



# Studies on riverine flora of Pamba river basin, Kerala

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# RIPARIAN ECOSYSTEMS

- Most diverse, dynamic and complex biophysical habitats
- Ecotonal assemblage of aquatic and terrestrial habitats
- Critical transition zones having rich biodiversity with high endemism of diverse flora, fauna and microbes



# Importance of riparian ecosystem

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- Regulating water cycle of the forest floor
- Regulating nutrient cycle
- Act as breeding sites for organisms
- Reduce ground and waste water pollution
- Minimize agricultural nutrient and pesticide run-off
- Prevent eutrophication
- Prevent Soil erosion
- Stabilize river banks



## Need and significance of the study

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- The vegetation along the rivers of Western Ghats has high degree of diversity, paleo-endemism and RET species
- Pamba river and its associated flood plain support a wide range of flora and fauna
- Anthropogenic intervention has fragmented riparian vegetation of Pamba river and many species are under the threat of extinction

The present paper tries to assess the riparian forest status of Pamba river basin with respect to its species composition and endemism





# Materials and methods

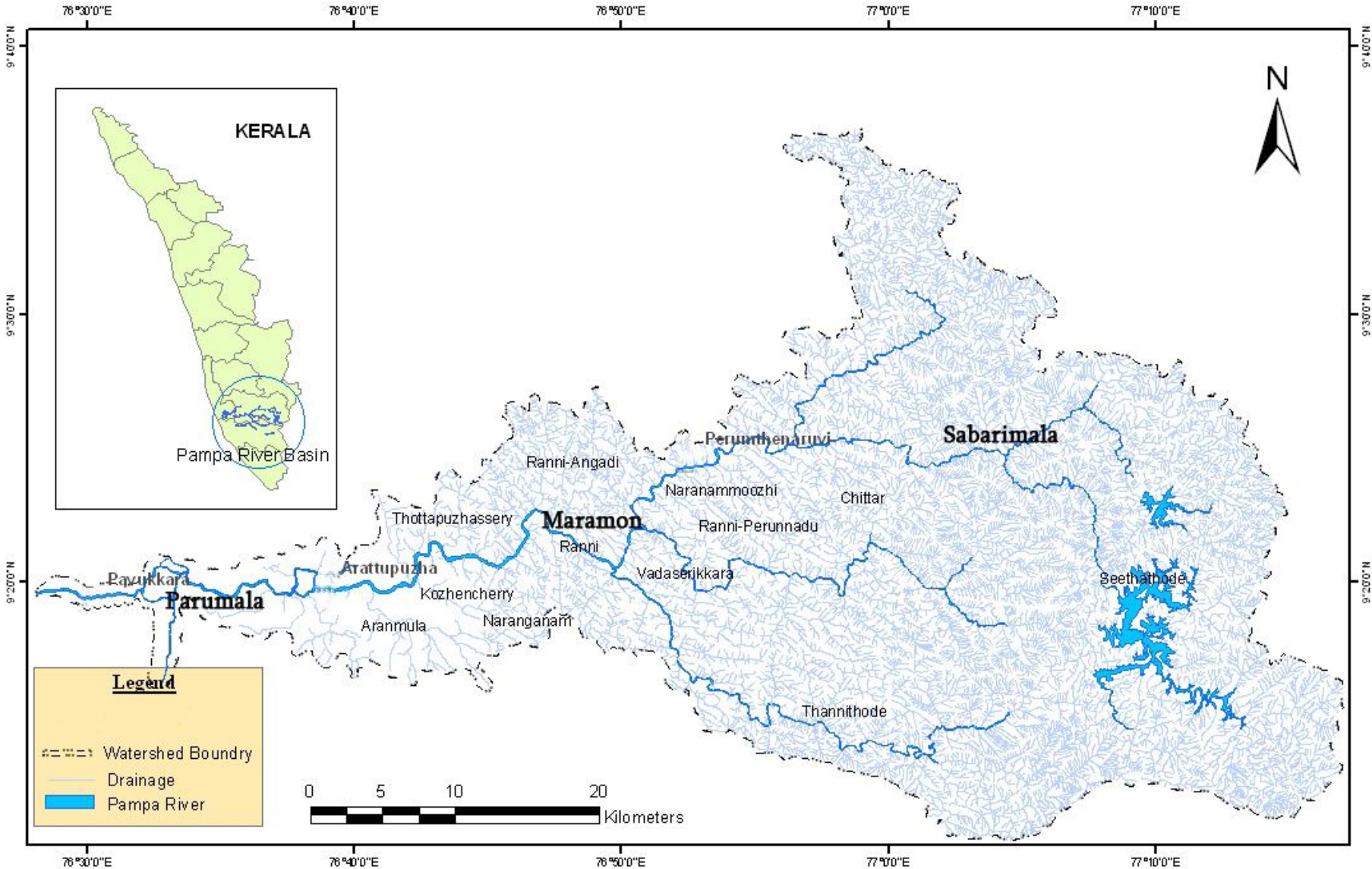
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## Study Area: The Pamba watershed

