Journal of Aquatic Biology & Fisheries | 2020 | **8** | S | pp. 122-126
**Special Issue on Rivers**
ISSN 2321–340X


# Role of Figs in Riparian Eco-Restoration

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**Abstract**

Riparian forests are one among the unique ecosystem supporting diverse plant and animal communities. The riparian ecosystem could be considered as an ecotone and are generally resilient to natural flood. But the recent abnormal rainfall and torrential flow in rivers made a disastrous effect on the riparian vegetation across the Kerala state. The riparian ecosystem must be properly restored for sustaining the diverse flora and fauna, that are depending on the riparian ecosystem for the survival. The members of the genus *Ficus* L., (Moraceae) commonly called 'figs' are keystone species, and the plants have a major role in sustaining the ecosystem. The figs are considered as a diverse genus with respect to their life forms and habitat patterns. Most of them are large trees, with a high growth rate and dominates the canopy in a short span of time. Figs could be one of the best plant group considered for the restoration of the riparian ecosystem. Many species of figs including *F. racemosa*, *F. tsjakela*, *F. drupacea* etc. are common along the riparian stretches of the river. Mostly being large trees with high growth rate, these plants could be a suitable species for ecorestoration along with the degraded riparian areas. The reckless growth rate of the figs will help to cover the open canopy at a faster rate than the other tree species. As the plants follow a wide range of growth habitats including rheophytes, it is preferred for ecorestoration even in rocky areas. Planting figs will not only restore the riparian forests but will sustain a large number of birds and animals; this will, in turn, help to maintain the functional aspects of the ecosystem.

**Keywords:** Ficus, Keystone species, Flood, Epiphytes, Eco-restoration methodology

## 1. Introduction

Riparian vegetation commonly refers to the plant community seen along the river banks. Riparian forests are unique ecotone, which is greatly influenced by water (Goebel *et al.*, 2003; Sunil *et al*., 2016). The nature of the plant community is determined by the elevation, annual rainfall, duration of the rainy season, wind, and temperature along with soil characteristics influenced by climatic factors (Nair, 1994). The riparian ecosystem is considered as a functionally dominant component of a terrestrial landscape (Tabacchi *et al.,* 1998). Riparian zones have been reported as some of the most species-rich and most productive systems (Malanson, 1993). Riparian forests are having unique vegetation and species diversity (Bachan, 2010). Riparian zones help to maintain the continuity of the forests and act as a corridor for the migration of many animal groups. As the riparian ecosystems are much sensitive to human influence and are mainly degraded by human disturbances (NRC, 1992), they are considered as a potentially threatened ecosystem (Malanson, 1993). Restoration denotes to bring back to the original form (Goodwin *et al.*, 1997). Thus, it implies that simply planting a species may not be a good restoration strategy. The suitable species must be planted in the proper place, commonly referred to as the ecorestoration methodology.

The plants belonging to the family Moraceae are one of the most abundant and extensively distributed taxa among the angiosperms. They are considered a keystone species (Vanitharani *et al.,* 2009; Kumar *et al.,* 2011) in many ecosystems. The presence of minute seeds and multiple dispersers of the fruits could be one of the reasons for the dispersal and distribution of the species (Corner, 1965; Lambert and Marshall, 1991; Lomáscolo *et al.*, 2010). They possess a varied habit ranging from climbers, woody shrubs, epiphytic and hemi epiphytic trees. The different habit patterns these plants could survive may be the possible reason for the success rate of the plants over a diversified habitat. Most of the plants being large trees, with a high growth rate and supporting many other life forms, these plants are a good choice for ecorestoration practices. The current study emphasises the role and the suitability of the fig plants in the ecorestoration of riparian forests. The seasonal availability of figs as well as, the fruiting pattern makes Ficus one among the most suitable food source for most of the frugivores and other animals.

