*Devario aequipinnatus*	
	Actinopterygii	*Cichlidae*	*Etroplus maculatus*	
	Actinopterygii	*Cichlidae*	*Etroplus suratensis*	
	Actinopterygii	*Cyprinidae*	*Garra gotyla*	
	Actinopterygii	*Cyprinidae*	*Garra hughi*	
	Actinopterygii	*Cyprinidae*	*Garra mullya*	
	Actinopterygii	*Cyprinidae*	*Garra nasuta*	
	Actinopterygii	*Cyprinidae*	*Garra periyarensis*	
	Actinopterygii	*Cyprinidae*	*Garra surendranathi*	
	Actinopterygii	*Gobiidae*	*Glossogobius giuris*	
	Actinopterygii	*Sisoridae*	*Glyptothorax housei*	
	Actinopterygii	*Cyprinidae*	*Haludaria fasciata*	
	Actinopterygii	*Cyprinidae*	*Haludaria melanampyx*	
	Actinopterygii	*Bagridae*	*Hemibagrus punctatus*	
	Actinopterygii	*Hemiramphidae*	*Hyporhamphus limbatus*	
	Actinopterygii	*Cyprinidae*	*Hypselobarbus carnaticus*	
	Actinopterygii	*Cyprinidae*	*Hypselobarbus curmuca*	
	Actinopterygii	*Cyprinidae*	*Hypselobarbus dubius*	
	Actinopterygii	*Cyprinidae*	*Hypselobarbus ophicephalus*	
	Actinopterygii	*Cyprinidae*	*Hypselobarbus periyarensis*	
	Actinopterygii	*Cyprinidae*	*Labeo ariza*	

	Actinopterygii	*Cyprinidae*	*Labeo boga*	
	Actinopterygii	*Cyprinidae*	*Labeo boggut*	
	Actinopterygii	*Cyprinidae*	*Labeo calbasu*	
	Actinopterygii	*Cyprinidae*	*Labeo kontius*	
	Actinopterygii	*Cobitidae*	*Lepidocephalichthys thermalis*	
	Actinopterygii	*Cobitidae*	*Lepidocephalichthys typus*	
	Actinopterygii	*Mastacembelidae*	*Macrognathus pancalus*	
	Actinopterygii	*Mastacembelidae*	*Mastacembelus armatus*	
	Actinopterygii	*Bagridae*	*Mystus cavasius*	
	Actinopterygii	*Siluridae*	*Ompok bimaculatus*	
	Actinopterygii	*Cichlidae*	*Oreochromis mossambicus*	
	Actinopterygii	*Cyprinidae*	*Osteochilus longidorsalis*	
	Actinopterygii	*Ambassidae*	*Parambassis ranga*	
	Actinopterygii	*Cyprinidae*	*Pethia bimaculata*	
	Actinopterygii	*Cyprinidae*	*Pethia conchonius*	
	Actinopterygii	*Cyprinidae*	*Pethia ticto*	
	Actinopterygii	*Pristolepididae*	*Pristolepis marginata*	
	Actinopterygii	*Cyprinidae*	*Puntius amphibius*	
	Actinopterygii	*Cyprinidae*	*Puntius chola*	
	Actinopterygii	*Cyprinidae*	*Puntius dorsalis*	
	Actinopterygii	*Cyprinidae*	*Puntius mahecola*	

	Actinopterygii	*Cyprinidae*	*Puntius sarana*	
	Actinopterygii	*Cyprinidae*	*Puntius sophore*	
	Actinopterygii	*Cyprinidae*	*Rasbora daniconius*	
	Actinopterygii	*Cyprinidae*	*Sahyadria chalakkudiensis*	
	Actinopterygii	*Cyprinidae*	*Sahyadria denisonii*	
	Actinopterygii	*Cyprinidae*	*Salmophasia acinaces*	
	Actinopterygii	*Nemacheilidae*	*Schistura denisoni*	
	Actinopterygii	*Nemacheilidae*	*Schistura guentheri*	
	Actinopterygii	*Cyprinidae*	*Securicula gora*	
	Actinopterygii	*Cyprinidae*	*Tor khudree*	
	Actinopterygii	*Cyprinidae*	*Tor malabaricus*	
	Actinopterygii	*Amblycipitidae*	*Travancoria jonesi*	
	Actinopterygii	*Belonidae*	*Xenentodon cancila*	
Cauvery, Kannike, Kabini, Bhavani, Amaravathi, Kollidam,	Actinopterygii	*Cichlidae*	*Amphilophus trimaculatus*	Kumar et al., 2021
	Actinopterygii	*Clariidae*	*Clarias gariepinus*	
	Actinopterygii	*Cyprinidae*	*Ctenopharyngodon idella*	
	Actinopterygii	*Cyprinidae*	*Cyprinus carpio*	
	Actinopterygii	*Cichlidae*	*Oreochromis mossambicus*	
	Actinopterygii	*Cichlidae*	*Oreochromis niloticus*	
	Actinopterygii	*Loricariidae*	*Pterygoplichthys disjunctivus*	
Kabini River	Actinopterygii	*Cyprinidae*	*Amblypharyngodon melettinus*	Thampy et al., 2021

	Actinopterygii	*Cyprinidae*	*Amblypharyngodon mola*	
	Actinopterygii	*Anguillidae*	*Anguilla bengalensis*	
	Actinopterygii	*Aplocheilidae*	*Aplocheilus lineatus*	
	Actinopterygii	*Aplocheilidae*	*Aplocheilus sp.*	
	Actinopterygii	*Balitoridae*	*Balitora mysorensis*	
	Actinopterygii	*Cyprinidae*	*Bangana dero*	
	Actinopterygii	*Balitoridae*	*Bhavania australis*	
	Actinopterygii	*Cyprinidae*	*Catla catla*	
	Actinopterygii	*Channidae*	*Channa gachua*	
	Actinopterygii	*Channidae*	*Channa marulius*	
	Actinopterygii	*Channidae*	*Channa punctata*	
	Actinopterygii	*Channidae*	*Channa striata*	
	Actinopterygii	*Cyprinidae*	*Cirrhinus mrigala*	
	Actinopterygii	*Clariidae*	*Clarias dussumieri*	
	Actinopterygii	*Clariidae*	*Clarias gariepinus*	
	Actinopterygii	*Cyprinidae*	*Ctenopharyngodon idella*	
	Actinopterygii	*Cyprinidae*	*Cyprinus carpio*	
	Actinopterygii	*Cyprinidae*	*Danio rerio*	
	Actinopterygii	*Badidae*	*Dario neela*	
	Actinopterygii	*Cyprinidae*	*Dawkinsia filamentosa*	
	Actinopterygii	*Cyprinidae*	*Dawkinsia rubrotincta*	

	Actinopterygii	*Cyprinidae*	*Devario malabaricus*	
	Actinopterygii	*Cyprinidae*	*Devario sp.*	
	Actinopterygii	*Cyprinidae*	*Esomus thermoicos*	
	Actinopterygii	*Cichlidae*	*Etroplus maculatus*	
	Actinopterygii	*Cyprinidae*	*Garra mcclellandi*	
	Actinopterygii	*Cyprinidae*	*Garra mullya*	
	Actinopterygii	*Cyprinidae*	*Garra stenorhynchus*	
	Actinopterygii	*Gobiidae*	*Glossogobius giuris*	
	Actinopterygii	*Sisoridae*	*Glyptothorax annandalei*	
	Actinopterygii	*Sisoridae*	*Glyptothorax madraspatanus*	
	Actinopterygii	*Sisoridae*	*Glyptothorax sp.*	
	Actinopterygii	*Cyprinidae*	*Haludaria fasciata*	
	Actinopterygii	*Cyprinidae*	*Haludaria melanostigma*	
	Actinopterygii	*Bagridae*	*Hemibagrus punctatus*	
	Actinopterygii	*Heteropneustidae*	*Heteropneustes fossilis*	
	Actinopterygii	*Hemiramphidae*	*Hyporhamphus limbatus*	
	Actinopterygii	*Cyprinidae*	*Hypselobarbus carnaticus*	
	Actinopterygii	*Cyprinidae*	*Hypselobarbus curmuca*	
	Actinopterygii	*Cyprinidae*	*Hypselobarbus dubius*	
	Actinopterygii	*Cyprinidae*	*Hypselobarbus kurali*	
	Actinopterygii	*Cyprinidae*	*Hypselobarbus micropogon*	