- ☒ Lies between  $9^{\circ} 10'$  -  $9^{\circ} 40'$  N. latitudes and  $76^{\circ} 15'$  -  $77^{\circ} 20'$  E. longitudes with 2082.80 sq. km. area.
- ☒ Located in Pathanamthitta, Alappuzha, Idukki & Kottayam districts of Kerala
- ☒ 176 km long river is formed by the confluence of Pamba Ar, Kakki Ar, Azhutha Ar, Kakkad Ar and Kall Ar

# Map of the study area

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## Methodology

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- Floristic investigation along the riparian forests of Pamba river basin was conducted during 2006 - '07.
- The riparian plants were collected, taxonomically identified and enumerated based on standard taxonomic literature (Hooker, 1872 – 1894; Gamble & Fisher, 1915 - 1936).



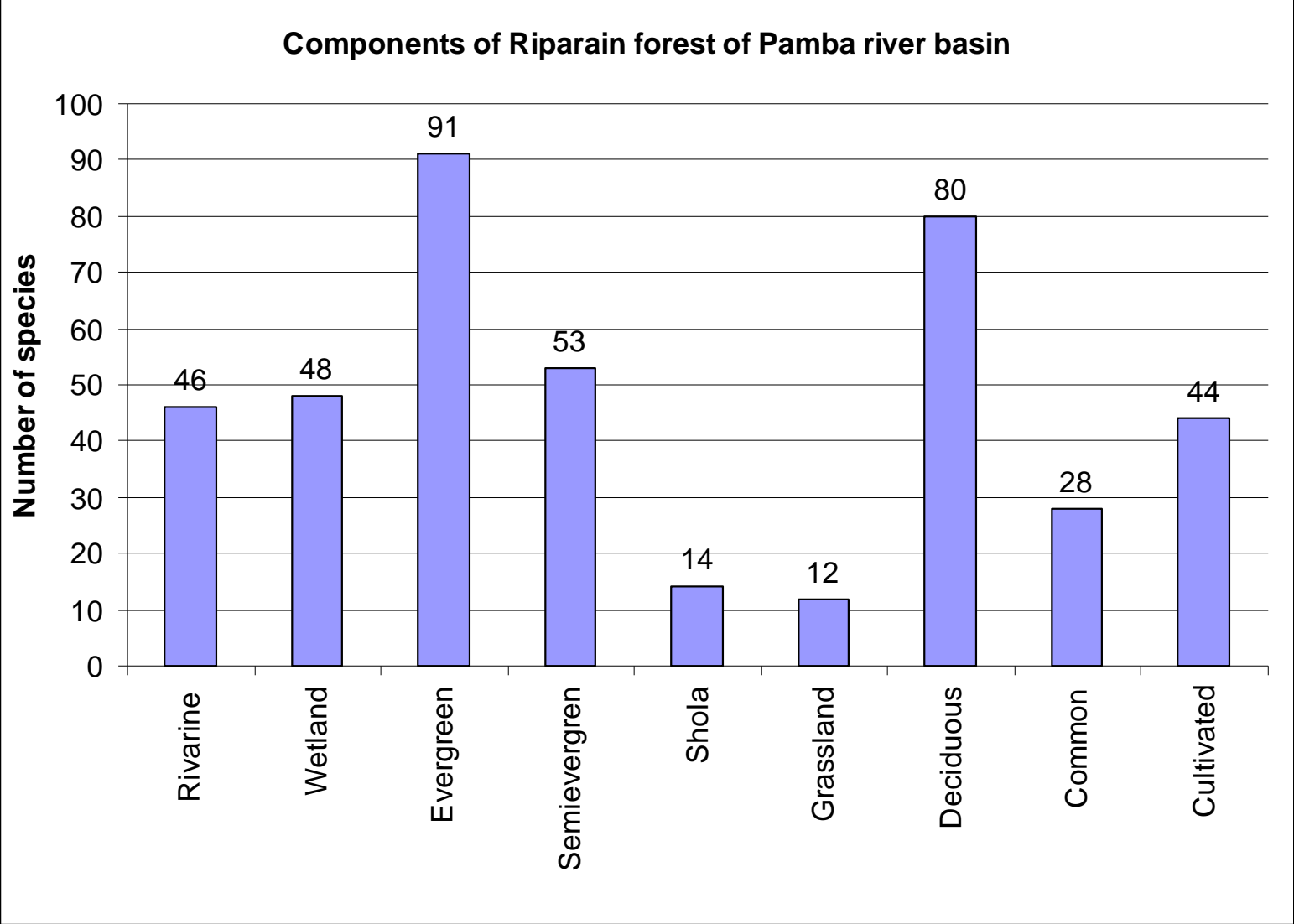
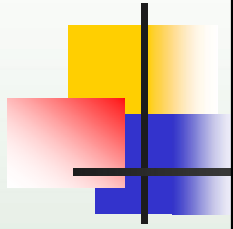
# Results

