



SAVING ENDANGERED SPECIES

M S Swaminathan Research Foundation
Community Agrobiodiversity Centre



Sir Dorabji Tata Trust

supported project on

Conserving 80 Threatened
Species by Creating
8 Research Fellowships
in Systematic Botany

Final Report
(2006-2009)



Cover page images:

Left: *Vateria macrocarpa*, a Critically Endangered tree of Western Ghats

Right: A glimpse of restoration activity at South Wayanad Forest Division

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Project on

Conserving 80 Threatened Species by Creating 8 Research Fellow ships in Systematic Botany

at M S Swaminathan Research Foundation,
Community Agrobiodiversity Centre, Wayanad, Kerala

Funded by Sir Dorabji Tata Trust, Mumbai



Project Reference : DTT/IG/ SNB/sb/sm/C/14/MNR/2005-2006

Total Grant : 41.00 Lakhs

Date of Sanction & Duration of Project : 10th November 2005, Three years

Date of Commencement of Project : 1st May 2006

Date of Closure of the Project : 30th June 2009

The idea of this project was conceived by MSSRF to commemorate the 80th birth year of Prof M. S. Swaminathan in 2006. 80 RET species were selected to mark the 80 years of Prof M. S. Swaminathan. 8 Fellowships were created to work upon these species and to produce a target number of 80,000 seedlings, comprising all the 80 species. When we closed the project in June 2009, the total number of seedlings produced came over to 50,000, covering these 80 species. We feel, our success in meeting the challenging goal of the project is fairly good.



80 Years

80 RET Species

8 Fellows

80,000 Seedlings



We owe our beloved Professor for this achievement, and
with great respect we wish to dedicate this report to him!

*The project team
(CAbC-MSSRF, KFRI, CM PR-AVS, CRIKSC & SNMC)*



Humboldtia brunonis Wall. in full bloom at CAbC Campus

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Eugenia argentea Bedd.

ACKNOWLEDGEMENT

We thank Sir Dorabji Tata Trust (SDTT), Mumbai for their generous support to our Fellowship programme for conserving 80 Threatened species of Western Ghats. We would also like to thank Dr Bhaskar Mitra, the Programme Officer, SDTT for his critical evaluation and suggestions in every step of the programme. We thank the Chief Conservator of Forests (WL) & Chief Wildlife Warden, Kerala for granting the permission to collect specimens and to conduct research activities in protected forest areas of the State. We are also thankful to Prof M. S. Swaminathan, the Chairman, Dr Ajay Parida, the Executive Director and Dr M. Velayutham and Sri A. M. Gokhale the former Executive Directors of M S Swaminathan Research Foundation for their valuable guidance and encouragement for the programme. We also acknowledge the timely advices and support of Dr K. U. K Nampoothiri who was the Director of the Community Agrobiodiversity Centre (CAbC), MSSRF in the

initial years of the programme. We are grateful to the concerned authorities of the French Institute of Pondicherry, the Kerala Forest Research Institute, Peechi, the Tropical Botanic Garden and Research Institute, Palode, the University of Calicut, the Botanical Survey of India, Coimbatore Circle, the Central National Herbarium, Calcutta, the Rapinat Herbarium, St. Joseph's College, Tiruchirapalli and the Indian Institute of Science, Bangalore for permitting to study the herbarium specimens and to utilize the library facilities. We would like to place on record our sincere thanks to the tribal trackers, the field assistants and the drivers who have helped our research team during the trekking and camping in remote forest areas. We extend our deep sense of gratitude to the partner organizations and the staff of CAbC for their creative suggestions and whole-hearted support that helped to make this endeavour a success.

PREFACE

UN has declared 2010 as the International Year of Biodiversity. Only a few months are left for all the 191 parties to the Convention on Biological Diversity (CBD) to take stock of their achievements in the ambitious commitments they had made with reference to the threefold objective of the Convention and the 2010 Biodiversity Target. India, as one of the earlier signatories of CBD, was committed to take meaningful strategies and action plan for the sustainable and equitable use of biodiversity of the country. The National Biodiversity Strategies and Action Plans (NBSAP) of India aims at achieving the 2010 targets as well as the CBD objectives. One of the targets at global level is achieving significant reduction in the current rate of loss of biodiversity.

The loss of biodiversity is alarming in all the known species groups. The tropical biomes that have rich endemic biodiversity faces severe developmental issues and hence believed to have more threatened species than any other biome. 99% of the threats in the tropics are attributed to human activities, largely in the form of conversion and/or degradation of habitats for alternate land uses. Although historically extinction occurs in oceanic islands, the recent trends are different; roughly 50% of extinction in last 20 years is said to have occurred in the continents. Experts say, the tropical region is losing dozens of species per day, mostly from the moist forests. Estimates show the percentage of threats on a global scale ranges between 12 and 52 in case of major species groups. The IUCN Red List (2006)¹ shows 350 vascular plant species are threatened with extinction in India, of which 203 species are found exclusively in the Western Ghats.

This report conveys the results and achievements of a flagship project entitled "Conserving 80 Threatened Species by Creating 8 Research Fellowships in Systematic Botany" that was operated by M S Swaminathan Research Foundation with the financial support of Sir Dorabji Tata Trust. The project aim was to address the issue of species extinction in Western Ghats of

India and it marked some notable results during the three-year period of its implementation. The project team was able to raise a total of over 50,000 seedlings of the 80 targeted Rare Endemic Threatened (RET) species through seed germination as well as vegetative propagation means. *Eugenia argentea* Bedd. (Myrtaceae), a small tree endemic to southern Western Ghats, which was presumed to be extinct has been rediscovered from its type locality after a lapse of 130 years of its first collection. Another species *Aspidopterys canarensis* Dalz., listed in the Red Data Book of Indian Plants² was recollected from the type locality after a period of fifty years. A tree planting campaign named "50,000 RET Trees by 2012" (the year end of Kyoto protocol)³ was launched on the World Environment Day 2008 by distributing over 20,000 seedlings of tree species raised by the project team. The team has located a handful of hitherto unknown species, which are under the process of description and publication. For example, a new woody species in the genus *Milium* of family Annonaceae has been named as *Milium gokhalei* and is in press. A regional level five-day workshop on Plant Taxonomy was organized under the auspices of the Indian Association of Angiosperm Taxonomy (IAAT) by the team and it helped in building up interest amongst the participants in applying Plant Taxonomy as a tool for conservation.

The project helped MSSRF in a greater way in achieving certain measurable progress towards conservation of RET plants of the Western Ghat's critical conservation sites like Wayanad region. On behalf of Prof M. S. Swaminathan, the Chairman, MSSRF, and Dr Ajay Parida, the Executive Director, MSSRF and everyone in the project team and CABIC, I take this opportunity to thank Sir Dorabji Tata Trust and Dr Bhaskar Mittra, the Programme Officer of the Trust who have placed faith on us and supported us in our endeavor of rescuing RET species through building human resource capability in Systematic Botany- a life line science for biodiversity conservation.



N. Anil Kumar (Ph. D.)
Project Investigator & Director (Biodiversity)

EXECUTIVE SUMMARY

The project was an initiative for addressing the issue of extinction and rarity of flowering plants, particularly tree species of the Western Ghats- a global biodiversity hotspot in India. A two-pronged approach consisting of field level verification of the status of a select group of Rare, Endemic and Threatened (RET) flowering plant species and multiplication of them was adopted by creating a team of research fellows in the discipline of Systematic Botany.

The primary objective was to conserve 80 RET plant species. This was achieved through field studies aimed at understanding the current status and large scale multiplication of these species targeting up to 1000 seedlings each and by adopting suitable *ex situ* and *in situ* conservation measures. The 50,533 healthy seedlings raised from genetically diverse populations of the 80 species serve as a measurable output of this key objective. A total of 20,970 seedlings has been distributed to various stakeholders and are being protected in suitable habitats such as sacred groves and private plantations, parts of which still has remnant forest, in and around Wayanad district. The establishment of one RET Garden in an area of 10 acres at the MSSRF campus and the raising of 20 tree groves in Wayanad region is worth mentioning. *In situ* conservation of the species has also been attempted with the participation of the Kerala Forest Department by introducing / reintroducing 18,000 seedlings in appropriate forest areas. Though the proposed number of 1000 seedlings could not be accomplished for all the 80 species, the present level of achievement, we believe is significant with respect to the case of rare and endangered forest species.

The successful raising and restoration of 1572 seedlings of the Endangered tree *Cynometra travancorica* which had been neglected even after the conservation

recommendations by the Botanical Survey of India in 1997, is a remarkable achievement of this programme. Highlighting the ornamental potential, various measures have also been adopted to conserve the rare wild liana *Beaumontia jerdoniana*. The conservation programme also place on record the first ever attempt of multiplication of *Ixora sivarajiana*, an endemic species so far recorded only from two highly restricted localities in Kerala. The multiplication of *Syzygium palghatense*, a Critically Endangered species thought to be extinct until its rediscovery in 2002, is another notable output of the programme. A total of 1197 seedlings has been raised to restore the population of highly threatened but still commercially exploited wild tree spice *Myristica malabarica*. The successful rescue of endemic medicinal species like *Poeciloneuron indicum* and *Strophanthus wightianus* is also a significant result of the programme.

The primary objective could gather ample pace when the integrated doctoral programme in the area of Applied Plant Taxonomy came in to the scene in which a team of 8 Research Fellows was assigned with the responsibility of studying the ecology and biology of the target species in order to provide scientific support to the conservation efforts. This has resulted in the initiation of compilation of a book on 80 RET species, with all the available information hitherto explored. Along with the conservation activities, key attention was also given to create widespread awareness on the conservation of threatened species by conducting awareness campaigns and education programmes. A total of 23 such programmes was organized.

The project also aimed to facilitate collaboration among like-minded organizations to promote off-site as well as on-site conservation of RET species. This has been achieved by facilitating

the formation and strengthening of the forum *for RET* through the networking of R & D organizations, academic institutions, government set-ups and interested individuals, that stand for the conservation of RET species of Western Ghats. *for RET* is being shaped into a leading conservation group in the State of Kerala with 280 registered members and ten partner-organizations. In order to ensure longevity of the major result of conserving the selected RET species, various means of up scaling activities have been initiated in association with the Kerala Forest Department and the enthusiastic private agencies.

The programme with the ambitious target of conserving 80 RET species through a period of 3 years provided a good opportunity in terms of an excellent learning phase. Research supported conservation efforts are effective and essential for understanding the specific microclimatic requirements of the species and hence for the successful implementation of *ex situ* as well as *in situ* conservation measures. Obviously, as evident from this initiative too, multi-institutional linkage as well as people's participation should be the key strategy for all conservation endeavours to bring out success stories. However, a time frame of minimum ten years is required to make visible the ecological impact of the programme through the successful establishment of these species in restoration plots.

The programme has successfully laid the foundation for conserving and restoring the RET species in the Kerala part of Western Ghats. Moreover, the endeavour has succeeded in showing that sound taxonomy underpins conservation and also in revealing the effectiveness when taxonomists partner with the managers of diversity for the conservation and sustainable use of plants.





INTRODUCTION

When we had taken up this project, the available predictions clearly showed that around 10 percent of all the wild plant species of India are under severe threat of extinction and will be lost in near future, thanks to the developmental pressures and the global climate change!

INTRODUCTION

Literature shows that approximately 600 tree species are threatened with extinction in India with a sizable percentage located in the south Indian region, mostly in the Western Ghats⁴. The once widespread 'trees outside forests' in the hilly regions like Wayanad district are also vanishing because of logging, agricultural development, pioneer settlements, drought and forest fires. The tree species listed out in various Red Lists were known only from one or a few collections and thus, it gave us insufficient picture of their variation, population structure, correct threat status and distribution. More holistic information is needed on the RET species in terms of the ecological, taxonomic, and medicinal or cultural importance.