	Actinopterygii	*Cyprinidae*	*Labeo ariza*	
	Actinopterygii	*Cyprinidae*	*Labeo boga*	
	Actinopterygii	*Cyprinidae*	*Labeo calbasu*	
	Actinopterygii	*Cyprinidae*	*Labeo kontius*	
	Actinopterygii	*Cyprinidae*	*Labeo nigrescens*	
	Actinopterygii	*Cyprinidae*	*Labeo porcellus*	
	Actinopterygii	*Cyprinidae*	*Labeo rohita*	
	Actinopterygii	*Cyprinidae*	*Laubuka fasciata*	
	Actinopterygii	*Cyprinidae*	*Laubuka laubuca*	
	Actinopterygii	*Cyprinidae*	*Laubuka trevori*	
	Actinopterygii	*Cobitidae*	*Lepidocephalichthys thermalis*	
	Actinopterygii	*Mastacembelidae*	*Mastacembelus armatus*	
	Actinopterygii	*Nemacheilidae*	*Mesonoemacheilus guentheri*	
	Actinopterygii	*Nemacheilidae*	*Mesonoemacheilus pambarensis*	
	Actinopterygii	*Bagridae*	*Mystus bleekeri*	
	Actinopterygii	*Bagridae*	*Mystus malabaricus*	
	Actinopterygii	*Bagridae*	*Mystus montanus*	
	Actinopterygii	*Bagridae*	*Mystus seengtee*	
	Actinopterygii	*Bagridae*	*Mystus vittatus*	
	Actinopterygii	*Cyprinidae*	*Neolissochilus wynaadensis*	
	Actinopterygii	*Notopteridae*	*Notopterus notopterus*	

	Actinopterygii	*Siluridae*	*Ompok bimaculatus*	
	Actinopterygii	*Siluridae*	*Ompok malabaricus*	
	Actinopterygii	*Cyprinidae*	*Opsarius bendelisis*	
	Actinopterygii	*Cyprinidae*	*Opsarius gatensis*	
	Actinopterygii	*Cyprinidae*	*Opsarius malabaricus*	
	Actinopterygii	*Cichlidae*	*Oreochromis mossambicus*	
	Actinopterygii	*Cichlidae*	*Oreochromis niloticus*	
	Actinopterygii	*Cyprinidae*	*Osteochilichthys nashii*	
	Actinopterygii	*Pangasiidae*	*Pangasius sp.*	
	Actinopterygii	*Nemacheilidae*	*Paracanthocobitis mooreh*	
	Actinopterygii	*Ambassidae*	*Parambassis ranga*	
	Actinopterygii	*Ambassidae*	*Parambassis thomassi*	
	Actinopterygii	*Cyprinidae*	*Pethia bimaculata*	
	Actinopterygii	*Cyprinidae*	*Pethia conchonius*	
	Actinopterygii	*Cyprinidae*	*Pethia nigripinnis*	
	Actinopterygii	*Cyprinidae*	*Pethia pookodensis*	
	Actinopterygii	*Cyprinidae*	*Pethia punctata*	
	Actinopterygii	*Cyprinidae*	*Pethia sharmai*	
	Actinopterygii	*Cyprinidae*	*Pethia vittata*	
	Actinopterygii	*Serrasalmidae*	*Piaractus brachypomus*	
	Actinopterygii	*Poeciliidae*	*Poecilia reticulata*	

	Actinopterygii	*Polypteridae*	*Polypterus sp.*	
	Actinopterygii	*Pristolepididae*	*Pristolepis marginata*	
	Actinopterygii	*Pristolepididae*	*Pristolepis sp.*	
	Actinopterygii	*Osphronemidae*	*Pseudosphromenus cupanus*	
	Actinopterygii	*Siluridae*	*Pterocryptis wynaadensis*	
	Actinopterygii	*Loricariidae*	*Pterygoplichthys sp.*	
	Actinopterygii	*Cyprinidae*	*Puntius chola*	
	Actinopterygii	*Cyprinidae*	*Puntius dorsalis*	
	Actinopterygii	*Cyprinidae*	*Puntius mahecola*	
	Actinopterygii	*Cyprinidae*	*Puntius sophore*	
	Actinopterygii	*Cyprinidae*	*Rasbora dandia*	
	Actinopterygii	*Cyprinidae*	*Sahyadria denisonii*	
	Actinopterygii	*Cyprinidae*	*Salmophasia acinaces*	
	Actinopterygii	*Cyprinidae*	*Salmophasia balookee*	
	Actinopterygii	*Cyprinidae*	*Salmophasia boopis*	
	Actinopterygii	*Nemacheilidae*	*Schistura denisoni*	
	Actinopterygii	*Nemacheilidae*	*Schistura monilis*	
	Actinopterygii	*Nemacheilidae*	*Schistura nilgiriensis*	
	Actinopterygii	*Nemacheilidae*	*Schistura semiarmata*	
	Actinopterygii	*Nemacheilidae*	*Schistura striata*	
	Actinopterygii	*Cyprinidae*	*Systomus parrah*	

	Actinopterygii	*Cyprinidae*	*Systomus sarana*	
	Actinopterygii	*Cyprinidae*	*Tor khudree*	
	Actinopterygii	*Cyprinidae*	*Tor remadevii*	
	Actinopterygii	*Osphronemidae*	*Trichopodus trichopterus*	
	Actinopterygii	*Cyprinidae*	*Waikhomia cauveriensis*	
	Actinopterygii	*Cyprinidae*	*Waikhomia sahyadriensis*	
	Actinopterygii	*Siluridae*	*Wallago attu*	
	Actinopterygii	*Belonidae*	*Xenentodon cancila*	
	Actinopterygii	*Poeciliidae*	*Xiphophorus maculatus*	
Arkavathi and Shimsha	Actinopterygii	*Cyprinidae*	*Amblypharyngodon microlepis*	Sreenivasan et al., 2021
	Actinopterygii	*Gobiidae*	*Awaous sp.*	
	Actinopterygii	*Badidae*	*Badis badis*	
	Actinopterygii	*Cyprinidae*	*Catla catla*	
	Actinopterygii	*Channidae*	*Channa gachua*	
	Actinopterygii	*Channidae*	*Channa marulius*	
	Actinopterygii	*Channidae*	*Channa pseudomarulius*	
	Actinopterygii	*Channidae*	*Channa striata*	
	Actinopterygii	*Notopteridae*	*Chitala chitala*	
	Actinopterygii	*Cyprinidae*	*Cirrhinus mrigala*	
	Actinopterygii	*Clariidae*	*Clarias gariepinus*	
	Actinopterygii	*Cyprinidae*	*Ctenopharyngodon idella*	

	Actinopterygii	*Cyprinidae*	*Cyprinus carpio*	
	Actinopterygii	*Cyprinidae*	*Dawkinsia arulius*	
	Actinopterygii	*Cyprinidae*	*Dawkinsia rubrotincta*	
	Actinopterygii	*Cyprinidae*	*Devario malabaricus*	
	Actinopterygii	*Cyprinidae*	*Esomus thermoicos*	
	Actinopterygii	*Cichlidae*	*Etroplus suratensis*	
	Actinopterygii	*Cyprinidae*	*Garra mullya*	
	Actinopterygii	*Cyprinidae*	*Garra stenorhynchus*	
	Actinopterygii	*Gobiidae*	*Glossogobius giuris*	
	Actinopterygii	*Bagridae*	*Hemibagrus punctatus*	
	Actinopterygii	*Hemiramphidae*	*Hyporhamphus xanthopterus*	
	Actinopterygii	*Cyprinidae*	*Hypselobarbus carnaticus*	
	Actinopterygii	*Cyprinidae*	*Hypselobarbus dubius*	
	Actinopterygii	*Cyprinidae*	*Hypselobarbus micropogon*	
	Actinopterygii	*Gobiidae*	*Kantaka brevidorsalis*	
	Actinopterygii	*Cyprinidae*	*Labeo dyocheilus*	
	Actinopterygii	*Cyprinidae*	*Labeo kontius*	
	Actinopterygii	*Cyprinidae*	*Labeo nigrescens*	
	Actinopterygii	*Cyprinidae*	*Labeo rohita*	
	Actinopterygii	*Mastacembelidae*	*Mastacembelus malabaricus*	
	Actinopterygii	*Bagridae*	*Mystus seengtee*	