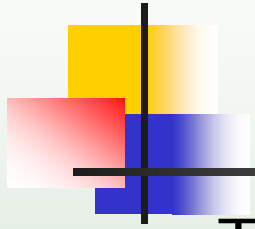
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The flora consists of a diverse blend of:

- Evergreen (91 spp)
- Deciduous (80 spp)
- Semi evergreen (53 spp)
- Wetland (48 spp)
- Riverine (46 spp)
- Cultivated (44 spp)
- Common (28 spp)
- Shola (14 spp)
- Grassland (12 spp) components



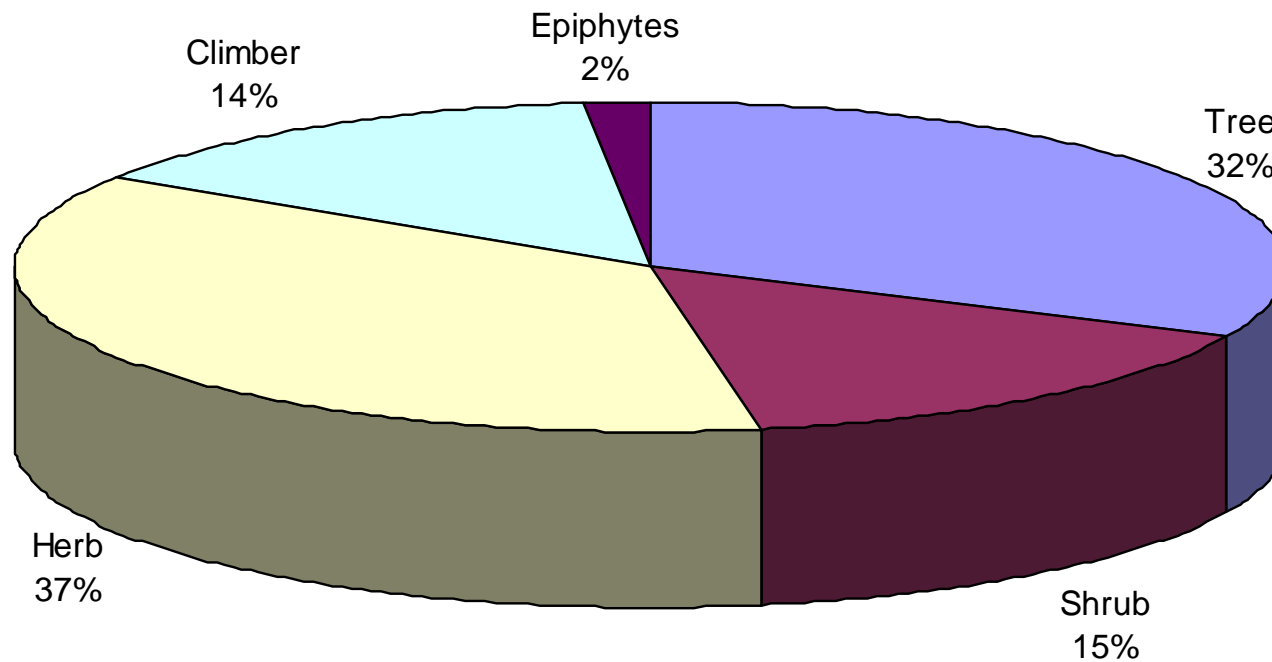




- Taxonomically identified 433 species which include 410 angiosperms, 3 gymnosperms and 20 pteridophytes
- The dominant families based on the diversity of species are Poaceae, Euphorbiaceae, Rubiaceae, Cyperaceae and Fabaceae
- The river basin holds 17.5 % endemism (76 species) and 17 RET species
- 14 potential riparian tree species were identified from the study area for natural buffer system management

# The vegetation profile includes trees, shrubs, climbers, epiphytes and herbs

Riverine vegetataion profile of Pamba river basin





## Endemism of the study area

<b>Endemism</b>	<b>Number of species</b>
Endemic to Peninsular India	10
Endemic to South India and Sri Lanka	1
Endemic to Southern Western Ghats	39
Endemic to Western Ghats	26
<b>Total</b>	<b>76</b>



## RET Plants from the study area

<b>Botanical Name</b>	<b>Family</b>	<b>Endemism</b>	<b>Status</b>
<i>Anaphyllum wighti</i> Schott.	Araceae	S. Western Ghats	Threatened (Nayar, 1997)
<i>Arenga wightii</i> Griff.	Araceae	Western Ghats	Vulnerable (IUCN, 2000)
<i>Belosynopsis vivipara</i> (Dalz.) Fischer	Commelinaceae	Western Ghats	Vulnerable (Nayar, 1997)
<i>Bentinckia condapanna</i> Berry & Roxb.	Arecaceae	S. Western Ghats	Vulnerable (IUCN, 2000)