## 2. Materials and Methods

### Study area

The Chalakkudy River extending for a stretch of 144 km is the 5$^{th}$ largest river in Kerala. It originates from the Anamala and Nelliyampathy hill ranges of Southern Western Ghats. The major tributaries are the Sholayar, Parambikulam Aar, Karappara Aar and the Kuriarkutty Aar, joins at Orukumbankutty and flow like the River Chalakkudy. The river has five large dams in its tributaries and another one after Orukumbankutty at Poringalkuthu in the main river. The remaining 70 km length of the river after Poringalkuthu dam is not having any large obstruction except a River Diversion Scheme at Thumboormuzhi to irrigate 14, 000 hector of land. The Chalakkudy river joins with another river Periyar at Elanthikkara just 6 km before they together end in the Lakshadweep sea. The Chalakkudy river stretch was filled with riparian forests along its margins (Fig. 1). The Kerala flood 2018 had a major impact on the riparian stretches

Received on: 15-04-2020; Revised on:30-10-2020; Accepted on: 30-11-2020

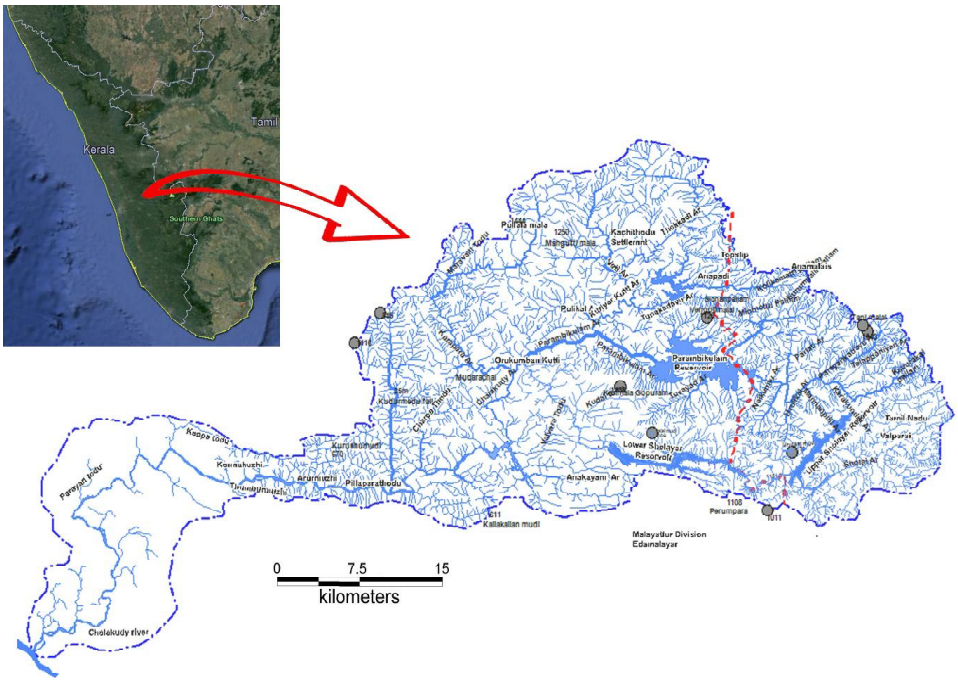


**Fig. 1.** Physical Map of Chalakkudy River Basin

of the river, and most of them were washed off (Bachan and Shajan, 2019).

**Methodology**

Field surveys were conducted across the riparian stretches for the assessment of the riparian vegetation (Bachan, 2010; Bachan and Pooja, 2017). One hundred six stratified random plots were laid across the riparian stretches (Fig. 2). Among them, plots with figs were enumerated. The plots identified with figs were revisited during the study period (2017-2019), before and after the flood for the confirmation of the presence of figs.

All the species of figs encountered were collected, identified using authentic floras (Gamble, 1925; Sasidharan and Sivarajan, 2004) and was confirmed by herbarium consultation in the herbariums MH, TBGT, KFRI and CALI. Individuals of all growth forms were considered in the study, and multiple individuals were studied to confirm the habitat preference of each species.