The project was to relocate 80 Rare, Endemic and Threatened (RET) species, which are said to be restricted to tiny pockets of type localities or they appeared as freaks or had vanished because of non-viable population strengths and to address the issues outlined above and thereby contribute to the national efforts in conserving the critically endangered plant species through creation of species recovery and management plans. It was also to contribute to the State level efforts for enhancing the connectivity of highly fragmented forests in Wayanad district through an envisaged tree planting campaign. The project contributed in a notable way in providing a strategic leadership in the area of RET Plant Conservation in Kerala. The major outcomes of this project are the new institutional linkages (inter-disciplinary teams) and new models for co-management of conservation of critically endangered and endemic species of Western Ghats.

The project was implemented in a partnership mode, jointly with four other organizations working in the area of conservation and sustainable management of threatened plant species of Kerala. Each organization worked on a select group of species from the targeted list of 80 RET-species and promoted 8 research fellowships.

The results and impacts of the projects are manifold, from conservation to income generation, food and livelihood security of the local communities and better scientific understanding of RET plant species of Western Ghats. We are sure that the people and the government of Kerala will also take up the project results further. The outputs such as the threat status, ecology and conservation strategies for the endemic trees and the eight Fellows pursuing the doctoral programmes in applied plant taxonomy/ecology/ethnobotany and bio-resource management are capable of contributing to the conservation science and goal of sustainable management of threatened plant diversity of India.

It is hoped that we will successfully complete the plan of '50,000 RET Tree Planting Campaign' by 2012, and the Forest Department of Kerala has extended their full support in taking up this as a model for forest augmentation programme. The outcomes of the results achieved and imparted to a wider group of individuals and institutions will help to accomplish the Global Strategy for Plant Conservation decision VI/9 and targets (ii), (vii) and (viii)⁵ that sets the

targets for the protection (60% conserved *in situ* and 60% in accessible *ex situ* collections) of the world's threatened species.

We are fully convinced that it is high time to take a concerted action to promote high quality action research in conservation of RET plant species, particularly tree species of the hotspots like Western Ghats and help to protect the society from the impacts of climate change. Towards this, the project has contributed in a small way, but the research fellowships like the one created by the project must be sustained in the related subject areas such as Forest Ecology, Plant Taxonomy and Ethnobiology to address the issue of poor growth of science and technology in the area of Conservation Biology in India. We are confident that the Fellows coming out of this project will continue their research to produce fresh knowledge and effective actions in the area of conservation.



Phaeanthus malabaricus Bedd.

THE RET PROGRAMME OF CAbC AND THE PROJECT

Since its inception in January 1997, CAbC has been working on the Rare, Endemic and Threatened plant species of Kerala state. The efforts toward this direction were started with the documentation of floristic diversity of Wayanad district - a biologically rich area in the Global Biodiversity Hotspot of Western Ghats. This study unravelled the angiosperm diversity of the area and highlighted the biological significance of the region that provides habitat for about 25% of the Rare, Endemic and/or Threatened flowering plant species of Western Ghats. A total of 2034 flowering plants was documented, with 32 Red Data Species and 491 endemics of Western Ghats. Besides, seven forest patches viz., Banasuramala, Chembramala, Kurichiarmala, Vaduvanchal forest, Sugandhagiri, Thirunelly and Chandanathodu of the district were prioritized for immediate conservation based on the restricted occurrence of Critically Endangered, endemic species in these locations.

From the year 2004 onwards, attention was given to *ex situ* conservation and sustainable utilization as a strategy towards the conservation of endangered plant species. In 2004, a two year project supported by the Botanic Garden Conservation International (BGCI) was taken up with this objective wherein we worked upon ten selected RET plant species of Wayanad by integrating conservation and livelihood security of the community. The species were selected giving thrust to the demand from the forest dwelling communities for their food, health and livelihood needs. The target was achieved through community-oriented multiplication of selected species and by adopting both *in situ* and *ex situ* conservation measures towards ensuring the easy availability of these forest species subsequently.

In 2006, the third phase of the programme was initiated by launching an exclusive project to accelerate the Centre's conservation efforts through an

increased number of RET species and an expanded outreach beyond the boundaries of Wayanad.

To mark the 80th birthday of Prof M. S. Swaminathan, 80 RET species were selected in the project supported by Sir Dorabji Tata Trust (Mumbai) to study and rescue the target species through a participatory approach. Targeting the conservation of these plant species, eight doctoral programmes were initiated in collaboration with four multi-disciplinary institutions viz. Kerala Forest Research Institute (KFRI), Peechi; Centre for Medicinal Plants Research, Arya Vaidya Sala (CMPR, AVS), Kottakkal; Sree Narayana Mangalam College, Maliankara and Centre for Research in Indigenous Knowledge Science & Culture (CRIKSC), Kozhikode. The project is described in detail in the following pages.

The RET conservation programme so far resulted in *ex situ* conservation of a large number of threatened species in different regions of Wayanad district. A 'RET Conservation Garden' with a total of 700 seedlings of 80 species in 10 acres of land has been established at CAbC campus. A display zone for RET species and a zone for climbing plant species are the other *ex situ* collections made under this programme. It led to the establishment of an Orchidarium with

125 orchid species, a Fernarium with 30 fern species and an Arboretum with 156 endemic tree species and a Herbarium with more than 8000 voucher specimens of flowering plants of Wayanad in CAbC. For recognizing the role of traditional beliefs in promoting conservation measures, the Centre has also facilitated establishment of *Nakshathra Vanam* (Zodiac Forest) and restoration of sacred groves in Wayanad district.

Further it needs to be specially mentioned that environmental education and awareness campaigns have been adopted in all the three phases of the programme as a major tool for enhancing and ensuring concerted actions in RET Conservation. The Centre has formed a forum '*for RET*' in 2007 for ensuring the open-ended participation of organizations and individuals working for the cause of conservation of RET species of Kerala.

THE PROJECT OBJECTIVES & ACTIVITIES

- To conserve 80 RET (Rare, Endemic & Threatened) species of southern Western Ghats
 - 1 Field exploration of natural population
 - 2 Multiplication of 80 RET species, each with not less than 1000 seedlings
 - 3 Restoration of the targeted species in suitable habitats
- „□ To create 8 Research Fellowships in the discipline of Systematic Botany to address the issue of species loss
 - 4 Support 8 Fellows to study the ecology and biology of target species
 - 5 Facilitate doctoral programmes in Applied Plant Taxonomy
- „„□ To facilitate collaboration among the organizations in Kerala that stand for off site and on site conservation of RET species.
 - 6 Formation of the forum '*for RET*'



THE PROJECT STRATEGIES & RESEARCH METHODOLOGY

For the programme, we adopted a two-pronged strategy of firstly, giving due priority to human resource building in conservation and secondly, production of enough planting materials of the threatened plants. This approach ensured wider participation of people and turned out as an effective method for species-rescue programme as well as for the capacity building in undertaking action research in conservation.

The concern for conservation, the talent in academic research and moreover, the willingness to work in the adventurous conditions of a forest atmosphere were the criteria for selecting the Research Fellows. Various training programmes were organized for the selected Fellows in relevant subject areas for their capacity enhancement and there by to ensure the successful achievement of the project objectives. Each research fellow was entrusted with the responsibility of collection and conservation of ten target species, and to take up complete study of the species giving emphasis to the distribution, taxonomy, ecology and conservation biological aspects. The distribution of Research Fellows among the five collaborative institutes was employed as an efficient strategy for effective resource utilization and an interdisciplinary approach for conservation.

As an initial step of research, the regional floras were studied in order to make correct taxonomic identification of the target species and to locate the type specimens deposited in various renowned herbaria. Further, the species were familiarized by examining specimens from French Institute of Pondicherry (HIFP), University of Calicut (CALI), Kerala Forest Research Institute (KFRI), Central National Herbarium, Kolkata (CNH) and Madras Herbarium, BSI, Coimbatore (MH). This preliminary information was supplemented with the maximum available secondary data gathered through a thorough literature survey.

The research plan built upon a hub and spoke model was the foundation for our

effort to study and conserve these forest species. Intensive literature surveys were synchronized with extensive field explorations throughout the operation period. The research team with the help of forest officials and local tribal men surveyed the interior forest areas to locate the natural populations in already reported localities as well as in other possible areas. The centuries old traditional knowledge and field observations of tribal people and other forest dependent communities were also gathered giving focus to the biological and ecological aspects of the target species. The direct field observations and analyses of ethnic knowledge together provided the scientific background to understand the species as well as to formulate suitable conservation measures in accordance with the habitat specificity of individual species.

The field explorations in search of the target species were also utilized as opportunities to campaign for conservation and sustainable utilization of the species, especially in their natural localities. Through the exploration trips in forest areas, the research team established strong rapport with the direct users of forest and its species- the local tribes as well as other forest dependent communities and also the regional responsible authorities - the personnel of the corresponding forest section offices and forest range offices to create awareness on the need and the mode to conserve these endemic species.

The RET plantlets were raised following a systematic procedure by which the natural populations of all the species were located and the phenology for each species was documented. Further, the healthy mother populations were identified for conducting propagation trials. The extent of natural regeneration, the seed characteristics and the mode of germination were studied using standard techniques⁶⁻⁹ and suitable propagation measures were formulated to multiply the species. The threat factors and the ecological role of the target species were



also documented to the possible extent within the short span of three years.

Certain species or group of species were selected from the list of 80 for detailed study, as part of pursuing doctoral programmes by the Research Fellows under different universities. Considering the severity of endangerment due to very low fruit setting, efforts were made to study the Pollination Biology of three species to unravel the hindrances in their effective conservation. Taxonomic Revision was attempted for three groups comprising a total of 15 target species owing to their morphological variations and phytogeographical relevance. The woody climbers of Wayanad region including ten of our target species were studied to reveal their ecological significance in different kinds of forest ecosystems and there by to help preserve them from destruction due to lack of awareness on their importance.

In order to achieve the third objective of facilitating collaboration for RET species conservation, the forum *for RET* serves as a platform for joint effort in conservation. Environmental education and awareness campaigns have been the major outreach methods for enhancing and ensuring a concerted action towards RET Conservation. The forum was also used to identify various stakeholder groups to facilitate *ex situ* conservation of the target species. The tie-up with the Kerala Forest Department was the strategy adopted to ensure *in situ* conservation of these forest species.



THE RESULTS

The action research in the 80 RET plant conservation programme facilitated skilled and committed candidates to engage in doctoral programmes on selected target species in the area of applied Plant Taxonomy. As of now, out of the 8 research fellows, 4 Fellows have completed the process of data collection for their doctoral degree programme, two Fellows have completed their Ph Ds and have received the Young Scientist Award from the Department of Science and Technology and one Fellow has qualified for the National Eligibility Test for undertaking research. Thus, the project has been a success in promoting scientific temper to revitalize the dying discipline of Systematic Botany and also in pooling scientific data on various aspects of the selected RET species of a region so as to frame suitable conservation strategies. Here the project aspiration was rightly meshed with the Fellows' academic aspiration in order to accelerate the pace without compromising the quality of work as a means to tackle the limitation of a three-year time frame.

The Species Recovery Programme

The 80 RET species comprised of 46 trees, 14 woody climbers, 9 shrubs, 5 palm species, 3 bamboos/ reeds, and 3 herb species (Fig. 1), encompassing floristic representations from all the major forest types in Kerala (Fig. 2).

