

BIODIVERSITY FOR CLIMATE RESILIENCE

Editors

**Dr. S.C. Joshi IFS
Dr. V. Balakrishnan
Dr. Preetha N.**



KERALA STATE BIODIVERSITY BOARD

Biodiversity for Climate Resilience

[This book is a compilation of the papers presented as part of the 1st Kerala State Biodiversity Congress held during 2018]



Editors

Dr. S.C. Joshi IFS, Dr. V. Balakrishnan, Dr. Preetha N.

Editorial Board

Dr. K. Satheeshkumar
Sri. K.V. Govindan
Dr. K.T. Chandramohan
Dr. T.S. Swapna
Sri. A.K. Dharni IFS

© Kerala State Biodiversity Board 2019

All rights reserved. No part of this book may be reproduced, stored in a retrieval system, transmitted in any form or by any means graphics, electronic, mechanical or otherwise, without the prior written permission of the publisher.

Published By

Member Secretary
Kerala State Biodiversity Board

ISBN: 978-81-934231-2-7

Citation:

In. Joshi, S.C., Balakrishnan, V. and Preetha, N. (Eds.), Biodiversity for Climate Resilience. Kerala State Biodiversity Board, Thiruvananthapuram.

CONTENTS

Best Practices of Biodiversity conservation

1. People's action for Rejuvenating lost waterbodies - The Aadi Pamba Varattar Story - 5
2. Jalasamrudhi – A Modal Initiative on Water Conservation -12
3. Best Practices in Biodiversity Conservation: A Case of M. S. Swaminathan Botanic Garden in Wayanad, Kerala -17
4. Yaongyimchen Community Bio-Diversity Conservation Area , Nagaland - 29
5. Hornbill Monitoring to Ecological Monitoring – One and Half decade of Indigenous community Based Conservation and Monitoring of Endangered Rainforest Species and Habitat in Western Ghats -35
6. Best Practices in Agrobiodiversity Conservation for Climate Resilience - 41
7. Best Practices on Biodiversity Conservation in Rice Ecosystems of Kerala - 46

Biodiversity Conservation Priorities

8. Agrobiodiversity Conservation: Participatory Management Systems in Small Millets - 53
9. Agro-biodiversity: Status, Trends and Conservation priority - 55
10. Vilwardi Cattle Breed: An Epitome of Biodiversity Conservation - 60
11. Protection and Conservation of Agro-Biodiversity- Strategies and Practices - 63
12. Circumventing the shortfalls in aquatic biodiversity documentation of Kerala and prioritizing research: The Way forward - 68
13. Ecorestoration and Biodiversity Conservation of Riparian Forests Along the Chalakkudy River, Southern Western Ghats -72
14. Impact of Flood on Threatened Plants in Kerala State; *Humboldtia Bourdillonii*- A case Study - 77
15. An action plan to mitigate the impacts of climate change on the native biota of Kerala (India): A proposal with special reference to butterflies 81
16. Prakriti Bus: A Mobile Exhibition for Raising Awareness on Biodiversity of Uttar Pradesh - 97
17. Connecting Biodiversity and Climate Resilience- Way foreword - 105

ECORESTORATION AND BIODIVERSITY CONSERVATION OF RIPARIAN FORESTS ALONG THE CHALAKKUDY RIVER, SOUTHERN WESTERN GHATS

Amitha Bachan K.H¹ and Pooja Suresh²

¹ Assi. Prof & Research Guide, Research Department of Botany MES Asmabi College & Founder member Western Ghats Hornbill Foundation

² PhD Fellow, Research Department of Botany MES Asmabi College

ABSTRACT

This article elucidates the studies and conservation intervention on the Riparian Forests and vegetation along the Chalakkudy River in the Anamalai part of Southern Western Ghats as a pioneering work in India. A methodology developed through the process has been used for understanding heterogenic community composition along bioclimatic gradient useful for classification and ecorestoration. The methodology has application in other forest and wetland ecosystems and is being applied in collaboration with various state agencies including Kerala State Landuse Board, Kerala Forest Department and Kerala State Biodiversity Board. The ecorestoration protocol prepared in detail for Chalakkudy River has been added to the working plan of the Forest Department in the Vazhachal Forest Division.