## 3. Results and Discussion

The riparian stretches along the Chalakkudy river are dominated with evergreen and semi-evergreen forests. These forest patches are found in the low elevation areas of the river, and the occurrence of such low elevation riparian forests are rare in the Western Ghats (Bachan and Pooja, 2017). The study revealed the presence of 10 species of figs in the riparian stretch across the river (Fig 3; Table 1). Out of the 106 plots studied, 26 plots had the presence of figs, *i.e.*, 24.5%. Figs were present from the very upstream to very downstream of the river (Fig 4).

Figs were present in all types of riparian vegetation including dry evergreen, dry deciduous, wet evergreen, evergreen, moist deciduous and low elevation estuarine forests. They were the most important as well as the common component in all types of riparian forests. The most common member was *F. racemosa*, with 20 individuals in 10 plots and distribution extending from

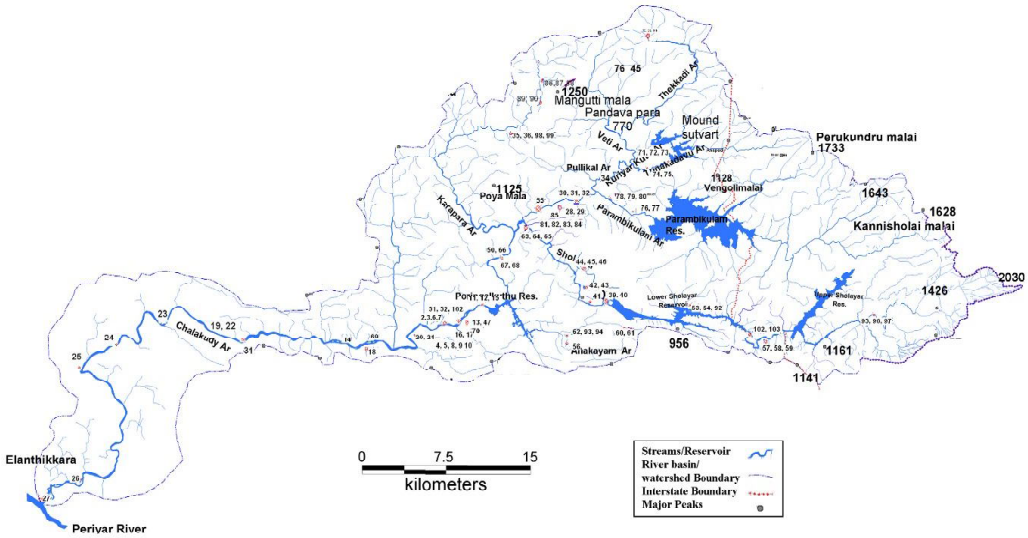


**Fig. 2.** Map showing the 106 stratified random plots studied

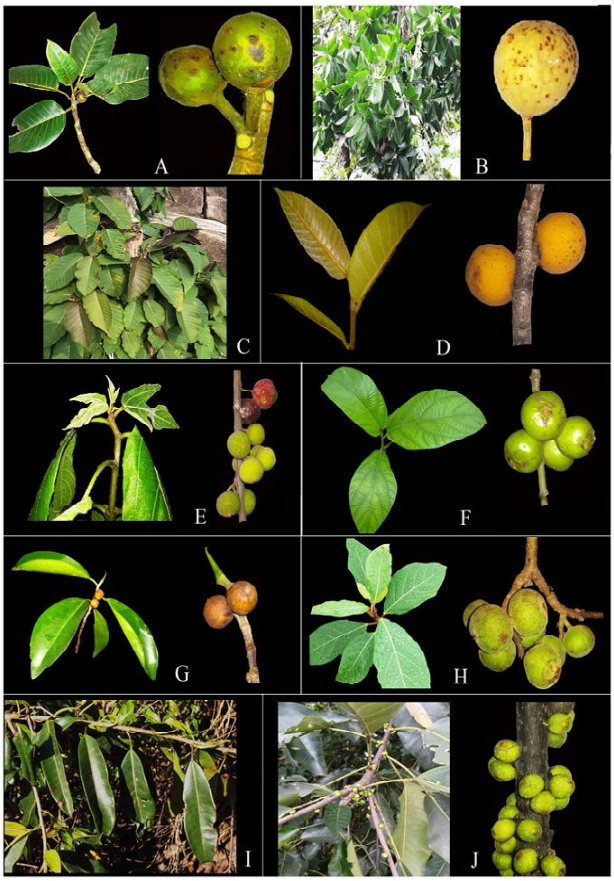


**Fig. 3.** Ficus species observed from Chalakkudy river basin **A.** *Ficus beddomei* King; **B.** *Ficus callosa* Wild; **C.** *Ficus dalhousiae* Miq. **D.** *Ficus drupacea* Thumb; **E.** *Ficus exasperata* Vahl; **F.** *Ficus hispida* L.f. **G.** *Ficus microcarpa* L.f; **H.** *Ficus racemosa* L; **I.** *Ficus rigida* var *bracheata* (Corner) Bennet; **J.** *Ficus tsjahela* Burm. f.

the very downstream of the river to the upstream of the river. Its presence is observed in all type of riparian vegetation (Oakley *et al.*, 1985) in the dry areas of Chinnar region and even in low elevation areas with salinity. *F. hispida* is distributed only to the low elevation part of the riparian area.