Field Survey, Multiplication and Conservation

Extensive field trips were conducted exploring 58 Forest Ranges coming under 33 Territorial and Wildlife Divisions of Kerala Forest Department (Map1). This has resulted in confirming the occurrence of natural populations of 80 RET species in already reported localities and in identifying a few hitherto unreported localities for the target species (Table1). Owing to the very small population size of the species in the Kerala part of Western Ghats, for the collection of propagules and for conducting studies on some of the ecological aspects of a few species, the explorations were extended to certain localities in the Reserved Forests of Tamil Nadu, Karnataka and Maharashtra.

Fig. 1. Habit wise spreading of target species

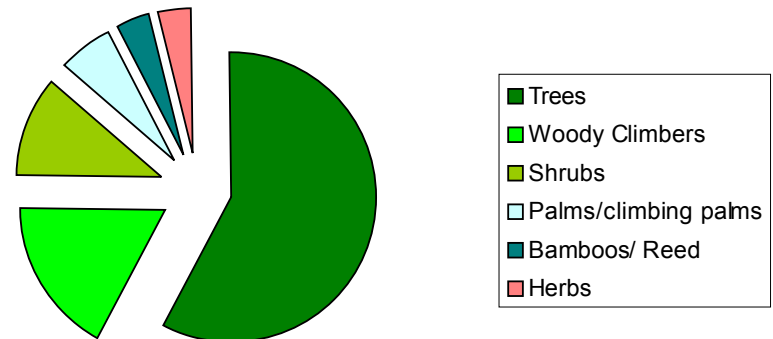
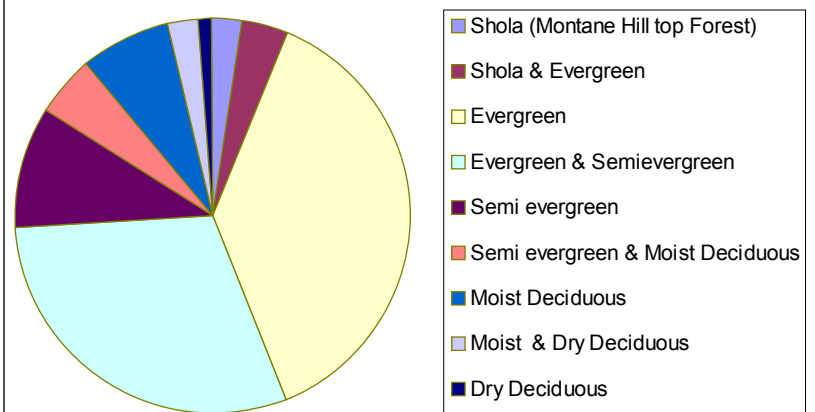


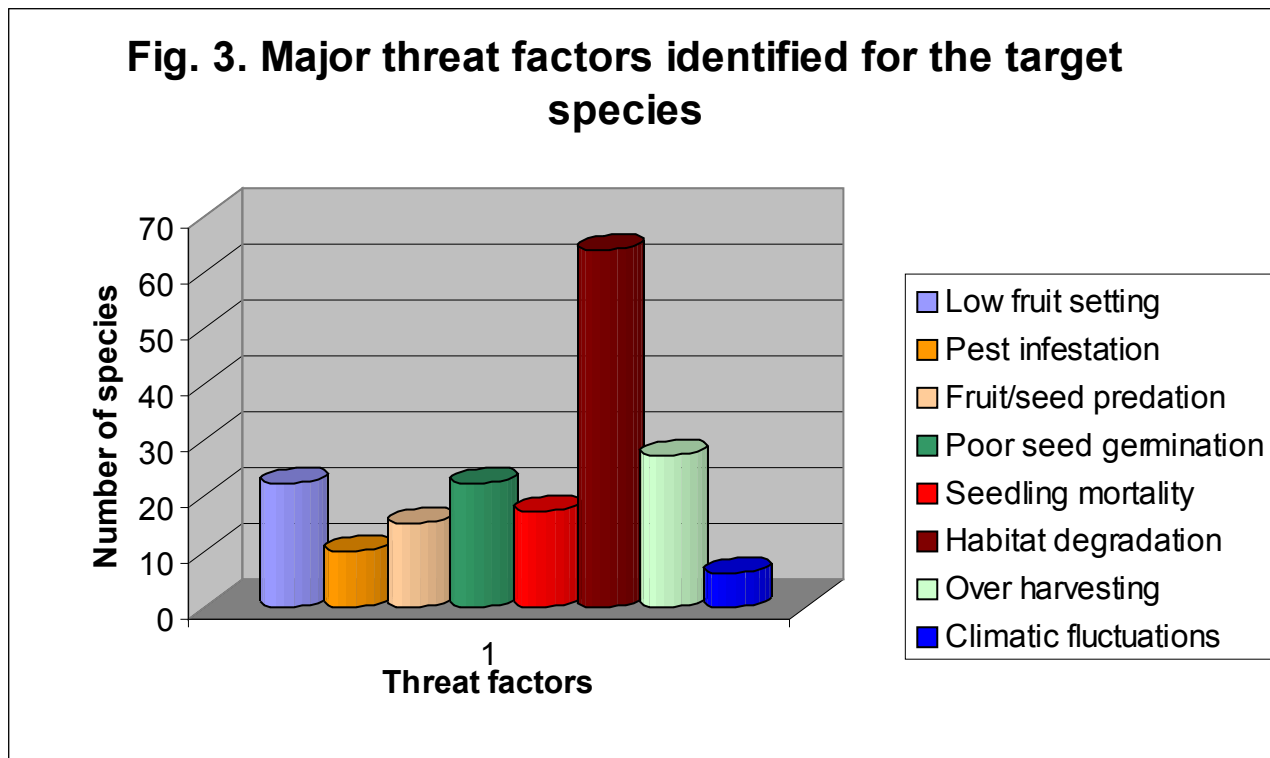
Fig. 2. Relative percentage of occurrence of target species in major forest types of Kerala



Along with the exploration trips, the real threat factors, including the historical processes that have led to the endangerment of each species were also traced. The severe decline in the population of most of the species, especially of the tree species was the result of the destruction of their natural habitat for establishing cash crops and forestry plantation crops (Fig. 3). Low fruit setting, pest infestation, fruit / seed predation, poor seed germination, seedling mortality, over harvesting and climatic fluctuations were identified as other major threat factors that are responsible for the limited natural regeneration of many of the target species in their natural localities. Even though there was profuse flowering noticed in some of the critically endangered species like *Eugenia argentea* and *Meteoromyrtus wynaadensis*, the seed setting was very rare or was completely absent. Similarly, despite the healthy flowering and seed setting that occurred in a few endangered species viz., *Cynometra beddomei* and *Atuna travancorica*, the number of seedling recruitments in the forests were very poor. Over harvesting was noticed to be a serious threat for *Myristica malabarica*, *M. beddomei*, *Cinnamomum malabatum*, *Phyllanthus indofischeri* etc., while illegal collection was found to be the major threat for three *Calamus* species and *Pinanga dicksonii*. Extreme habitat specificity was also observed as a factor that

Table 1. New localities identified for the target species through the study

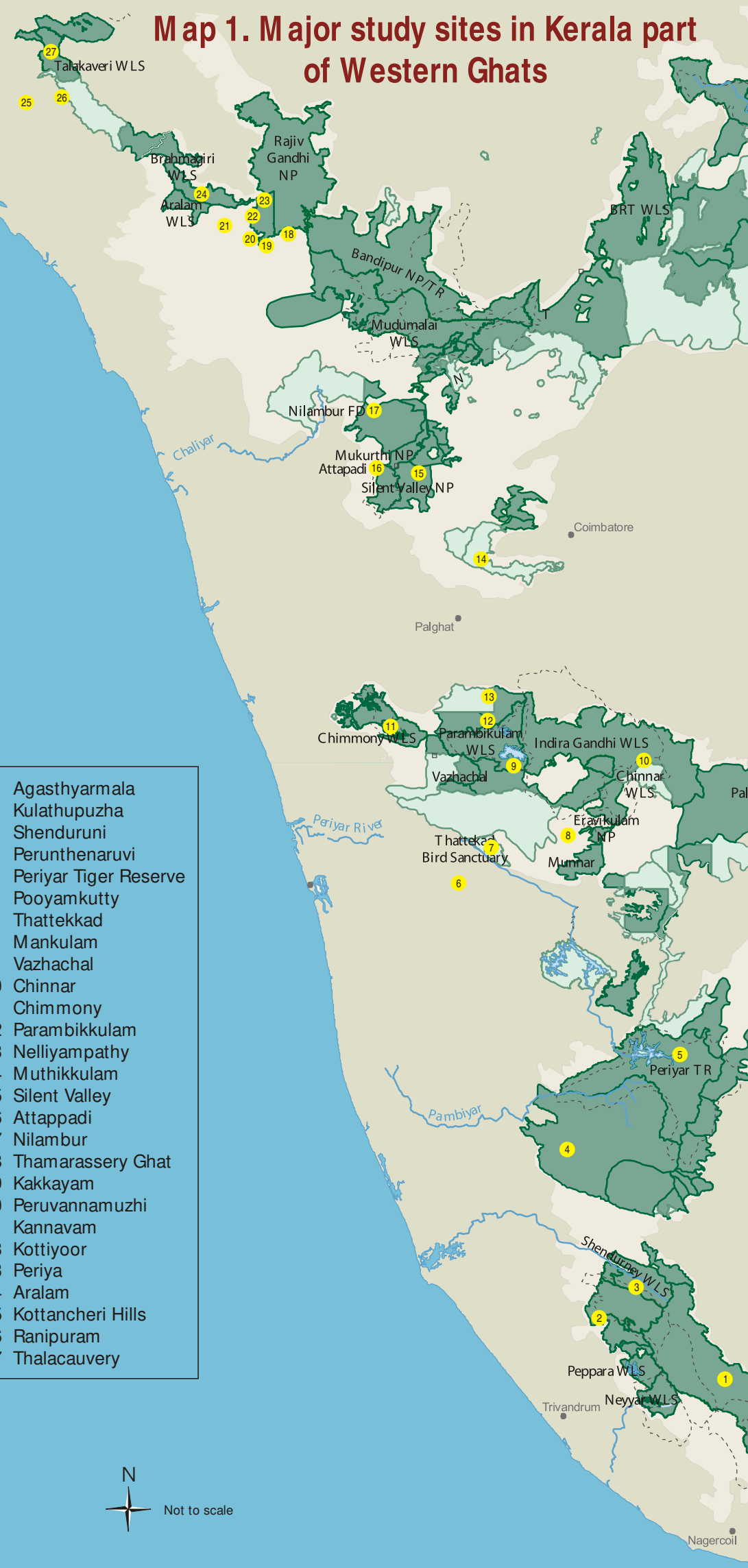
| No | Species | Localities |
|----|---|---|
| 1 | <i>Anaphyllum wightii</i> Schott. | Kasaragod (Kottencheri hills) |
| 2 | <i>Arenga wightii</i> Griff. | Kasaragod (Kottencheri hills) |
| 3 | <i>Aspidopterys canarensis</i> Dalz. | Kozhikode (Thamarassery Ghat) |
| 4 | <i>Atuna travancorica</i> (Bedd.) Kosterm. | Malappuram (Nilambur) |
| 5 | <i>Bauhinia phoenicea</i> Wight & Arn. | Malappuram (Nilambur), Kozhikode (Thusharagiri) |
| 6 | <i>Beaumontia jerdoniana</i> Wight | Kasaragod (Kottencheri hills, Ranipuram) |
| 7 | <i>Blepharistemma serratum</i> (Dennst.) Suresh | Ernakulam (Thattekkad) |
| 8 | <i>Cinnamomum riparium</i> Gamble | Ernakulam (Pooyamkutti) |
| 9 | <i>Colubrina travancorica</i> Bedd. | Thrissur (Vellikulangara) |
| 10 | <i>Derris brevipes</i> (Benth.) Baker | Wayanad (Chembra peak, Kurichyar mala) |
| 11 | <i>Dysoxylum malabaricum</i> Bedd. ex Hiem | Kannur (Aralam) |
| 12 | <i>Eugenia argentea</i> Bedd. | Kozhikode (Kakkayam) |
| 13 | <i>Goniothalamus wynaadensis</i> Bedd. | Kozhikode (Peruvanamuzhi, Thusharagiri) |
| 14 | <i>Gymnema khandalense</i> Sant. | Thrissur (Chimmony) |
| 15 | <i>Hydnocarpus macrocarpa</i> (Bedd.) Warb. | Ernakulam (Neryamangalam) |
| 16 | <i>Ixora sivarajiana</i> Pradeep | Wayanad (Kurichyar mala) |
| 17 | <i>Jerdonia indica</i> Wight | Kannur(Aralam), Kasaragod (Kottencheri hills) |
| 18 | <i>Kunstleria keralensis</i> Mohanan & Nair | Kannur (Ambayathod), Kasaragod (Kottencheri hills, Ranipuram) |
| 19 | <i>Hippocratea bourdillonii</i> Gamble | Kozhikode (Thamarassery Ghat) |
| 20 | <i>Meteoromyrtus wynaadensis</i> (Bedd.) Gamble | Karnataka (Thala Cauvery) |
| 21 | <i>Pinanga dicksonii</i> (Roxb.) Blume | Kasaragod (Kottencheri hills, Ranipuram) |
| 22 | <i>Pterospermum reticulatum</i> Wight & Arn. | Wayanad (Mukkamkunnu) |
| 23 | <i>Quisqualis malabarica</i> Bedd. | Kannur (Kannavam, Aralam) |
| 24 | <i>Sageraea grandiflora</i> Dunn. | Ernakulam (Thattekkad), Thrissur (Vazhachal) |
| 25 | <i>Semecarpus auriculata</i> Bedd. | Wayanad (Kunjome) |
| 26 | <i>Spatholobus purpureus</i> Benth. ex Baker | Kozhikode (Kakkayam) |
| 27 | <i>Syzygium laetum</i> (Buch.-Ham.) Gandhi | Kasaragod (Kottencheri hills) |