	Actinopterygii	*Bagridae*	*Mystus vittatus*	
	Actinopterygii	*Siluridae*	*Ompok bimaculatus*	
	Actinopterygii	*Cyprinidae*	*Opsarius bendelisis*	
	Actinopterygii	*Cyprinidae*	*Opsarius gatensis*	
	Actinopterygii	*Cichlidae*	*Oreochromis mossambicus*	
	Actinopterygii	*Cichlidae*	*Oreochromis niloticus*	
	Actinopterygii	*Adrianichthyidae*	*Oryzias carnaticus*	
	Actinopterygii	*Cyprinidae*	*Osteochilichthys nashii*	
	Actinopterygii	*Pangasiidae*	*Pangasius sp.*	
	Actinopterygii	*Ambassidae*	*Parambassis ranga*	
	Actinopterygii	*Cyprinidae*	*Pethia conchonius*	
	Actinopterygii	*Loricariidae*	*Pterygoplichthys sp.*	
	Actinopterygii	*Cyprinidae*	*Puntius sophore*	
	Actinopterygii	*Cyprinidae*	*Rasbora dandia*	
	Actinopterygii	*Mugilidae*	*Rhinomugil corsula*	
	Actinopterygii	*Cyprinidae*	*Salmophasia boopis*	
	Actinopterygii	*Schilbeidae*	*Silonia silondia*	
	Actinopterygii	*Bagridae*	*Sperata seenghala*	
	Actinopterygii	*Cyprinidae*	*Systomus sarana*	
	Actinopterygii	*Cyprinidae*	*Tor remadevii*	
	Actinopterygii	*Cyprinidae*	*Tor sp.*	

	Actinopterygii	*Siluridae*	*Wallago attu*	
	Actinopterygii	*Belonidae*	*Xenentodon cancila*	
Thippagondanahalli Reservoir, Arkavathy River	Actinopterygii	*Cyprinidae*	*Amblypharyngodon mola*	Leela et al., 2021
	Actinopterygii	*Cyprinidae*	*Catla catla*	
	Actinopterygii	*Channidae*	*Channa orientalis*	
	Actinopterygii	*Channidae*	*Channa striata*	
	Actinopterygii	*Cyprinidae*	*Cirrhinus mrigala*	
	Actinopterygii	*Clariidae*	*Clarias gariepinus*	
	Actinopterygii	*Cyprinidae*	*Cyprinus carpio*	
	Actinopterygii	*Gobiidae*	*Glossogobius giuris*	
	Actinopterygii	*Heteropneustidae*	*Heteropneustes fossilis*	
	Actinopterygii	*Cyprinidae*	*Labeo rohita*	
	Actinopterygii	*Bagridae*	*Mystus malabaricus*	
	Actinopterygii	*Cichlidae*	*Oreochromis mossambicus*	
	Actinopterygii	*Cichlidae*	*Oreochromis niloticus*	
	Actinopterygii	*Ambassidae*	*Parambassis ranga*	
	Actinopterygii	*Cyprinidae*	*Pethia ticto*	
	Actinopterygii	*Cyprinidae*	*Puntius sarana*	
	Actinopterygii	*Cyprinidae*	*Rasbora daniconius*	
Bhavani River	Actinopterygii	*Botiidae*	*Botia lohachata*	Jain et al., 2022
	Actinopterygii	*Botiidae*	*Botia striata*	

	Actinopterygii	*Tetraodontidae*	*Carinotetraodon travancoricus*	
	Actinopterygii	*Channidae*	*Channa aurantimaculata*	
	Actinopterygii	*Channidae*	*Channa barca*	
	Actinopterygii	*Channidae*	*Channa bleheri*	
	Actinopterygii	*Channidae*	*Channa striata*	
	Actinopterygii	*Cyprinidae*	*Cirrhinus mrigala*	
	Actinopterygii	*Cyprinidae*	*Dawkinsia spp.*	
	Actinopterygii	*Cichlidae*	*Etroplus canarensis*	
	Actinopterygii	*Sisoridae*	*Glyptothorax kashmirensis*	
	Actinopterygii	*Sisoridae*	*Glyptothorax kudremukhensis*	
	Actinopterygii	*Cyprinidae*	*Haludaria melanampyx*	
	Actinopterygii	*Bagridae*	*Hemibagrus kudremukhensis*	
	Actinopterygii	*Horabagridae*	*Horabagrus brachysoma*	
	Actinopterygii	*Tetraodontidae*	*Leiodon cutcutia*	
	Actinopterygii	*Nemacheilidae*	*Mesonoemacheilus herrei*	
	Actinopterygii	*Cyprinidae*	*Neolissochilus hexagonolepis*	
	Actinopterygii	*Cyprinidae*	*Neolissochilus wynaadensis*	
	Actinopterygii	*Cichlidae*	*Oreochromis mossambicus*	
	Actinopterygii	*Cyprinidae*	*Osteobrama belangeri*	
	Actinopterygii	*Pangasiidae*	*Pangasianodon gigas*	
	Actinopterygii	*Cyprinidae*	*Probarbus jullieni*	

	Actinopterygii	*Cyprinidae*	*Probarbus labeamajor*	
	Actinopterygii	*Cyprinidae*	*Sahyadria denisonii*	
	Actinopterygii	*Nemacheilidae*	*Schistura papulifera*	
	Actinopterygii	*Cyprinidae*	*Semiplotus semiplotus*	
	Actinopterygii	*Clupeidae*	*Tenualosa ilisha*	
	Actinopterygii	*Cyprinidae*	*Tor putitora*	
	Actinopterygii	*Cyprinidae*	*Tor remadevii*	
	Actinopterygii	*Cyprinidae*	*Waikhomia sahyadriensis*	
	Actinopterygii	*Belonidae*	*Xenentodon cancila*	
Kabini and tributaries (Panamaram, Mananthavady, Tirunelli, etc.)	Actinopterygii	*Cyprinidae*	*Amblypharyngodon melettinus*	Jacob and Kandambeth, 2022
	Actinopterygii	*Cyprinidae*	*Amblypharyngodon microlepis*	
	Actinopterygii	*Anguillidae*	*Anguilla bengalensis*	
	Actinopterygii	*Aplocheilidae*	*Aplocheilus lineatus*	
	Actinopterygii	*Aplocheilidae*	*Aplocheilus sp.*	
	Actinopterygii	*Balitoridae*	*Bhavania australis*	
	Actinopterygii	*Cyprinidae*	*Catla catla*	
	Actinopterygii	*Channidae*	*Channa gachua*	
	Actinopterygii	*Channidae*	*Channa marulius*	
	Actinopterygii	*Channidae*	*Channa striata*	
	Actinopterygii	*Cyprinidae*	*Cirrhinus mrigala*	
	Actinopterygii	*Clariidae*	*Clarias dussumieri*	