**Table 1.** List of Figs seen across the Chalakkudy river basin

| SL.NO. | SCIENTIFIC NAME | LOCAL NAME |
|---|---|---|
| 1. | *Ficus beddomei* King. | Thavittal |
| 2. | *Ficus callosa* Wild. | Kadapilavu |
| 3. | *Ficus dalhousiae* Miq. | Kallal |
| 4. | *Ficus drupacea* Thumb. | Kallal |
| 5. | *Ficus exasperata* Vahl. | Therakam |
| 6. | *Ficus hispida* L.f. | Thonditherakam |
| 7. | *Ficus microcarpa* L.f. | Itthi |
| 8. | *Ficus racemosa* L. | Atthi |
| 9. | *Ficus rigida* var *bracheata* (Corner) Bennet. | - |
| 10. | *Ficus tsjahela* Burm. f. | Chela |

There are about 34 species of figs in Kerala (Sasidharan and Sivarajan, 2004). 17 species of figs were recorded from the Vazhachal forest (Bachan and Jisy, 2016). As 10 species of figs are reported from the Chalakkudy River basin, it accounts for 30 % of the total diversity of figs in the state. And hence supports that figs are a common component of the riparian forests. The fig species showed a varied range of habitats including independent trees, hemi epiphytes and rarely climbers. Around 50 percentage of the existing species of figs are hemi epiphytic in the habit. Some of the epiphytic species were growing attached to the rock and were rheophytic in nature. While the other epiphytic species were growing on other tree species. No host specificity was observed in such epiphytic species. Rather than the basic belief of figs killing the host plant by surviving over them, the observation suggests the figs are dominant over tree species that are degraded or are in a state of degradation. In such conditions, the figs grow up over them, but established as an independent tree soon, obtaining nutrients their own and thereby filling the canopies. Based on the habitat preference, the suitable species of figs suitable for riparian ecorestoration are shown in Table 2.