Map 1. Major study sites in Kerala part of Western Ghats



- 1 Agasthyarmala
- 2 Kulathupuzha
- 3 Shenduruni
- 4 Perunthenaruvi
- 5 Periyar Tiger Reserve
- 6 Pooyamkutty
- 7 Thattekkad
- 8 Mankulam
- 9 Vazhachal
- 10 Chinnar
- 11 Chimmony
- 12 Parambikkulam
- 13 Nelliampathy
- 14 Muthikkulam
- 15 Silent Valley
- 16 Attappadi
- 17 Nilambur
- 18 Thamarassery Ghat
- 19 Kakkayam
- 20 Peruvannamuzhi
- 21 Kannavam
- 23 Kottiyoor
- 23 Periya
- 24 Aralam
- 25 Kottancheri Hills
- 26 Ranipuram
- 27 Thalacauvery

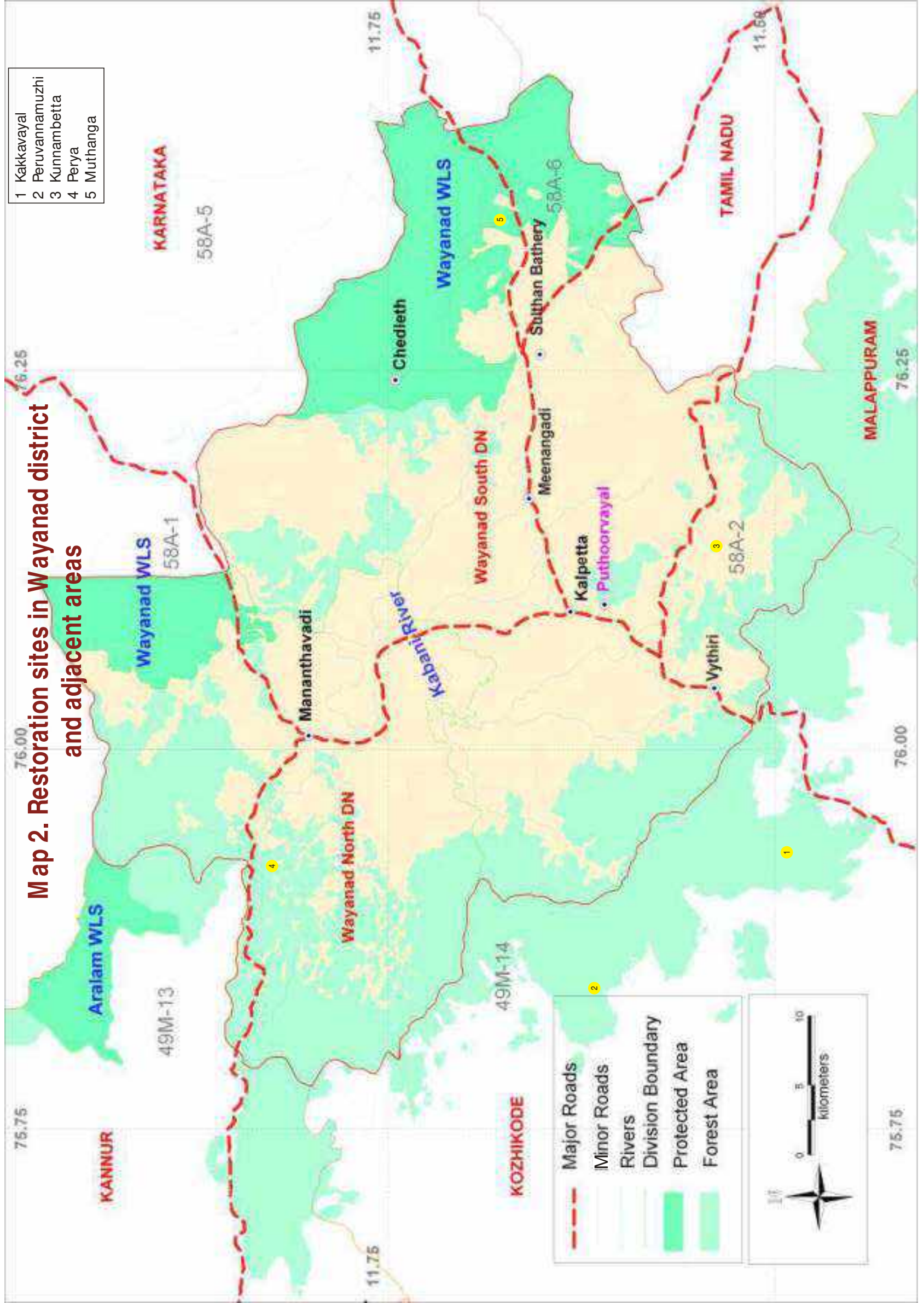


N

 Not to scale

Map 2. Restoration sites in Wayanad district and adjacent areas

- 1 Kakkavayal
- 2 Peruvannamuzhi
- 3 Kunnambetta
- 4 Perya
- 5 Muthanga



delimit the population size in some of these endemics. For example, *Medinilla malabarica* and *Hedyotis wynaadensis* show high preference for small isolated pockets of high altitude shola forests where as the rare shrub *Utleria salicifolia* grows only in rock crevices found in specific semi evergreen forest patches. Species like *Osbeckia wynaadensis* that require marshy areas in semi evergreen forests and *Myristica magnifica* that is exclusive to the highly fragile Myristica swamp ecosystem within lowland evergreen forest patches are also facing severe threat of extinction. Hence, any action that disturbs these ecosystems will definitely wipe out the remaining population of these species.

Apart from the secondary information collected on already reported uses, the important indigenous uses of all the target species were also documented through a survey among the user community (Annexure I). It shows that most of these species are known to local people and have been used in multiple ways.

All the target species were multiplied either through seeds and/or by vegetative means (Fig.4) in nursery under different experimental conditions and a total of 50,533 seedlings was raised during the project period (Table 2 - 7, Fig.5). This includes 4 Critically Endangered, 14 Endangered, 3 Vulnerable and 4 Rare plant species listed by IUCN.

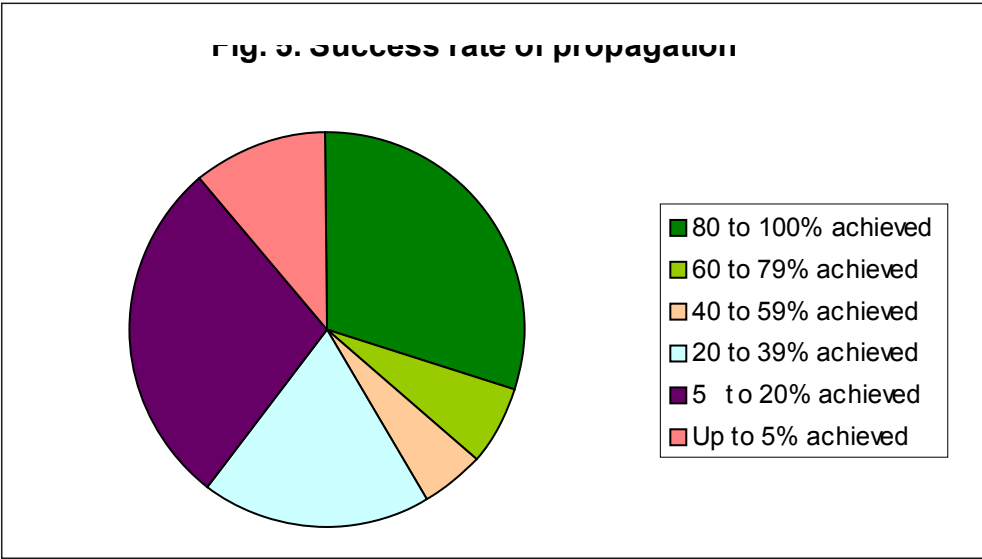
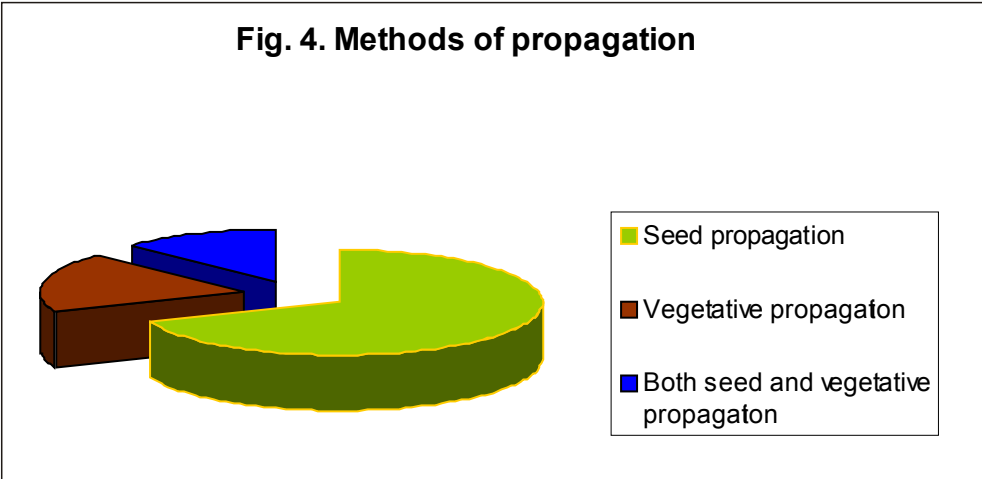