INTRODUCTION

Chalakkudy River is the fifth longest and most fish diverse river in Kerala (NBFGR, 2000). The river is originating from the Anamalai landscape unit of southern Western Ghats covering Nelliampathy, Parambikulam valley, Valparai- Malkkaparaiplatue, Sholayar valley and Vazhachal- Athirappilly forests. The rich fish diversity in the river is a reflection of availability of different bioclimatic regimes (Dry Deciduous, Moist Deciduous, Wet Evergreen, Evergreen, Dry Evergreen, Semi evergreen, Low elevation evergreen) and availability of river stretches in 6-7 altitudinal planes with good amount of Riparian vegetation and riverine micro habitat (Bachan et al., 2014).

The catchment forests of Chalakkudy River within the Anamalis considered as one of the hottest hotspot (Nayar, 1996; Bawa et al., 2007) in terms of biodiversity with in the Western Ghats Sri Lanka biodiversity hotspot. The riparian forest along the river is very unique in its structure and floristic composition with good number of endemic and threatened flora and fauna (Bachan and Pradeep, 2015) the low elevation evergreen riparian forests in the Vazhachal - Athirappilly region (50-350m Elevation) has been recognised as unique ecosystem because of unavailability of similar vegetation across the Western Ghats (Bachan, 2010; Bachan and Pradeep, 2015). The presence of true evergreen flora, nesting of three Hornbills especially Great hornbills, Malabar Pied Hornbills and many endemic and endangered flora and fauna indicates its biological significance.

CONSERVATION PRIORITIES AND BEST PRACTICES

The studies on biodiversity and conservation significance of Riparian forests across Chalakkudy River and major initiatives on conservation and Eco restoration has reflections in four different aspects a. Uniqueness of the vegetation and its biodiversity significance, b. Pioneer effort in India to understand the community structure and composition of riparian forests in relation with bioclimate and its classification, c. The methodology to understand heterogenic community structure of vegetation across a landscape cutting across the conventional methodologies used in our region and d. Methodological and practical inputs to prioritise Eco restoration areas and selection of species corresponding to the bioclimate and succession or degradation stages.

a. Pioneering the studies on riparian vegetation revealing the conservation significance

The first attempt to understand and map the composition of low elevation riparian forests along Chalakkudy river especially downstream to the Vazhachal – Athirapilly region done in 2001-2003 period (Bachan, 2003) which revealed good amount of riparian vegetation in the very lower elevations 220m to 50m MSL (Vazhachal to Thumburmuzhy) including islands with evergreen forest composition. The detailed report was published (Bachan, 2003; Bachan, 2005). This could be useful for BMC in the Grama Panchayaths along the Chalakkudy river as a guideline for the restoration of riparian vegetation and river banks.

The riparian vegetation along various gradients account for the high fish diversity, endemic flora, endemic fauna and many unique features contributing to the Biodiversity significance of the region. Sympatric nesting of three important Hornbills Great Hornbill, Malabar Pied Hornbills and Malabar Grey Hornbills where recorded from Vazhachal were with the Great hornbill nest at 180 m on an endangered tree *Kingiodendron pinnatum*. The Malabar Pied Hornbills is confined to low elevation forests and now reported only from Vazhachal-Athirapilly riparian forests along Chalakkudy River and Aralam Wildlife Sanctuary in Kerala part of Western Ghats (Bachan 2003, Bachan 2006, Bachan et al., 2011).