	Actinopterygii	*Cyprinidae*	*Cyprinus carpio*	
	Actinopterygii	*Cyprinidae*	*Danio rerio*	
	Actinopterygii	*Badidae*	*Dario huli*	
	Actinopterygii	*Badidae*	*Dario neela*	
	Actinopterygii	*Cyprinidae*	*Dawkinsia filamentosa*	
	Actinopterygii	*Cyprinidae*	*Devario neilgherriensis*	
	Actinopterygii	*Cichlidae*	*Etroplus maculatus*	
	Actinopterygii	*Cichlidae*	*Etroplus suratensis*	
	Actinopterygii	*Cyprinidae*	*Garra mcclellandi*	
	Actinopterygii	*Cyprinidae*	*Garra mullya*	
	Actinopterygii	*Gobiidae*	*Glossogobius giuris*	
	Actinopterygii	*Cyprinidae*	*Haludaria fasciata*	
	Actinopterygii	*Cyprinidae*	*Haludaria melanampyx*	
	Actinopterygii	*Cyprinidae*	*Haludaria melanostigma*	
	Actinopterygii	*Heteropneustidae*	*Heteropneustes fossilis*	
	Actinopterygii	*Cyprinidae*	*Labeo rohita*	
	Actinopterygii	*Cobitidae*	*Lepidocephalichthys thermalis*	
	Actinopterygii	*Mastacembelidae*	*Mastacembelus armatus*	
	Actinopterygii	*Nemacheilidae*	*Mesonoemacheilus guentheri*	
	Actinopterygii	*Nemacheilidae*	*Mesonoemacheilus pambarensis*	
	Actinopterygii	*Bagridae*	*Mystus malabaricus*	

	Actinopterygii	*Bagridae*	*Mystus montanus*	
	Actinopterygii	*Siluridae*	*Ompok bimaculatus*	
	Actinopterygii	*Siluridae*	*Ompok malabaricus*	
	Actinopterygii	*Cichlidae*	*Oreochromis mossambicus*	
	Actinopterygii	*Cyprinidae*	*Osteochilichthys nashii*	
	Actinopterygii	*Ambassidae*	*Parambassis thomassi*	
	Actinopterygii	*Cyprinidae*	*Pethia bimaculata*	
	Actinopterygii	*Cyprinidae*	*Pethia conchonius*	
	Actinopterygii	*Cyprinidae*	*Pethia nigripinnis*	
	Actinopterygii	*Cyprinidae*	*Pethia pookodensis*	
	Actinopterygii	*Cyprinidae*	*Pethia punctata*	
	Actinopterygii	*Cyprinidae*	*Pethia vittata*	
	Actinopterygii	*Poeciliidae*	*Poecilia reticulata*	
	Actinopterygii	*Osphronemidae*	*Pseudosphromenus cupanus*	
	Actinopterygii	*Cyprinidae*	*Puntius mahecola*	
	Actinopterygii	*Cyprinidae*	*Rasbora dandia*	
	Actinopterygii	*Cyprinidae*	*Salmophasia balookee*	
	Actinopterygii	*Nemacheilidae*	*Schistura nilgiriensis*	
	Actinopterygii	*Nemacheilidae*	*Schistura semiarmata*	
	Actinopterygii	*Siluridae*	*Wallago attu*	
	Actinopterygii	*Belonidae*	*Xenentodon cancila*	

Hemavathi Reservoir, Harangi Reservoir, Kabini Reservoir, Krishnaraja Sagara Reservoir, Mettur Dam, Bhavani Dam	Actinopterygii	*Cyprinidae*	*Catla catla*	Pownkumar et al., 2022
	Actinopterygii	*Channidae*	*Channa striata*	
	Actinopterygii	*Cyprinidae*	*Cirrhinus mrigala*	
	Actinopterygii	*Clariidae*	*Clarias gariepinus*	
	Actinopterygii	*Gobiidae*	*Glossogobius giuris*	
	Actinopterygii	*Cyprinidae*	*Labeo calbasu*	
	Actinopterygii	*Cyprinidae*	*Labeo rohita*	
	Actinopterygii	*Latidae*	*Lates calcarifer*	
	Actinopterygii	*Mastacembelidae*	*Mastacembelus armatus*	
	Actinopterygii	*Cyprinidae*	*Mylopharyngodon piceus*	
	Actinopterygii	*Cichlidae*	*Oreochromis niloticus*	
	Actinopterygii	*Pangasiidae*	*Pangasius pangasius*	
	Actinopterygii	*Belonidae*	*Xenentodon cancila*	
Hemavathi Reservoir, Hemavathi River	Actinopterygii	*Cyprinidae*	*Catla catla*	Adarsh et al., 2024
	Actinopterygii	*Cyprinidae*	*Cyprinus carpio*	
	Actinopterygii	*Cyprinidae*	*Hypselobarbus kolus*	
	Actinopterygii	*Cyprinidae*	*Labeo fimbriatus*	
	Actinopterygii	*Cichlidae*	*Oreochromis niloticus*	
	Actinopterygii	*Cyprinidae*	*Osteobrama cotio*	
	Actinopterygii	*Ambassidae*	*Parambassis ranga*	
	Actinopterygii	*Cyprinidae*	*Puntius sophore*	

	Actinopterygii	*Cyprinidae*	*Waikhomia sahyadriensis*	

3.2.2.4. Higher Aquatic Vertebrates

The higher aquatic vertebrate fauna accorded across the tributaries of the Cauvery River is presented by the class Mammalia signifying the ecological significance of these river systems in supporting higher trophic levels. The distribution of these species the Bhavani River, Kollidam river, and Bhavani–Noyyal River implies ecological diversity and habitat suitability. In Bhavani River, the presence of *Orcaella brevirostris* highlights the ecological importance of this tributary in supporting large aquatic mammals (Jain et al., 2022). Whereas, the occurrence of *Lutrogale perspicillata* in the Kollidam river suggests the availability of suitable riparian habitat and preys (Acharya et al. 2023; Jayasurya et al., 2023; Awasthi et al. 2025). Further, the occurrence of e *Aonyx cinereus* and *Lutrogale perspicillata* species in the Bhavani–Noyyal River highlights favourable environmental conditions for semi-aquatic mammals (Raha and Hussain, 2016; Moun et al., 2024). The occurrence of these species across tributaries suggests the presence of healthy aquatic habitats and highlights the abaptability of these species in these river systems. The table 18 provide the comprehensive overview of different higher aquatic vertebrates recorded in the different tributaries and distributaries of the Cauvery River.

Table 18. List of higher aquatic vertebrates observed in the different tributaries and distributaries of the CRB

Tributary/ Tributaries	Class (Taxa)	Family	Species	References
Bhavani River	Mammalia	*Delphinidae*	*Orcaella brevirostris*	Jain et al., 2022
Kollidam River	Mammalia	*Mustelidae*	*Lutrogale perspicillata*	Jayasurya et al., 2023
Bhavani-Noyyal River	Mammalia	*Mustelidae*	*Aonyx cinereus*	Moun et al., 2024
	Mammalia	*Mustelidae*	*Lutrogale perspicillata*	

3.2.2.5. Aquatic Aves

The aquatic and riparian aves diversity recorded in the Bhavani River showed rich diversity of species with different families within the class Aves. These diverse species include aquatic and semi-aquatic birds reflecting the ecological heterogeneity in the river. Among the recorded class, the occurrence of family *Ardeidae* has been predominant involving species like *Ardea cinerea*, *Ardea intermedia*, *Ardeola grayii*, *Bubulcus ibis*, *Butorides striata*, and *Egretta garzetta.* The occurrence of these species suggests the availability of shallow water habitats suitable for foraging (Choi et al., 2007; Manikandan and Balasubramanian, 2016;

Kasprzykowski and Golawski, 2024; Rajpar et al., 2026). Similarly, the presence of species *Alcedo atthis*, *Ceryle rudis*, *Halcyon smyrnensis*, and *Pelargopsis capensis* highlights the presence of fish-rich waters supporting piscivorous birds (Manikandan and Balasubramanian, 2016; Shifa et al., 2026). Further, the occurrence of species like *Anhinga melanogaster*, *Phalacrocorax carbo, Microcarbo niger*, and *Tachybaptus ruficollis* suggests the ecological suitability of the river system for diving and swimming birds (Manikandan and Balasubramanian, 2016; Khiyani et al., 2022).