Table 2. Details of Multiplication of Tree species

| Sl. No. | Species | No. of seedlings raised | |
|---------|---|-------------------------|--------|
| | | Vegetative | Seed |
| 1 | <i>Aglaiya malabarica</i> Sasidh. | | 1435 |
| 2 | <i>Atuna travancorica</i> (Bedd.) Kosterm. | | 56 |
| 3 | <i>Blepharistemma serratum</i> (Dennst.) Suresh | | 16 |
| 4 | <i>Calophyllum calaba</i> L. | | 106 |
| 5 | <i>Casearia wynadensis</i> Bedd. | | 209 |
| 6 | <i>Cinnamomum malabatum</i> (Burm. f.) Blume | | 1743 |
| 7 | <i>Cinnamomum riparium</i> Gamble | 51 | |
| 8 | <i>Cynometra beddomei</i> Prain | | 456 |
| 9 | <i>Cynometra travancorica</i> Bedd. | | 1572 |
| 10 | <i>Dysoxylum beddomei</i> Hiern | | 53 |
| 11 | <i>Dysoxylum malabaricum</i> Bedd.ex Hiern | | 1255 |
| 12 | <i>Eugenia argentea</i> Bedd. | | 12 |
| 13 | <i>Hopea ponga</i> (Dennst.) Mabb. | | 1380 |
| 14 | <i>Humboldtia brunonis</i> Wall. | | 553 |
| 15 | <i>Hydnocarpus macrocarpa</i> (Bedd.) Warb. | | 366 |
| 16 | <i>Ixora sivarajiana</i> Pradeep | | 243 |
| 17 | <i>Kingiodendron pinnatum</i> (Roxb. ex DC.) Harms. | | 1578 |
| 18 | <i>Knema attenuata</i> (Hook. f. & Thoms.) Warb. | | 792 |
| 19 | <i>Litsea coriacea</i> (Heyne ex Meisner) Hook. f. | | 1011 |
| 20 | <i>Madhuca bourdillonii</i> (Gamble) H. J. Lam. | | 1388 |
| 21 | <i>Meteoromyrtus wynadensis</i> (Bedd.) Gamble | | 9 |
| 22 | <i>Myristica beddomei</i> King. | | 841 |
| 23 | <i>Myristica magnifica</i> Bedd. | | 60 |
| 24 | <i>Myristica malabarica</i> Lam. | | 1197 |
| 25 | <i>Ochna gamblei</i> King ex Brandis | 202 | |
| 26 | <i>Palaquium ellipticum</i> (Dalz.) Baill. | | 1298 |
| 27 | <i>Phyllanthus indofischeri</i> Bennet | | 123 |
| 28 | <i>Poeciloneuron indicum</i> Bedd. | | 1600 |
| 29 | <i>Pterospermum reticulatum</i> Wight & Arn. | | 333 |
| 30 | <i>Sageraea grandiflora</i> Dunn. | | 1370 |
| 31 | <i>Semecarpus auriculata</i> Bedd. | | 295 |
| 32 | <i>Solenocarpus indicus</i> Wight & Arn. | | 62 |
| 33 | <i>Symplocos wynadense</i> (O. Ktze.) Nooteb. | | 412 |
| 34 | <i>Syzygium palghatense</i> Gamble | | 353 |
| 35 | <i>Syzygium densiflorum</i> Wall. ex Wight & Arn. | 73 | |
| 36 | <i>Syzygium salicifolium</i> (Wight) Graham | | 83 |
| 37 | <i>Syzygium laetum</i> (Buch.-Ham.) Gandhi | | 67 |
| 38 | <i>Syzygium malabaricum</i> (Bedd.) Gamble | 2 | 112 |
| 39 | <i>Syzygium mundagam</i> (Bourd.) Chithra | 4 | 346 |
| 40 | <i>Syzygium munronii</i> (Wight) Chandrab. | 12 | 208 |
| 41 | <i>Syzygium occidentale</i> (Bourd.) Gandhi | 1300 | 1350 |
| 42 | <i>Syzygium stocksii</i> (Duthie) Gamble | 750 | 1600 |
| 43 | <i>Syzygium rama-varmae</i> (Bourd.) Chithra | | 33 |
| 44 | <i>Syzygium travancoricum</i> Gamble | | 1385 |
| 45 | <i>Vateria indica</i> L. | | 1369 |
| 46 | <i>Vateria macrocarpa</i> Gupta | | 19 |
| | Total | 2, 394 | 28,749 |
| | Grand Total | 31, 143 | |



Bauhinia phoenicea Wight & Arn.

Fruit predation



Atuna travancorica (Bedd.) Kosterm.



Cynometra travancorica Bedd.



Aglaia malabarica Sasidh.



Derris brevipes (Benth.) Baker



Cynometra beddomei Prain



Dysoxylum malabaricum Bedd. ex Hook. f.



Spatholobus purpureus Benth. ex Baker



Salacia beddomei Gamble



Vateria macrocarpa Gupta



Sageraea grandiflora Dunn.

Mass multiplication



Table 3. Details of Multiplication of Woody climber species

| Sl. No. | Species | No. of seedlings raised | |
|---------|---|-------------------------|--------|
| | | Vegetative | Seed |
| 1 | <i>Aspidopterys canarensis</i> Dalz. | 735 | |
| 2 | <i>Bauhinia phoenicea</i> Wight & Arn. | 1428 | 103 |
| 3 | <i>Beaumontia jerdoniana</i> Wight | 729 | 832 |
| 4 | <i>Caesalpinia spicata</i> Dalz. | | 1009 |
| 5 | <i>Decalepis hamiltonii</i> Wight & Arn. | | 1045 |
| 6 | <i>Derris brevipes</i> (Benth.) Baker | | 1338 |
| 7 | <i>Gymnema khandalense</i> Sant. | 73 | |
| 8 | <i>Kunstleria keralensis</i> Mohanan & Nair | | 1223 |
| 9 | <i>Hippocratea bourdillonii</i> Gamble | 168 | 332 |
| 10 | <i>Quisqualis malabarica</i> Bedd. | 247 | |
| 11 | <i>Salacia beddomei</i> Gamble | | 622 |
| 12 | <i>Salacia macrosperma</i> Wight | | 113 |
| 13 | <i>Spatholobus purpureus</i> Benth. ex Baker | | 5674 |
| 14 | <i>Strophanthus wightianus</i> Wall. ex Wight | | 609 |
| | Total | 3,380 | 12,900 |
| | Grand Total | | 16,280 |

Table 4. Details of Multiplication of Shrub species

| Sl. No. | Species | No. of seedlings raised | |
|---------|--|-------------------------|------|
| | | Vegetative | Seed |
| 1 | <i>Capparis rheedei</i> DC. | | 346 |
| 2 | <i>Colubrina travancorica</i> Bedd. | 79 | |
| 3 | <i>Goniothalamus wynaadensis</i> Bedd. | 58 | |
| 4 | <i>Hedyotis wynaadensis</i> (Gamble) Rao & Hemadri | | 23 |
| 5 | <i>Medinilla malabarica</i> (Bedd.) Bedd. | 54 | |
| 6 | <i>Memecylon randerianum</i> SM & MR Almeida | | 634 |
| 7 | <i>Osbeckia wynaadensis</i> Clarke | 230 | |
| 8 | <i>Phaeanthus malabaricus</i> Bedd. | 55 | |
| 9 | <i>Utleria salicifolia</i> Bedd. ex Hook. f. | | 12 |
| | Total | 476 | 1015 |
| | Grand Total | | 1491 |

Table 5. Details of Multiplication of Palm/Climbing palm species

| Sl. No. | Species | No. of seedlings raised | |
|---------|--|-------------------------|------|
| | | Vegetative | Seed |
| 1 | <i>Arenga wightii</i> Griff. | | 78 |
| 2 | <i>Calamus hookerianus</i> Becc. | | 88 |
| 3 | <i>Calamus travancoricus</i> Bedd. ex Becc. & Hook. f. | | 58 |
| 4 | <i>Calamus vattayila</i> Renuka | | 303 |
| 5 | <i>Pinanga dicksonii</i> (Roxb.) Blume | 84 | 290 |
| | Total | 84 | 817 |
| | Grand Total | | 901 |

Table 6. Details of Multiplication of Reed/ Bamboo species

| Sl. No. | Species | No. of seedlings raised | |
|---------|--|-------------------------|------|
| | | Vegetative | Seed |
| 1 | <i>Ochlandra beddomei</i> Gamble | 84 | |
| 2 | <i>Oxytenanthera bourdillonii</i> Gamble | 6 | |
| 3 | <i>Munrochloa ritchiei</i> (Munro) M. Kumar & Remesh | 189 | |
| | Total | 279 | 0 |
| | Grand Total | | 279 |



Beaumontia jerdoniana Wight

A total of 38,970 seedlings of the target species was distributed to conserve both in protected forests and in private/public lands (Fig. 6) so as to increase the area of occupancy and to expand the extent of occurrence of each target species. This was achieved through the following initiatives.

1. Restoration of the species in protected forests

The restoration efforts for the target species were undertaken as a joint conservation programme with Kerala Forests and Wildlife Department by establishing special conservation zones for the target species in the Reserved Forest areas. A total of 125 ha of land in five plots (Map 2) was selected for reintroducing the seedlings in Wayanad and Kozhikode districts (Annexure II). The survival of the seedlings of each species is being monitored on a regular basis.

2. RET Plants Conservation Garden at CAbC

A 'RET Conservation Garden' in 10 acres of area with a total of 700 seedlings of 80 species has been established at CAbC, for *ex situ* conservation of the target species. As part of the *ex situ* collections made under the programme, a Display Zone for RET species with 126 species and a zone for climbing plant species with a total of 232 species were also set up.

3. Vallikkudil (Vine Hut) initiative at 10 schools

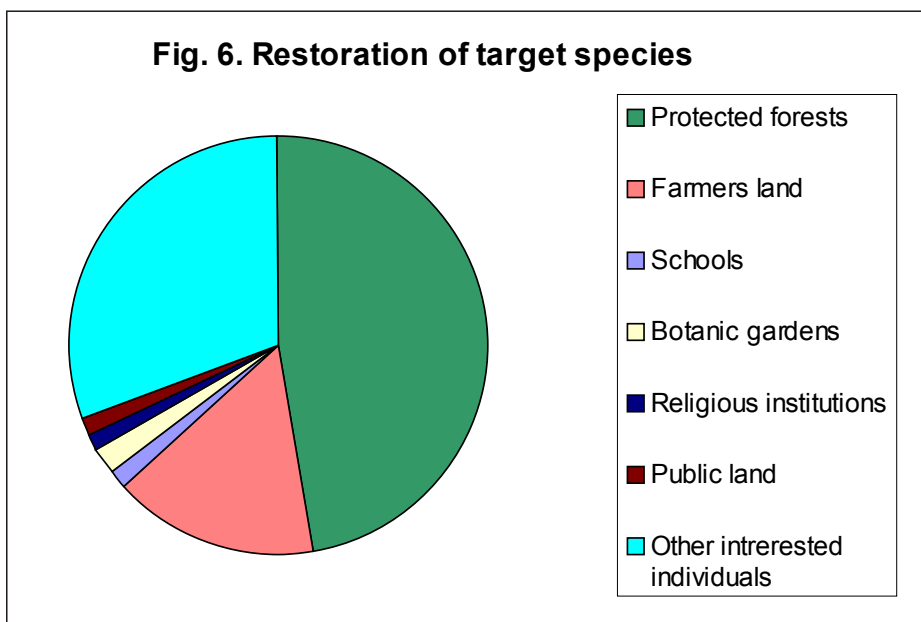
An initiative 'Vallikkudil' (Vine Hut) has been designed to conserve the threatened woody climbers from the 80 species list by establishing vine huts at 10 selected schools in Wayanad, in association with the National Green Corps, a students movement in conservation. 600 seedlings of 10 woody climber species were distributed to the selected schools.