<i>Derris benthamii</i> (Thw.) Thw.	Fabaceae		Endangered (Nayar, 1997)
<i>Dipterocarpus bourdillonii</i> Brandis	Dipterocarpaceae	Western Ghats	Critically Endangered (IUCN, 2000)
<i>Elaeocarpus munronii</i> (Wt.) Mast.	Elaeocarpaceae	S. Western Ghats	Lower risk: Near threatened (IUCN, 2000)

<b><i>Holigarna grahamii</i> (Wt.)Kurz.</b>	<b>Anacardiaceae</b>	<b>Western Ghats</b>	<b>Rare (Nayar, 1997)</b>
<b><i>Ixora johnsonii</i> Hook.f</b>	<b>Rubiaceae</b>	<b>S Western Ghats</b>	<b>Critically Endangered (IUCN 2000)</b>
<b><i>Lasianthus jackianus</i> Wt.</b>	<b>Rubiaceae</b>	<b>S. Western Ghats</b>	<b>Rare (Nayar, 1997)</b>
<b><i>Ochreinauclea missionis</i> (Wall. ex G. Don) Ridsd.</b>	<b>Rubiaceae</b>	<b>S. Western Ghats</b>	<b>Vulnerable (IUCN, 2000)</b>
<b><i>Schefflera bourdillonii</i> Gamble</b>	<b>Araliaceae</b>	<b>S. Western Ghats</b>	<b>Endangered (IUCN, 2000)</b>
<b><i>Semicarpus travancorica</i> Bedd.</b>	<b>Anacardiaceae</b>	<b>S. Western Ghats</b>	<b>Rare (Nayar, 1997)</b>
<b><i>Symplocos macrocarpa</i> Wt. ex Clarke</b>	<b>Symplocaceae</b>	<b>S. Western Ghats</b>	<b>Vulnerable (Nayar, 1997)</b>
<b><i>Syzygium bourdillonii</i> (Gamble) Rathkr. &amp; Nair</b>	<b>Myrtaceae</b>	<b>S. Western Ghats</b>	<b>Endangered (IUCN, 2000)</b>
<b><i>Tabernaemontana gamblei</i> Subram. &amp; Henry</b>	<b>Apocyanaceae</b>	<b>S. Western Ghats</b>	<b>Lower risk: Conservation dependant (IUCN, 2000)</b>
<b><i>Tabernaemontana heyneana</i> Wall.</b>	<b>Apocyanaceae</b>	<b>S. Western Ghats</b>	<b>Lower risk: Near threatened (IUCN, 2000)</b>





*Anaphyllum wighti* Schott.