Moreover, the presence of species like *Accipiter badius*, *Aquila fasciata*, *Haliastur indus*, *Milvus migrans*, and *Spilornis cheela* suggests a well-structured trophic system with availability of prey in abundance (Anoop et al., 2018b). In addition, a large number of birds from families like *Muscicapidae, Sturnidae, Pycnonotidae, Dicruridae*, and *Nectariniidae* were recorded indicating the presence of insectivorous and omnivorous guilds that uses riparian vegetation and surrounding habitats (Manikandan and Balasubramanian, 2016; Kühnert et al., 2019). The diversity of these aves species in the bhavani river system highlights the integrated nature of aquatic and adjacent terrestrial habitats. Table 19 provide the comprehensive list of different aquatic aves vertebrates recorded in the different tributaries of the Cauvery River.

Table 19. List of aquatic aves observed in the different tributaries of the CRB

Tributary/ Tributaries	Class (Taxa)	Family	Species	Reference
Bhavani River	Aves	*Accipitridae*	*Accipiter badius*	Manikandan and Balasubramanian, 2016
	Aves	*Sturnidae*	*Acridotheres fuscus*	
	Aves	*Sturnidae*	*Acridotheres tristis*	
	Aves	*Muscicapidae*	*Acritillas indica*	
	Aves	*Acrocephalidae*	*Acrocephalus agricola*	
	Aves	*Acrocephalidae*	*Acrocephalus dumetorum*	
	Aves	*Scolopacidae*	*Actitis hypoleucos*	
	Aves	*Aegithinidae*	*Aegithina tiphia*	
	Aves	*Alcedinidae*	*Alcedo atthis*	
	Aves	*Rallidae*	*Amaurornis phoenicurus*	
	Aves	*Ciconiidae*	*Anastomus oscitans*	
	Aves	*Anhingidae*	*Anhinga melanogaster*	
	Aves	*Bucerotidae*	*Anthracoceros coronatus*	

	Aves	*Nectariniidae*	*Anthreptes singalensis*	
	Aves	*Apodidae*	*Apus affinis*	
	Aves	*Accipitridae*	*Aquila fasciata*	
	Aves	*Ardeidae*	*Ardea cinerea*	
	Aves	*Ardeidae*	*Ardea intermedia*	
	Aves	*Ardeidae*	*Ardeola grayii*	
	Aves	*Artamidae*	*Artamus fuscus*	
	Aves	*Strigidae*	*Athene brama*	
	Aves	*Accipitridae*	*Aviceda jerdoni*	
	Aves	*Strigidae*	*Bubo bengalensis*	
	Aves	*Ardeidae*	*Bubulcus ibis*	
	Aves	*Bucerotidae*	*Buceros bicornis*	
	Aves	*Ardeidae*	*Butorides striata*	
	Aves	*Cuculidae*	*Cacomantis passerinus*	
	Aves	*Fringillidae*	*Carpodacus erythrinus*	
	Aves	*Cuculidae*	*Centropus sinensis*	
	Aves	*Alcedinidae*	*Ceryle rudis*	
	Aves	*Columbidae*	*Chalcophaps indica*	
	Aves	*Chloropseidae*	*Chloropsis aurifrons*	
	Aves	*Picidae*	*Chrysocolaptes festivus*	
	Aves	*Timaliidae*	*Chrysomma sinense*	
	Aves	*Nectariniidae*	*Cinnyris asiaticus*	
	Aves	*Nectariniidae*	*Cinnyris lotenius*	
	Aves	*Cuculidae*	*Clamator coromandus*	
	Aves	*Cuculidae*	*Clamator jacobinus*	
	Aves	*Columbidae*	*Columba elphinstonii*	
	Aves	*Columbidae*	*Columba livia*	
	Aves	*Muscicapidae*	*Copsychus malabaricus*	
	Aves	*Muscicapidae*	*Copsychus saularis*	
	Aves	*Coraciidae*	*Coracias benghalensis*	
	Aves	*Campephagidae*	*Coracina macei*	
	Aves	*Campephagidae*	*Coracina melanoptera*	

	Aves	*Corvidae*	*Corvus culminatus*	
	Aves	*Corvidae*	*Corvus splendens*	
	Aves	*Phasianidae*	*Coturnix coturnix*	
	Aves	*Muscicapidae*	*Cyornis tickelliae*	
	Aves	*Corvidae*	*Dendrocitta vagabunda*	
	Aves	*Picidae*	*Dendrocopos mahrattensis*	
	Aves	*Motacillidae*	*Dendronanthus indicus*	
	Aves	*Dicaeidae*	*Dicaeum erythrorhynchos*	
	Aves	*Dicruridae*	*Dicrurus aeneus*	
	Aves	*Dicruridae*	*Dicrurus hottentottus*	
	Aves	*Dicruridae*	*Dicrurus paradiseus*	
	Aves	*Picidae*	*Dinopium javanense*	
	Aves	*Timaliidae*	*Dumetia hyperythra*	
	Aves	*Dicruridae*	*Edolius caerulescens*	
	Aves	*Dicruridae*	*Edolius leucophaeus*	
	Aves	*Dicruridae*	*Edolius macrocercus*	
	Aves	*Ardeidae*	*Egretta garzetta*	
	Aves	*Cuculidae*	*Eudynamys scolopaceus*	
	Aves	*Muscicapidae*	*Eumyias albicaudatus*	
	Aves	*Muscicapidae*	*Eumyias thalassinus*	
	Aves	*Phasianidae*	*Gallus sonneratii*	
	Aves	*Strigidae*	*Glaucidium radiatum*	
	Aves	*Sturnidae*	*Gracula religiosa*	
	Aves	*Alcedinidae*	*Halcyon pileata*	
	Aves	*Alcedinidae*	*Halcyon smyrnensis*	
	Aves	*Accipitridae*	*Haliastur indus*	
	Aves	*Trogonidae*	*Harpactes fasciatus*	
	Aves	*Cuculidae*	*Hierococcyx varius*	
	Aves	*Acrocephalidae*	*Hippolais caligata*	
	Aves	*Hirundinidae*	*Hirundo tahitica*	
	Aves	*Pycnonotidae*	*Hypsipetes leucocephalus*	

	Aves	*Accipitridae*	*Ichthyophaga humilis*	
	Aves	*Accipitridae*	*Ictinaetus malayensis*	
	Aves	*Irenidae*	*Irena puella*	
	Aves	*Strigidae*	*Ketupa zeylonensis*	
	Aves	*Laniidae*	*Lanius vittatus*	
	Aves	*Nectariniidae*	*Leptocoma zeylonica*	
	Aves	*Estrildidae*	*Lonchura malabarica*	
	Aves	*Estrildidae*	*Lonchura malacca*	
	Aves	*Estrildidae*	*Lonchura punctulata*	
	Aves	*Estrildidae*	*Lonchura striata*	
	Aves	*Psittaculidae*	*Loriculus vernalis*	
	Aves	*Meropidae*	*Merops leschenaulti*	
	Aves	*Meropidae*	*Merops orientalis*	
	Aves	*Phalacrocoracidae*	*Microcarbo niger*	
	Aves	*Picidae*	*Micropternus brachyurus*	
	Aves	*Accipitridae*	*Milvus migrans*	
	Aves	*Alaudidae*	*Mirafra cantillans*	
	Aves	*Alaudidae*	*Mirafra erythroptera*	
	Aves	*Motacillidae*	*Motacilla alba*	
	Aves	*Motacillidae*	*Motacilla cinerea*	
	Aves	*Motacillidae*	*Motacilla flava*	
	Aves	*Motacillidae*	*Motacilla maderaspatensis*	
	Aves	*Muscicapidae*	*Muscicapa dauurica*	
	Aves	*Muscicapidae*	*Muscicapa latirostris*	
	Aves	*Muscicapidae*	*Myophonus horsfieldii*	
	Aves	*Strigidae*	*Ninox scutulata*	
	Aves	*Accipitridae*	*Nisaetus cirrhatus*	
	Aves	*Meropidae*	*Nyctyornis athertoni*	
	Aves	*Bucerotidae*	*Ocyceros birostris*	
	Aves	*Oriolidae*	*Oriolus chinensis*	
	Aves	*Oriolidae*	*Oriolus kundoo*	