4. Tree Groves in farm-lands and government/private institution-campuses

In view of the fact that most of the targeted tree species can be grown as shade trees in the cash crop plantations, which are in fact an extension of the natural forests or the buffer zones of the Reserved Forests, 20 tree groves with 6000 seedlings were established in cardamom and coffee plantations in Wayanad district. A bimonthly monitoring system is on track for ensuring the survival of these seedlings. In addition to that, 13,500 species were also distributed to various groups comprising religious institutions, NGOs, schools and other interested individuals.

Table 7. Details of Multiplication of Herb species

| Sl. No. | Species | No. of seedlings raised | |
|---------|------------------------------------|-------------------------|------|
| | | Vegetative | Seed |
| 1 | <i>Anaphyllum wightii</i> Schott. | 34 | 4 |
| 2 | <i>Curcuma vama</i> Sabu & Mangaly | | 8 |
| 3 | <i>Jerdonia indica</i> Wight | 379 | |
| | Total | 413 | 12 |
| | Grand Total | 425 | |



1 SUCCESS STORIES

Successful Rescue of an Endangered Tree

Contributor: C. S. Dhanya, M S Swaminathan Research Foundation

Cynometra travancorica Bedd. of the legume family Fabaceae is a lofty, beautiful tree, whose population is globally restricted to only four localities in the Western Ghats of India and hence red listed as 'Endangered' by IUCN¹⁰. R. H. Beddome has described this species for the first time in 1870, based on a single collection from Tamil Nadu¹¹. Later, this has been reported from few more pockets in the evergreen forests of Karnataka and Kerala¹². The highly fragmented sub-populations and the poor number of individuals in each locality reveal the fact that the species might have had a wide range of distribution in the past and might have shrunk to the present state due to extensive habitat loss. In view of all these facts, in 1997 the species was included in the Red Data Book of Indian Plants¹³ and was recommended for *in situ* protection with the help of the State Forest Departments and for *ex situ* protection by introducing into botanic gardens. But sadly, nobody has taken up any conservation efforts for this species until MSSRF included the species in its threatened species conservation programme in 2006.

Ms Dhanya's efforts of rescuing this important tree species began with tracing the real factors, including the historical processes that have led to the



endangerment of the species, so as to evolve the right strategy for its long-term conservation. For this, we adopted an approach wherein she rediscovered the natural population in the earlier reported localities in Kerala and studied the biological and ecological aspects of the species. The trees were observed thoroughly for three consecutive years to study the phenological events.

The severe decline in the population of this tree species is the result of destruction of its habitat for establishing cash crops and forestry plantation crops. Since the remaining population is in the Reserved Forests protected by the State Forest Department, there is minimal risk of further habitat loss, except the threat due to construction or widening of roads through these protected areas. Despite the healthy flowering and seed setting that occurred in the individuals, the number of seedling recruitments was very poor. Seed predation by insects was found to be a contributing factor for the poor seedling establishment in the field. But the major reason for the low regeneration was noticed to be the absence of soil moisture during the seed maturity period, as there exists a strong positive correlation between the seed maturity and the availability of rain and good soil moisture condition in the evergreen patch of its

occurrence that is crucial for the seeds to germinate. Owing to the climatic fluctuation that is occurring in the recent years, no seeds were found germinated under natural conditions. To tackle this problem she has collected mature seeds from selected mother population and sown in the nursery under different experimental conditions. The seeds showed 95% germination in river sand medium and 1572 healthy seedlings were raised by providing suitable nursery conditions.

These seedlings were used to restock the present population in order to keep up the minimum viable population of the species in the natural forests. Reintroduction of *Cynometra travancorica* as a shade tree in the cash crop plantations, which are in fact an extension of the natural forests or the buffer zone of the Reserved Forests, is a bold step towards restoring the once lost habitat of the species.

The efforts taken for planting this species in various botanical gardens, public lands, religious institutions etc. would help to achieve its *ex situ* conservation. It is expected that these actions will guarantee the continued existence of this endangered species in nature.





Fresh Lease of Life for a Wild Tree Spice

Contributor : Smitha S. Nair, M S Swaminathan Research Foundation

Myristica malabarica Lam. is a tree spice occurring in the low land evergreen forests of Western Ghats. It is a wild relative of the economically important tree spice *Myristica fragrans*. The species also has a very significant ecological role. It is reported that the aril is an important food item of Hornbills, a threatened group of birds, especially during their breeding season. During our survey it was also observed that the over harvesting of unripe fruits of *Myristica malabarica* has forced these avian species to migrate from the forests to adjacent farm lands in search of their favourite food. This has initiated crop loss to nut-meg cultivators in several parts of Kerala.

Being endemic to Western Ghats, conserving this species means conserving a set of precious genome of global significance for the future rescue of the cash crop and hence for the Indian economy in the changing scenario of climate crisis. Even though it is not commercially cultivated, the fruits of this wild species are harvested for the aril. The dried aril is widely used as an adulterant to the true spice and as raw material for various industries. Due to the comparatively high market value, harvesting is practiced throughout the Western Ghats, especially in the Kerala



part, which is the major distribution area for the species and thereby the species contribute as a seasonal means of subsistence for the forest dependent communities of Sahyadri. The mature fruits left out after harvesting are collected by the agri-nursery enterprisers for raising seedlings to be used as rootstocks for preparing grafted nut-meg plantlets.

Ms Smitha's study showed that over-exploitation and unscientific harvesting practices play a crucial role in limiting the natural regeneration rates, which subsequently lead to the rapid endangerment of the species. Since the fruits are not being allowed to mature, in the initial stages of research, it was really difficult to identify the correct maturation period or to collect healthy seeds to attempt propagation. The severity of the situation can be realized



from the fact that in the first and second years she could hardly collect 100 mature healthy seeds.

However, by establishing a good rapport with the local tribal harvesters, 1197 seedlings of *M. malabarica* were raised from different healthy mother populations selected from the northern, middle and southern parts of Kerala. Considering the short viability period, the mature seeds were collected either in gunny bags or in the intact fruit form without detaching from the fruit pod. The seeds sown in large poly bags (7 x 14 ") filled with a mixture of sand and vermi-compost in 1:1 ratio showed hundred percent germination and seedling survival under nursery conditions.

Since the harvesters of this forest commodity alone are the so far recognized drivers of population decline, awareness on the need and the mode of scientific harvesting has also been adopted along with the appropriate restoration efforts for rescuing the species.

3

Flight from Wild to Garden: On the Introduction of a “Wild Ornamental Vine”

Contributor: Sujana K. A., M S Swaminathan Research Foundation

Ms Sujana was able to successfully raise 16,280 seedlings of 10 RET woody climbers. Of the 10 species, *Beaumontia jerdoniana* Wight, a narrow endemic species confined to northwestern part of Brahmagiri hills attracts special attention because of its fragrant beautiful flowers. She propagated this species through seeds and by conventional vegetative means like stem cuttings and air layering. It is a gorgeous climbing plant and has a woody stem covered with green, leathery leaves. This fast growing plant produces large, white, aromatic, trumpet-shaped flowers in winter. Its fruits are long, thick and woody, at length separating into spreading follicular mericarps. Since the plant shows unrestrained growth, a large conservatory or shade is necessary for its cultivation.

A deep, well-drained bed of equal parts of sand, soil and compost is the best for *Beaumontias*. Planting should be done in early monsoon. While planting, wires or strings should be attached as support so that the shoots can hold up and climb. The side shoots need to be shortened by two-thirds after the flowers wither off, which results in the formation of new shoots. New young shoots can be inserted in sand or sandy soil in the spring season and place them in a propagating chamber until they get rooted. They can then be potted individually, in 5- or 6-inch pots and subsequently in their permanent position. Seed germination is also possible to raise seedlings; seeds planted in sand will give rise to new healthy seedlings within 3 weeks. Its white flowers in terminal cymes and evergreen nature makes it quite showy and it too has the potentiality to be introduced as an ornamental plant as *Beaumontia grandiflora* which is a close allied species of the same plant. Through this conservation effort, MSSRF distributed 228 seedlings of *Beaumontia jerdoniana* to farmers, planters, environmentalists for *ex situ* conservation of RET woody climbers. Efforts were also taken to introduce this species to landscape designers.



4

First Ever Record of Multiplication of *Ixora sivarajiana* Pradeep

Contributor: Manudev K. M., M S Swaminathan Research Foundation

Ixora sivarajiana Pradeep is a small tree with rose coloured showy flowers in dense terminal cymes and is found in tropical hill-top evergreen forests of southern Western Ghats. This species was first described by Pradeep¹⁴ from Vellarimala, Kozhikode and later, the occurrence of this tree was reported from the Chembra hills of Wayanad district. In both the areas the natural population is represented by only a few mature trees. In addition to that, Mr Manudev could locate a fairly rich population of this species in the montane forests of Kurichiarmala in South Wayanad Forest Division.

The tree is known for its habitat specificity as all the located populations are from the shola forests above 1600 MSL. The species is seen along the margins of shola forests, associated with *Symplocos racemosa*, *Calophyllum austroindicum*, *Syzygium hemisphericum* etc. Stem of this tree is characterised by prominent leaf scars having broadly ovate stipules. The pendent inflorescence is attractive with densely arranged rose coloured flowers blooming from November to March. During February to May, large numbers of globose, dark purple mature fruits are available.

He could observe a complete absence of seed borne plantlets in the natural population of the species that normally multiplies only through root suckers. However, with repeated field explorations to all the reported localities, he could note that there is profuse flowering followed by good rate of seed setting. His observations revealed that each tree produces thousands of seeds, but none of them germinates. Later, it was also noted that 95% seeds are infested with an insect pest that feeds on the mature embryo inside. Since the outer surface of the fruit does not show any signs of larval infestation, it is assumed that the plant has an important role in the life cycle of that insect which might have laid eggs inside the flowers.

Mr Manudev tried out different vegetative propagation techniques using stem and root cuttings. Introduction of roots suckers *ex situ* was not completely successful. Stem cuttings showed very poor response even to the application of rooting hormones. However, he succeeded in producing over 200 healthy seedlings of this species through seed propagation under nursery condition. This is a noteworthy success towards the conservation of a narrow endemic tree species.



5

Cent percent Seed Germination for a difficult species *Poeciloneuron indicum* Bedd.

Contributor : K. Satheesh, Centre for Medicinal Plants Research, Arya Vaidya Sala, Kottakkal

Poeciloneuron indicum Bedd., “Poothamkolli, Vayila or Vazha” of family Bonnetiaceae is a case for special mention due to its rarity, medicinal property and economic importance. Hence, the multiplication of the species is relevant. It is reported that the root paste prepared in goat milk, if taken internally on the first and second day of menstruation, can act as an oral contraceptive. The wood is economically important as it is used for making agricultural implements, rice-pounder, walking sticks, electric transmission poles, railway-sleepers and paving blocks.