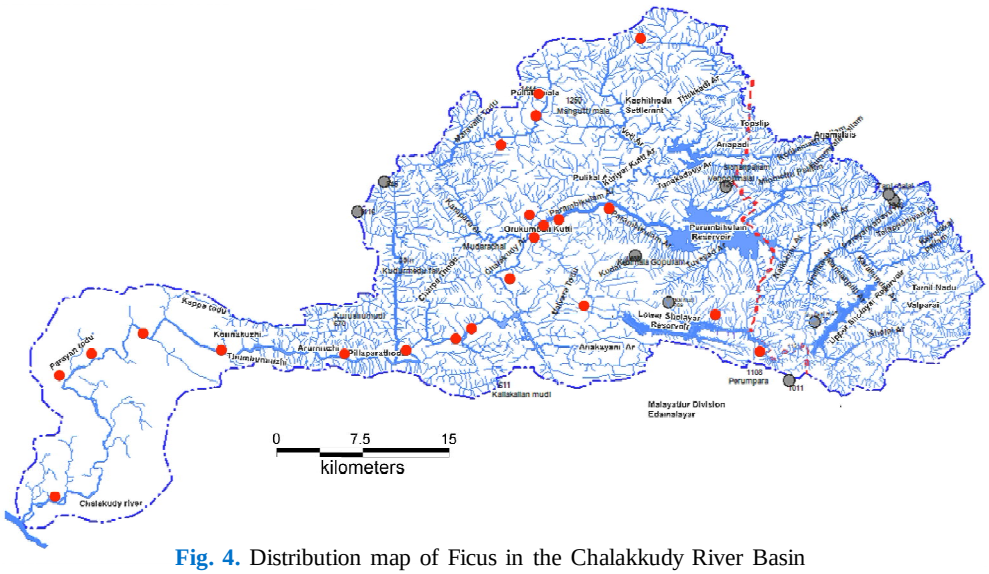


**Fig. 4.** Distribution map of Ficus in the Chalakkudy River Basin

**Table 2.** Suitable species of Figs for ecorestoration based on habitat preference

| AREAS FOR ECO RESTORATION | SUITABLE SPECIES OF FIG |
|---|---|
| Rocky areas | *F. beddomei* King. |
| | *F. dalhousiae* Miq. |
| | *F. drupacea* Thumb. |
| | *F. microcarpa* L.f. |
| | *F. racemosa* L. |
| | *F. tsjahela* Burm.f. |
| Normal riparian areas | *F. callosa* Wild. |
| | *F. drupacea* Thumb. |
| | *F. exasperata* Vahl. |
| | *F. racemosa* L. |
| | *F. rigida* var *bracheata* (Corner) Bennet. |
| | *F. tsjahela* Burm.f. |
| Sandy areas | *F. exasperata* Vahl. |
| | *F. hispida* L.f. |
| | *F. racemosa* L. |

A single individual of fig could cover large canopies than the normal plants, especially the species like *F. drupacea, F. tsjakela, F. microcarpa* etc. Thus, a single fig tree could survive in the place of many large trees and can support a wide range of life forms. In most of the cases, the syconium of the fig plants is attractive by their appearance and nutritional quality. Figs fruit throughout the year. Being seasonal in flowering, one or the other species of fig will be having fruits, that attract a large number of faunas. Thus, figs are a constant source of nutrition for them. A single individual of fig plant can thus support a large number of animals and birds, so figs are always considered to be a keystone species (Vanitharani *et al.*, 2009; Kumar *et al.*, 2011).

The growth rate of fig plants is considered to be much faster than the other tree species and all the members of figs process latex. Latex primarily acts as a biochemical barrier against pathogen and pest attack. Latex production is a metabolic activity with large energy requirements. The extensive growth of the plant is mainly to meet this energy expenditure (Harrison, 2005).

Figs are pollinated by wasps (Priyadarsanan, 2000; Harrison, 2005). The unique pollination system in the figs ensures successful pollination and seed set. The constant visit of many frugivores and other fauna to consume the ripened fruits make the dispersal of the figs to long distances a successful event. And ensures establishment of the plants to distances away from the parent plant. Figs are supposed to be a plant group that can be propagated from stem cuttings as well as from their seeds. The adaptation of these plants to establish in various habitats makes them a suitable plant for ecorestoration.

## 4. Conclusion

As 25% of the total study plots showed the presence figs in all types of riparian vegetation confirming as important component in the riparian forest vegetation including dry evergreen, dry deciduous, wet evergreen, evergreen, moist deciduous and estuarine forests. Hence figs could be considered as a suitable species for ecorestoration, as they are large trees with good canopy and establish in varied habitats also being a keystone species supporting a wide range of animals and birds.

## Acknowledgements

The authors are grateful to the Research Department of Botany, MES Asmabi College, P. Vemballur, for the support in the completion of the work. We also thank the members of the Western Ghats Hornbill Foundation for the support and services throughout the work period. Our sincere gratitude to the Forest Department of Kerala for the necessary permissions and support.