	Aves	*Oriolidae*	*Oriolus xanthornus*	
	Aves	*Cisticolidae*	*Orthotomus sutorius*	
	Aves	*Strigidae*	*Otus lettia*	
	Aves	*Paridae*	*Parus nuchalis*	
	Aves	*Passeridae*	*Passer domesticus*	
	Aves	*Sturnidae*	*Pastor roseus*	
	Aves	*Phasianidae*	*Pavo cristatus*	
	Aves	*Alcedinidae*	*Pelargopsis capensis*	
	Aves	*Phasianidae*	*Perdicula asiatica*	
	Aves	*Phasianidae*	*Perdicula erythrorhyncha*	
	Aves	*Campephagidae*	*Pericrocotus cinnamomeus*	
	Aves	*Campephagidae*	*Pericrocotus flammeus*	
	Aves	*Cuculidae*	*Phaenicophaeus viridirostris*	
	Aves	*Phalacrocoracidae*	*Phalacrocorax carbo*	
	Aves	*Phylloscopidae*	*Phylloscopus trochiloides*	
	Aves	*Picidae*	*Picus chlorolophus*	
	Aves	*Pittidae*	*Pitta brachyura*	
	Aves	*Cisticolidae*	*Prinia hodgsonii*	
	Aves	*Cisticolidae*	*Prinia inornata*	
	Aves	*Cisticolidae*	*Prinia socialis*	
	Aves	*Megalaimidae*	*Psilopogon haemacephalus*	
	Aves	*Megalaimidae*	*Psilopogon malabaricus*	
	Aves	*Megalaimidae*	*Psilopogon viridis*	
	Aves	*Megalaimidae*	*Psilopogon zeylanicus*	
	Aves	*Psittaculidae*	*Psittacula columboides*	
	Aves	*Psittaculidae*	*Psittacula cyanocephala*	
	Aves	*Psittaculidae*	*Psittacula krameri*	
	Aves	*Pycnonotidae*	*Pycnonotus cafer*	
	Aves	*Pycnonotidae*	*Pycnonotus jocosus*	

	Aves	*Pycnonotidae*	*Pycnonotus luteolus*	
	Aves	*Muscicapidae*	*Saxicola caprata*	
	Aves	*Muscicapidae*	*Saxicoloides fulicatus*	
	Aves	*Sittidae*	*Sitta frontalis*	
	Aves	*Accipitridae*	*Spilornis cheela*	
	Aves	*Columbidae*	*Streptopelia chinensis*	
	Aves	*Columbidae*	*Streptopelia tranquebarica*	
	Aves	*Sturnidae*	*Sturnia malabarica*	
	Aves	*Sturnidae*	*Sturnia pagodarum*	
	Aves	*Cuculidae*	*Taccocua leschenaultii*	
	Aves	*Podicipedidae*	*Tachybaptus ruficollis*	
	Aves	*Vangidae*	*Tephrodornis pondicerianus*	
	Aves	*Vangidae*	*Tephrodornis sylvicola*	
	Aves	*Monarchidae*	*Terpsiphone paradisi*	
	Aves	*Columbidae*	*Treron affinis*	
	Aves	*Leiothrichidae*	*Turdoides caudata*	
	Aves	*Leiothrichidae*	*Turdoides striata*	
	Aves	*Turdidae*	*Turdus simillimus*	
	Aves	*Upupidae*	*Upupa epops*	
	Aves	*Charadriidae*	*Vanellus indicus*	
	Aves	*Picidae*	*Yungipicus nanus*	
	Aves	*Zosteropidae*	*Zosterops palpebrosus*	

4. Status of major focal riverine species

The CRB is a habitat for a diverse biological system characterized by different organism groups ranging from primary producers to higher vertebrates, which collectively define the ecosystem integrity. The collected dataset on phytoplankton, periphyton, riparian vegetation, floodplain vegetation, zooplankton, zoobenthos, fishes, aquatic birds, and higher aquatic vertebrates demonstrate the strong spatial and functional gradient across the CRB.

Phytoplankton communities are dominated by class *Chlorophyceae* and *Cyanophyceae*, followed by the class *Bacillariophyceae, Euglenophyceae*, and *Zygnematophyceae*. The predominance of green algae indicates the presence of nutrient-rich ecosystems (Jeevitha and Somashekar, 2025), while the presence cyanobacteria reflect localized eutrophication and organic enrichment (Delgado-Fernández et al., 2025). The variability between datasets highlights shifts in the nutrient regime and water conditions.

The periphyton community was determined to largely composed of the family *Bacillariophyceae* by species like *Achnanthidium, Cymbella, Gomphonema*, and *Eunotia.* The occurrence of these species serves as the indicator of substrate stability and flow conditions (Venkatachalapathy and Karthikeyan, 2013; Michalak and Messyasz, 2021; Uthirasamy et al., 2021a; González-Paz et al., 2022). Whereas the presence of filamentous algae (*Cladophora*) and cyanobacteria suggests nutrient enrichment and habitat heterogeneity (Michalak and Messyasz, 2021).

Riparian vegetation exhibits high diversity of plant taxa dominated by angiosperms belonging to families like *Fabaceae, Euphorbiaceae, Rubiaceae*, and *Asteraceae*. Key species like *Terminalia arjuna*, *Syzygium cumini*, and various species of *Ficus* have been extensively recorded and are known to play a critical role in bank stabilization, nutrient cycling, and habitat provision (Sunil et al., 2019; Shukla et al., 2025). Whereas, floodplain vegetation encompasses species like *Cyperus spp.*, *Alternanthera sessilis*, *Eichhornia crassipes*, *Pistia stratiotes*, and *Typha angustifolia*. The presence of these species highlights ecological disturbance and nutrient enrichment in floodplain systems (Ravi et al., 2016; Sarkar et al., 2021; Rao et al., 2024).

Zooplankton communities were determined to dominated by families *Brachionidae, Lecanidae, Daphniidae, Bosminidae, Cyclopidae,* and *Diaptomidae*. The presence of species like *Brachionus*, *Daphnia*, and *Mesocyclops* indicate meso- to eutrophic nutrient conditions and complex trophic interactions (Silva et al., 2003; Hołyńska, 2008; Wang et al., 2017; Razak and Sharip, 2019; Odigie et al., 2025). On the other hand, zoobenthic assemblages include protozoans, ostracods, and cladocerans with species like *Cypris, Difflugia, Euglypha*, and *Vorticella*. The presence of these species are strong indicators of sediment quality, organic matter availability, and benthic habitat conditions (Nisbet, 1984; Radhakrishnan and Jayaprakas, 2015; Bonkowski et al., 2019; Schmitz et al., 2025). Further, the presence of chironomids and dipteran larvae in tributaries suggests organic enrichment and tolerance to environmental stress.

The extensive diversity of fish dominated by family *Cyprinidae,* followed by *Bagridae, Cichlidae,* and *Channidae.* The presence of native species like *Labeo, Puntius, Garra,* and *Tor* along with introduced and invasive species like *Oreochromis* spp. indicates ecological shifts

(Russell et al., 2012; Ahamed and Dharmaretnam, 2015; Dhakal, 2015; Anusha et al., 2024; Sajina et al., 2026). Further, aquatic aves serve as an important ecological component in the CRB as top predators and bioindicators of wetland health which rely on the availability of fish and macroinvertebrates. Higher aquatic vertebrates represented by amphibians (*Bufonidae, Dicroglossidae, Rhacophoridae*) and mammals (*Mustelidae, Delphinidae, Felidae*) indicate high ecological value in certain stretches, especially in relatively undisturbed tributaries and forested regions (Mallick, 2019; Mani et al., 2020; Rajiv et al., 2025; Aravind et al., 2026).

4.1. Identification of ecologically significant species for each stretch

The ecological characterization of the CRB based on the compiled datasets reveals that ecologically significant species are distributed across multiple trophic levels, and their occurrence varies distinctly along the longitudinal gradient of the river system. Integrating phytoplankton, periphyton, macrophytes (riparian and floodplain vegetation), zooplankton, zoobenthos, fishes, aquatic aves, and higher aquatic vertebrates provide a holistic understanding of ecological integrity across stretches.