Through various experiments conducted for multiplication by seeds, the normal rate of germination was found to be below 50%. However, it was accidentally discovered that the mature fruits in transparent air-tight plastic bags, kept in dark could accelerate the process of germination. Repeated experiments have proved 100% germination rate in air-tight transparent polythene bags kept in dark. Based on these trials, he has standardized an efficient protocol for the multiplication of this difficult species. Using this technique, the seedlings with an average length of 9 cm for radicle and 5 cm for plumule can be produced within eight days. The seeds thus germinated were then transferred to soil and the seedlings have shown healthy growth in normal condition. He has succeeded in raising about 1600 robust seedlings to augment the deteriorating natural population of this endemic medicinal tree.



This is an occasional species in evergreen forests. Mr Satheesh collected the fruits from all the reported localities in Kerala viz. Agasthyarmala (Thiruvananthapuram), Pandimotta (Kollam), Periyar Tiger Reserve (Idukki) Parambikulam (Palakkad), Changaramkulam (Malappuram), Chandanathode (Kannur) and Perya (Wayanad).



6

Saving a Little-Known Medicinal Climber from the Fate of Extinction

Contributor : K. S. Surabhi, S N M College, Malliankara

Strophanthus wightianus Wall. ex Wight is a woody climber found along the western coasts of Kerala with the distribution restricted mainly to sacred groves, which are true remnants of a past vegetation. The plant is of great phytogeographical significance as it is one among the only two species of *Strophanthus* found in the Indian sub continent. The genus is represented with a good majority of species in Africa where these plants serve as the principal source for the fatal arrow poison used by indigenous people. The related species of this plant are reported to possess cardiac glycosides that have application in the production of drugs for heart ailments. The glycosidic content of the seeds of *Strophanthus wightianus* has also been mentioned in several pharmacopoeias under the name strophanthin¹⁵. Hence the plant is considered as an under-exploited endemic officinal species having much scope in future medical research. But presently, the plant is under threat due to severe habitat loss by increased human interference in sacred groves. It may face the fate of extinction even before the human race can fully recognize its healing potential.

In this context, the contribution of Ms Surabhi to conserve the species deserves special mention. Her efforts of saving this important species began with exploring its reported localities and collecting propagules for mass multiplication. It has been observed that the seeds of this plant have a fairly long viability period of three years and a germination success of 86 percent. By this action research she was able to raise over 600 seedlings through seed



germination trials. As an attempt to increase the population size by expanding the distribution extent to other possible areas through *ex situ* conservation measures, 300 seedlings were translocated to Wayanad district for introduction into wild habitats including Reserved Forests.



7

Resurrection of a 'Possibly Extinct' Species

Contributor : P. Sujanapal, Kerala Forest Research Institute

Syzygium palghatense Gamble (Myrtaceae) is a Critically Endangered tree species restricted to the Palghat hills of southern Western Ghats, Kerala. This species was presumed to be extinct until Dr P. Sujanapal along with Dr N. Sasidharan rediscovered the species in the montane forests in 2002¹⁶, which has confirmed its existence in the type locality. They reported 16 mature trees from the type locality, Pandaravarai of Parambikulam Wildlife Sanctuary. There after, the conservation efforts taken up by the Kerala Forest Research Institute has resulted in its rescue up to certain level of *ex situ* conservation. The threat factors identified for this species are infrequent flowering, low seed setting, highly restricted populations of the species, reduced number of mature individuals and predation of fruits by wild fauna.

As part of the RET project of MSSRF, he began locating the earlier reported localities of this species and collected propagules for mass multiplication. It is observed that the fruits of these plants are edible. By this action research he was able to raise over 350 seedlings through both seed and vegetative propagation trials. 300 seedlings were successfully translocated to wild



habitats in Wayanad district including Reserved Forests. His study was an attempt to understand the problems involved in the translocation and conservation status of this highly habitat specific Critically Endangered tree.



8

'*Munrochloa*' - A New Genus (Poaceae: Bambusoideae)

Contributor : M. Remesh, CRIKSC, Kozhikode

Dr Remesh was involved in an interesting study as part of the project work. He and his earlier colleagues at KFRI while working on the revisionary studies of the genera *Oxytenanthera* Munro, *Pseudoxytenanthera* Soderstr. & Ellis, observed that *Pseudoxytenanthera ritchiei* (Munro) Naithani, possessed characters not included in the genus *Pseudoxytenanthera*. Detailed morphological studies revealed that the species possesses a number of unique characters which are very distinct from the generic characters of *Oxytenanthera* and *Pseudoxytenanthera*. The researchers erected a new genus to accommodate the species. It was Colonel Munro¹⁷ who first described the new species in his monograph on Bambusa. *Bambusa ritcheyi*, was based on a herbarium specimen collected by J.C. Ritchie from Kala Nuddi, Bombay, India. In the addenda of the same publication, Munro corrected the spelling of the ritcheyi to 'ritchiei' to commemorate Ritchie's name. After a lapse of five years Beddome¹⁸ collected this bamboo from Anamalai and included it under the genus *Oxytenanthera* Munro. Due to the presence of a monostigmatic ovary, Beddome named this species as *Oxytenanthera monostigma*. This species was subsequently reported by various workers from Western Ghats, hills of south west India from Mahabaleshwar to Anamalai up to



Palakkad gap such as Brandis from Sattara Ghats in 1870; R.S. Fagan at Mahabaleshwar in 1892; WA. Talbot from North Canara in 1884 and 1889; R.C. Wroghton, from Pune district and A.D. Wilkins from Ahamed Nagar in 1892¹⁹. Gamble stated that Munro himself had also agreed with the new treatment as *Oxytenanthera monostigma*. Later, Brandis²⁰ and Bourdillon²¹ followed this treatment. Gamble noted that the species has very well-marked velvety culms, a narrow culm sheath, long narrow spikelets with only one flower, and a glabrous ovary and style.

This species is endemic to Western Ghats. It is distributed in northern Kerala and Karnataka. It was also reported from Maharashtra. It is found growing from an altitude of 200 to 1100 MSL. It is a component of moist deciduous forests and also found as pure patches. Sporadic flowering is common during summer months. Gregarious flowering was observed at Nilambur forests, Malappuram district, Kerala. This potential bamboo of south India is extracted for various uses. The solid culms of this bamboo are used for making furniture, lathi etc. It is also used as a support for betel plants, for making baskets, umbrella handles and walking

sticks. The recent study by the authors revealed that the species is Conservation Dependent as per the IUCN standards and needs appropriate conservation and management strategies for sustainable utilization.



'for RET Activities

In 2007, the forum *for RET* was formed with the major objective to ensure open-ended participation of organizations and individuals working for the cause of conservation of RET species of Western Ghats and Western Indian Coast. The forum, since then, has been active and has conducted some notable discussions and workshops on themes related to the mandated subjects. The members of the forum, notably the Fellows extended several education programmes to various institutions and individuals on conservation related topics (Box 1). Considering one of the creative suggestions that emerged during *for RET* discussions, a bird census was conducted in the south Wayanad region, a major operational location of the project. It was with the rationale that the variations in avian population before and after the establishment success (by the time of reproductive maturity) of the reintroduced RET plant species in the area would serve as an indicator to assess the ecosystem level impact of the 80 RET programme and thereby to generate further scientific background for future conservation initiatives. The fact behind this idea was that birds are the easily detectable direct indicators of sudden ecosystem changes.

The forum has now initiated steps in bringing out a publication on the major components of biodiversity of Wayanad district. This common platform of *for RET* is expected to equip the member researchers to work together for the common goal of RET conservation. This forum is also offering scientific and technical advice for other institutions

and individuals in survey, collection, multiplication and reintroduction of threatened species into the natural habitats. By working in close co-operation with established organizations like Departments of Forests and Tribal Welfare, Non-Governmental Organizations and key individuals/institutions who can influence and motivate society for conservation, the *for RET* proved highly effective in executing a wide outreach to the call for saving RET plant species.

Two major initiatives that was undertaken by the *for RET* team are described:

I. Survey of Birds of south Wayanad

A survey was carried out under the leadership of Mr C. K. Vishnudas, an active member of the *for RET* on the avian fauna of south Wayanad region under the capacity building initiative of the project. Altitudinal variations and diverse vegetation types (evergreen,

semi evergreen, moist deciduous, grasslands, sholas and rocky shrubs) in south Wayanad offers ideal habitat for a good number of birds including many endemic ones. During the survey, there were some opportunistic observations of rare and endemic birds such as White-bellied Shortwing, Nilgiri Laughing Thrush, Grey-breasted Laughing Thrush, Black- and- orange Flycatcher, Nilgiri Wood Pigeon, Jerdon's Baza, Great Pied Hornbill etc. from this region.

The major highlights of this study are:

- 8,869 birds were recorded in 210.10 field hours with 70 transects!
- 214 species in a single survey, highest for any surveys in Kerala
- 14 Western Ghat endemic species
- High raptors diversity (18 species)
- Good population of endemic Black-chinned Laughing Thrush
- 8 Red Listed species

Table 8. Red Listed birds in south Wayanad

| Species | IUCN Category (2008) | Numbers |
|-------------------------------|----------------------|---------|
| Black-chinned Laughing Thrush | Endangered | 100 |
| Nilgiri Wood Pigeon | Vulnerable | 7 |
| White-bellied Shortwing | Vulnerable | 4 |
| Pallid Harrier | Near Threatened | 2 |
| Nilgiri Pipit | Near Threatened | 12 |
| Tytler's Leaf Warbler | Near Threatened | 4 |
| Black-and-orange Flycatcher | Near Threatened | 16 |
| Nilgiri Flycatcher | Near Threatened | 28 |

The threatened bird species recorded during the survey that followed the Birdlife International Guidelines²², are enlisted in Table 8. The high concentration of Grey- breasted Laughing Thrush, Nilgiri Wood Pigeon, Tytler's Leaf Warbler and Black- and- orange Flycatcher is particularly noteworthy, emphasizing the importance of this biologically rich area.





Nilgiri Flycatcher

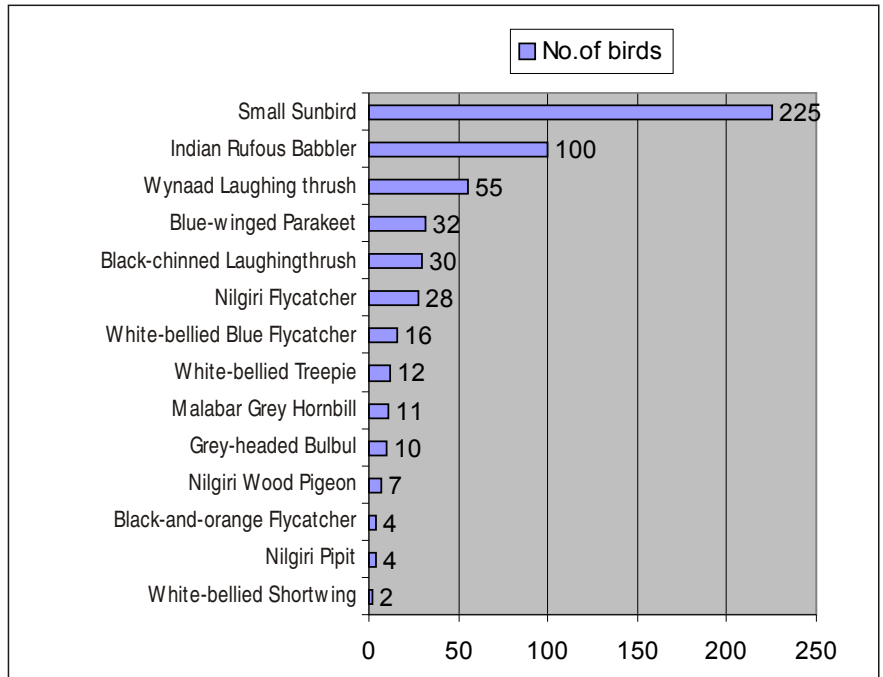


Fig 7. Endemic population of birds in south Wayanad

The number of bird species endemic to Western Ghats recorded from this study is shown in Fig. 7. We could observe fourteen out of the sixteen endemic bird species of Western Ghats from south Wayanad region. The high concentration of endemic species indicates the richness of this tropical ecosystem.