*Arenga wightii* Griff.



*Anaphyllum wighti* Schott.



*Arisaema leschenaultii* Bl.



*Tabernaemontana gamblei*  
Subram. & Henry



*Connarus sclerocarpus*  
(Wt. & Arn) Schellenb

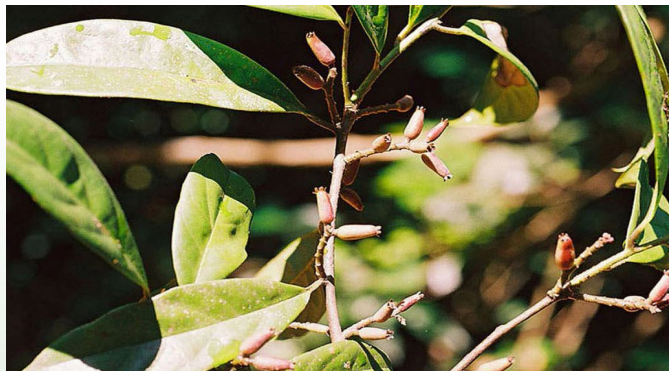


*Lasianthus jackianus* Wt.





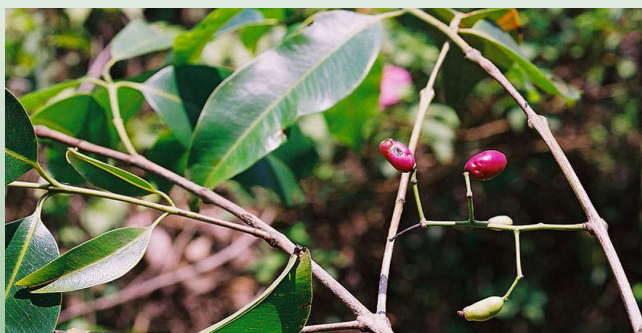
*Otonophelium stipulaceum*  
(Bedd.) Radlk.



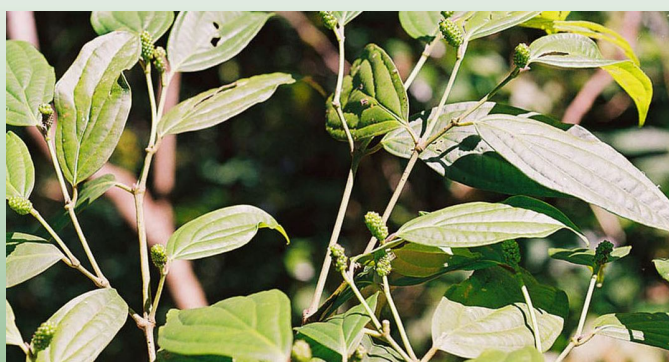
*Symplocos macrocarpa* Wt. ex Clarke



*Calamus travancoricus*  
Bedd. ex. Becc. & Hook.



*Syzygium cumini* (L.) Skeels var.  
*axillare* (Gamble) Sastry & Kashyapa



*Piper trichostachyon* (Miq.) C. DC



*Cinnamomum keralaense* Kosterm.



*Acrotrema arnottianum* Wt.



*Acrotrema arnottianum* Wt.