4.1.1. Upper Reaches (Western Ghats and Forested Tributaries)

The upper stretches include tributaries like Hemavathi, Kabini, Harangi, and Nugu which are characterized by relatively pristine conditions, high flow regimes, and structurally complex habitats. These stretches support a diverse and ecologically sensitive biotic community across multiple trophic levels. The phytoplankton and periphyton communities are dominated by species like *Achnanthidium minutissimum*, *Cymbella spp.*, *Gomphonema spp.*, and *Eunotia spp.* which are indicative of well-oxygenated, low-nutrient, and stable flow conditions (Uthirasamy et al., 2021a; Venkatachalapathy and Karthikeyan, 2013; Jeevitha and Somashekar, 2025). The riparian vegetation is well-developed and includes key species like *Terminalia arjuna, Syzygium cumini, Ficus benghalensis*, and *Vitex negundo*. These species are known to play a key role in bank stabilization, shading, and nutrient buffering (Ravi et al., 2016; Moun et al., 2024; Sunil et al., 2019; Shukla et al., 2025). Further, floodplain vegetation supports submerged macrophytes like *Hydrilla spp.*, *Vallisneria spp.*, and *Potamogeton spp.* indicating clear water conditions and hydrological stability (Ramakrishniah et al., 2000; Sousa, 2011; Liao et al., 2024).

The zooplankton and zoobenthic communities showed balanced diversity encompassing species like *Lecane*, *Keratella*, *Daphnia*, *Bosmina*, *Cypris*, *Difflugia*, and *Vorticella* which collectively indicate good water quality and stable trophic interactions (Nisbet, 1984; Radhakrishnan and Jayaprakas, 2015; Bonkowski et al., 2019; Uthirasamy et al., 2021b; Schmitz et al., 2025). In the stretches, the fishes were determined to be dominated by native and endemic species like *Tor spp.*, *Garra spp.*, *Devario spp.*, and *Schistura spp.* which are highly sensitive to environmental changes and require well-oxygenated flowing waters (Ramachandra et al., 2012; Dhakal, 2015; Mani et al., 2020; Anusha et al., 2024; Bandara and Gunawardena, 2026). Moreover, in this region the aquatic aves found are primarily dependent on fishes and reflect intact trophic linkages. Further, the higher aquatic vertebrates encompassing amphibians like *Nyctibatrachus* and *Raorchestes*, along with mammals like *Lutrogale perspicillata* indicate high ecological integrity and habitat continuity (Jain et al., 2022; Jayasurya et al., 2023; Awasthi et al., 2025). Conclusively, the upper reaches function as a biodiversity hotspot and ecological reference zone that supports sensitive and endemic species and represent relatively undisturbed riverine conditions within the basin.

4.1.2. Middle Reaches (Transitional and Semi-Urban Stretches)

The middle reaches of the CRB represent a transitional ecological zone influenced by agricultural activities, urban settlements, and regulated flow regimes. These stretches exhibit moderate levels of disturbance which results in noticeable shifts in biological communities across trophic levels. The phytoplankton community showed the dominance of the family *Chlorophyceae* by species like *Scenedesmus*, *Chlorella*, and *Pediastrum* indicating moderate nutrient enrichment and increased primary productivity (Ali et al., 2011; Venkatachalapathy and Karthikeyan, 2013; Dahiya et al., 2021; Uthirasamy et al., 2021a). Further, periphyton community showed the presence of mixed diatoms along with increased number of tolerant species suggesting altered flow conditions and nutrient availability (Venkatachalapathy and Karthikeyan, 2013; Michalak and Messyasz, 2021; González-Paz et al., 2022).

In these stretches, riparian vegetation is found to be partially altered and often fragmented, even the species like *Pongamia pinnata*, *Syzygium cumini*, and *Terminalia arjuna* are persistently present (Ravi et al., 2016; Moun et al., 2024). Moreover, the reduction in riparian continuity diminishes the buffering capacity of the riverbanks which is eventually influencing the sediment dynamics and nutrient influx. Floodplain vegetation unveiled the presence of amphibious and disturbance-tolerant species like *Alternanthera sessilis*, *Commelina benghalensis*, and *Cyperus spp.* signifying fluctuating hydrological conditions and anthropogenic influence (Ravi et al., 2016; Sarkar et al., 2021; Rao et al., 2024).

Zooplankton communities presented the dominance of species like *Brachionus spp.* and *Mesocyclops spp.* Whereas, zoobenthic communities showed the increased representation of pollution-tolerant organisms like chironomid larvae which are indicative of moderate organic enrichment (Komala et al., 2013; Uthirasamy et al., 2021b; Schmitz et al., 2025). Fish diversity remains relatively high but is dominated by economically important and moderately tolerant species like *Labeo rohita*, *Catla catla*, *Cirrhinus mrigala*, *Puntius spp.*, and *Mystus spp.*, suggesting influence of both ecological and anthropogenic activities (Ramachandra et al., 2012; Russell et al., 2012; Mani et al., 2020; Sajina et al., 2026). Further, moderate diversity of aquatic aves has been recorded, supported by the availability of plankton and small fishes. However, habitat disturbances and altered flow regimes may influence their feeding and breeding patterns. Higher aquatic vertebrates are comparatively less diverse than in the upper reaches, even though adaptable species continue to persist in suitable habitats (Jayasurya et al., 2023). Conclusively, the middle reaches serve as the transitional ecological zone, where natural riverine characteristics gets influenced by human interventions leading to a shift from sensitive species toward more tolerant species.

4.1.3. Lower Reaches and Floodplain Systems (Deltaic and Highly Modified Zones)

The lower reaches of the CRB involves tributaries and distributaries like Bhavani, Noyyal, and Kollidam, which are characterized by reduced flow variability, extensive anthropogenic modification, and high nutrient loading. These conditions are well-known for influencing biological communities, resulting in the dominance of opportunistic and tolerant species across trophic levels. The phytoplankton community showed the dominance of family *Cyanophyceae* involving species like *Anabaena* and *Aphanothece* along with eutrophic green algae. These species are indicator of elevated nutrient levels and eutrophication (Venkatachalapathy and Karthikeyan, 2013; Uthirasamy et al., 2021a; Kuczyńska-Kippen et al., 2024). Periphyton community showed the presence of tolerant diatom species and filamentous algae suggesting altered substrate conditions and reduced flow dynamics (Venkatachalapathy and Karthikeyan, 2013; Zelnik et al., 2018).

In these stretches, riparian vegetation is often degraded or replaced by disturbance-tolerant species leading to weakened bank stabilization and ecological functionality (Ravi et al., 2016; Moun et al., 2024). Whereas floodplain vegetations are determined to be influenced by invasive and opportunistic macrophytes like *Eichhornia crassipes*, *Pistia stratiotes*, and *Typha angustifolia* that can thrive under stagnant and nutrient-rich conditions (Coetzee et al., 2014; Sarkar et al., 2021; Jayasurya et al., 2023; Moun et al., 2024; Rao et al., 2024). Further, zooplankton communities have been determined to be dominated by pollution-tolerant species (Oh et al., 2017). On contrary, zoobenthic community was reported to have species adapted to high organic loads and degraded sediment conditions indicating poor water quality (Komala et al., 2013; Uthirasamy et al., 2021b; Schmitz et al., 2025). Moreover, fish communities showed marked shift toward tolerant and invasive species like *Oreochromis mossambicus* and

Oreochromis niloticus, which outcompete native species and alter trophic dynamics (Ramachandra et al., 2012; Russell et al. 2012; Mani et al., 2020; Sajina et al., 2026).
Aquatic aves are commonly associated with floodplain wetlands in these regions that rely on modified habitats and seasonal water availability. Although bird diversity may remain relatively high, but it is often influenced by altered ecosystem conditions. Higher aquatic vertebrates are limited but include species like *Lutrogale perspicillata* and *Aonyx cinereus.* These species are known to be present in localized habitats where suitable conditions persist in spite of overall degradation (Jain et al., 2022; Jayasurya et al., 2023; Awasthi et al., 2025). Conclusively, the lower reaches represent a highly modified and ecologically stressed system. They are characterized by eutrophication, habitat degradation, and the dominance of tolerant and invasive species. These patterns reflect the cumulative impacts of anthropogenic pressures on the riverine ecosystem.