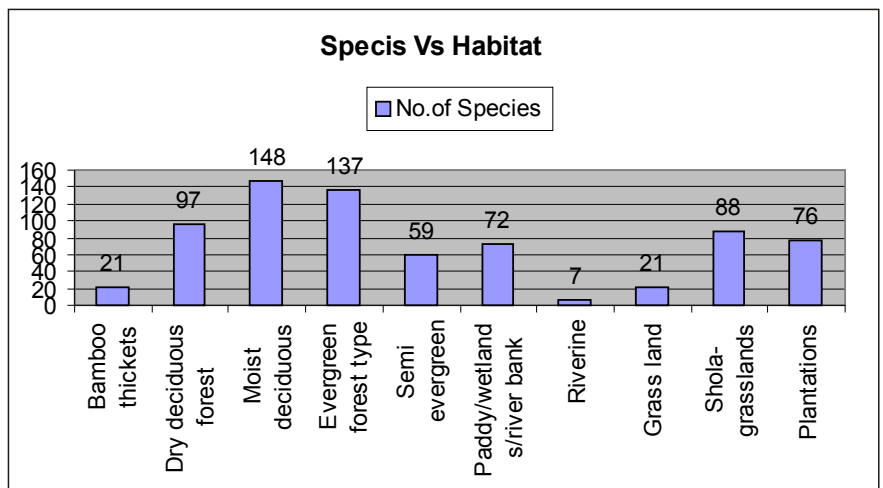


Fig 8. Species vs. Habitat distribution of birds in south Wayanad



Nilgiri Pipit



Mr C. K. Vishnudas

2. Workshop on Plant Taxonomy for Taxonomy Teachers and Researchers

A five-day workshop on plant taxonomy was jointly organized by the Community Agrobiodiversity Centre and the Centre for Floristic Research- Department of Botany, Madras Christian College (CFR-MCC), Chennai under the auspices of the Indian Association for Angiosperm Taxonomy (IAAT) for teachers and researchers from 19th to 23rd February 2009 at CAbC, MSSRF. The workshop was partially sponsored by Sir Dorabji Tata Trust (SDTT), Mumbai and the Kerala State Council for Science, Technology and Environment (KSCSTE), Thiruvananthapuram and training funds of MSSRF. This was an effort to strengthen the activities of the *for RET*.

The objectives of the workshop were: (i) to provide sound theoretical knowledge on important taxonomic concepts including nomenclature, (ii) to provide training in writing descriptions and making keys, (iii) to update the knowledge on available taxonomic resources such as databases, floras, journals and websites, (iv) to offer training in methods of vegetation sampling and analysis, and (v) to train the participants to draw quality illustrations.

Nineteen participants from various research institutes, colleges and universities from Kerala and Tamil Nadu attended the workshop. Seven research scholars of CAbC also attended the workshop. Fourteen resource persons were invited to give lectures with fieldwork and hands on training on various topics in taxonomy. Dr D. Narasimhan, Reader, MCC co-ordinated the academic schedule of the workshop.



Recommendations from the workshop forum

The enthusiasm of the participants and the number of applications received on the announcement of the taxonomy workshop has made it clear that there is a large lacuna where such trainings are concerned. Based on this, the following recommendations were made:

- 1 Through strong partnership building, CAbC will explore the possibility of holding the 2011 Indian Association Angiosperm Taxonomy (IAAT) Congress at the Community Agrobiodiversity Centre (CAbC) campus by coordinating with IAAT member organizations like KFRI, TBGRI, MCC etc.
- 2 *for RET*, the forum for conservation of Rare, Endemic and Threatened Species of Western Ghats and Western Indian Coast will explore the possibility of making CAbC a focal point for plant/angiosperm conservation and extension programmes.
- 3 CAbC with the support of Sir Dorabji Tata Trust will explore the possibility of instituting more fellowships in the field of taxonomy.
- 4 CAbC through the *for RET* forum will also extend support to colleges offering taxonomy at Post Graduate level in helping their teachers upgrade their skill and knowledge in plant identification by offering 1-2 days training programmes.

The Fellows showed exemplary commitment in conducting conservation awareness campaigns and proved that these are the major outreach methods for enhancing and ensuring RET conservation through the forum *for RET*.



Training for the participants in vegetation sampling

Awareness campaigns undertaken by for RET

- ▶ Campaign of the forum for RET was conducted and seedlings of RET species were planted at DFO's Office, Mananthavady (19th January 2007).
- ▶ On World Forest Day 2007, 40 RET species were planted in the Conservation Garden of Community Agrobiodiversity Centre, MSSRF, Kalpetta.
- ▶ A one-day seminar on 'Taxonomy *vis-à-vis* conservation' was organized in commemoration with the 300th birth anniversary of Carl Linnaeus, the 'Father of Taxonomy'. A total of 95 participants comprising scientists, research scholars, post graduate students, Forest Department officials and VSS members was given awareness on the need of conserving threatened plant species and the role of taxonomy in conservation (23rd May 2007).
- ▶ As part of observing the World Environment Day 2007, a colloquium was conducted on the topic "Significance of Biodiversity Conservation in the Context of Wayanad".
- ▶ In association with Mananthavady River Protection Forum, an Environment Awareness Campaign was conducted at Aksharajothi Library, Valliyurkavu, Mananthavady and 40 riparian species were planted (2nd September 2007).
- ▶ A one-day programme on "Conservation of Biodiversity of Wayanad District" was conducted with an aim to develop comprehensive strategies for conserving the floral and faunal components of the District (24th January 2008).
- ▶ In order to popularize RET species among the public, an exhibition stall was arranged at the 21st Annual Flower, Fruit and Vegetable Show cum Commercial Exhibition organized by Wayanad Agri-Horticultural Society (18th - 27th January 2008).
- ▶ Focusing the UNEP's World Environment Day theme for 2008 'CO₂ KICK THE HABIT! TOWARDS A LOW CARBON ECONOMY', a one-day programme was organized at CABc. The significance of conserving RET species to address the issues of climate change was highlighted on the occasion. A talk on Climate Change by Prof (Dr) P. V. Joseph (Former Director, Indian Meteorological Department, Ex Research Associate, University of Colorado, USA and former UGC Visiting Professor, CUSAT) was organized and a display of RET species was also arranged for the popularization of the species.
- ▶ A one-day awareness programme on RET conservation was organized for the coordinators of National Green Corps (Harithasena), a conservation movement among school children where in 75 teachers attended (25th July 2008).
- ▶ Campaign for the inclusion of RET tree species in the afforestation programmes of Kerala Forest Department at a meeting of environmentalists from five districts of North zone, organized by the State Forest Dept. chaired by the State Minister for Forests (26th May 2009).



Inauguration of the one day seminar on Taxonomy



Visitors in RET nursery



Distribution of RET seedlings



Planting of *Vateria indica* by Dr Sharmila Mary Joseph IAS, District Collector



Executive Committee meeting of for RET

Education programmes undertaken by for RET

As part of Education on conservation, following lectures were delivered:

- ▶ Lectures on the 'Need of conserving Biodiversity' for the students of Every Child a Scientist Programme of CAbC during the summer vacation camp (March 2007).
- ▶ Lecture on 'Bamboo: Significance Taxonomy and Identification' in connection with International Training Workshop on Bamboo Propagation, Management and Harvesting: Methods, Policy and Strategies at KFRI, Peechi, Thrissur (7th April 2007).
- ▶ Lecture on 'The Relevance of Indigenous Knowledge and Biodiversity Conservation' at Government Teacher Training Institute for Women, Kumarapuram, Palakkad (20th August 2007).
- ▶ Lecture on 'Significance of Conserving Little known Medicinal Plants' at the National Seminar on Medicinal Plants: Strategies for Conservation at Arya Vaidya Sala, Kottakkal (4th December 2007).
- ▶ Lecture on 'The importance of Medicinal Plants Conservation' at Chengara Govt. V.H.S.S as part of National Service Scheme training programme (23rd December 2007).
- ▶ A lecture on 'Bamboo: Significance, Taxonomy and Identification' in connection with Bamboo Technical Support Group for South Zone Third Training for Field Functionaries on Priority Species, Resource Estimation, Plantation Development, Post harvest Technology and Socio-economic Livelihood Potential Bamboos at KFRI (4th February 2008).
- ▶ Lecture on 'Floristic Wealth of Kerala' for the students of summer vacation camp (May 2008).
- ▶ Lecture on 'The Significance of Agrobiodiversity Conservation' at CAbC as part of observing the World Agrobiodiversity Day 2008 (16th May 2008).
- ▶ Lecture on the 'Need of Conserving the Endangered Trees of Western Ghats' for the students of Govt. Girls Higher Secondary School, Panthalayani, Koyilandy, Kozhikode (5th July 2008).
- ▶ Lecture on 'An Introduction to Biodiversity' for the school children on OISCA Day 2008 (23rd July 2008).
- ▶ Lecture on 'Importance of Conserving Rare Plants of Kerala' for the Post Graduate students of S.N.M. College, Maliankara (27th July 2008).
- ▶ Demonstration lecture on 'Local Plants in Indigenous Knowledge and their Significance for Livelihood of Rural and Tribal Population' at the workshop on 'Conservation and Application of Indigenous Knowledge and Biodiversity for better Livelihood' held at Vilayannur Lower Basic School, Vilayannur Post, Thenkurussi, Palakkad District (March 2008).

The plant species of a few conservation gardens were identified and labeled so as to educate the visitors. The said gardens are:

1. Botanic Garden IFGTB, Coimbatore Tamil Nadu
 - Campus of Sunglow Biotech, Vadavalli, Coimbatore, Tamil Nadu
 - Campus of Amrita Vishwa Vidhyapeetham, Ettimadai, Coimbatore Tamil Nadu
 - Medicinal Plants Conservation Park of Wayanad Social Service Society, Mananthavady, Wayanad
 - Medicinal Plants Garden of SHREYAS, Sulthan Bathery, Wayanad



Box 3

Restoration and Awareness programme

A programme for restoration and awareness generation was organized from 5th to 10th June 2009 in collaboration with the Department of Forests and Wildlife, Govt. of Kerala, National Green Corps, Kalpetta and the Rotary Club, Kalpetta in connection with the World Environment Day programmes. The talk by Sri. O. Jayarajan (Deputy Conservator of Forests (Rtd.)) on 'The Need of Conserving Trees' started off the programme on June 5th. Labels, bookmarks and posters on RET species were prepared and distributed to school students, Government departments and NGOs. The display of potted RET species was also arranged in the courtyard of Community Training Centre at CAbC for creating awareness and popularizing RET species. 123 participants comprising Forest Department officials, students, farmers and other interested groups attended the programme.

A 'Road Campaign' was organized on 8th June at the Traffic Junction, Kalpetta and 1500 stickers conveying the message of promoting a 'tree care culture in the society', were distributed to private/government vehicles and taxis of Wayanad district. A team of 25 volunteers comprising the conservation team of CAbC, the members of Biodiversity Conservation Corps (BCC) and the members of Rotary Club Kalpetta participated.

As part of promoting the conservation of RET species by including it in the afforestation programmes, a planting programme was organized in association with Rotary Club, Kalpetta and 100 seedlings of *Vateria indica*, one of the target tree species were planted approximately for 1 km distance of the bypass road, Kalpetta.





Casearia wynadensis Bedd.