## 5. References

Amitha Bachan, K.H and Jisy, E.D. 2016. A preliminary assessment of the diversity of the genus 'Ficus' in the Vazhachal Forests, Western Ghats, India. Meridian., 5 (1): 45- 54.

Amitha Bachan, K.H, 2010. Riparian flora of the Chalakkudy River Basin and its ecological significance. PhD Thesis. University of Calicut. Kerala. India.

Amitha Bachan, K.H and Pooja, S. 2017. Riparian forest vegetation - A highly endangered wetland plant community: A case study from Vazhachal, Chalakkudy River, Western Ghats Meridian., 6. (2): 30-40.

Corner, E.J.H, 1965. Check list of Ficus in Asia and Australasia with keys to identification. Gardens Bulletin, Singapore., 21: 1–186.

Gamble, J.S. 1925. Flora of the Presidency of Madras. Adlard & Son. Ltd., London., 1351 – 1371.

Goebel, P.C., Palik, B.J and Pregitzer, K.S. 2003. Plant diversity contributions of riparian areas in watersheds of the Northern Lake States, USA. Ecological Applications., 13: 1595-1609.

Goodwin, C.N., Hawkins, C.P and Kershner, J.L.1997. Riparian Restoration in the Western United States: Overview and Perspective. Restoration ecology., 5: 4-14.

Harrison, R.D. 2005. Figs and the diversity of tropical rainforests. Bioscience., 55(12): 1053-1064.

Kumar, A., Bajpai, O., Mishra, A.K., Sahu, N., Behera, S.K and Chaudhary, L.B. 2011. Assessment of diversity in the genus Ficus L. (Moraceae) of Katerniaghat Wildlife Sanctuary, Uttar Pradesh, India. American Journal of Plant Sciences., 2: 78-92.

Lambert, F.R. and Marshall, A.G. 1991. Keystone characteristics of bird-dispersed Ficus in a Malaysian Lowland rain forest. The Journal of Ecology., 79: 793-809.

Lomáscolo, S.B., Levey, D.J., Kimball, R.T., Bolker, B.M and Alborn, H.T. 2010. Dispersers shape fruit diversity in Ficus (Moraceae). Proceedings of The National Academy of Sciences., 107: 14668-14672.

Malanson, G. P. 1993. Riparian landscapes. Cambridge University Press., 1-287.

Nair, S. 1994. The high ranges problems and potential of a hill region in the Southern Western Ghats, Indian National Trust for Art & Cultural Heritage, New Delhi.

NRC (National Research Council). 1992. Restoration of aquatic ecosystems: science, technology, and public policy. Committee on Restoration of Aquatic Ecosystems. National Academy Press, Washington, D.C.

Oakley, A. L., Collins, J. A., Everson, L. B., Heller, D. A., Howerton, J. C. & Vincent, R. E. (1985). Riparian zones and freshwater wetlands. Management of wildlife and fish habitats in forests of western Oregon and Washington., 57-80.

Priyadarsanan, D. R. 2000. Fig insects of Kerala. Zoological Survey of India., 1-175.

Sasidharan, N and Sivarajan, V.V. 2004. Biodiversity Documentation of Kerala. Part 6. KFRI Hand Book., 438-442.

Sunil, C., Somashekar, R.K and Nagaraja, B.C. 2016. Diversity and composition of riparian vegetation across forest and agroecosystem landscapes of river Cauvery, southern India. Tropical ecology., 57.2: 343-354.

Tabacchi, E., Correll, D.L., Hauer, R., Pinay, G., Planty Tabacchi, A.M and Wissmar, R.C. 1998. Development, maintenance and role of riparian vegetation in the river landscape. Freshwater Biology., 40(3): 497-516.

Vanitharani, J., Bharathi, B.K., Margaret, I.V., Malleshappa, H., Ojha, R.K and Naik, K.G.A. 2009. Ficus diversity in Southern Western Ghats: a boon for biodiversity conservation. Journal of Theoretical Experimental Biology., 6: 69-79.