4.2. Conservation and management needs

The multi-trophic assessment of the CRB highlights the need for integrated, basin-scale conservation and management strategies that address ecological processes from primary producers to higher vertebrates. The observed shift from sensitive, endemic species in upper reaches to tolerant and invasive taxa in downstream stretches underlines the urgency of restoring ecological integrity while balancing developmental pressures.

4.2.1. Maintenance of Environmental Flows and Hydrological Regimes

Sustaining ecological flow (e-flow) regimes is important for maintaining habitat heterogeneity, sediment transport, and biological connectivity. Altered flow patterns due to dams and water abstraction have drastically impacted phytoplankton dynamics, periphyton colonization, fish migration, and floodplain functioning. Restoration of natural flow variability is crucial to support spawning cycles of fishes, sustain diatom-dominated communities in upstream regions, and maintain floodplain productivity.

4.2.2. Water Quality Improvement and Pollution Control

Elevated nutrient levels and organic pollution, mainly in middle and lower reaches have led to eutrophication and proliferation of *Cyanophyceae* and invasive macrophytes like *Eichhornia crassipes*. Regulating industrial discharge, infrastructure strengthening of wastewater treatment, and implementing of nutrient management strategies in agricultural landscapes are important. Biological indicators such as phytoplankton, zooplankton, and zoobenthos should be routinely monitored to determine the trend of water quality.

4.2.3. Riparian and Floodplain Restoration

Riparian vegetation plays a fundamental role in bank stabilization, nutrient buffering, and habitat provision. Whereas floodplain ecosystems regulate hydrological connectivity and support biodiversity. Thus, restoration efforts should focus on re-establishing native riparian species such as *Terminalia arjuna* and *Syzygium cumini*. As these species are well known for controlling invasive macrophytes and protecting floodplain wetlands from encroachment and land-use change.

4.2.4. Conservation of Native and Endemic Biodiversity

Upper reaches and Western Ghats tributaries serve as biodiversity hotspots as it supports endemic fishes (*Tor spp.*, *Garra spp.*), amphibians (*Nyctibatrachus*, *Raorchestes*), and sensitive invertebrate communities. These regions require targeted conservation measures, including habitat protection, restriction of destructive activities (e.g., sand mining), and establishment of aquatic conservation zones.

4.2.5. Management of Invasive Species

The proliferation of invasive species like *Oreochromis spp.*, *Eichhornia crassipes*, and *Pistia stratiotes* has significantly altered trophic dynamics and habitat structure in downstream stretches. Effective management requires early detection, monitoring, and control strategies, along with promotion of native species restoration and regulation of aquaculture practices.

4.2.6. Habitat Restoration and Sediment Management

Physical habitat degradation due to channel modification, sand mining, and reduced sediment flow has severely impacted benthic communities and fish habitats. Restoration should aim to re-establish natural channel morphology, riffle–pool sequences, and substrate diversity as they are vital for periphyton development and benthic fauna.

4.2.7. Sustainable Fisheries and Livelihood Management

Fisheries in the basin are both ecologically and economically significant. There is a need to regulate fishing pressure, prevent overexploitation, and promote sustainable harvesting practices. Conservation of breeding grounds and seasonal fishing restrictions can support recovery of native fish populations.

4.2.8. Community Participation and Policy Integration

Effective river management requires active involvement of local communities, stakeholders, and policymakers. Awareness programs, participatory conservation initiatives, and integration of scientific findings into policy frameworks are required for long-term sustainability.

5. Conclusion

The comprehensive assessment of the CRB across multiple biological components like phytoplankton, periphyton, riparian and floodplain vegetation, zooplankton, zoobenthos, fishes, aquatic aves, and higher aquatic vertebrates. The diversity among species in these biological components revealed a clear longitudinal gradient in ecological condition.

The upper reaches (Western Ghats and forested tributaries) are characterized by high biodiversity, dominance of sensitive taxa (e.g., diatoms, endemic fishes, amphibians), and relatively undisturbed habitats, reflecting near-pristine conditions. In contrast, the middle reaches exhibit transitional characteristics with moderate nutrient enrichment, shifts in community composition, and increasing anthropogenic influence. The lower reaches are highly modified, showing signs of eutrophication, habitat degradation, and increased dominance of tolerant and invasive species, including cyanobacteria, invasive macrophytes, and non-native fishes.

Across trophic levels, consistent ecological signals emerge:

- Primary producers (phytoplankton and periphyton) indicate nutrient enrichment and flow alterations
- Zooplankton and zoobenthos suggest changes in trophic status and sediment quality
- Fishes and higher vertebrates reveal long-term habitat degradation and fragmentation
- Riparian and floodplain vegetation demonstrate land-use impacts and loss of ecological buffers

On the whole, the basin showed a shift from structurally complex, biodiverse ecosystems to simplified and stressed systems downstream driven by hydrological alteration, pollution, habitat loss, and biological invasions. This highlights the need for integrated, science-based river basin management.

6. Recommendations

Based on the compiled multi-trophic ecological evidence from the Cauvery River Basin, the following recommendations are proposed:

1. Basin-Scale Integrated River Management

- Adopt an integrated river basin management framework incorporating hydrology, biodiversity (phytoplankton to higher vertebrates), land use, and socio-economic factors.
- Strengthen inter-state and inter-agency coordination for effective management of interconnected tributaries.

2. Restoration of Environmental Flows

- Maintain minimum ecological flow regimes in regulated tributaries (e.g., Hemavathi, Kabini, Harangi).
- Mimic natural flow variability to support spawning, migration, sediment transport, and nutrient cycling.

3. Strengthening Pollution Control Measures

- Upgrade sewage and industrial effluent treatment infrastructure in impacted stretches (e.g., Bhavani, Noyyal, Arkavathi).
- Regulate agricultural runoff and nutrient inputs to control eutrophication.
- Implement continuous water quality monitoring using biological indicators (phytoplankton, zoobenthos).

4. Protection and Restoration of Riparian and Floodplain Zones

- Re-establish native riparian vegetation (e.g., *Terminalia arjuna*, *Syzygium cumini*, *Ficus* spp.) to stabilize banks and reduce runoff.
- Prevent encroachment and regulate land-use changes along river corridors.
- Restore wetlands and reconnect floodplains to enhance ecological resilience.

5. Conservation of Biodiversity Hotspots

- Designate upper catchments and Western Ghats tributaries as ecologically sensitive zones.
- Conserve endemic and habitat-sensitive taxa (e.g., diatoms, native fishes, amphibians).
- Restrict destructive activities such as sand mining and channel modification.

6. Invasive Species Monitoring and Control

- Control invasive macrophytes (*Eichhornia crassipes*, *Pistia stratiotes*) in nutrient-enriched stretches.
- Regulate exotic fish introductions (e.g., *Oreochromis* spp.) and promote native species recovery.

7. Habitat Restoration and Sediment Regulation

- Restore degraded river channels and natural geomorphology.
- Regulate sand mining to maintain sediment balance.
- Enhance habitat heterogeneity (riffles, pools, substrates) to support periphyton, zoobenthos, and fishes.

8. Sustainable Fisheries Management

- Implement regulated fishing practices and seasonal restrictions.
- Protect breeding and nursery habitats of native fish species.

- Promote community-based and conservation-oriented fisheries management.

9. Long-Term Ecological Monitoring Framework

- Establish a multi-trophic biomonitoring program integrating:
    - Phytoplankton and periphyton (nutrient and flow indicators)
    - Zooplankton and zoobenthos (trophic status and sediment quality indicators)
    - Fishes and higher vertebrates (ecosystem health indicators)

10. Community Engagement and Policy Integration

- Promote stakeholder participation and awareness at local and regional levels.
- Integrate scientific findings into river basin management policies.
- Encourage sustainable land and water use practices across the basin.

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