The riparian and streamside vegetation along the Chalakkudy River contains 70% of the total flora in the region including 80% of the endemics and 75% of the endangered and threatened species (Bachan 2010, Bachan and Pradeep 2015). The endangered Cochin Forest Cane Turtle (*Vijayachelious sylvatica*), Purple Frog (*Nasutabatrachus sahyadrica*), Lion Tailed Macaques (*Macaca silinus*), King Cobra (*Ophiophagus hannah*), Tiger (*Panthera tigris*), Leopard (*Panthera pardus*), Slender loris (*Loris malabaricus*) etc have been reported from the riparian forests at Vazhachal (Bachan et al., 2018). The river recorded highest diversity of fresh water fishes and the Orukombankooty, Vazhachal, Athirapilly are important regions (Ajithkumaret al., 1999; Raghavanet al., 2008).

b. Understanding the Community Composition and Classification of the riparian vegetation

The heterogenic community composition of the riparian forests correlating with bioclimate was identified for the first time in India and Western Ghats region (Bachan 2003, 2010). The entire river basin was mapped and rainfall and temperature data pooled for more than 20 years to reveal the different bioclimate existing in the river basin following the methods provided by Mehr-Homji (2001). Five different bioclimates were identified from the region (Bachan et al., 2014). Champion and Seth (1968) in their revised classification of the forests types in India mention riparian vegetation only in the dry deciduous regions in the Deccan region and the next comprehensive attempt (Bachan, 2010) classifies nearly 24 sub types in four major forest types for the riparian forests (Bachan and Pradeep, 2010, 2015). This has made a bench mark information to understand the riparian vegetation across the Western Ghats region and progressive efforts are ongoing adding to the information. The studies and methodology on riparian vegetation is being used in the assessment of flood impact on Riparian forests along four major rivers in Kerala including Chalakkudy by Kerala State Biodiversity Board.

c. The methodology to understand heterogenic community structure of vegetation across a landscape cutting across the conventional methodologies used in our region.

A new methodology to understand heterogenic composition as well as succession stages or degradation types was developed and applied in the study of riparian forests in the Chalakkudy river basin of the Anamalai landscape unit (Bachan, 2010). The conventional method of pooling phytosociological data across a landscape based on altitude or administrative boundaries resulting in masking of subdominant communities or degradation stages with dominant community composition was modified to reveal the heterogenic diverse community composition (Bachan and Pradeep, 2010). All the enumerated phytosociological data were segregated with the heterogenic species composition. This methodology was used by Kerala State Land use Board (KSLUB) in the preparation of Eco restoration protocol in the Kurumali river basin (Nizammudeen et al., 2018). Also enumeration of natural forest in the preparation of working plan Vazhachal Forest Division. A standardised methodology for collection of bench mark data, understanding heterogenic community composition and succession or degradation stages and a guideline to prioritise species for Eco restoration has been developed for practical application. (Bachan, 2018).

d. Methodological and practical inputs to prioritise Eco restoration areas and selection of species corresponding to the Bioclimate and succession or degradation stages.

Heterogenic riparian community composition enumerated from Chalakkudy river basin were ranked for its succession or degradation stages using the methodology developed (Bachan, 2018). A detailed eco restoration plan including species composition representing each successional or degradation stages were prepared and a chart to prioritise species for

Ecorestoration developed as a comprehensive site specific plan for long term monitoring and Ecorestoration of riparian forests of Chalakkudy river basin within the administrative boundary of Vazhachal forest division. This was added to the newly prepared working plan of Vazhachal forest division. A detailed guide line on monitoring and Ecorestoration of riparian forests including the Ecorestoration methodology is being published for the use of academicians as well as general public.