*Litsea insignis* Gamble



*Ixora johnsonii* Hook.f



*Medinella beddomei* Clarke



*Ophiorrhiza eriantha* Wight

## Potential riparian trees in the Pamba river basin

<b>Botanical Name</b>	<b>Family</b>
<i>Barringtonia racemosa</i> (L.) Spreng.	Lecythidaceae
<i>Calophyllum inophyllum</i> L.	Clusiaceae
<i>Crataeva magna</i> (Lour.) DC.	Capparaceae
<i>Dillenia pentagyna</i> L.	Dilleniaceae
<i>Elaeocarpus tuberculatus</i> Roxb.	Elaeocarpaceae
<i>Garcinia gummi-gutta</i> (L.) Robs.	Clusiaceae
<i>Humboldtia vahliana</i> Wight	Caesalpiaceae
<i>Lagerstroemia speciosa</i> (L.) Pers.	Lythraceae
<i>Madhuca neerifolia</i> (Moon) H. J. Lam.	Sapotaceae
<i>Neolamarkia cadamba</i> (Roxb.) Bosser	Rubiaceae
<i>Ochreinauclea missionis</i> (Wall. ex G. Don) Ridsd.	Rubiaceae
<i>Syzygium salicifolium</i> (Wight) Graham	Myrtaceae
<i>Talipatri tiliaceum</i> (L.) Fryxell.	Malvaceae
<i>Trewia nudiflora</i> L.	Euphorbiaceae





*Calophyllum inophyllum* L.



*Crataeva magna* (Lour.) DC.



*Crataeva magna* (Lour.) DC.



*Dillenia pentagyna* Roxb.





*Humboldtia vahliana* Wight



*Neolamarkia cadamba* (Roxb.) Bosser



*Lagerstroemia speciosa* (L.) Pers.



*Ochreinauclea missionis* (Wall. ex G. Don) Ridsd.





*Homonoia riparia* Lour.



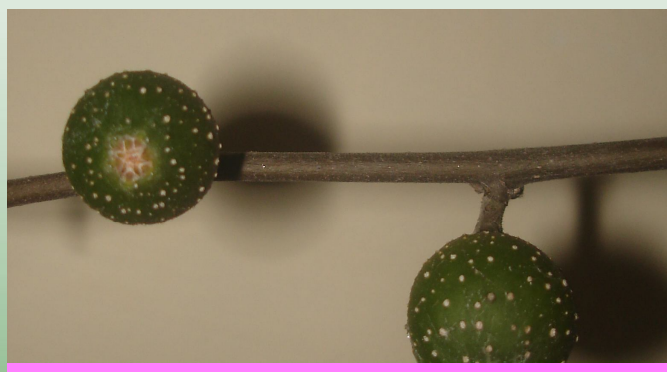
*Trewia nudiflora* L.



*Ficus heterophylla* L.f.



*Syzygium occidentale* (Bourd.) Gandhi



*Ficus heterophylla* L.f.



*Hydnocarpus macrocarpa* (Bedd.) Warb



*Saccharum spontaneum* L.



*Saccharum spontaneum* L.





**Riparian vegetation near Kochupamba**



**Riparian vegetation near Athikkayam**



**Riparian vegetation near Aranmula**



**Riparian vegetation near Pavukara**





**Erosion of riparian vegetation bathing ghats at Pamba triveni**



**Riparian vegetation near Periyar tiger reserve**



**Riparian vegetation near Edakadathi**



**Riparian vegetation near Perunthenaruvi**





**Landuse pattern of a riparian belt at Attathode**



**Riparian zone of Cherukolpuzha**



**Sand mining near Pavukara**



**River bank erosion near Cherukolpuzha**

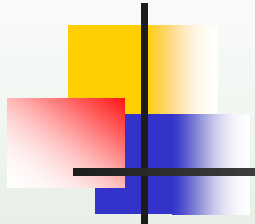


# Conclusion

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- The riparian species composition revealed the predominance of herbs followed by trees, shrubs, climbers and epiphytes
- The forest type shows structural similarity with west coast tropical evergreen as observed in the Chalakkudy river basin (Bachan 2003)
- The identified taxa constitute 9.25 % of the flowering plants of Kerala
- The river basin holds 17.5% of endemism. This estimate shows a reduction in the percentage of endemism when compared with the endemism of Western Ghats-Sri Lanka biodiversity hotspot (45.6%) as reported by Myers *et al.*, (2000)





- **Natural riparian vegetation in the upper stretches of Pamba river has crucial role for restoring stream functions and aquatic habitats**
- **Since the lower stretches of the river, from Vembanad lake to Perinad region, has fragmented riparian vegetation, the study recommends urgent restoration efforts based on natural buffer system concept**
- **This natural buffer system management strategy can be developed incorporating the potential riparian trees identified from the river basin**



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