REFERENCE

- Ajithkumar, C.R., Rema Devi, K., Raju Thomas, K. and Biju, C.R. (1999). Fish fauna, abundance and distribution in Chalakkudy river system, Kerala. *Journal of the Bombay Natural History Society*, 96: 244-254.
- Amitha Bachan, K.H., Kannan, R., Muraleedharan, S. and Shenthil Kumar, (2011). Participatory conservation and monitoring of Great hornbills and Malabar pied hornbills with the involvement of endemic Kadar tribe in the Anamalai hills of southern Western Ghats, India. *The Raffles Bulletin of Zoology*. 24: 37-43
- Amitha Bachan, K.H. (2005). Riparian Vegetation Along Chalakkudy River. In Nair K.N. & S. Chattopadhyay (ed.) *Water Resources of Kerala – Issues and Case Studies*. KRPLLD, Centre for Developmental Studies, Thiruvananthapuram. 83-86.
- Amitha Bachan, K.H. (2006). The Hornbill Haven. *Sanctuary Asia*. 25(6): 46-49.
- Amitha Bachan, K.H. (2010). Riparian flora of the Chalakkudy river basin and its ecological significance. PhD Thesis. Calicut University. Kerala. India.
- Amitha Bachan, K.H. and Pradeep, A.K. (2010). The community composition and classification of the riparian vegetation of the Chalakkudy River, Western Ghats and its significance in the management of forested landscape and biodiversity, *Proceedings of the First Indian Biodiversity Congress*, December 2010.
- Amitha Bachan, K.H. (2018). Principle and Methodology for Ecorestoration of Forested and Non Forested Landscapes in the Western Ghats. Keynote Paper in the Seminar on Principle and Methodology for Ecorestoration of Forested and Non Forested Landscapes in the Western Ghats. *Proceedings of the seminar organised by Kerala state Landuse Board at Thrissur on 17th March 2018*.
- Amitha Bachan, K.H. and Pradeep, A.K. (2015). Flora and Ecology of Riparian Forests in the Chalakkudy River basin, Anamalai Part of Southern Western Ghats and its Conservation Significance. (Role S. Rao Award winning Paper). *Proceedings of the International seminar on Advancements in Angiosperm Systematics & Conservation*. IAAT&IAPT. 37.
- 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 Vol. 6 (2)*.30-40.

- Amitha Bachan, K. H., Fasila, P.K. and Anitha, K.T. (2014). Understanding the Physiography, Bioclimate and Mapping of the Vegetation of the Chalakkudy River basin, Anamalai part of Southern Western Ghats, India. *Lifescience leaflets*. 58. 1-17.
- Amitha Bachan, K.H. (2003). Riparian Vegetation along the Middle and Lower Zones of the Chalakkudy River, Kerala, India. Project Report 26/2000, KRPLLD, CDS, Thiruvananthapuram.
- Bawa, K. S., Das, A. and Krishnaswamy, J. (2007). *Ecosystem Profile of Western Ghats & Sri Lanka Biodiversity Hotspot, Western Ghats region*. Conservation International-Center for Applied Biodiversity Science.
- Champion, H. G. and Seth, S.K. (1968). A revised survey of the forest types of India. Manger Publications, Delhi.
- Meher-Homji, V.M. (2001). Bioclimatology and Plant Geography of Peninsular India. Scientific Publishers, New Delhi, India.
- Nayar, M.P. (1996). Hot spots of endemic plants of India, Nepal and Bhutan. Tropical Botanical Garden and Research Institute, Trivandrum.
- NBFGR, (2000). *Annual report: Fish biodiversity database*. NBFGR, Lucknow pp. 16-70.
- Nizammudeen, A., Usha, T., Bindu, V, and Amitha Bachan, K.H. (2017). Linkages between terrain and biodiversity in Kurumali river basin phase-I upper catchment .pilot project report on eco restoration plan. Kerala State Land Use Board. Pp188.
- Raghavan, R., Prasad, G., Ali, A. and Pereira, B. (2008). Fish fauna of River Chalakkudy part of Western Ghats biodiversity hotspot (South India): patterns of distribution, threats and conservation needs. *Biodivers Conserv* 17:3119–3131.